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MILITARY SPECIFICATION

CORROSION-PREVENTIVE OIL, GAS TURBINE ENGINE, AIRCRAFT SYNTHETIC BASE

This specification has been approved by the Department of Defense and is mandatory for use of the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 This specification covers one grade of corrosion-preventive oil for the preservation of engines which normally operate on oils conforming to Specification MIL-L-7808.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

QQ-C-576—Copper Plates, Rolled Bars, Sheets, and Strips
QQ-S-636—Steel; Carbon (Low-Carbon) Sheets and Strips
TT-T-291—Thinner; Paint, Volatile Mineral Spirits (Petroleum-Spirits)
WW-T-799—Tubing, Copper, Seamless (for Use with Soldered or Flared-Tube Fittings)

MILITARY

JAN-H-792—Humidity Cabinet; Operation of
MIL-E-5009—Engines, Aircraft, Turbojet, Qualification Tests for
MIL-L-7808—Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

STANDARDS

FEDERAL

Federal Test Method Standard No. 791—Lubricants, Liquid Fuels and Related Products; Methods of Testing

MILITARY

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-290—Packaging, Packing and Marking of Petroleum Products

(Copies of specifications, standards, drawings, and publications required by contractors 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. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply:

WADC Handbook—Detailed Handbook on Test Procedure in Support of Turbojet and Turboprop Lubricants

(This handbook may be obtained from the Commander, Wright Air Development Center, ATTN: WCLPF-2, Wright-Patterson Air Force Base, Ohio.)

AMERICAN SOCIETY FOR TESTING MATERIALS STANDARD METHOD OF TEST DESIGNATIONS

D91-52—Method of Test for Precipitation Number of Lubricating Oils
D92-52—Method of Test for Flash and Fire Points by Means of Cleveland Open Cup
D97-47—Method of Test for Cloud and Pour Points
D-270-55T—Method of Sampling Petroleum and Petroleum Products (Tentative)
D445-53T—Method of Test for Kinematic Viscosity (Tentative)
D664-54—Method of Test for Neutralization Value (Acid and Base Numbers) by Potentiometric Titration

FSC 6850P

D892-46T—Method of Test for Foaming Characteristics of Crankcase Oils (Tentative)
D972-51T—Method of Test for Evaporation Loss of Lubricating Greases and Oils (Tentative)

3. REQUIREMENTS

3.1 Qualification. The corrosion-preventive oil furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein.

3.2 Materials. The composition of the oil is not limited. Additives to impart oxidation stability, corrosion inhibiting properties, and antiwear properties are permitted. The right is reserved to subject oils of new or unusual composition to such additional tests as agreed upon by the contractor and the procuring activity to assure the serviceability of the material.

3.3 Appearance. The corrosion-preventive oil shall be transparent, uniform in appearance, and shall be free from sediment and suspended matter when examined visually, both before and after centrifuging.

3.4 Corrosion and oxidation stability.

3.4.1 *Corrosion and oxidation stability at 347° F (175° C).*

3.4.1.1 *Resistance to corrosion.* The change in weight of steel, silver, aluminum alloy, and magnesium alloy when subjected to the oil for 72 hours at 347° F (175° C) shall be not greater than ±0.2 milligram (mg) per square centimeter of surface. The change in weight of the copper shall be not greater than ±0.4 mg per square centimeter of surface. 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. Staining of the metals shall be permitted. Dark gray or black deposits on the metals will be cause for rejection. (See 4.6.6.)

3.4.1.2 *Resistance to oxidation.* The corrosion-preventive oil shall not have changed more than −5 to +25 percent from the original centistoke viscosity at 100° F (38° C) after the tests specified in 4.6.6. The total acid number of the sample after oxidation at 347° F (175° C) shall not have increased by more than 3.0 over the total acid number of the original sample. Acid number determination of both new and oxidized oils shall be run by method 5106 of Federal Test Method Standard No. 791 (ASTM D664-54) to an end point of pH-11. Darkening of the oil during the test shall not be cause for rejection.

3.4.2 *Corrosion.*

3.4.2.1 *Silver corrosion.* When tested in accordance with 4.6.7, the maximum weight loss shall not exceed 3.0 mg per square inch.

3.4.2.2 *Copper corrosion.* When tested in accordance with 4.6.7, the maximum weight loss shall not exceed 3.0 mg per square inch.

3.5 Load-carrying ability (gear test). The oil, when tested as specified in 4.6.8, at 10,000 rpm and 165° F (74° C) oil inlet temperature, shall exhibit a load-carrying ability of not less than the limits established in 4.6.8.

3.6 Swelling of synthetic rubbers. Swelling of standard synthetic rubber H by the corrosion-preventive oil shall be within the limits of 12 percent to 35 percent. (See 4.6.9.)

3.7 Compatibility. The oil shall be compatible with each of the oils listed in QPL-7808 and QPL-8188.

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

TABLE I—*Properties*

Kinematic Viscosity Centistokes			COC Flash Point (min)	Pour Point (max)
210° F (93° C)..... 3.0 (min).....	100° F (38° C).... 11.0 (min).....	−65° F (−54° C)..... 18,000 (max) (see 3.8.1)....	400° F (204° C)...	−75° F (−59° C).

3.8.1 *Viscosity stability.* Viscosity determinations at −65° F, (−54° C) when conducted in accordance with 4.6.4.2, shall not differ by more than ±10 percent when reported in centistokes, and both shall be less than 18,000.

3.9 Storage stability. The corrosion-preventive oil, after 12 months storage in the dark

at room temperature 75° ±5° F (24° ±3° C), shall show no indication of separation. A sample withdrawn from the top ⅓ layer shall pass the Protection test (4.6.11) and the viscosity at −65° F (−54° C) shall not exceed 18,000 centistokes maximum. Tentative approval shall be granted upon the successful completion of all other tests of the specification. Final approval shall be granted upon completion of the 12 months storage test. Failure to pass this test shall be cause for withdrawal of approval.

3.10 Foaming. The oil shall not exceed the following values for the indicated sequence, when tested as specified in 4.6.8:

(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.

3.11 Protection. Not more than 1 panel out of 5 shall fail after being covered with a film of oil and subjected to the protection test for the 144-hour period. (See 4.6.11.) If more than 1 panel fails, the product may be retested by repeating the test with an additional 10 panels. Not more than 4 panels shall fail out of the total of 15 panels.

3.12 Coking. When tested as specified in 4.6.12, there shall be not more than 100 mg of coke deposited.

3.13 *Evaporation.* When tested as specified in 4.6.13, the evaporation loss shall not exceed 50 percent.

3.14 25-hour engine test. The oil shall not adversely affect the engine after the 25-hour test. Any malfunctioning in the operation of the engine attributable to the oil shall be cause for rejection. (See 4.6.14.)

3.14.1 *Used oil control.* The right is reserved to subject any sample removed from the engine test to all the tests of this specification and such additional tests as agreed upon by the contractor and the procuring activity to assure the serviceability of the material. Significant changes in physical or chemical properties, or both, as a result of engine operation shall be cause for rejection.

3.15 S.O.D. lead corrosion. When tested in the Standard Oil Development (S.O.D.) lead corrosion test, the oil shall not cause a weight loss of more than 6 mg per square inch in 1 hour at 325° F (163° C).

3.16 Identification of product.

3.16.1 *Use of AN or MIL designations.* AN or MIL designations shall not be applied to a product, except for qualifications test samples, nor referred to in correspondence, until notice of approval has been received from the activity responsible for qualification.

3.17 Workmanship. The workmanship shall be in accordance with high-grade commercial practice covering this class of material. The finished oil shall be free from suspended matter, grit, water, or other adulteration.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified herein, the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.2 Classification of tests. The inspection and testing of corrosion-preventive oil shall be classified as follows:

(a) Qualification tests (see 4.3.)

(b) Acceptance tests (see 4.4.)

4.3 Qualification tests.

4.3.1 *Sampling instructions.* The Qualification test samples shall consist of 100 gallons of finished corrosion-preventive oil, selected as specified in 4.4.1, from a single lot. Samples shall be identified as required by the authorizing letter and forwarded to the activity responsible for qualification, designated in the letter of authorization from that activity. (See 6.5.)

4.3.1.1 Qualification test samples shall be accompanied by a certified test report containing

laboratory test data showing the results of all tests required by the specification, except the 25-hour engine test (4.6.14) and Storage stability test (4.6.15), and including general information as to the chemical type or trade name of the ingredients used, identifying major and minor constituents. Exact formulation data in terms of relative percentages will not be required, but the right is reserved to require complete and exact formulation data should the need arise.

4.3.2 *Tests.* The Qualification tests shall consist of all the tests of this specification, as described under 4.6.

4.4 **Acceptance Tests.** Acceptance tests shall consist of all the tests of this specification, as described under 4.6, except the Compatibility test (4.6.10), the 25-Hour engine test (4.6.14), the Kinematic viscosity test (4.6.4.2) and the Storage stability test (4.6.15).

4.4.1 *Sampling plans and tests.* Samples shall be selected in accordance with the provisions of Federal Test Method Standard No. 791, method 8001 (ASTM D270-55T).

4.4.1.1 *Lot.* For purposes of sampling, a lot shall consist of all corrosion-preventive oil manufactured as one batch at one time and place.

4.4.1.2 *Inspection.* Inspection shall be in accordance with the provisions of Federal Test Method Standard No. 791, method 9601.

4.4.1.3 *Samples.* Samples shall consist of a sample from a single lot, selected as specified in 4.4.1. The size of the sample shall be determined by the Inspector or by the procuring activity or both.

4.4.2 *Rejection and retest.* When one or more samples from a lot fail to meet the specification, acceptance of the lot will be withheld until the extent and cause of failure are determined. After corrections have been made, all necessary tests shall be repeated.

4.4.2.1 *Resubmittal.* Corrosion-preventive oils which have been rejected may be reworked and replaced to correct the defects, and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original sample shall be furnished the Inspector. Corrosion-preventive oils rejected after retest shall not be resubmitted without the specific approval of the procuring activity. Consistent failure of material to pass the Acceptance tests shall be cause for removal from the qualified products list.

4.5 **Test conditions.**

4.5.1 *Atmospheric conditions.* Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of 28 to 32 inches of mercury and at a temperature of 70° ±15° F (21° ±7° C) and a relative humidity of 80 percent or less. Where tests are made with atmospheric pressure or temperature substantially different from the above values, proper allowance shall be made for the change in instrument reading.

4.6 **Test methods.**

4.6.1 *Examination of product.* The corrosion-preventive oil shall be examined as necessary to determine conformance to this specification with respect to workmanship and appearance.

4.6.2 *Appearance.* The corrosion-preventive oil shall be examined visually for any cloudiness and suspended matter. The oil shall then be centrifuged as specified in Federal Test Methods Standard No. 791, method 3101 (ASTM D91-52), except that the precipitation naphtha shall not be used, and shall again be examined for cloudiness and suspended matter.

4.6.2.1 Each sample filled container selected in accordance with 4.4.1 shall be examined for defects of the container and the closure, for evidence of leakage, and for unsatisfactory markings. Each sample-filled container shall also be weighed to determine the amont of contents. Any container in the sample having one or more defects or being under the required fill shall be rejected, and if the number of defective containers in any sample exceeds the acceptance level (Standard MIL-STD-105, Inspection Level II, Acceptable Quality Level 2.5 percent), the lot represented by the sample shall be rejected. Rejected lots may be submitted for Acceptance tests provided the contractor has removed or repaired all nonconforming containers.

4.6.3 The following tests shall be made in accordance with the methods described in Federal Test Method Standard No. 791.

Tests	*Methods*
Cloud and pour point	201 (ASTM D97-47)
Flash and fire point (Cleveland open cup)	1103 (ASTM D92-52)
Foaming characteristics of crankcase oils	3211 (ASTM D892-46T)

4.6.4 *Kinematic viscosity.*

4.6.4.1 Viscosity at 210° F and 11° F (99° C and 38° C) shall be determined in accordance with method 305 of Federal Test Method Standard No. 791 (ASTM D445-53T) or any other standard viscosimeter giving results within an accuracy of ±1.0 percent and which can be converted into centistokes. For referee tests, the viscosity shall be determined by method 305 of Federal Test Method Standard No. 791 (ASTM D445-53T), and the thermometers used shall be certified by the National Bureau of Standards.

4.6.4.2 Viscosity at −65° F (−54° C) shall be tested in a No. 5 Ubbelonde viscosimeter, and stability shall be determined as specified in 3.8.1. Any suitable bath which is capable of being maintained at the specified test temperature ±0.02° F (±0.01° C) may be used. For referee tests, the temperature shall be measured by means of a potentiometer and a copper-constantan, single-junction thermocouple, which have been checked against a platinum-resistance thermometer calibrated by the National Bureau of Standards. One satisfactory type of apparatus is described in the following paragraph.

4.6.4.2.1 A cylindrical pyrex jar of a size capable of holding several viscosity pipettes is used for the bath. Alcohol or other low-freezing liquid is used as the cooling medium. The jar is placed in a well-insulated cold box containing double- or triple-paned glass windows. Condensation of moisture between panes is prevented by use of a desiccent such as activated silica gel. Suitable openings in the portion of the box above the jar allow the introduction of the viscosity pipettes, stirrer, calibrated resistance thermometer or thermocouple, thermoregulator, and 25-watt immersion heater. To insure adequate cooling facilities, the cold box is made large enough that a large quantity of dry ice may be placed in it around the bath. The box is filled with dry ice and the bath is cooled to approximately test temperature by the cautious addition of dry ice. The thermoregulator and relay are used in conjunction with the heater to maintain the bath at test temperature ±0.02° F (−0.01° C). All viscosity pipettes used in the bath are connected to drying tubes at all times to prevent condensation of moisture on the inside.

4.6.4.2.2 Two viscosity determinations shall be made on each sample at −65° F (−54° C) as follows:

(a) The initial viscosity determination shall be made within 35±1 minutes after placing the sample in the bath.

(b) The second viscosity determination shall be made a minimum of 3 hours after completion of the initial viscosity determination during which time the sample shall be maintained in −65° F (−54° C).

4.6.5 *S.O.D. lead corrosion test.* The S.O.D. lead corrosion test shall be run at 325° ±2° F (163° ±1° C) in accordance with method 5321 of Federal Test Method Standard No. 791, except that 4-pound chemical lead shall be used for the lead test panel.

4.6.6 *Corrosion and oxidation stability.* This test shall be conducted in accordance with method 5308 of Federal Test Method Standard No. 791, except for the temperature, duration, arrangement of the test specimens, and that in place of cadmium plated steel, pure electrolytic silver shall be used. Four specimens shall be arranged in the order of aluminum alloy, magnesium alloy, steel, and copper, tied together to form a square. The silver test specimen shall be tied in as a diagonal between the copper-steel and the aluminum-magnesium intersections.

4.6.7 *Corrosion.* Test specimens of pure electrolytic silver and copper in accordance with either Specification QQ-C-576 or WW-T-799, approximately 5 square inches in size, shall be treated as follows:

(a) The specimens shall be dipped in a 3:7 mixture of nitric acid and water, rinsed in hot water followed by hot distilled water,

and dipped in acetone and allowed to air dry.

NOTE: Different acid baths shall be used for each metal, and the silver specimens shall be wet polished after the acid bath with FFF pumice.

(b) Each specimen shall be weighed and mounted on clean, dry, glass supports and placed in a separate, clean, dry, 400-ml beaker so that the specimen is vertical and is not resting on either the sides or bottom of the beaker. A 200-ml sample of the test oil shall then be added to each beaker and the beaker placed in a vacuum oven maintained at the existing atmospheric pressure and at a temperature of 450° ±5°F (232° ±2°C).

(c) At the end of 50 hours at 450°F (232°C), the specimens shall be removed and washed in hot chloroform. If necessary, carbonaceous deposits shall then be removed by cathodic acid cleaning (5 percent by weight sulfuric acid and a current of 0.5 amp for 10 minutes, using a carbon rod for an anode. Traces of deposit shall be removed by erasing with an Eberhard Faber No. 212 ruby eraser (or equivalent) under a jet of hot distilled water. The specimens shall then be dried with acetone and reweighed. The results shall be reported as weight change in milligrams per square inch.

4.6.7.1 All reagents used above shall be analytical grade.

4.6.8 *Load-carrying ability (gear test).* The test device shall be an approved "Ryder gear testing machine." Tests shall be conducted in accordance with the WADC Handbook titled "Detailed Handbook on Test Procedures in Support of Turbojet and Turboprop Lubricants."

(a) Qualification test requirement: Eight determinations shall be made, the reported average of which shall be 70 percent of the reference oil "B" rating (see 6.6).

(b) Acceptance test requirement: A minimum number of determinations shall be made, as listed below, to satisfactorily pass the acceptance requirement. The reported result shall include all determinations and the average obtained.

Number of determinations	Relative rating (percent)
2	78
4	74
6	72
8	70

4.6.9 *Swelling of synthetic rubber.* Volume swell of standard H stock rubber shall be determined in accordance with method 3603 of Federal Test Method Standard No. 791. Standard H stock rubber will be supplied by the Wright Air Development Center. These samples shall not be used more than 6 months after the date stamped on the standard rubber sheet. The test shall not be valid if the values of the percent volume swell for the individual test specimens differ from each other by more than 5 percent of the average.

4.6.9.1 The cleanser shall be anhydrous ethanol or anhydrous methanol.

4.6.9.2 *Procedure at 158° F (70° C).* The water displaced by each rubber specimen shall be determined with a jolly, or an analytical balance, and the displacements recorded. The specimens shall then be dried and immersed in the test oil and allowed to remain immersed for 1 week, during which time the temperature of the oil shall be maintained at 158° ±2° F (70° ±1° C). At the end of the week, each rubber specimen shall be removed from the oil, dipped into the cleanser, and wiped lightly with a soft cotton cloth. Within 5 minutes after wiping, the water displacement of the sample shall be determined a second time, and the displacement recorded. The water used for the determination of the water displacement shall be maintained at room temperature. The percent increase in volume, computed from the following equation, shall be reported:

$$V = \frac{D_a - D_b}{D_b} \times 100$$

Where V = Percentage increase in volume of the specimen
D_a = Water displacement after immersion in the oil
D_b = Water displacement before immersion in the oil

4.6.9.3 The swelling test shall be accomplished in the corrosion preventive oil on three samples of the rubber as specified above, and the average of the three results shall be reported.

4.6.10 *Compatibility.* The following mixtures shall be prepared in 250 ml glass-stoppered flasks:

Amount of test corrosion preventive oil	Amount of each of the following
All lubricants qualified under Specifications MIL-C-8188 and MIL-L-7808.	
180 ml	20 ml
100 ml	100 ml
20 ml	180 ml

The flasks shall be thoroughly agitated and then stored in an oven held at 221° ±2° F (105° ±1° C) for 1 week. At the end of this time, none of the mixtures shall show more than a trace of sediment or turbidity.

Note: Trace shall be defined as that condition which exists when 100 ml of the mixture at 220° F (104° C), without dilution, has a precipitation number of not more than 0.03 when tested in accordance with Federal Test Method Standard No. 791, method 5101 (ASTM D91-62).

4.6.11 *Protection tests.*

4.6.11.1 *Panel composition and size.* Steel panels shall be fabricated from open hearth, cold finish, dead-soft temper, low-carbon steel, conforming to Specification QQ-S-636. The panels shall be ⅛ by 2 by 4 inches, conforming to the description contained in Specification JAN-H-792.

4.6.11.2 *Panel finish and cleaning.* The panel test surface shall be prepared by use of 240- to 280-grit Alundum abrasive with cloth or paper backing, in order to produce a surface finish of 6–12 microinches (rms). The use of iron-oxide abrasives, "wet or dry" cloths, or "wet or dry" papers is prohibited. The final abrasion marks shall be in the direction parallel to the length of the panel. The surface shall be thoroughly cleaned by a method which will reduce all types of superficial contamination to the practical minimum. A cleaning method which has proved satisfactory is described in the following paragraphs.

4.6.11.2.1 *Cleaning.* The following procedure has been found to produce duplication specimen surfaces of a high level of cleanliness and shall be used:

(*a*) After rounding the edges of the panel, reaming out the holes used for suspension, etc., wipe the surface as clean as possible by use of solvent-saturated rags.

(*b*) Scrub the panel with a clean cotton or surgical gauze swab in a beaker of hot paint thinner (Specification TT-T-291).

(*c*) Rinse in clean hot paint thinner.

(*d*) Rinse in hot commercial anhydrous methyl alcohol at least 10 seconds and let the panel dry. If the specimens are not processed at once, preserve them in a desiccator.

(*e*) Buff the panels, ending with a new section of 240 or 280 grit carborundum or Alundum abrasive paper with strokes in a direction parallel to the length of the panel, in order to produce a surface finish of 6–12 microinches (rms).

(*f*) Wipe off superficial dusts from the abrasive operation, using surgical gauze.

(*g*) Scrub abraded face of panel thoroughly with clean surgical gauze until there is no dark stain on a clean section of the gauze.

(*h*) Spray the panel with hot paint thinner from a wash bottle. The panel should be held in a rack at 20 ±5 degrees from the vertical. The spray should be directed vertically downward on the panel, flushing the test surface progressively downward. Spray both sides of the panel.

(*i*) Finally, rinse the panel in fresh, boiling, anhydrous methanol, allowing the panel to be immersed for at least 10 seconds to permit the panel to reach the temperature of the methanol before withdrawal.

(*j*) Permit the specimen to dry and preserve in a desiccator, using it on the day of preparation.

4.6.11.2.2 *Other precautions.* The following comments are also important and pertinent to the cleaning method:

(*a*) The utensils and the solvents used in the preparation of the panels shall be clean and free from contamination.

(*b*) In all stages of treatment, beginning with step (*b*), manual handling shall be avoided. The panels shall be handled with hooks or forceps, etc, and contact with the contaminated surface during cleaning procedure shall be avoided.

(*c*) In general:

(1) The thinner removes oily or grease-like contamination.

(2) The methyl alcohol removes most water-soluble contamination to be encountered, such as fingerprints, salt-like or acridic contaminants, and atmospheric dust or fumes, etc.

(3) The rubbing and spraying operations aid in the removal of the foregoing as well as inert materials, adherent films, and smuts, etc. The solvents are heated in order that the specimen temperature is maintained above the ambient dewpoint at all points where rapid solvent evaporation might cause moisture condensation and consequent rapid rusting.

(*d*) The following test method shall be used in evaluating the surface cleanliness:

Place the panel directly under a burette on a table free of vibrations and drafts. A drop of distilled water 0.05 ml in volume, is allowed to drop vertically and perpendicularly to the panel from a distance of 30 centimeters above the panel. If the surface is absolutely clean, successive droplets on various parts of the surface will spread out completely in spots of closely reproducible dimensions. A clean panel should give a spread of 21 to 23 mm, for each 0.05 ml of distilled water. The test is considered necessary and important because of variations found in different abrasive materials and because the personal factors involved in the procedure require some method of check on final results.

4.6.11.2.3 *Examining test panels.* It is recommended that examination of the test panels be carried out under a shaded fluorescent light (15W) of the analytical balance illuminator type, so suspended that the panel may be held at a distance of approximately 12 inches from the light, and further that all examinations be made without the aid of magnification.

4.6.11.2.4 *Maintaining constant humidity of test chamber.* It has been found that a satisfactory constant humidity test chamber may be obtained by using a deep desiccator with a saturated magnesium-nitrate solution in the base and by suspending the test specimens from a rack supported by a desiccator plate.

4.6.11.3 *Procedure.* Five panels, prepared as above, shall be dipped into a suitable sample of the corrosion-preventive oil under test in order to completely submerge all surfaces. The panels shall be suspended by stainless-steel hooks for 4 hours in a chamber or cabinet where the relative humidity does not exceed 50 percent and the temperature is 77° ±5° F (25° ±3° C). At the end of this period, the panels shall be suspended in a humidity cabinet conforming to Specification JAN-H-792 for a period of at least 144 hours (6 days) taking care that the top of the panel is level, bending the hooks, if necessary, for minor adjustment. The humidity cabinet shall be maintained at a dry bulb temperature of 120° ±2° F (49° ±1° C). The panels shall be removed from the cabinet, cleaned with paint thinner (Specification TT-T-291), and examined (see 4.6.11.2.3). A panel shall be considered as having failed the protection test if, at the end of the test period, one of the following conditions exists in the significant area of the panels, as defined by Specification JAN-H-792, considering both sides of the panel:

(*a*) One or more corroded areas of 2 mm diameter or larger.

(*b*) Two or more spots of between 1 and 2 mm diameter.

(*c*) One spot between 1 and 2 mm diameter and two or more dots of less than 1 mm diameter.

(*d*) Four or more dots of less than 1 mm diameter.

More than 1 panel in 5 failing as defined above shall be sufficient for retest. Retests shall consist of repeating the protection test, using an additional 10 panels. Upon completion of the retest, the failure of more than 4 panels, adding failures of both test and retest, shall be cause for rejection of the material.

4.6.12 *Coking.* The coking test shall be conducted in an apparatus described as Model C. Detailed descriptions and source of the machine may be obtained upon request from the activity responsible for qualification. The test panel shall be polished with No. 1 polishing emery paper, washed in petroleum ether, and weighed. It shall be heated to 600° F (315° C) and the splasher run for 8 hours at 1,000 rpm with an oil splash rate on the test panel of 2.4 ±0.1 grams per minute. After the test, the panel shall be washed in petroleum ether and reweighed. Any coke on the edges of the test panel shall be removed prior to weighing.

4.6.13 *Evaporation test.* The evaporation test shall be conducted in accordance with method 351 of Federal Test Method Standard No. 791 (ASTM D972-51T), except that the test shall be conducted at 400° F (204° C) and for 6½ hours only, and only the new oil cell shall be used (Precision Scientific Co. Catalog No. 74929, or equal).

Note: Assembly of the apparatus at room temperature is recommended since at 400° F (204° C) metal expansion interferes with assembly.

4.6.14 *25-Hour engine test.* An engine, type and model qualified in accordance with Specification MIL-E-5009, as specified by the activity responsible for qualification, shall be employed for conducting this test. The test engine shall be mounted on a test stand and instrumented to collect data as outlined in the paragraph titled "Data" of Specification MIL-E-5009. The engine shall then be subjected to 5 complete 5-hour test cycles as listed in the procedures of the 150-hour endurance test of Specification MIL-E-5009. Following this, the engine shall be completely disassembled for inspection.

4.6.15 *Storage stability test.* The storage stability test shall be run on a 1-gallon sample of a lot of material which shall be placed in a 1-gallon sealed wide-mouth glass jar as soon as possible after the lot has been formulated. The jar shall be wrapped with aluminum foil in such a manner as to exclude all light from the oil and the closure shall be lined with aluminum foil. The jar and sample shall be placed in a suitable enclosure at a temperature of 75° ±5° F (24° ±3° C) for 12 months. The sample shall not be agitated or stirred during the storage period. At the end of the storage period, a sample withdrawn from the top ⅓ layer shall pass the protection test and the viscosity at −65° F shall not exceed 18,000 centistokes maximum.

5. PREPARATION FOR DELIVERY

5.1 Packaging and packing. Packaging and packing shall be in accordance with Standard MIL-STD-290. The container closure, lining, or space filler shall not interact physically or chemically to alter the strength, purity, or quality of the container contents. All containers shall be new and free from contamination. The oil shall be filtered through a filter assembly rated at 10 microns situated as close to the filling equipment as is feasible. Applicable levels of packaging and packing to be specified by the procuring activity. (See 6.2.)

5.2 Marking. The marking of the containers shall be in accordance with Standard MIL-STD-290. In addition to any other special markings required in the contract, the unit container shall be marked as follows:

NATO Symbol | C-638

6. NOTES

6.1 Intended use. The corrosion-preventive oil covered by this specification is intended for preservation of turboprop and turbojet engines using Specification MIL-L-7808 oils. The corrosion-preventive oil should be capable of limited use, not to exceed 25 hours, as an aircraft engine lubricant, and will be used for both preservation and final acceptance runs of aircraft engines requiring the use of Specification MIL-L-7808 oils.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Size and type of containers required.

(c) Level of packaging and packing required. (See Standard MIL-STD-290.)

(d) Quantity required (in U.S. gallons at 60°F (16°C)).

6.2.1 *Qualified products list.* Products considered acceptable under this specification are listed in QPL-8188 (latest revision).

6.3 **Samples of synthetic rubber H.** Samples of the synthetic rubber H may be obtained upon request to the Commander, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, Attention: WCLT.

6.4 **S.O.D. Sample tubes.** S.O.D. sample tubes may be obtained from Gottlieb Greiner, New York, New York.

6.5 **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 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. Information pertaining to qualification of products by this specification may be obtained from the Commander, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio ATTN: WCLPF.

6.6 **Reference oil "B".** Reference oil "B" may be procured from the Research Section, Engine Fuels and Lubricants Department, Southwest Research Institute, San Antonio, Texas.

Provisions of this specification are the subject of international standardization agreement. When amendment, revision, or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the international agreement concerned.

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