This is Amendment List No. 12 to Air Publication 4282, Volume 1

Section 3. List of Chapters: *delete* "(to be issued later)" after the title of Chapter 3, and *write* "(A.L.12)" in the outer margin against the deletion. *Insert* this Chapter 3 to follow Chapter 2. *Record* the incorporation of this A.L. in the Amendment Record Sheet at the beginning of the book.

Chapter 3

CONTROL BOX AND DUMP VALVE

This chapter applies to the Goblin Mk. 2 aero-engine

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LIST OF ILLUSTRATIONS

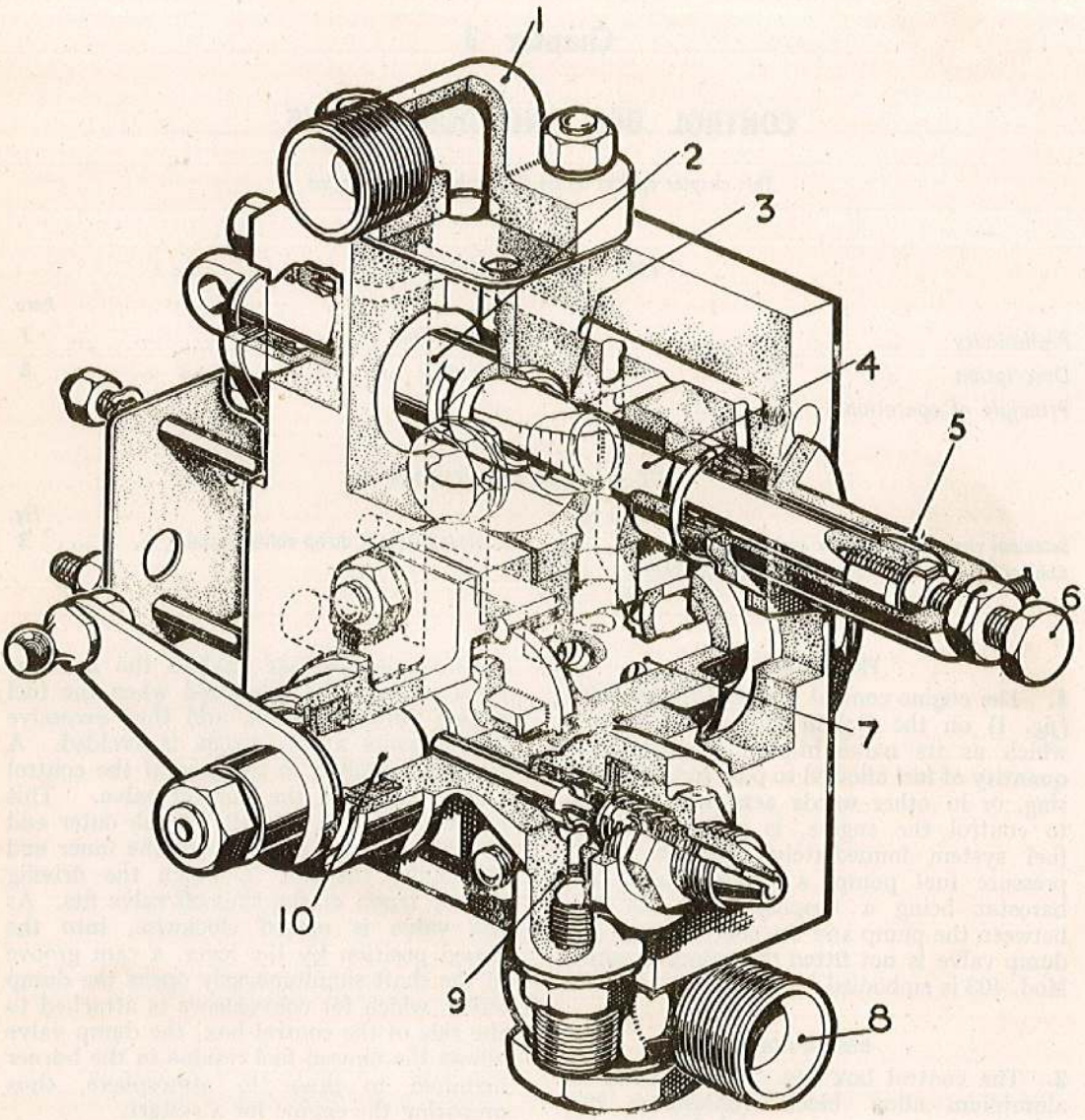
PRELIMINARY

1. The engine control box and dump valve (*fig.* 1) on the Goblin Mk. 2 aero-engine, which as its name implies, regulates the quantity of fuel allowed to pass to the burner ring, or in other words acts as a throttle to control the engine, is situated in the fuel system immediately after the high-pressure fuel pump, a connection to the barostat being a tapping from the line between the pump and the control box. The dump valve is not fitted to engines in which Mod. 403 is embodied.

DESCRIPTION

2. The control box (*fig.* 2) consists of an aluminium-alloy block containing two cylindrical cavities connected by internal passages. One cavity, which is fitted with a flanged cylinder having two metering orifices contains a stainless steel metering needle or plunger of graduated cross section; the other cavity contains a brass bush, housing a steel high-pressure fuel cock or shut-off valve. Internal passages in the body of the control box connect an anti-hammer passage in the shut-off valve, and the top and bottom seals of the control valve plunger to the main control box drain; the drain passage to the top seal is connected to the seal annulus so that any fuel leakage past the seals is removed. The anti-hammer passage enables the barostat relief valve to be by-passed when the fuel cut-off valve is closed, and thus excessive fuel pressure at low r.p.m. is avoided. A housing is bolted to the face of the control box in line with the shut-off valve. This housing contains a shaft, at the outer end of which a lever is attached, the inner end containing the slot in which the driving dog or tenon of the shut-off valve fits. As the valve is moved clockwise, into the closed position by the lever, a cam groove in the shaft simultaneously opens the dump valve, which for convenience is attached to the side of the control box; the dump valve allows the unused fuel residue in the burner manifold to drain to atmosphere, thus preparing the engine for a restart.

3. The dump valve assembly (*fig.* 3) is a small aluminium casing containing a poppet-type valve and two ports. The inlet port is connected to the burner manifold through the starting valve and the outlet port is connected to the common drain. When the starting valve is in the closed position, the burner manifold inlet port is sealed off, but when the high-pressure fuel cock or shut-off valve is closed, the dump valve as previously stated is lifted by a cam, allowing the unused fuel in the manifold to drain to atmosphere as stated at the end of para. 2.



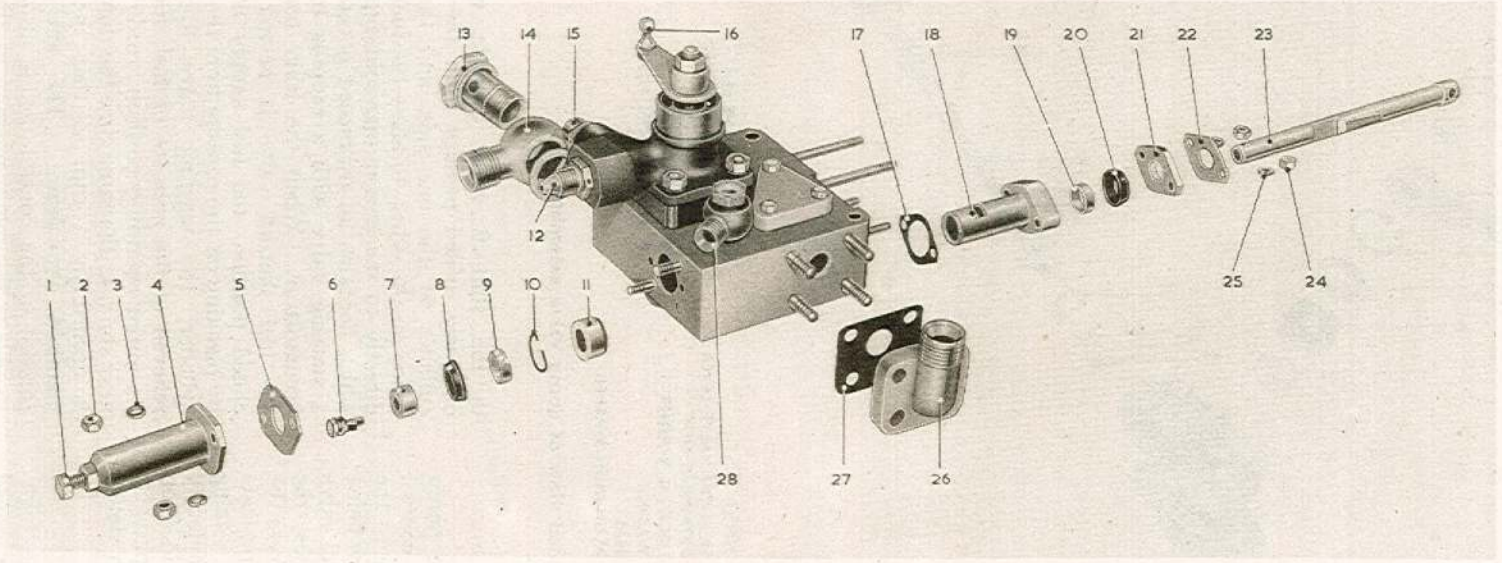
1 FUEL INLET CONNECTION
2 CONTROL VALVE OR FLANGED CYLINDER
3 ANTI-HAMMER PASSAGE
4 CONTROL VALVE PLUNGER
5 PLUNGER STOP
6 SLOW-RUNNING ADJUSTING SCREW
7 CUT-OFF VALVE
8 FUEL OUTLET CONNECTION
9 DUMP VALVE
10 CUT-OFF VALVE SPINDLE

Fig. 1. Sectional view of control box and dump valve

ENGINEER

ADMIRALTY
AIR MINISTRY

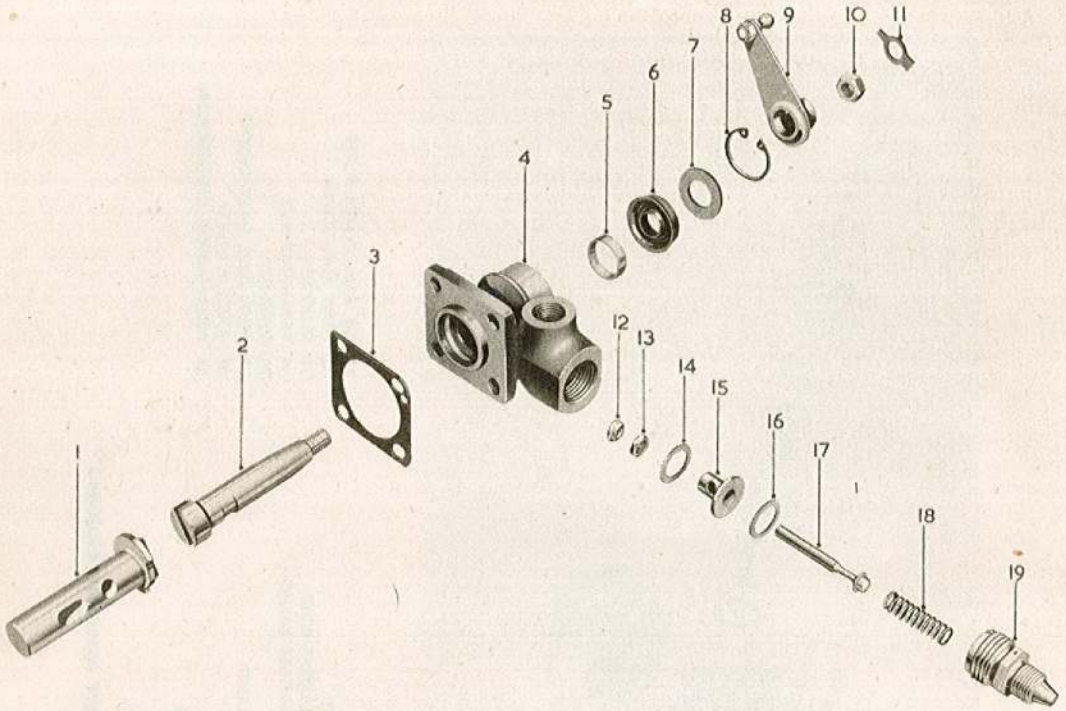
This is Amendment List No. 16 to Air Publication 4282, Volume I Section 3, Chapter 3. *Remove* and *dispose of* the leaf bearing fig. 2 and 3 and para. 4 and 5, and *substitute* this new leaf. *Record* the incorporation of this A.L. in the Amendment Record Sheet at the beginning of the book.



1 SLOW-RUNNING ADJUSTING SCREW
2 COVER RETAINING NUT
3 WASHER
4 CONTROL VALVE PLUNGER COVER
5 WASHER
6 PLUNGER SET-SCREW
7 PLUNGER STOP
8 SEAL
9 COLLAR
10 CIRCLIP
11 GUIDE BUSH
12 'DUMP 'VALVE INLET
13 SHUT-OFF VALVE OUTLET BOLT
14 SHUT-OFF VALVE OUTLET BANJO
15 DRAIN
16 SHUT-OFF VALVE LEVER
17 JOINT WASHER
18 CYLINDER
19 DISTANCE COLLAR
20 SEAL
21 OIL SEAL COVER PLATE
22 DUST SEAL COVER
23 PLUNGER
24 RETAINING NUT
25 WASHER
26 MAIN FUEL INLET UNION
27 JOINT WASHER
28 ANTI-HAMMER CONNECTION

Fig. 2. Control box showing plunger assembly exploded

This leaf issued with A.L. No. 16, June, 1950



1 SHUT-OFF VALVE
2 SHUT-OFF VALVE SPINDLE
3 JOINT WASHER
4 DUMP VALVE HOUSING
5 DISTANCE COLLAR
6 SPINDLE GLAND
7 RETAINING WASHER
8 CIRCLIP
9 SHUT-OFF VALVE LEVER
10 RETAINING NUT
11 LOCKING WASHER
12 WASHER
13 SEAL
14 ALUMINIUM WASHER
15 LOOSE VALVE SEAT
16 ALUMINIUM WASHER
17 DUMP VALVE
18 VALVE SPRING
19 INLET UNION ADAPTER

Fig. 3. Exploded view of dump valve assembly

PRINCIPLE OF OPERATION

4. The fuel from the high-pressure pump flows into the inlet passage in the control box and through the metering orifice to the inside of the plunger cylinder, this flow being governed by the position of the control valve plunger as it moves past the orifices; the position of the plunger is controlled from the cockpit according to the pilot's requirements of engine speed. The slow-running setting of the metering plunger has previously been adjusted with the screw provided on the cap covering the lower end of the plunger; this screw constituting a stop which determines the minimum orifice.

5. When the lever controlling the high-pressure fuel cock or shut-off valve is moved anti-clockwise to the open position, ports in the shut-off valve coincide with an obliquely drilled passage from the plunger cylinder on the one side, and the outlet union on the other, to allow the fuel to flow directly to the burner manifold supply line which contains an overspeed governor and a starting valve with a tapping to a fuel accumulator. When the lever controlling the fuel shut-off valve is moved to the closed position, the fuel supply is cut-off by blanking off the passage from the plunger cylinder; the starting valve diaphragm, relieved of the pressure of fuel, returns to its initial operating position, ready for the next start, at the same time the dump valve is opened by a cam so that the burner manifold can drain. The anti-hammer passage in the control box is also opened to relieve the pump pressure as the engine comes to rest. In the open position of the

fuel shut-off valve, the anti-hammer passage, which is a drilling in the bush in which the barrel turns, is closed. The closing of the shut-off valve causes one of the slots in the valve to align with the anti-hammer hole in the bush. The hole is connected by internal ducts to the plunger seal drain, and from there to the inlet to the pump, the fuel from the pump by-passes the relief valve of the barostat and excessive fuel pressure is prevented. Without the anti-hammer passage, the closing of the fuel cock might also be temporarily accompanied by a complete cessation of flow, until the delivery of the pump could be diverted through the relieve valve of the barostat.

6. Two facts must be remembered in connection with the pressure of the fuel at the control box. Firstly, the barostat controls the pressure at the inlet side of the metering orifices in accordance with altitude, the variation of pressure with altitude being arranged to give approximately constant r.p.m. at any given setting of the control valve plunger. Secondly, although as previously stated the delivery of fuel by the high-pressure fuel pump is proportional to speed, a sufficient quantity of fuel is delivered at a sufficiently high pressure to meet every engine requirement and consequently at idling speeds where the quantity and burner pressure are very low, a large amount of fuel is spilled back through the relief valve of the barostat to the supply tank. There is, therefore, in these circumstances a large pressure drop across the metering orifices, but as the speed of the engine rises, both the quantity spilled and the pressure drop diminish.

INSTALLATION

7. The control box is situated on the bottom port side of the sump. Before attempting to install a new control box, reference must be made to the relevant engine Air Publication.

SERVICING

8. The only servicing allowed in the field is the replacement of damaged seals for the control valve plunger. If for any reason the other contents of the control box, including the dump valve, are suspected, the whole control box must be renewed.

9. To renew the seals, remove the control box from the engine and carry out the dismantling instructions given in A.P.4282, Vol. 2, Part 3, Sect. 3, Chap. 3. To replace these components, having renewed the seals, reference must be made to the assembling section of the same chapter.