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Section 72-00 General
This chapter provides a descriptive overview of the IOF-240-B engine installed on the airplane. Detailed information for routine line maintenance for each engine subsection or system is provided in the appropriate chapter. More detailed information for repairs and maintenance on systems and components specific to the IOF-240-B engine (in particular, the FADEC system) are provided in the current release of the Teledyne Continental Motors Maintenance Manual for IOF-240-B series engines, TCM p/n: M-22.

Section 00-01 Engine Model Description
The airplane is powered by a Teledyne Continental Motors IOF-240-B engine rated at 125 bhp maximum continuous power. Recommended cruise power is 90 bhp. The engine drives a two-blade wooden fixed pitch propeller.

The IOF-240-B-X is a four-cylinder air-cooled engine. Its type designation reflects the following:

I – the engine is fuel injected

O – Cylinder layout - horizontally opposed

F – The engine uses a Full Authority Digital Engine Control system (FADEC)

240 – Engine displacement is 240 cubic inches

B – Model designation indicating that the engine is designed for use with a fixed-pitch propeller, with a doweled six bolt hole propeller flange and no provision for a hydraulic propeller governor

X – Specific configuration of accessories as supplied to Liberty Aerospace, Inc., for use on the airplane.

Figure 72-1 Engine Assembly
Because of the nature and complexity of the FADEC system, procedures covered in this maintenance manual include routine line servicing, replenishment of operating fluids, and replacement of “consumable” components such as spark plugs only. Detailed information and procedures covering maintenance and troubleshooting of the FADEC system and related components are provided in the Teledyne Continental Motors Maintenance Manual for IOF-240-B series engines, TCM P/N: M-22.
Section 72-10 Front Section Description

The IOF-240-B engine is direct drive; there is no reduction gear. A front crankshaft seal prevents leakage of engine oil.

In the airplane installation, the alternator is installed at the front of the engine and belt-driven via pulleys on the alternator and engine crankshaft. A solid propeller shaft extension is installed on the crankcase flange, with the propeller and spinner installed at the forward end of the shaft extension.

![Diagram of Engine Front View](image)

Figure 72-2 Engine Front View
Section 72-20 Power Section Description

The engine power section includes the crankshaft, camshaft, connecting rods, valve lifters, and related bearings.

The crankshaft rotates on three bearings (front, intermediate, and rear). The bearings are of the metal-to-metal type and are lubricated by oil under pressure fed through drillings in the crankshaft. Additional drilled oil passages provide lubrication to the connecting rods.

The camshaft is supported by three main bearings and is gear driven (at a 1:2 ratio) by the crankshaft. The crankshaft/camshaft gear train is located at the rear of the engine. Self-adjusting hydraulic valve lifters (tappets) are moved by the camshaft to operate cylinder intake and exhaust valves.

Figure 72-3 Engine Case
Section 72-30 Cylinder Section Description

There are four (identical) cylinder assemblies. Each assembly consists of a steel cylinder barrel with an aluminum alloy cylinder head assembly screwed and shrunk to the barrel. Cooling fins are machined in both the barrel and the head. The interior of the barrel has a nitride coating for increased wear.

The intake and exhaust valves are installed in valve guides in the cylinder head and each have two concentric valve springs. Rocker arms, installed via brass bushings on a single rocker shaft in each cylinder head, transmit motion from the valve pushrods to the valve stems. The pushrods and rockers are drilled to provide an oil passage from the hydraulic valve lifters in the crankcase, through the pushrods and the rockers, to the rocker arm bearings and to the valve stem faces. Oil spray from the rocker arm bearings lubricates the valve stems. Excess oil returns to the crankcase via the pushrod tubes, which are spring-loaded to seal against the cylinder head and the crankcase.

A cylinder head temperature (CHT) sensor is installed in each cylinder head to provide required data to the FADEC system computers. An exhaust gas temperature (EGT) sensor is installed in each cylinder’s exhaust pipe, approximately two inches from its attachment to the cylinder exhaust port, to provide required data to the FADEC system computers.

![Figure 72-4 Cylinder Head Assembly](image)

Section 30-01 Baffles

Baffles are installed in the Liberty XL2 airplane to direct airflow through the engine compartment to augment engine. Each baffle assembly consists of a sheet metal baffle and a silicon cowl seal riveted to the edge of the baffle. Cutouts in the baffle fit around engine parts so as to direct the airflow aft and down through the engine compartment.
Figure 72-5 Engine Baffle System

The baffle system is made up of 4 assemblies as follows:

1. Port Baffle Assembly
2. Starboard Baffle Assembly
3. Aft Baffle Assembly
4. Forward Baffle Assembly

Figure 72-5 depicts placement of each baffle assembly along with relates attachment hardware. Port and starboard baffle assemblies can be removed without disturbing engine systems penetrate the forward and aft baffles assemblies. Forward and aft baffle assembly removal requires some engine system removal. Procedures to follow identify supporting manual chapters required to support baffle removal and installation.

Section 30-02 Baffle Procedures

The following Baffle Procedures perform removal and installation of the engine baffle system. Procedures for each baffle assembly may be run together or individually as required by the maintenance operation supported.
PORT BAFFLE REMOVAL

This performs Port Baffle Removal. Refer to Figure 72-5 for location of hardware.

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Remove upper and lower cowl in accordance with Chapter 71 – Power Plant of this manual
5. Locate and remove “P” clamp securing the ignition lead above cylinders
6. Remove wire tie securing landing light lead and connector J62 to the baffle mounted wire tie anchor.
7. Remove one (1) #10 screw, washer and nut set securing the baffle to the forward baffle assembly
8. Remove two (2) #10 screw, washer and nut sets securing the baffle to the aft baffle assembly.
9. Remove two (2) ¼-20 bolt, lock washer and spacers securing the lower baffle section to the cylinders
10. Remove the port baffle.

This completes the Port Baffle Removal procedure.
PORT BAFFLE INSTALLATION

This performs Port Baffle Installation. Refer to Figure 72-5 for location of hardware.

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Position the baffle aligning with the cylinder ¼-20 bolt hole locations.
5. Install two (2) ¼-20 bolt, lock washer and spacers securing the lower baffle section to the cylinders. Do not tighten at this time.
6. Install two (2) #10 screw, washer and nut sets securing the baffle to the aft baffle assembly. Do not tighten at this time
7. Install one (1) #10 screw, washer and nut set securing the baffle to the forward baffle assembly. Do not tighten at this time.
8. Locate and install “P” clamp securing the ignition lead above cylinders
9. Install wire tie to secure landing light lead and connector J62 to the baffle mounted wire tie anchor.
10. Align baffle with adjacent baffle structure and tighten #10 hardware.
11. Torque ¼-20 baffle bolts (2) in accordance with Teledyne Continental Motors manual M-22 Appendix B.
12. Install upper lower cowl in accordance with Chapter 71 – Power Plant of this manual
13. Position BAT1 circuit breaker – CLOSED
14. Position SYSTEM, START circuit breaker – CLOSED

This completes the Port Baffle Removal procedure.
STARBOARD BAFFLE REMOVAL

This performs Starboard Baffle Removal. Refer to Figure 72-5 for location of hardware.

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Remove upper and lower cowl in accordance with Chapter 71 – Power Plant of this manual.
5. Locate and remove “P” clamp securing the ignition lead above cylinders
6. Remove one (1) #10 screw, washer and nut set securing the baffle to the forward baffle assembly
7. Remove two (2) #10 screw, washer and nut sets securing the baffle to the aft baffle assembly.
8. Remove two (2) ¼-20 bolt, lock washer and spacers securing the lower baffle section to the cylinders.
9. Remove the port baffle.

This completes the Starboard Baffle Removal procedure.
STARBOARD BAFaffle INSTALLATION

This performs Starboard Baffle Installation. Refer to Figure 72-5 for location of hardware.

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Position the baffle aligning with the cylinder ¼-20 bolt hole locations.
5. Install two (2) ¼-20 bolt, lock washer and spacers securing the lower baffle section to the cylinders. Do not tighten at this time.
6. Install two (2) #10 screw, washer and nut sets securing the baffle to the aft baffle assembly. Do not tighten at this time.
7. Install one (1) #10 screw, washer and nut set securing the baffle to the forward baffle assembly. Do not tighten at this time.
8. Locate and install “P” clamp securing the ignition lead above cylinders
9. Align baffle with adjacent baffle structure and tighten #10 hardware.
10. Torque the two ¼-20 baffle bolts in accordance with Teledyne Continental Motors manual M-22 Appendix B.
11. Install upper lower cowl in accordance with Chapter 71 – Power Plant of this manual
12. Position BAT1 circuit breaker – CLOSED
13. Position SYSTEM, START circuit breaker – CLOSED

This completes the Starboard Baffle Installation procedure.
FORWARD BAFFLE REMOVAL

This performs Forward Baffle Removal. Refer to Figure 72-5 for location of hardware

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Remove upper and lower cowl in accordance with Chapter 71 – Power Plant of this manual.
5. Remove alternate air box assembly in accordance with Chapter 71 – Power Plant of this manual

NOTE

The XL-2 can be fitted with one of two different breather installations. The first is a direct overboard breather and the second is an air/oil separator. If an air/oil separator is installed proceed to step 9. If an overboard breather is installed proceed with the following step.

6. Loosen clamps securing the coupler tube to the breather line
7. Slide the breather tube up and out of the couple tube
8. Remove the couple tube by sliding it upward off of the lower breather tube

Figure 72-6 Overboard Breather Penetration
9. Remove #10 screw, nut and washer sets (2) from the forward baffle upper bracket assembly as shown in Figure 72-7.

![Forward Baffle Assembly Upper Bracket](image)

**Figure 72-7  Forward Baffle Assembly Upper Bracket**

10. Remove #10 screw, nut and washer sets (2) from the forward baffle lower bracket assembly as shown in Figure 72-8.

![Forward Baffle Assembly Lower Bracket](image)

**Figure 72-8  Forward Baffle Assembly Lower Bracket**

11. Remove the #10 screw, nut and washer set (1) connecting the forward baffle assembly to the port baffle assembly.

12. Remove the #10 screw, nut and washer set (1) connecting the forward baffle assembly to the starboard baffle assembly.

13. Remove the #10 screw and washer from the port and starboard cylinder inter-baffle assemblies as shown in Figure 72-9.
14. Remove the forward baffle assembly from the engine.

This completes the Forward Baffle Removal procedure.
FORWARD BAFFLE INSTALLATION

The following procedure performs Forward Baffle Installation

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Position the forward baffle assembly at the front of the engine
5. Install the #10 Screw and washer from the port and starboard cylinder inter-baffle assemblies as shown in Figure 72-9. Do not tighten hardware at this time.
6. Install the #10 screw, nut and washer set (1) connecting the forward baffle assembly to the starboard baffle assembly. Do not tighten hardware at this time.
7. Install #10 screw, nut and washer sets (2) from the forward baffle lower bracket assembly as shown in Figure 72-8. Do not tighten hardware at this time.
8. Install #10 screw, nut and washer sets (2) from the forward baffle upper bracket assembly as shown in Figure 72-7.

NOTE

The XL-2 can be fitted with one of two different breather installations. The first is a direct overboard breather and the second is an air/oil separator. If an air/oil separator is installed do not perform the next four (4) steps.

9. Install the couple tube by sliding it downward onto the lower breather tube
10. Secure the lower tube section with clamps removed previously
11. Slide the breather tube down and into the couple tube
12. Secure the breather tube and couple tube with clamp removed previously.
13. Align forward baffle with port and starboard baffle and torque all hardware.
14. Install alternate air box assembly in accordance with Chapter 71 – Power Plant of this manual
15. Install upper and lower cowl in accordance with Chapter 71 of this manual.
16. Position SYSTEM, START circuit breaker – CLOSED
17. Position BAT1 circuit breaker – CLOSED

This completes the Forward Baffle Installation procedure.
AFT BAFaffle REMOVAL

The following procedure performs Aft Baffle Removal

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Remove upper and lower cowl in accordance with Chapter 71 – Power Plant of this manual.
5. Remove the throttle arm linkage bolt, nut, washer and split key.
6. Remove the throttle cable from the throttle cable bracket sliding “B” nuts off the end of the throttle cable.

![Throttle Cable Bracket](image)

Figure 72-10 Throttle Cable and Bracket

7. Remove the air/oil separator line by removing the separator band clamp as shown in Figure 72-11.
8. Slide the hose out of the aft engine baffle.

**NOTE**

The XL-2 can be fitted with one of two crank case breather systems. One is a direct overboard breather and the other is an air/oil separator. For engines fitted with an air/oil separator perform the following step else go to step 8.

7. Remove the air/oil separator line by removing the separator band clamp as shown in Figure 72-11.
8. Slide the hose out of the aft engine baffle.
9. Remove port ignition leads by removal of #10 screw, nut washer sets (2) and sliding the leads aft out of the baffle.

10. Remove starboard ignition leads by removal of #10 screw, nut washer sets (2) and sliding the leads aft out of the baffle.

In the following step a fuel line will be opened. Some residual fuel and vapors may be released as the line is opened. Capture residual fuel in a container. No heat sources can be exposed during this procedure.

11. Remove and cap fuel return line connected to the recirculation valve assembly and route the line back out of the aft baffle as shown in Figure 72-12.
12. Remove wire tie securing landing light lead and connector J62 to the baffle mounted wire tie anchor.

13. Remove the #10 screw and washer from the port and starboard cylinder inter-baffle assemblies securing the aft baffle.

14. Remove port #10 screw, nut, washer assemblies (2) connecting the aft baffle assembly to the port side baffle assembly as shown in Figure 72-5.

15. Remove starboard #10 screw, nut, washer assemblies (2) connecting the aft baffle assembly to the starboard side baffle assembly as shown in Figure 72-5.

16. Disconnect the alternate air box control cable at the box.

17. Slide the aft baffle up and out of the engine guiding the throttle cable and alternate air control cable out of the baffle as it is removed.

This completes the Aft Baffle Removal procedure.
AFT BAFFLE INSTALLATION

The following procedure performs Aft Baffle Installation

1. Position the aircraft split master switch – OFF
2. Position BAT1 circuit breaker – OPEN
3. Position SYSTEM, START circuit breaker – OPEN
4. Position the aft baffle above the engine accessory case and feed the throttle cable and alternate air control cable through the aft baffle.
5. Install port #10 screw, nut, washer assemblies (2) connecting the aft baffle assembly to the port side baffle assembly as shown in Figure 72-5. Do not tighten at this time.
6. Install starboard #10 screw, nut, washer assemblies (2) connecting the aft baffle assembly to the starboard side baffle assembly as shown in Figure 72-5. Do not tighten at this time.
7. Install the #10 screw and washer from the port and starboard cylinder inter-baffle assemblies securing the aft baffle. Do not tighten at this time.
8. Install wire tie securing landing light lead and connector J62 to the baffle mounted wire tie anchor.
9. Route the fuel return line through the aft baffle and connect to the recirculation valve assembly as shown in Figure 72-12.
10. Install port ignition leads by sliding leads through the aft baffle and securing the baffle seal with #10 screw, nut washer sets (2).
11. Install starboard ignition leads by sliding leads through the aft baffle and securing the baffle seal with #10 screw, nut washer sets (2).

NOTE

The XL-2 can be fitted with one of two crank case breather systems. One is a direct overboard breather and the other is an air/oil separator. For engines fitted with an air/oil separator perform the following step else go to step 14.

12. Slide the hose through the aft engine baffle.
13. Secure the air/oil separator line by installing the separator band clamp as shown in Figure 72-11.
14. Slide throttle cable “B” nuts over the cable assembly and secure throttle cable to the engine cable bracket.
15. Connect the throttle cable end to the air body arm and secure with split key.
16. Connect control cable to alternate air box control arm and secure with new split key.
17. Align aft baffle with port and starboard side baffles and tighten hardware.

18. Install upper and lower cowl in accordance with Chapter 71 – *Power Plant* of this manual

19. Position SYSTEM, START circuit breaker – CLOSED

20. Position BAT1 circuit breaker – CLOSED

This completes the Aft Baffle Installation procedure
## Section 30-03 Baffle Troubleshooting Guide

Use this troubleshooting guide to resolve issues with the baffle system. This guide provides initial troubleshooting guidance.

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<th>Remedy</th>
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<td>• Standard repair in accordance with Chapter 51 – <em>Standard Practices Structures</em></td>
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<td>• Loose installation</td>
<td>• Replace</td>
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<tr>
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<td>• Corrosion</td>
<td></td>
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<tr>
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<td>• Repair in accordance with Chapter 51 – <em>Standard Practices Structures</em> if superficial</td>
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<tr>
<td></td>
<td></td>
<td>• Replace if greater than superficial</td>
</tr>
<tr>
<td>Baffle Seal Damage</td>
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<td>• Replace seal</td>
</tr>
<tr>
<td></td>
<td>• Faulty cowling installation</td>
<td>• Install cowl in accordance with Chapter 71 – <em>Power Plant</em></td>
</tr>
<tr>
<td>Damaged baffle penetration</td>
<td>• In service wear</td>
<td>• Replace</td>
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<td>grommets</td>
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Table 72-1 Troubleshooting Table
Section 72-40 Accessory Case Description

The aluminum alloy casting of the accessory case is attached to the rear of the engine crankcase, aligned with crankcase dowels; the accessory case is secured to the crankcase-by-crankcase studs and various attaching hardware. Accessory mount pads on the rear surface are machined in one plane parallel to the machined parting flange, which surrounds the front side of the casting. Mounting pads for the magnetos, alternator cover, starter, tachometer drive, oil filter adapter, a relief valve for the oil pressure and an oil suction screen boss are provided. The accessory case casting has two holes above and three studs to attach the starter and starter adapter. A mounting pad is provided for the oil screen housing in lieu of the screw-on type oil filter.

The oil pump housing is machined into the internal portion of the accessory case. A machined, threaded boss is located on the lower right side of the accessory case for installation of a non-adjustable valve for oil pressure relief. The chamber for the oil pump gears are machined in the interior of the accessory case. The hole for the gear shaft of the oil pump drive is machined in-line with the camshaft and the driven gear shaft hole is directly above it.

A semicircular opening at the accessory case bottom is a machined threaded hole to accommodate installation of the oil suction tube. Passages cast into the accessory case allow oil to flow from the oil suction tube to the oil pump gears, pressure relief valve, and main oil gallery. The tachometer drive shaft is the slotted end of the oil pump driven gear shaft.
Figure 72-13 Accessory Case
Section 72-50 Lubrication

Oil is stored in an oil sump bolted to the bottom of the crankcase near the rear of the engine. A gear-type oil pump at the rear of the engine is driven by the camshaft drive gear. The oil sump incorporates an external filler tube to allow oil replenishment. A calibrated dipstick is installed in the oil filler tube.

A suction tube extends from the oil pump into the oil tank. Oil leaves the oil pump under pressure. A regulating valve allows some oil to return to the oil tank to maintain oil pressure within limits at varying engine speeds. Oil from the pump is routed to an oil cooler adapter on the left side of the engine accessory case.

The oil cooler adapter has hose connections to route oil to the firewall-mounted oil cooler, which incorporates a “Vernatherm” thermostatically controlled valve to control oil temperature, and to the oil filter element. An integral bypass valve will open in the event of blockage of the oil cooler. The oil temperature sensor for the engine instruments are is located on the oil cooler adapter. Oil pressure is located remotely and not installed on the engine.

A full-flow oil filter is mounted to an adapter on the lower accessory case. The oil filter is located just aft of the engine oil sump.

Figure 72-14 Cut-A-Way View of Engine and Oil Related Components
Figure 72-15 Oil Distribution

Figure 72-15 shows the flow of oil within the engine. Oil galleries and drilled passages inside the engine route oil to the crankshaft and camshaft main bearings and to the hydraulic valve lifters. Drillings inside the crankshaft route oil to the connecting rod lower bearings. Oil escaping from the main and connecting rod bearings creates an oil mist inside the crankcase which lubricates the connecting rod upper bearings and cylinder walls, as well as the cam lobes and lower faces of the lifters. In addition, oil nozzles on the main bearings direct a jet of oil at the undersides of the pistons to cool them.

Oil in the hydraulic lifters is routed via the hollow valve pushrods to the cylinder rocker boxes, where it lubricates the rockers, valve stems, and valve guides before returning, via the pushrod housings, to the crankcase. Any excess oil in the crankcase returns, via the large-diameter opening between the crankcase and the sump, to the oil sump.