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MILITARY SPECIFICATION

ENGINES, AIRCRAFT, GAS TURBINE; CORROSION-PREVENTION PRE-OILING AND GROUND OPERATION OF, PROCESSES FOR

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

1. SCOPE

1.1 This specification covers the detail requirements governing the corrosion-prevention pre-oiling and ground operation of aircraft gas turbine engines and is applicable to all contractors having physical custody of these engines.

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:

SPECIFICATIONS

Federal

P-D-680	Dry Cleaning Solvent

Military

MIL-C-4339	Corrosion Preventive, Soluble Oil, For Water Injection Systems
MIL-E-5607	Engine, Gas Turbine, Preparation For Storage and Shipment of, Process For
MIL-O-6081	Oil, Lubricating, Jet Engine
MIL-C-6529	Corrosion-Preventive, Aircraft Engine
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine Synthetic Base
MIL-L-7870	Lubricating Oil; (General Purpose, Low Temperature)
MIL-C-15074	Corrosion Preventive, Fingerprint Remover
MIL-L-23699	Lubricating Oil, Aircraft Turboprop and Turboshaft Engines, Synthetic Base
MIL-I-26860	Indicator, Humidity, Plug, Color Change

FSC 2840

STANDARDS

Military

MS20003	Indicator, Humidity, Card, Three Spot Impregnated Areas

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

3. MATERIAL REQUIREMENTS

3.1 Materials and processes. - Materials and processes used in the corrosion-prevention pre-oiling and ground operation of gas turbine engines shall be as specified herein. If contractor's specifications are used, such specifications will be subject to approval by the Government. The use of nongovernmental specifications shall not constitute waiver of Government inspection.

3.2 Corrosion preventive. - The corrosion preventive, as referenced in this specification, shall, at the time of use, be water free and at a minimum temperature of 60° F.

3.2.1 Mineral base corrosion preventive. - When a corrosion-preventive oil is specified for the preservation of aircraft gas turbine engines which require MIL-O-6081 lubricating oil for normal operation, the corrosion preventive shall be one of the following:

a. A mixture of 25 percent of corrosion-preventive compound conforming to MIL-C-6529, type I, and 75 percent MIL-O-6081 lubricating oil of the grade specified for the engine.

b. Undiluted corrosion-preventive compound conforming to MIL-C-6529, type III.

3.2.2 Synthetic base corrosion preventive. - When corrosion preventive methods are specified for the preservation of aircraft gas turbine engines which require MIL-L-7808 or MIL-L-23699 oil for normal operations, the corrosion preventive oil used shall be the operating oil of the grade specified for the engine.

4. PREPARATION OF ENGINES AND PARTS

4.1 Cleaning. - Every precaution shall be exercised to keep the engine and its accessories clean and free from foreign material of any kind at all times. Complete external cleaning of the engine shall not normally be undertaken. When cleaning individual parts for application of

preservatives, tapes, or other materials, and for removing these from surfaces, only petroleum solvent cleaners shall be used. In the case of close tolerance, bare metal surfaces, great care shall be taken to insure removal of any perspiration residues. Perspiration residues shall be removed by wiping the surface first with a cloth containing finger-print remover conforming to MIL-C-15074, and then with a cloth containing P-D-680 solvent.

5. *PROCEDURE*

5.1 General. - All aircraft gas turbine engines shall be treated in accordance with one or more of the following procedures as applicable.

5.2 Treatment of engines in containers. -

5.2.1 Inspection of engines. -

5.2.1.1 Inspection in nonpressurized containers. - Immediately upon receipt and at least every 30 days thereafter, the humidity indicator shall be inspected by comparison with the color comparison chart shown on MS20003 or MIL-I-26860. If the inspection reveals that the humidity indicator is in a fully activated condition with the relative humidity less than 40 percent, no further maintenance shall be required until the next inspection. If the inspection reveals the internal relative humidity to be 40 percent or over, action shall be taken as specified in 5.2.1.2.3.

5.2.1.2 Inspection in pressurized containers. - Immediately upon receipt, a pressure check and an inspection of the internal relative humidity shall be made. At least once every 90 days thereafter, pressure and humidity checks shall be made. Subsequent action shall be taken as specified in 5.2.1.2.1, 5.2.1.2.2, or 5.2.1.2.3, whichever is applicable.

5.2.1.2.1 If the inspection reveals that the humidity indicator is in a fully activated condition with the internal pressure more than 1 psi gage and the relative humdity less than 40 percent, then no further maintenance of either the engine or container shall be required until the next inspection.

5.2.1.2.2 If the inspection reveals the internal pressure to be less than 1 psig, and the relative humidity to be less than 40 percent, the container shall be checked for leakage, using soap solution around all closures. After checking, the container shall be repressurized to 5±1 psig, using clean compressed air free of liquid water. The container shall then be rechecked for leakage, using a soap solution brushed over all seams and closures. If no leakage is evident, no further action is required until the next inspection.

5.2.1.2.3 If the inspection reveals the internal relative humidity to be 40 percent or above, an unsafe or corrosive condition exists. The cover shall be removed from the container, and the engine inspected to determine its serviceability. If the engine is found to be in a serviceable condition, the container shall be closed and redesiccated in accordance with the appropriate container specification.

5.2.2 Storage of engines and afterburners in containers. - All gas turbine aircraft engines and afterburners in containers shall be stored in such manner as to allow ready access for the inspections required under this specification.

5.2.3 Renewal of preservation of engines and afterburners in containers. -

5.2.3.1 Removal from shipping containers. - After release of all pressure from the shipping container, the engine shall be removed from the shipping container to permit the subsequent operations specified herein.

5.2.3.2 Depreservation. - Oil shall be drained from the fuel control unit and replaced with the fuel specified for the engine.

5.2.3.3 Represervation. - The engine shall be represerved in accordance with the requirements of 5.9.

5.2.4 Modification of parts. - If modifications are to be made on any detachable part of the engine or afterburner, the engine container shall be opened and the part removed. The container shall be resealed. Upon completion of the modification, the part shall be replaced and fresh quantities of the desiccant and a new humidity indicator shall be installed in the container.

5.2.5 Modification of engines. - If the engine itself must be modified, it shall be removed from the container. Necessary modification shall be made and the engine shall be prepared for storage in accordance with the requirements of 5.9.

5.2.6 Historical record form entries. - A complete record of all inspections, including regular monthly or 90-day inspection, whichever is applicable, of the internal relative humidity or pressure, and all maintenance and renewals of preservation shall be entered in the engine and/or afterburner historical record form. Any modification shall be entered in the appropriate section of the engine/afterburner historical record form.

5.3 Treatment of engines/afterburners undergoing installation. -

5.3.1 Engines/afterburners awaiting installation. - Engines/afterburners awaiting installation in aircraft shall remain in the dehumidified container as long as possible.

5.3.2 Shipping containers. - After engines/afterburners have been removed, the empty containers shall be cleaned and completely assembled with all engine/afterburners attachments, parts, gaskets, closure bolts, etc., in place or enclosed. Containers, blank-offs, covers, seals and fasteners that are usable shall be held as Government property, and disposition instructions, therefore, shall be requested from the cognizant Government inspector.

5.3.3 Installation. - While the engine is being installed, the original factory installed closures shall be left intact or suitable closures installed to secure the engine and prevent the entrance of water or foreign matter. The engine shall be installed in the aircraft in accordance with the applicable Engine Service Instructions Handbook furnished by or available from the Using Service for each model and type of aircraft engine. On turboprop and turboshaft engines, the shaft shipping cap and sleeve and the corrosion preventive compound shall be carefully removed and the propeller, if applicable, shall then be installed in accordance with pertinent service instructions.

5.3.4 Historical record form entries. - The date of installation on the airplane, extent of preservation applied, and the name of the activity shall be entered in the engine historical record form.

5.4 Depreservation and preparation for ground run-up. -

5.4.1 General. - Engines shall not be prepared for ground run-up more than 24 hours in advance of the actual ground run. Water injection equipment shall not be depreserved, unless specifically directed.

5.4.2 Removal of seals. - All seals from joints, drain holes, and breathers shall be removed.

5.4.3 Oil drainage. - The oil shall be drained from all accessible drains and from the reduction gear case on turboprop engines. When drainage is complete, all drain plugs shall be reinstalled.

5.4.4 Depreservation of fuel system. - The 1010 oil shall be drained from the fuel control unit and replaced with the fuel specified for the engine.

5.4.5 Disconnecting fuel system. - The fuel lines shall be disconnected between the control and the nozzle as near the nozzle as possible or at the flowmeter pipe. The disconnected fuel lines shall be connected to an overboard container of sufficient capacity to trap the fuel-oil

mixture, which shall be washed out of the fuel system during the pre-oiling operation.

5.4.6 Servicing fuel tank. - Fuel, as specified for the particular type airplane, shall be added to the fuel tank in sufficient quantity to insure completion of the operations required.

5.4.7 Prestarting inspection. - All checks required by the applicable Engine Service Instructions Handbook shall be made.

5.4.8 Pre-oiling. - The oil sump or oil tank shall be filled with the oil specified for the engine. Any entrapped air shall be bled from the oil supply line and pressure lines to the bearings. The bearing oil lines shall be filled. With the ignition in the off position, the normal starting procedure shall be accomplished. If no oil pressure rise is observed during the second attempt, the procedure shall be discontinued and the necessary corrective action indicated in the Engine Service Instructions Handbook shall be taken. Sufficient false starts shall be performed to insure that clear fuel drains from the disconnected line(s) of the fuel system. All fuel line connections shall be restored.

5.4.9 Salt corrosion preservation. - When required by the Using Service, during engine cycling, the engine shall be preserved with an approved chemical solution and procedure outlined in the Engine Service Handbook or other Using Service instruction.

5.5 Historical record form entry. - The date of depreservation, pre-oiling, and the name of the activity shall be entered in the engine historical record form.

5.6 Ground run-up. - If necessary, service the oil tank or sump with the normal quantity of oil of the type and grade specified for the engine. Complete ground tests shall be performed in accordance with the applicable Engine Service Instructions Handbook.

5.7 Historical record form entry. - The date of ground run-up, the disposition of the engine, and the name of the activity shall be entered in the engine historical record form.

5.8 Treatment of engines after flight test. - After completion of flight tests, pending delivery of the airplane to the Government, or while the airplane is undergoing modification, the engines shall be treated in accordance with 5.9 and 5.4.9 if applicable.

5.9 Treatment of engines during definite periods of inactivity. -

5.9.1 Inactive 1 to 45 days. - Where it is definitely known that the engine will not be operated within 24 hours but will be operated within 45 days, the engine shall be preserved, maintained in preservation, and depreserved, in accordance with 5.10.

5.9.2 Inactive 45 to 180 days. - If it is not known that the engine will be operated within 45 days, it shall be preserved, maintained in preservation, and depreserved in accordance with 5.11.

5.9.3 Engines which cannot be run or motored over during the period of idleness. - Engines which for any reason cannot be operated or motored over during the period of idleness shall be preserved in accordance with 5.12.

5.10 Inactive 1 to 45 days. -

5.10.1 Preservation. - At the beginning of the period of idleness, using the lubricating oil specified for the engine, the engine shall be operated for a minimum of 10 minutes at approximately 75 percent rated speed, unless otherwise specified in the applicable contract, to insure coverage of all internal engine parts with oil. The afterburner shall be operated in accordance with existing directives for the engine. During the period of idleness, the engine openings shall be adequately sealed to prevent the entrance of water or foreign matter. NOTE: Desiccant materials shall not be placed inside engines or afterburners.

5.10.2 Depreservation. - Engines preserved for 1 to 45 days require no depreservation.

5.10.3 Renewal of preservation. - There shall be no renewal of 1 to 45 days preservation.

5.10.4 Historical record form entries. - The dates of preservation and depreservation, type of preservation, and name of the activity, shall be entered in the engine historical record form.

5.11 Inactive 45 to 180 days. -

5.11.1 Preservation. - The following steps shall be taken at the beginning of the period of idleness:

5.11.1.1 Preparation. - At the beginning of the period of idleness, using the lubricating oil specified for the engine, the engine shall be operated for a minimum of 10 minutes at approximately 75 percent rated speed, unless otherwise specified in the applicable contract, to insure coverage of all internal engine parts with oil. Corrosion-preventative oil shall not be used unless specified in the applicable contract or model specification.

5.11.1.2 Compressor spraying. - Unless otherwise specified in the applicable contract or model specification, the compressor section shall be sprayed with corrosion-preventive oil conforming to MIL-C-6529 while being rotated by the starter or auxiliary turning device. The speed of rotation shall not exceed the starting speed, and spraying shall be accomplished during both run-up and coast-down. The spraying operation shall not be started until the engine has cooled sufficiently to eliminate auto-ignition. Precautions shall be taken to prevent accidental firing by either grounding the ignition plugs or by disconnecting the ignition leads. Spraying shall be accomplished with a suitable spray gun held approximately 18 inches from the compressor inlet. The spray nozzle shall be moved constantly in order that the entire area will be covered.

5.11.1.3 Preservation of deicing system and fluid injection system. - Where applicable, the deicing system and fluid injection system shall be drained, blown out with air, and then flushed with solvent conforming to P-D-680, containing 5 percent by volume of corrosion-preventive soluble oil, in accordance with MIL-C-4339. Then the systems shall again be drained and blown out with air.

5.11.1.4 Preservation of fuel system. The fuel system shall be preserved by disconnecting the fuel line from the fuel tank and introducting into the fuel system oil conforming to MIL-O-6081, grade 1010, or MIL-L-7870 by means of an auxiliary tank and pump. All parts of the fuel system normally subjected to fuel shall be coated with oil.

5.11.2 Maintenance during preservation. - The engine shall be motored for 2 minutes either by means of a starter or an auxiliary turning device at least once every 60 days during the period of idleness, unless the engine is stored in a sealed container. If the starter is used, the starter limitations specified in the starter handbook of operation and maintenance instructions shall be observed. The fuel system, fuel deicing system, and fluid injection system require no maintenance during the period of preservation. The throttle and water-injection control shall not be activated. The compressor system shall be inspected at least once every 60 days, unless stored in a sealed container. If found dry, it shall be resprayed.

5.11.3 Depreservation. - Engines shall be depreserved according to the procedures in 5.4. The deicing system and the fluid injection system shall not be depreserved unless specifically directed.

5.11.4 Renewal of preservation. - The 45 to 180 day preservation procedures may be renewed once by repeating the techniques outlined in 5.11. Engines inactive at the end of the second preservation period shall be preserved in accordance with MIL-E-5607. Engines in sealed containers will require no renewal of preservation, provided periodic inspections performed in accordance with 5.1 indicate such action is unnecessary.

5.11.5 Historical record form entry. - The dates of preservation, maintenance in preservation, and depreservation, and the name of the activity shall be entered in the engine historical records.

5.12 Instructions for the preservation of aircraft gas turbine engines which cannot be run or motored over during the period of idleness. -

5.12.1 Inoperable engines. -

5.12.1.1 When the shaft can be rotated. - When the shaft of the engine can be rotated, the engine shall be preserved by motoring the engine at the highest attainable speed (at least 300 rpm). While the shaft is being turned, the compressor shall be sprayed in accordance with 5.11.1.1, unless otherwise specified in the applicable contract or model specification. The starter shall not be used unless no other means of motoring the engine are available. If the starter is used, its limitations shall not be exceeded. The remainder of the engine and its accessories shall be preserved, packaged, and packed as set forth in MIL-E-5607.

5.12.1.2 When the shaft cannot be rotated. - When the shaft cannot be rotated, all accessible oil lines or lubricator ducts shall be disconnected, and generous quantities of normal lubricating oil shall be forced into the bearings. Corrosion-preventive oil shall not be used unless specified in the applicable contract or model specification. The remainder of the engine shall be preserved, packaged, and packed in accordance with MIL-E-5607.

6. INSPECTION

6.1 Approval. - The process of preparation of engines for storage and all material entering into the procedure thereof shall be subject to inspection by the cognizant Government inspector.

7. MAINTENANCE

7.1 Effectiveness of equipment and procedure. - The effectiveness of the equipment and the procedure used in handling aircraft gas turbine engines at any nongovernmental activity shall be checked at such intervals as may be deemed necessary by the cognizant Government inspector.

8. NOTES

8.1 Intended use. - This specification is intended for use in the corrosion-prevention preoiling and ground operation of aircraft gas turbine engines. The original preparation of aircraft gas turbine engines by aircraft engine manufacturers is covered by MIL-E-5607.

8.2 Contamination. - Extreme caution must be observed to avoid oil contamination. Synthetic-base oils must never be mixed with mineral-base oils.

8.3 Inspection and disposition of defective items. - If, in the course of inspections specified in this specification, defective engines, containers, or attachment of engines to containers are encountered, the disposition and reporting procedures required by the Services will be followed.

8.4 Marginal indicia. - The margins of this specification are marked to indicate where changes, deletions, or additions to the previous issue have been made. This is 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 as written, irrespective of the marginal notations and relationship to the last previous issue.

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