

MIL-L-25336B (USAF)

2 July 1965

SUPERSEDING

MIL-L-25336A (ASG)

23 March 1960

## MILITARY SPECIFICATION

LUBRICATING OIL, AIRCRAFT TURBINE ENGINE,  
SYNTHETIC BASE, HIGH FILM STRENGTH

## 1. SCOPE

1.1 This specification covers high film strength, synthetic base, aircraft turbine engine lubricating oil.

STANDARDSFederal

Federal Test  
Method  
Standard  
No. 791

Lubricants, Liquid  
Fuels, and Related  
Products; Method  
of Testing

## 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Military

MIL-STD-290

Packaging, Packing  
and Marking of  
Petroleum and  
Related Products

SPECIFICATIONSMilitary

MIL-E-5009 Engines, Aircraft,  
Turbojet, Qualifica-  
tion Tests for  
MIL-O-6081 Oil, Lubricating,  
Jet Engine  
MIL-L-7808 Lubricating Oil,  
Aircraft Turbine  
Engine, Synthetic  
Base  
MIL-C-8188 Corrosion-Preventive  
Oil, Gas Turbine  
Engine, Aircraft  
Synthetic Base  
MIL-L-9236 Lubricating Oil,  
Aircraft Turbine,  
400°F

(Copies of documents required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing Materials  
Standards on Petroleum Products and  
Lubricants

American Society for Testing Materials  
Manual on Measurement and Sampling  
of Petroleum and Petroleum Products

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(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

## 3. REQUIREMENTS

3.1 Qualification. The lubricating oil furnished under this specification shall be a product which has been tested, and passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable Qualified Products List.

3.2 Materials. The composition of the lubricating oil shall not be limited. Additives to impart oxidation stability, corrosion-preventive properties, and antiwear properties will be permitted.

3.3 Properties. The properties of the lubricating oil shall conform to table I.

3.3.1 Viscosity stability. The viscosity determination shall be made at  $-65^{\circ}\text{F}$  ( $-54^{\circ}\text{C}$ ). The two determinations under the 3-hour test shall not differ by more than 6.0 percent of the lowest value, and both shall be below 13,000 centistokes. All determinations made under the 72-hour test shall be below 17,000 centistokes.

3.4 Corrosion and oxidation stability at  $347^{\circ}\text{F}$  ( $175^{\circ}\text{C}$ )

3.4.1.1 Corrosion. When subjected to the lubricating oil for 72 hours at  $347^{\circ}\text{F}$  ( $175^{\circ}\text{C}$ ), the change in weight of steel, silver, aluminum alloy, and magnesium alloy shall be not greater than  $\pm 0.2$  milligram per square centimeter of surface. The change in weight of copper shall be not greater than  $\pm 0.4$  milligram per square centimeter of surface. There shall be no pitting, etching, or visible corrosion on the surface on any of the metals when viewed under a magnification of 20 diameters. Staining of the metals shall be permitted.

3.4.1.2 Oxidation stability. The lubricating oil shall not change more than  $-5$  to  $+15$  percent from the original viscosity at  $100^{\circ}\text{F}$  ( $37.8^{\circ}\text{C}$ ) under the corrosion requirements specified in 3.4.1.1. The total acid number shall not increase by more than 2.0. Darkening of the oil during testing will be permitted.

3.4.2 Silver and copper corrosion. When subjected to the lubricating oil for 50 hours at  $450^{\circ}\text{F}$  ( $232^{\circ}\text{C}$ ), the loss in weight of silver and copper shall not exceed 3.0 milligrams per square inch.

TABLE I. Properties

Viscosity, centistokes at $210^{\circ}\text{F}$ ( $98.9^{\circ}\text{C}$ ), (min)---	3.0
Viscosity, centistokes at $100^{\circ}\text{F}$ ( $37.8^{\circ}\text{C}$ ), (min)--	11.0
Flash point (min) (COC)-----	$400^{\circ}\text{F}$ ( $204^{\circ}\text{C}$ )
Pour point (max)-----	$-75^{\circ}\text{F}$ ( $-59^{\circ}\text{C}$ )

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**3.4.3 Lead corrosion.** When subjected to the lubricating oil for 1 hour at 325°F (163°C), the loss in weight of lead shall not exceed 6 milligrams per square inch.

**3.5 Evaporation.** When subjected to 400°F (204°C) for a period of 6-1/2 hours, evaporation loss of lubricating oil shall not exceed 35 percent.

**3.6 Load-carrying ability.** When run with the lubricating oil at 10,000 ±100 rpm for 10 minutes at each prescribed load with an oil inlet temperature to the gears at 165° ±5°F (73.9° ±2°C), scuffing of the working tooth area of the gears shall not exceed 22.5 percent. Scuffing is that degree of scratching, scoring, wear, or abrasion which obliterates the axial grinding marks on the gear tooth.

**3.7 Swelling of synthetic rubber.** Swelling of standard synthetic rubber H due to the test lubricating oil shall be not less than 12 percent nor more than 35 percent.

**3.8 Foaming characteristics.** The lubricating oil shall not exceed the following values for the indicated sequence:

a. Sequence 1. 100 ml maximum foam immediately following the bubbling period and complete foam collapse within 5 minutes.

b. Sequence 2. 25 ml maximum foam immediately following the bubbling period and complete foam collapse within 3 minutes.

c. Sequence 3. 100 ml maximum foam immediately following the bubbling period and complete foam collapse within 5 minutes.

**3.9 Deposition number.** The average deposition number for the lubricating oil shall not exceed 5.0 for qualification testing nor 5.5 for acceptance testing (see 4.6.1.2).

**3.10 Compatibility.** The lubricating oil covered by this specification shall be compatible with oil conforming to MIL-O-6081, grade 1010, MIL-C-7808, MIL-C-8188, and MIL-L-9236. The mixtures shall not be turbid at the conclusion of testing.

**3.11 Storage stability.** When tested as specified in 4.6.2, the lead corrosion in the lubricating oil shall not exceed 150 mg/in.<sup>2</sup> after 45 days.

**3.11.1 Extended storage stability.** After 12 months of storage, in a dark room at a room temperature of 75° ±5°F (24° ±3°C), the oil shall show no sign of separation and shall meet the requirements specified herein except those specified for the engine.

**3.12 Sediment.** After centrifuging, the sediment shall not be more than 0.005 ml per 200 ml of oil.

**3.13 Engine endurance.** The lubricating oil shall meet the requirements of MIL-L-7808 after the 100-hour engine endurance test. There shall be no significant changes in physical or chemical properties as a result of engine operation.

**3.14 Workmanship.** The lubricating oil shall be transparent, uniform in appearance, and shall be free from sediment, cloudiness, suspended matter, or other alterations when examined visually by reflected light both before and after centrifuging.

#### 4. QUALITY ASSURANCE PROVISIONS

**4.1 Responsibility for inspection.** Unless otherwise specified in the

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contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

**4.2 Classification of tests.** The inspection and testing of lubricating oil shall be classified as follows:

- a. Qualification tests
- b. Quality conformance tests.

**4.3 Inspection lots**

**4.3.1 Bulk lot.** An indefinite quantity of a homogeneous mixture of material manufactured as one batch at one time and place shall be considered a bulk lot.

**4.3.2 Packaged lot.** A homogeneous mixture of material from a single bulk lot in an indefinite number of 55-gallon drums or smaller containers shall be considered a packaged lot.

**4.3.3 Sampling instructions.** Each bulk or packaged lot shall be sampled in accordance with method 8001 of Federal Test Method Standard No. 791.

**4.3.4 Material inspection.** Material inspection shall be in accordance with method 9601 of Federal Test Method Standard No. 791

**4.4 Qualification tests**

**4.4.1 Test samples.** The test samples shall consist of 200 gallons of lubricating oil from a single lot selected in accordance with 4.3.1. The samples shall be identified with the manufacturer's own part number and such other information as required by the qualifying activity.

**4.4.1.1** The qualification test samples shall be accompanied by a certified test report containing laboratory test data from a commercial testing laboratory, certified by the qualifying activity, showing the results of all tests specified herein except the endurance test (see table II) and the storage stability test (see 4.6.2). The report shall include general information as to the chemical type or trade name of the ingredients used and shall identify the major or minor constituents and source of the constituents. Exact formulation data in terms of relative percentages will not be required; however, the right is reserved to require complete and exact formulation data should the need arise.

**4.4.2 Qualification tests.** The qualification tests shall consist of all the tests specified under 4.6.

**4.5 Quality conformance tests.** The quality conformance tests shall consist of all the tests specified under 4.6 except the compatibility test (see table II), the storage stability test (see 4.6.2), and the 72-hour viscosity stability test (see table II).

**4.5.1 Sampling.** The samples shall be selected from a single lot as

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TABLE II

Test methods 1/

Requirements	Fed Test Method Std No. 791	ASTM Stds
Kinematic viscosity at 210°F and 100°F	305	D445
Flash point	1103	D92
Pour point	201	D97
Viscosity and viscosity stability test at -65°F (-54°C)	307-T	
Corrosion and oxidation stability test at 347°F (175°C) <u>2/</u>	5308	
Corrosion test at 450°F (232°C)	5305-T	
Lead corrosion test	5321	
Evaporation test <u>3/</u>	351	D972
Load-carrying ability (gear test) <u>4/</u>	6508-T	
Swelling of synthetic rubber test	3604-T	
Foaming test <u>5/</u>	3211	D892
Deposition test	5003-T	
Compatibility test <u>6/</u>	3403-T	
100-Hour engine endurance test <u>7/</u>	----	
Sediment <u>8/</u>	3004	

1/ At the time of qualification, the right is reserved to subject the lubricating oil to such additional tests as considered necessary to assure the serviceability of the material.

2/ Use a test temperature of 347° ±1°F (175 ±0.05°C) for 72 hours.

3/ Use a test temperature of 400° ±1°F (204° ±0.05°C) for 72 hours.

4/ Contact qualifying activity for instructions for obtaining Ryder gear test data

5/ Use foam collapse periods of 5 minutes, 3 minutes, and 5 minutes for sequences 1, 2, and 3 respectively.

6/ Centrifuging shall be in accordance with method 3004 of Federal Test Method Standard No. 791 except dilution shall not be used. Referee lubricating oils used in the test shall consist of all lubricating oils qualified under this specification and under MIL-O-6081, grade 1010, MIL-L-7808, MIL-C-8188, and MIL-L-9236.

7/ Engine, type, and model as specified by RTD, qualified in accordance with MIL-E-5009.

8/ When using method 3004 to determine presence of suspended matter in the lubrication oil, required under workmanship, et cetera, no diluents shall be used.

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specified in 4.3.1. The sample size shall be as specified by the qualifying activity.

**4.5.2 Rejection and retest.** Lubricating oils that have been rejected may be reworked and replaced to correct the defects and resubmitted for acceptance. Before resubmission, the contractor shall fully advise the qualifying activity of the defects found in the original sample and the action taken to correct the defects. Consistent failure of the oil to pass the tests shall be cause for rejection.

#### 4.6 Test methods

**4.6.1 Chemical and physical tests.** Unless otherwise specified, the tests specified in table II shall be conducted in accordance with Federal Test Method Standard No. 791.

**4.6.1.1 Load-carrying ability (gear test) (qualification).** For qualification testing, eight determinations shall be made, the reported average of which shall be a minimum of 107 percent of the reference oil B rating.

**4.6.1.2 Load-carrying ability (gear test) (quality conformance).** For quality conformance testing, the following minimum number of determinations shall be made. The reported result shall include all determinations and the averages obtained.

Number of Determinations	Relative Rating, Percent (Min)
2	116
4	111
6	109
8	107

**4.6.1.3 Deposition number.** Four runs shall be made for qualification and two runs shall be made for quality conformance.

**4.6.2 Storage stability test.** The storage stability test shall be conducted as follows: Two 1-gallon cans of the test oil shall be placed in an unvented oven capable of maintaining a temperature of  $185^{\circ} \pm 2^{\circ}\text{F}$  ( $85^{\circ} \pm 1^{\circ}\text{C}$ ) throughout the test. At 0, 7, and 14 days, and every 14 days thereafter, a 500-cc sample shall be removed from each can and subjected to a lead corrosion test as specified in table II. The cans shall be returned to the oven after each sample is removed. No replenishment oil shall be added to the cans. This procedure shall be followed until the oil reaches a lead corrosion value of 160 mg/in.<sup>2</sup> or greater in both cans, or until all the oil is used, whichever occurs first.

**4.6.2.1** A plot of lead corrosion values versus time in the oven shall be kept for each test can. The time required to reach a lead corrosion value of 150 mg/in.<sup>2</sup> is obtained from these curves. The test values shall be the average of the two curves. Final approval shall be granted upon the successful completion of this test. Failure to pass this test shall be cause for rejection.

**4.7 Inspection of packaging, packing, and marking for shipment and storage.** Packaging, packing, and marking shall be inspected to determine compliance with section 5 or the documents referenced therein.

#### 5. PREPARATION FOR DELIVERY

**5.1 Packaging, packing, and marking** shall be in accordance with MIL-STD-290.



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5.2 Additional marking. In addition to the markings specified in MIL-STD-290, the following shall appear on each container:

THIS LUBRICATING OIL IS NOT  
INTERCHANGEABLE AND SHOULD  
NOT BE MIXED WITH ANY OTHER  
AIRCRAFT ENGINE OIL.

5.3 The oil shall be filtered through a suitable filter assembly rated at 10 microns or finer and situated as close to the container filler equipment as practicable.

5.4 Just prior to filling, the 1-quart and 1-gallon metal containers specified in MIL-STD-290 shall be inspected visually for loose solder, dirt, fibers, lint, metal particles, seaming compound, or other foreign contaminants. The bottom seam shall show no extruded seaming compound, and there shall be no seaming compound on the body immediately adjacent to the side seam. Visible seaming compound, evenly distributed and forming a very fine edge at the point of contact of the seam with the body, shall not be cause for rejection. If a soldered side seam is used in the fabrication of the can, residual soldering flux shall not be present on the inside of the containers. After filling, the container shall be inspected for marking, fill, closure, and leakage.

## 6. NOTES

6.1 Intended use. The lubricating oil covered by this specification is intended for use in specific models of aircraft turbine engines and helicopter transmissions.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification

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

c. Levels of packaging and packing required (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, 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. The activity responsible for the Qualified Products List is the Research and Technology Division (RTD), Attn: APFL, Wright-Patterson Air Force Base, Ohio 45433, and information pertaining to qualification of products may be obtained from that activity.

Custodian:	Preparing activity:
Air Force - 11	Air Force - 11