INCH-POUND

MIL-PRF-6081D
w/Amendment 1
30 January 2009
SUPERSEDING
MIL-PRF-6081D
10 November 1997

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 two grades of jet engine lubricating oil.

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

Grade	NATO Symbol
1005	
1010	0-133
1010N	

Comments, suggestions, or questions on this document should be addressed to ASC/ENRS, 2530 Loop Road West, Wright-Patterson AFB, OH 45433-7101 or emailed to engineering.standards@wpafb.af.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.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 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-791	Lubricants, Liquid Fuels, and Related Products; Methods of Testing

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-290	Packaging of Petroleum and Related Products

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 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 or contract.

CODE OF FEDERAL REGULATIONS (CFR)

DEPARTMENT OF LABOR

29 CFR 1910.1200	Occupational Safety and Health Standards – Hazard Communications

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 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 Oils
ASTM D130	Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity) (DoD adopted)
ASTM D974	Standard Test Method for Acid and Base Number by Color-Indicator Titration
ASTM D1500	Standard Test Method for ASTM Color of Petroleum Products
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

(Copies of these documents are available online at www.astm.org or from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959.)

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 which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see *4.2* and *6.3*).

3.2 Materials. The composition of this lubricating oil is not limited; however, viscosity index improvers and known or suspected human carcinogens (as defined by the Occupational Safety and Health Standards – Hazard Communications, *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*).

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

ASTM Test Method	Toxic Chemicals/ ODC Substance	Acceptable Substitutes
ASTM D2532 Viscosity and Viscosity Change After Standing at Low Temperature of Aircraft Turbine Lubricants	Toluene	n-Heptane
ASTM D4636 *Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils*	*Trichlorotrifluoroethane* *1,1,1-Trichloroethane*	*n-Heptane*
Federal Test Method		
FTM 5308 *Corrosiveness and Oxidation Stability of Light Oils (Metal Squares)*	*1,1,1-Trichloroethane*	*n-Heptane* *or* *Acetone*

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.

Characteristic	Requirement		Test Method	
	Grade 1005	Grade 1010/1010N	ASTM	FED-STD-791
Acid number (T.A.N.), mg KOH/g	0.10 max 1/	0.10 max 1/	*D974*	
Viscosity at:				
37.8°C (100 °F), cs	5.0 min	10.0 min	*D445*	
-40°C (-40 °F), cs		3000 max	*D2532*	
-54°C (-65 °F), cs	2600 max		*D2532*	
Viscosity stability cs, % change @ 3 hours:			*D2532*	
-54ºC (-65 ºF)	3 max 2/			
-40ºC (-40 ºF)		2 max 2/		
Flash point, °C (°F)	107 (225) min	132 (270) min	*D92*	
Pour point, ºC (ºF)		-57 (-70) 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 121ºC (250 ºF) 3/			*D4636*	*FTM 5308* 5/
Post Test Oil Properties				
Viscosity change, % 4/	-5 to +20 max	-5 to +20 max		
Acid number change	0.2 max	0.2 max		
Sludge volume, ml	no visible sludge	no visible sludge		
Post Test Metal Specimen Weight change, mg/cm^2 6/				
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) 7/	0.005 ml max 8/	0.005 ml max 8/	D2273	*FTM 3010.1*
Grade 1010 N sediment requirement, mg/l		2.0 max		

1/ *Titrate to a pH 11 end point.*

2/ *Viscosity measurements taken at the specified temperature after three hours at test temperature, 121ºC (250ºF).*

3/ *Measurements taken after metal has been subjected to the lubricating oil for 168 hours at 121ºC (250ºF).*

4/ *Compared with viscosity of new oil samples tested at 37.8ºC (100ºF).*

5/ *When substituting heptane or acetone for 1,1,1-trichloroethane, use the heptane or acetone at ambient temperature; do not heat as required by paragraphs 6.6.1 and 6.10.1 of FTM 5308.*

6/ *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.*

7/ *When using Method D2273 to determine presence of trace sediment in the lubricating oil, no diluents shall be used.*

8/ *Measurements taken after centrifuging.*

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

4. VERIFICATIONS

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 may be required on candidate formulations.

4.2.1 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 submitted shall be from the same bulk lot used in preparation of the qualification test sample. Upon receiving authorization from AFRL/RZTM, these samples shall be forwarded to AFRL/RZTM, 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:
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*).

4.2.2 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.

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 *3.5*) of the candidate product and for each of the additive components used in the formulation.

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* or *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 acceptance 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/RZTM, 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.*

4.4.1 Reported data. Test results of all determinations shall be included in reporting data.

TABLE II. Conformance tests.

Characteristic	Test Paragraph	Test Method ASTM
Copper strip corrosion (see *table I*)	--	*D130*
Viscosity stability at -54 ºC (-65 ºF) and –40 ºC (-40 ºF), % 1/	--	*D2532*
Acid number, mg KOH/g (see *table I*)	--	*D974*
Viscosity (see *table I*), cSt at 37.8 °C (100 °F) at -40 °C (-40 °F) at –54 °C (-65 °F)	--	 *D445* *D445* *D2532*
Flash point ºC (ºF). (see *table I*)	--	*D92*
Pour point ºC (ºF). (see *table I*)	--	*D97*
ASTM color (see *table I*)	--	*D1500*
Trace sediment in lubricating oils (see table I)	--	*D2273/ FTM 3010.1*

1/ *Viscosity measurements taken at the specified temperature after three hours at test temperature, 121ºC (250ºF).*

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 material 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. The lubricating oils procurable to the 1005 and 1010 grades of this specification are intended for the use in specific models of military aircraft jet engines. Lubricating oil procured to the 1010N grade of this specification are intended for use as preservative fluids for aircraft fuel system components and equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, grade, and date of this specification, including any amendments.

b. Type and size of containers required (see *5.1*).

c. Quantity desired.

d. Submittal of conformance test results (see *4.3.3*).

e. 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 *QPL-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 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/RZTM, 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 should forward a written request for such action to the Propulsion Directorate at the above address. This letter should 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.

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 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
petroleum product
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 would 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. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Air Force - 11
Navy - AS

Preparing activity:
Air Force - 11

(Project. 9150-2009-002)