2. Preservation

Table 302. Equipment and Materials

Equipment or Material	Manufacturer
NOTE: Equivalent substitutes may be used for listed items.	
Barrier material (MIL-PRF-121)	Commercially available
Barrier material (MIL-PRF-131, Type I, Class III)	Commercially available
Desiccant (MIL-D-3464, Type I)	Commercially available
Humidity indicator card (MX-56789)	AGM Container Controls Inc, P.O. Box 40020, 3526 E Fort Lowell, Tucson, AZ 85717-0020
Humidity indicator plug (Type II) (SAE AS26860) or (HUM 2156)	Commercially available
Mineral base oil (Grade 1010) (MIL-PRF-6081) (Alternate for Oil (Univolt 60 Preservative))	Commercially available
Oil (Univolt 60 Preservative)	Exxon Co, USA, P.O. Box 4803, 600 Jefferson St, Houston, TX 77210-4803
Sealer (Metric Model HS-B)	Doboy Inc, 869 S Knowles Ave, New Richmond, WI 54017-1745

A. Installed Engine Preservation Instructions (Six Months or Less)

WARNING: MOST PRESERVATIVE SOLUTIONS ARE FLAMMABLE AND SHOULD NOT BE USED EXCESSIVELY NOR APPLIED TO A HOT ENGINE. ALLOW ENGINE TO COOL FOR A MINIMUM OF 10 MINUTES BEFORE USING PRESERVATIVE MATERIAL ON ANY PART OF THE ENGINE.

(1) Allow engine to cool.

(2) Inspect engine to assure that inlet area is clean and dry.

CAUTION: AIRCRAFT INLET AND TAILPIPE PLUGS FOR ENGINE SHALL BE INSTALLED PRIOR TO WASHING THE AIRCRAFT OR IF AIRCRAFT IS TO BE PARKED UNSHELTERED WHEN NOT IN SERVICE. TO MINIMIZE OR PREVENT CORROSION, WATER OR CLEANING SOLUTION SHALL NOT BE PERMITTED TO ENTER THE ENGINE INLET AREA.

(3) Install inlet and tailpipe plugs.

CAUTION: DO NOT EXCEED MANUFACTURER'S RECOMMENDED DUTY CYCLE FOR STARTER.

2. A. (4) Every four weeks, with inlet and tailpipe plugs removed, motor engine with starter sufficiently to achieve N1 rotation, observing manufacturers recommended duty cycle for starter.

(5) Repeat Steps (2) and (3).

(6) It is recommended that digital electronic engine control (DEEC) (76-10-02) be placed in air-tight bag containing desiccant for storage.

B. Installed Engine Preservation Instructions (More Than Six Months)

CAUTION: THE COMPRESSOR SECTION SHALL NOT BE SPRAYED WITH ANY CORROSION-PREVENTIVE COMPOUND. NO HYDROCARBONS OR OILS, INCLUDING DE-ICING/ANTI-ICE FLUID SHALL EVER BE SPRAYED INTO INLET, EXHAUST, SCOOPS, VENTS, AND DRAINS DURING ENGINE OPERATION. UNCONTROLLED COMBUSTION COULD BE A POSSIBLE RESULT. AVOID OPERATING ENGINE DURING AIRCRAFT DE-ICING.

(1) Disconnect fuel control discharge line between oil temperature regulator (fuel/oil cooler) and fuel control and connect a line to the fuel control discharge port to drain overboard.

(2) Disconnect fuel supply line at inlet connection on fuel pump and connect supply of oil. Supply oil under two to five pounds per square inch pressure.

CAUTION: DO NOT EXCEED MANUFACTURER'S RECOMMENDED DUTY CYCLE FOR STARTER-GENERATOR.

(3) De-energize ignition system. Advance power lever to idle position. Motor fuel control until clean oil flows from overboard drain line. Fuel control may be motored by motoring engine, observing motoring procedures established by the particular installation.

(4) Stop motoring engine, disconnect oil supply lines from fuel inlet port on fuel pump and cap inlet port. Allow residual oil to drain from fuel control and lines, then disconnect overboard drain line and reconnect fuel line between fuel control and fuel/oil cooler.

NOTE: Use of corrosion-preventive compound in the engine lubrication system for preservation is not required. Specified engine lubricating oil is a satisfactory corrosion preventive.

(5) Wipe all fuel and oil from engine. Secure warning tags to engine and as required to indicate preservation procedures have been performed and that engine shall not be operated except as noted until depreservation procedures are performed. Maintain engine motoring record indicating engine shall be motored every four weeks.

(6) Install inlet and tailpipe plugs.

CAUTION: TO PREVENT LOSS OF PRESERVATION OIL FROM FUEL CONTROL, DO NOT OPEN FUEL SHUTOFF VALVE OR MOVE THROTTLE WHILE MOTORING ENGINE.

2. B. (7) Every four weeks motor engine with starter sufficiently to obtain N1 rotation, observing starter manufacturers recommended duty cycle. Ensure fuel shutoff valve is in cut-off position.

(8) It is recommended that digital electronic engine control (76-10-02) be placed in air-tight bag containing desiccant for storage.

C. Engine Preservation Instructions (Engine Removed from Aircraft)

CAUTION: THE COMPRESSOR SECTION SHALL NOT BE SPRAYED WITH ANY CORROSION-PREVENTIVE COMPOUND. NO HYDROCARBONS OR OILS, INCLUDING DE-ICING/ANTI-ICE FLUID SHALL EVER BE SPRAYED INTO INLET, EXHAUST, SCOOPS, VENTS, AND DRAINS DURING ENGINE OPERATION. UNCONTROLLED COMBUSTION COULD BE A POSSIBLE RESULT. AVOID OPERATING ENGINE DURING AIRCRAFT DE-ICING.

(1) Prior to removing engine from aircraft perform fuel control preservation procedures as outlined in Steps B.(1) through B.(5).

(2) Drain engine lubricating oil observing procedures in Oil Servicing.

(3) Remove engine from aircraft and install inlet and tailpipe plugs.

(4) Wrap engine in barrier material (MIL-PRF-121) and seal all openings to prevent entrance of foreign material.

(5) Install engine into barrier material (MIL-PRF-131, Type I, Class III) with four bags of desiccant and two humidity indicator cards. Install humidity indicator plug into barrier material (MIL-PRF-131, Type I, Class III). Seal barrier material (MIL-PRF-131, Type I, Class III) seam using sealer.

(6) Cut opening into barrier material (MIL-PRF-131, Type I, Class III) and insert vacuum line. Evacuate air from barrier material (MIL-PRF-131, Type I, Class III) until barrier material (MIL-PRF-131, Type I, Class III) is drawn snugly to engine. Remove vacuum line and seal opening in barrier material (MIL-PRF-131, Type I, Class III) using heat gun.

(7) Record preservation in Engine Log Book.

(8) Check humidity indicator plug and humidity indicator cards every 30 days. If indicator plug or card changes from blue to pink, bag must be opened and engine inspected for rust or corrosion. If rust or corrosion is evident, take appropriate corrective action. Preserve engine in accordance with Steps (4) through (8) after inspection completed.

2. C. (9) Engines preserved as stated in Steps (4) through (7) shall be removed from preservation storage every two years, serviced with oil and motored sufficiently to achieve N1 rotation. Ensure fuel control power lever is in cutoff position prior to motoring. Preserve engine in accordance with Steps (2) through (8) after motoring.

(10) Engines received from manufacturer have been preserved prior to shipment. Preservation is good for two years. Inspection of preserved engines shall be as stated in Steps (8) and (9).

(11) It is recommended that digital electronic engine control (76-10-02) be placed in air-tight bag containing desiccant for storage.

D. If Aircraft is Not Sheltered During Extreme Wet Conditions

WARNING: AREAS IN PROXIMITY OF ENGINE INLET AND EXHAUST ARE EXTREMELY HAZARDOUS TO PERSONNEL WHEN ENGINES ARE OPERATING. PERSONNEL SHALL CLEAR THESE AREAS DURING ENGINE START AND OPERATION TO AVOID INJURY.

(1) Engine conditions permitting, perform normal engine start in accordance with Aircraft Flight Manual and/or appropriate aircraft document. Run engine at idle speed for ten minutes.

(2) Perform normal engine shutdown in accordance with Aircraft Flight Manual and/or appropriate aircraft document.

(3) Preserve engine in accordance with Paragraph 2.A.

E. If Aircraft is Operated in a Salt Atmosphere or On Air Strips Treated With Salt

NOTE: Refer to Paragraph 3.B. for additional recommended procedure.

(1) Wash engine externally as soon as possible with clean fresh water.

WARNING: AREAS IN PROXIMITY OF ENGINE INLET AND EXHAUST ARE EXTREMELY HAZARDOUS TO PERSONNEL WHEN ENGINES ARE OPERATING. PERSONNEL SHALL CLEAR THESE AREAS DURING ENGINE START AND OPERATION TO AVOID INJURY.

(2) Perform normal engine start in accordance with Aircraft Flight Manual and/or appropriate aircraft document. Run engine at idle speed for a minimum of ten minutes to remove moisture and salt residue.

(3) Perform normal engine shutdown in accordance with Aircraft Flight Manual and/or appropriate aircraft document.

2. F. If Aircraft is Operated Over Saltwater Below 4000 Feet for More Than 30 Minutes, Perform Compressor Rinse

(1) Prepare aircraft for compressor rinse.

(a) Position aircraft into wind in order to carry exhaust discharge away from aircraft.

(b) Close all bleed systems (anti-ice valves, cabin pressurization/air condition, etc) and install protective covering over starter/generator prior to performing cleaning procedure. (Refer to Aircraft Maintenance Manual.)

(2) Prepare engine for compressor rinse.

(a) Disconnect P3 tube at fuel control P3 pressure limiter valve fitting. Leave tube end open to atmosphere. Cap fuel control P3 pressure limiter valve fitting. *(See Figure 301.)*

(b) Place protective cover (or tape) over inlet pressure and temperature sensor (located at engine inlet).

(3) Prepare equipment and materials for compressor rinse.

Turn water control valve to OFF and attach supply of clean tap water (of drinking purity) to spray mix applicator inlet.

CAUTION: ALLOW THE ENGINE TO COOL APPROXIMATELY ONE HOUR OR UNTIL ITT INDICATOR READS 100˚C OR LESS.

NOTE: Caution should be exercised during cold weather (below 0˚C (32˚F)) since equipment has no provisions to prevent freezing.

2. F. (4) Perform compressor rinse procedure.

CAUTION: REFER TO AIRCRAFT MAINTENANCE MANUAL FOR STARTER DUTY CYCLE. DO NOT EXCEED STARTER DUTY CYCLE AT ANY TIME DURING CLEANING PROCEDURE.

TO ELIMINATE BATTERY DISCHARGE DUE TO STARTER MOTORING CYCLES, IT IS RECOMMENDED THAT A GROUND POWER UNIT BE UTILIZED DURING THESE OPERATIONS.

(a) Verify that ITT indicator reads 100˚C or less.

(b) Verify that all bleed systems are closed and that power lever is in cut-off position.

NOTE: Ensure that power lever is in cut-off position (no fuel) and ignition system is turned off throughout rinse cycles.

If spray mix applicator nozzle is not properly angled, fan rotor assembly will centrifuge fluid. *(See Figure 302.)*

(c) Energize starter and motor engine in accordance with Aircraft Maintenance Manual. As engine high pressure spool starts to rotate, direct nozzle of spray mix applicator as close as possible to base of fan rotor assembly blades at an angle that is parallel to blade airfoil contour and blade base contour and open water control valve on spray mix applicator to inject fresh water. Motor engine to a minimum speed of ten percent N2 indication for 45 seconds or starter duty cycle limit, whichever is less.

De-energize starter and continue to inject fresh water until engine rolls down then shut off water control valve on spray mix applicator. Success of fresh water inducement is noted by water being discharged from exhaust nozzle.

(d) Allow starter to cool in accordance with Aircraft Maintenance Manual. Allow engine to drain induced water.

2. F. (5) Restore engine to operational status.

(a) Remove protective cover (or tape) from inlet pressure and temperature sensor and starter/generator.

(b) Reverse blow compressed air (approximately **50 psig**) through disconnected P3 tubes removed from fuel control P3 pressure limiter valve fitting.

(c) Remove cap, previously installed, from fuel control P3 pressure limiter valve fitting. Connect P3 tube to fuel control P3 pressure limiter valve fitting. *(See Figure 301.)*

(6) Perform dry-out procedure of engine immediately following compressor rinse and restoration of engine to operational status.

WARNING: AREAS IN PROXIMITY OF ENGINE INLET AND EXHAUST ARE EXTREMELY HAZARDOUS TO PERSONNEL WHEN ENGINES ARE OPERATING. PERSONNEL SHALL CLEAR THESE AREAS DURING ENGINE START AND OPERATION TO AVOID INJURY.

NOTE: Refer to Aircraft Maintenance Manual for any special instructions relative to dry-out procedure.

(a) Perform normal engine start in accordance with Aircraft Flight Manual and/or appropriate aircraft document.

(b) **[5-1J]** Operate engine at idle speed for approximately 10 minutes, then advance power to 80 percent N1 speed indication. Turn on anti-ice air. When ITT indication rises, turn off anti-ice air.

(c) **[5A, 5-1H]** Operate engine at idle speed for approximately 10 minutes.

(d) Perform normal engine shutdown in accordance with Aircraft Flight Manual and/or appropriate aircraft document.