Beech Aircraft Corporation

# OVERHAUL SPECIFICATION

PRE-OILING AND GROUND OPERATION

OF

AIRCRAFT ENGINES

Overhaul Specification 7005

ISSUED May 20, 1953

REVISED March 29, 1954

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E-371

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1. SCOPE

1.1 Purpose.- The purpose of this overhaul specification is to provide instructions and establish procedures to be used in pre-oiling and ground operation of Model 18 aircraft engines.

1.2 Application.- This overhaul specification is applicable to all Beech Model 18 aircraft equipped with Pratt and Whitney R-985 engines.

1.3 List of Pages and Revisions.- This specification consists of the pages listed below. An asterisk (*) denotes the pages revised by the current revision.

| Page | Date | Description of Revision | Serial Effectivity |
|---|---|---|---|
| *1 | 3-29-54 | Record revision | Record change |
| *2 | 3-29-54 | Add 2R-1-15 to Para. 2.2 | Record change |
| *3 | 3-29-54 | Delete Step (d) Para. 3.3.1 | Record change |
| 4 | 5-20-53 | | |
| 5 | 5-20-53 | | |
| 6 | 5-20-53 | | |
| 7 | 5-20-53 | | |
| 8 | 5-20-53 | | |
| *9 | 3-29-54 | Add Para. 3.9 | Record change |

E-3389

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2. APPLICABLE PUBLICATIONS

2.1 Bosch:

OS 7004 , Preservation and Storage of Reciprocating Aircraft Engines

2.2 Technical Orders:

| | |
|---|---|
| ANO1-90CDB-1 | Flight Handbook - C-45G, dated December 1, 1952 |
| ANO1-90CE-1 | Flight Handbook - SNB-5, dated December 15, 1952 |
| 02A-1-1 | Corrosion Control for Reciprocating Aircraft Engines, dated November 25, 1952 |
| 02A-1-29 | Pre-Oiling and Ground Operation of Reciprocating Aircraft Engines, dated March 20, 1951 |
| 2R-1-15 | Handbook, Engine Conditioning |

3. REQUIREMENTS

3.1 General.- Preservation agents should not be removed until time for engine run-up; therefore, the procedures contained in this specification will not be accomplished until immediately prior to the time of initial engine run-up. If, after completing engine run-up, flight test, and final inspection, the aircraft is not to be delivered within two weeks, it will be preserved for predelivery storage according to OS 7004.

3.2 Depreservation of Engines.- Depreserve the engine in accordance with OS 7004. When spark plugs are installed, remove one plug from each cylinder.

3.3 Pre-Oiling.- To avert possible bearing failures resulting from lack of lubrication during initial starts, dry sump aircraft engines will be pre-oiled prior to initial start after each engine change or overhaul. Engines need not be pre-oiled after oil change or after oil lines have been disconnected for any reason. However, after an oil change or whenever the oil lines have been disconnected, it will be necessary to disconnect the oil inlet connection at the oil pump and drain a sufficient amount of oil from the tank to insure that there are no obstructions or air in the inlet line to the oil pump.

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3.3 Pre-Oiling.- (Continued)

NOTE: Under no circumstances will the engine be pre-oiled by feathering and unfeathering the propeller.

3.3.1 Pre-Oiling with Engine Oil Pump:

(a) Fill the oil tank to the proper level with corrosion-preventive mixture as called out on OS 7004 for engine run-up during preservation. All new engines or newly overhauled engines installed on aircraft delivered to the government will have corrosion-preventive mixture in the engine oil system.

(b) Disconnect the oil inlet connection at the oil pump and drain a sufficient amount of oil to insure that there are no obstructions or air in the inlet line to the oil pump.

(c) Install the oil inlet connection to the oil pump.

(d) DELETED

(e) Remove the oil sump plug.

(f) Place the mixture control in the idle cut-off position.

(g) Place the fuel shut-off valve in the off position.

(h) Make sure the ignition switch is off.

(i) Turn the propeller with the starter until a positive indication of oil pressure is noted on the oil pressure gage installed in the aircraft and oil runs from the sump. A portable energizer or external power source will be used for turning the engine.

(j) If, after three tries, the oil neither flows from the sump nor indicates pressure on the gage, a thorough inspection will be made for obstructions or air in the system.

(k) Install the sump plug when the pre-oiling is complete.

(l) Install spark plugs. Torque to 300 to 360 inch-pounds.

3.3.2 Mechanical Pre-oilers.- No instructions are included in this overhaul specification for utilizing nonstandard mechanical pre-oilers of the various designs because of the numerous methods of attaching and using such pre-oilers. Any method which will force oil through the engine and will remove all trapped air from the oil passages and oil lines is satisfactory.

3.4 Pre-engine Start:

3.4.1 Procedure.- The following will be accomplished on all engines prior to starting the engine, except where specific instructions may direct otherwise:

CAUTION: Do not operate throttle when the engine is not running. Float type carburetors employ throttle operated accelerating pumps and operation of the throttle will discharge fuel into the carburetor scoop with possible fire hazard on subsequent engine start.

1. All ignition switches - off
2. Engine selector - off
3. Ignition booster, starter and primer switches - cover down
4. Battery switches - off (Do not use ships batteries for starting except in emergencies.)
5. Fuel booster switches - off
6. Instrument inverter switch - off
7. All light switches - off
8. Fuel quantity gage - check all tanks
9. Propeller levers - take-off rpm
10. Manifold heat levers - cold
11. Throttles - closed
12. Mixture levers - idle cut off
13. Oil shutter levers - cold
14. Cowl flap handles - open
15. Landing gear lever - down
16. Flap lever - off (flaps retracted)

NOTE: If flaps are not fully retracted, retract them.

3.4.1 Procedure.- (Continued)

17. Automatic pilot handle - off
18. Automatic pilot emergency vacuum valve - on
19. Automatic pilot emergency hydraulic valve - on
20. Left engine fuel selector handle - off
21. Right engine fuel selector handle - off
22. Tail wheel handle - locked
23. Parking brake handle - on
24. Oil bypass button - cold
25. Landing gear circuit breaker - check (push to reset)
26. Fire extinguisher control - release handle in place
    selector handle in neutral
27. Fuel cross-feed handle - off
28. Propeller anti-icer - place knob at normal. Check for alcohol flow at the propeller. Return knob to off.

    NOTE: If there is no indication of alcohol flow with the knob at normal, the knob should be slowly turned toward max and the position at which flow begins noted.
29. De-icing button - off
30. Pitot heat switches - off
31. Windshield wiper switch - off
32. All indicator lights - push to test
33. Pilot's instrument lights knob - off
34. Engine and subpanel instruments lights knob - off
35. Pilot's turn-and-bank power selector switch - normal
36. Manifold pressure gage - check (remember indication for power check)

    NOTE: Manifold pressure gages should indicate the current barometic pressure. Any variation should be noted.
37. Co-pilot's instruments lights knob - off
38. Pull the propeller through in the direction of rotation a minimum of two complete turns to determine if all combustion chambers are clear and free from fuel or oil which may result in a hydraulic lock which is indicated by abnormal effort required to rotate the propellers. This may be accomplished with the starter when external power is utilized. The starter should be used intermittently

3.4.1 Procedure.- (Continued)

in such a manner that rotation will be in approximately 90-degree increments. Use of the starter in this method will not exert sufficient force on the crankshaft to cause bending or breaking of the connecting rods in the event a hydraulic lock is present.

NOTE: A hydraulic lock will be recognized by the resistance it offers to rotation. When hydraulic lock is detected, it is not to be relieved by turning the engine in either direction. The spark plugs for those cylinders affected are to be removed and all fluid drained.

3.5 Engine Start:

3.5.1 General.- After the controls have been adjusted as specified under Paragraph 3.4, the engine will be started according to the instructions under Paragraph 3.5.2. To reduce the strain on the aircraft battery, an external power source will be used whenever equipment and time permits. Determine that the area to the rear of the aircraft is clear and that no damage will result from the propeller air stream. The fire guard, who is to stand by for all starts, should be in such a position that he is visible to the pilot to indicate the area is clear. No start should be attempted until the clear signal is received. The left engine should not be started with the cabin door open.

3.5.2 Procedure:

3.5.2.1 Right Engine.-

a. Fire extinguisher selector handle - right engine
b. Right engine fuel selector handle - right
c. Right cowl flap handle - check open
d. Right throttle - 1/8 open
e. Right mixture lever - full rich
f. Right fuel booster switch - on
g. Master ignition switch - on
h. Engine selector switch - right
i. Starter switch - on

3.5.2.1 Right Engine.- (Continued)

j. Allow engine to turn two revolutions, then:

k. Right ignition switch - both

l. Primer switch - use until the engine fires and is operating smoothly

m. Starter switch - release

n. Ignition booster switch - release

NOTE: If engine ceases to fire after starting, move the mixture lever to idle cut off until it again begins to fire. Then return the mixture lever to full rich.

CAUTION: Overheating of the starter motor will occur with prolonged operation. Thirty seconds should be considered as the maximum period of continuous operation without a cooling period.

o. Adjust engine speed to 1000 rpm

p. Fuel booster switch - off

q. Engine selector switch - off

CAUTION: If oil pressure is not indicated within 30 seconds after starting, shut down engine and investigate.

r. Fire - see Paragraph 3.5.2.3 for fire fighting instructions.

3.5.2.2 Left Engine.- Position controls and start the left engine in the manner prescribed for the right engine, Paragraph 3.5.2.1.

a. Start left engine.

b. With both engines running:

(1) Instrument inverter - on

(2) External power - disconnect

(3) Battery switches - on

3.5.2.3 Fire.- Engine fire on the ground is usually on induction system fire which occurs during the starting operation. For this type of fire, proceed as follows:

(a). If the engine has started, keep it running. Most fires can be pulled through the induction system.

3.5.2.3 Fire.- (Continued)

(b) If the engine has not started, place mixture control in idle cut off, the throttle open and continue to turn the engine with the starter in an attempt to extinguish the fire by drawing it into the engine.

(c) If in either case the fire is not extinguished, stop the engine and order the ground crew to extinguish with hand extinguishers. If ground crew does not immediately extinguish the fire, discharge the engine fire-extinguishing system.

NOTE: If both engines are running when it becomes necessary to combat fire with extinguishers, both engines should be stopped.

3.6 Engine Warm-up:-

3.6.1 General.- Aircraft engines should always be warmed up on the ground until proper lubrication and engine operation for take-off and flight are assured. As soon as the engine has started, oil pressure permitting, the throttle will be adjusted to the smoothest speed between 1200 and 1600 rpm. Warm-up at this speed will assure best possible operation of the engine, since adverse conditions such as improperly adjusted idle mixture, improperly adjusted engine valves, etc., will have the least effect at this speed. Cowl flaps will always be placed in the "FULL-OPEN" position for warm-up. All gages and instruments, such as oil pressure gage, oil temperature gage, fuel pressure gage, and cylinder head temperature gage will be watched to insure proper operation of the engine.

3.7 Taxiing of Aircraft:

3.7.1 General.- Have chocks pulled and release the parking brake. As the aircraft first begins to move, the brakes should be applied to determine that adequate brake is available for stopping. It can also be noted if there is grab, drag or other malfunction of either brake. The tail wheel must be unlocked before attempting any turn.

In taxiing, pilot visibility is restricted, by the nose, in an area to the right and forward of the aircraft. To determine adequate clearance in this area will require an occasional S-turn.

Insofar as is possible, directional control should be maintained and turns executed by varying the power of the engines. This will permit minimum use of brakes. The tendency for this aircraft to nose-over is not critical, however, brake application should be made with caution when the aircraft is empty or lightly loaded.

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3.8 Stopping Engines:

3.8.1 General.- With the engine speed set for scavenging of the engine oil system or oil dilution, move the carburetor mixture control to the "IDLE CUT-OFF" position. After the engine ceases firing, slowly move the throttle control to the "FULL OPEN" position. When the engine is equipped with Aeroproducts Hydraulic or Hamilton Standard Hydromatic propellers, the engine will be stopped with the propellers in "FULL-LOW", high rpm position. Hamilton Standard counterweight type propeller controls will be shifted to the low rpm high pitch position approximately one minute prior to actually shutting off the engine and accomplish the engine shut-off with the propeller and control in this position. This will allow oil dumped into the engine and the propeller to be properly scavenged and returned to the oil tank.

NOTE: The engine may be stopped with the Hamilton Standard counterweight type propeller in the low pitch position when it is necessary to inspect the propeller cylinders for cooling and wear and for cleaning and lubricating the exposed positions of the cylinders.

3.9 Complete Cockpit Check.- A complete cockpit check will be accomplished on Model 18 airplanes manufactured or reconditioned under Air Force contracts at the time of initial engine installation, removal of aircraft from storage, after each spark plug change, valve adjustment, cylinder change, carburetor change, propeller change, and tachometer or manifold pressure gage change. Readings obtained will be recorded on a cockpit check sheet which meets the requirements of TO 2R-1-15 and will be attached to the Form 1 and 1A binder.