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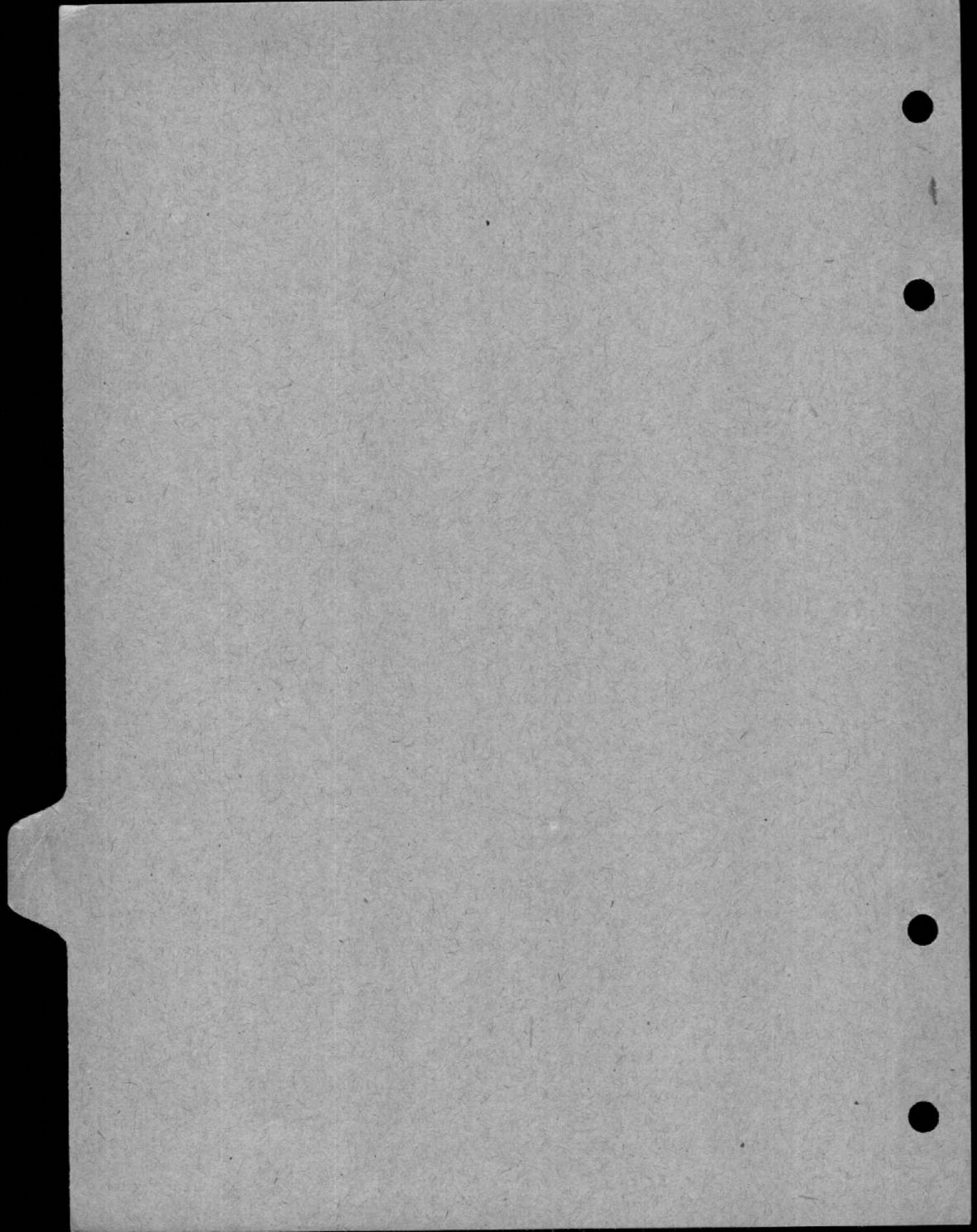
SECTION

8

ENGINE INSTALLATION

SECT

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SECTION 8

ENGINE INSTALLATION

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Introduction

1. The aircraft is powered with a de-Havilland Goblin gas turbine engine. The engine consists of a single stage compressor supplying air to the sixteen combustion chambers which discharge the products of combustion through the blades of a turbine wheel, the purpose of which is to drive the compressor, and various accessories required for aircraft services. After leaving the turbine wheel, the gas discharges at a very high velocity to the rear, thus forming a propulsive jet.

2. The engine bearer frames are tubular steel structures, bolted to the main structure at the rear of the fuselage. Starting is by special electric starter motor and timing switch gear which must be operated from a ground starter battery. The starter socket is a B.T.H., Type E.1, situated on the underside of the starboard engine cowling. The aircraft accumulators must not be used for ground starting.

Engine accessories

3. The following engine-driven accessories (refer to Sect. 5 fig. 2) are fitted:—

On the upper wheel case, left-hand side:—
Hymatic compressor, Marshall cabin supercharger (when fitted).

On the lower wheel case left-hand side:—
Starter motor, fuel pump.

On the upper wheel case right-hand side:—
1,500 watt generator, vacuum pump.

On the lower wheel case, right-hand side:—
Overspeed governor, hydraulic pump.

The air supply to the engine impeller passes through two intakes situated in the wing leading edge, one either side of the fuselage, and thence through ducts in the main plane which extend to the engine air intakes. A rubber sealing ring, secured by Jubilee clips, is fitted over the aft edge of each duct and the forward lip of the engine intake and forms an air-tight joint.

Fuel system

4. The fuel system is shown diagrammatically in fig. 1. The fuel is contained in three metal tanks, two of which are housed in the wing, and the other (centre) tank in the fuselage between bulkheads 3 and 4. An additional tank may be carried under each wing; fuel is transferred from these tanks to the centre and wing tanks by air supplied from the pressure side of the vacuum pump. The drop tanks are of metal or Pyram construction having a capacity of 100 gall. each.

Flow to engine-driven fuel pump

5. Fuel is led from the main collector box on the bottom of the centre tank to the fuel pump located on the port bottom rear accessory facing. A booster pump, a low pressure fuel cock and a fuel filter are all fitted in the line between the fuel tank and the engine-driven fuel pump.

Barostat

6. Interposed between the fuel pump delivery and a control box inlet is a tapping leading off to a barostat; the latter is an altitude-sensitive relief valve which by-passes an increasing amount of fuel as the ambient atmospheric pressure decreases. This excess fuel by-passes the control box, and flows direct through a purolator filter to the barostat and thence back into the centre tank.

Note . . . The barostat is a self-contained unit which is carefully adjusted prior to installation. It must never be re-adjusted in the field; should trouble develop the unit must be replaced by a new one.

Minimum pressure valve

7. Fuel, at the pressure regulated by the barostat, is led from the engine-driven fuel pump to the metering needle in the H.P. fuel control box. This needle regulates the quantity of fuel allowed to pass on to the remainder of the power unit system, and is, in fact, the equivalent of a throttle on a normal type of engine. A minimum pressure valve is connected to the control box across the throttle needle. The purpose of the minimum pressure valve is to reduce the possibility of the flame being extinguished in flight, due to too low a pressure in the fuel manifold, as would occur if the throttle were closed quickly at extreme altitude. Consequently, the valve is connected to the inlet and outlet sides of the control needle and, at low fuel manifold pressures, sufficient fuel is by-passed to maintain a safe minimum fuel pressure irrespective of the position of the throttle control. On the Goblin Mk. 1, the valve is mounted on the bottom starboard side of the diffuser casing, but on the Goblin Mk. 2 it is mounted directly on the control box.

High pressure fuel cock and dump valve

8. Incorporated in the control box are the H.P. fuel cock and the dump valve. The H.P. fuel cock directly controls the flow of fuel from the engine control box to the burner manifold through the overspeed governor and starting valve (*fig. 5*). The dump valve which is interconnected with the H.P. fuel cock, is attached to the side of the control box. It is a small aluminium casing containing a poppet valve and two ports. The inlet port is connected to the burner manifold through the starting valve, and the outlet port to the drain to atmosphere. The common operating lever for the H.P. fuel cock and the

dump valve is interlinked with the starting valve by a Bowden cable. When the lever is moved forward for fuel ON, fuel is fed to the starting valve and the dump valve is automatically closed. When sufficient pressure has built up to open the starting valve, it is locked in the open position by a spring-loaded plunger, allowing a free passage of fuel to the burner manifold. When the lever is moved back for fuel OFF, the supply of fuel to the burner manifold is cut off and the dump valve is opened automatically. By means of a catch on the lever and the Bowden cable, the locking plunger is withdrawn from the starting valve which is allowed to close. Surplus fuel may now drain from the burner manifold, by-passing the starting valve, through the open dump valve to the atmospheric drain.

Overspeed governor, accumulator and starting valve

9. The overspeed governor is in the line from the control box to the fuel manifold. It only comes into operation in the event of the r.p.m. tending to exceed the maximum laid down, such as when diving, throttle open, or during an acceleration. Its purpose, therefore, is to ensure that at no time can the engine r.p.m. reach dangerous proportions. This does not mean, however, that the pilot can rely solely on the governor to check the r.p.m. exceeding the maximum. From the governor, the fuel is led to the starting valve, feeding a fuel pressure accumulator on the way. This accumulator stores a small quantity of fuel at a pressure sufficient for starting. The starting valve ensures that the fuel is prevented from reaching the burners until the accumulator is fully charged, and the engine-driven pump has built up a pressure slightly in excess of that in the accumulator.

Oil system

10. No part of this system is incorporated within the airframe. The oil sump, of 1½ gall. capacity, is under the lower wheel case at the forward end of the engine. For filling instructions refer to Sect. 4, Chap. 2, para. 13.

11. A gear type pump is situated on the sump which supplies oil at 40-45 lb. per sq. in. pressure through a filter. On the port side of the sump is an adjustable oil pressure relief valve by which this pressure is set. From the sump, oil is led to a number of jets playing on the accessory gear train and also to the vacuum pump. The return oil drains down the accessory gear casing into the sump and re-

enters the pump through a gauze filter, access to which is on the underside of the sump. Immediately below the oil pump upon the underside of the sump will be found two metering pumps. These are supplied from the main pump and carry a metered quantity of oil, one to the front main bearing of the impeller and the other to the rear main bearing.

12. As a guide as to whether these pumps are operating or not, the drain pipe from the rear bearing housing to the common drain box should be disconnected at the combined drain collector box and observation made at the end of the rear bearing drain pipe. The delivery of these pumps should not be less than 100 c.c. per hour at 3,000 r.p.m. and provided that the oil is seen to be dripping slowly out of the drain pipe there is little danger of any untoward happening.

Engine controls

13. Teleflex controls in the cockpit extend to control boxes fitted on the top rear face of the bulkhead which are interconnected with sprockets by layshafts. Movement is then transmitted to further layshafts located at the bottom of the bulkhead by chains, tie rods and sprockets; these layshafts, in turn, are connected to the throttle valve, H.P. fuel cock and, when fitted, the L.P. fuel cock.

Air cooling and gun heating system

14. The air enters an intake in the wing leading edge outboard of the starboard air intake and passes through a pipe which extends through the wing to a channel-section ring fitted over the exhaust cone. A branch pipe from the main pipe supplies air for cooling the Hymatic compressor and the generator. The warm air, on leaving the heater ring, passes through a pipe which extends from the ring, underneath the engine to the bulkhead, and thence to the gun bay in the fuselage nose.

Fire-extinguishing system

15. A system of fire warning and extinguishing is incorporated. The system comprises four flame switches, a warning lamp and control switch in addition to a fire-extinguisher bottle and pipelines. One flame switch is mounted on each engine bearer behind the firewall and one on each diaphragm at the trailing edge of rib No. 1, the warning lamp and control switch being located on the instrument panel and the starboard side of the cockpit respectively. When the system is operated, the bottle, mounted in the port wing root, is discharged through a pipeline and thence through perforated pipelines which extend round the engine in the form of two rings, one at the front, the other at the rear.



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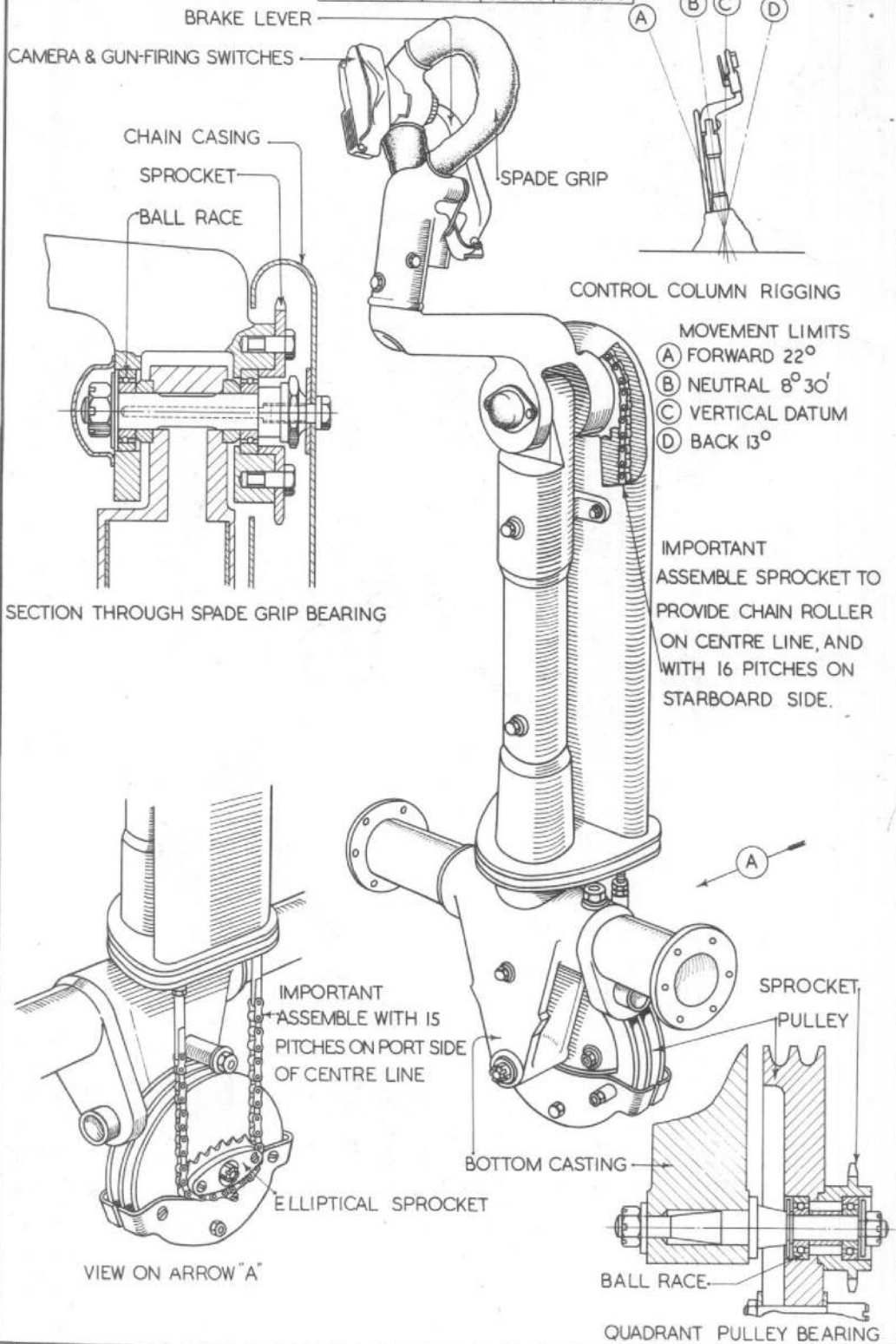
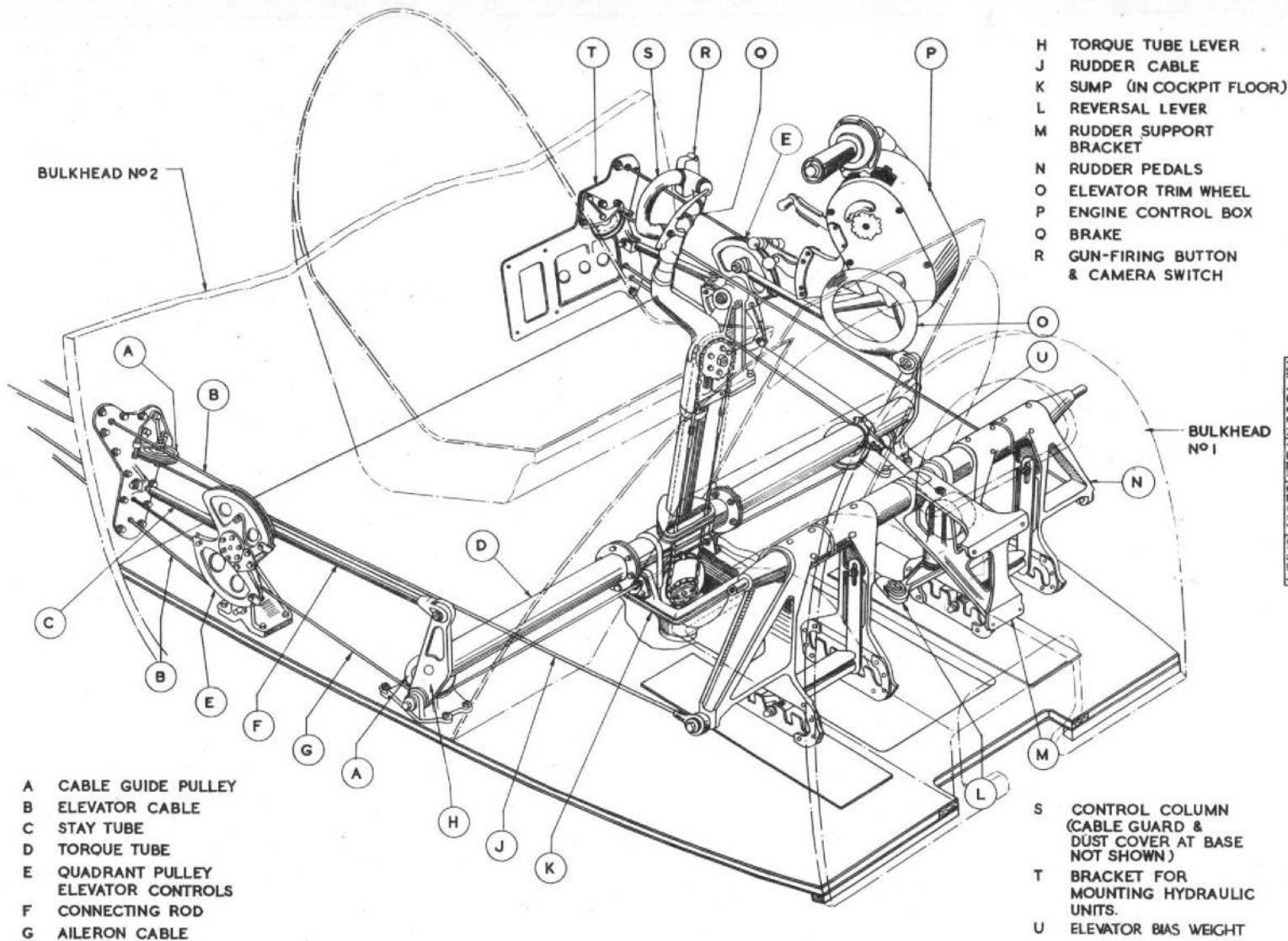


FIG
I

CONTROL COLUMN

FIG
I

FLYING CONTROLS IN COCKPIT



- A CABLE GUIDE PULLEY
- B ELEVATOR CABLE
- C STAY TUBE
- D TORQUE TUBE
- E QUADRANT PULLEY
ELEVATOR CONTROLS
- F CONNECTING ROD
- GAILERON CABLE

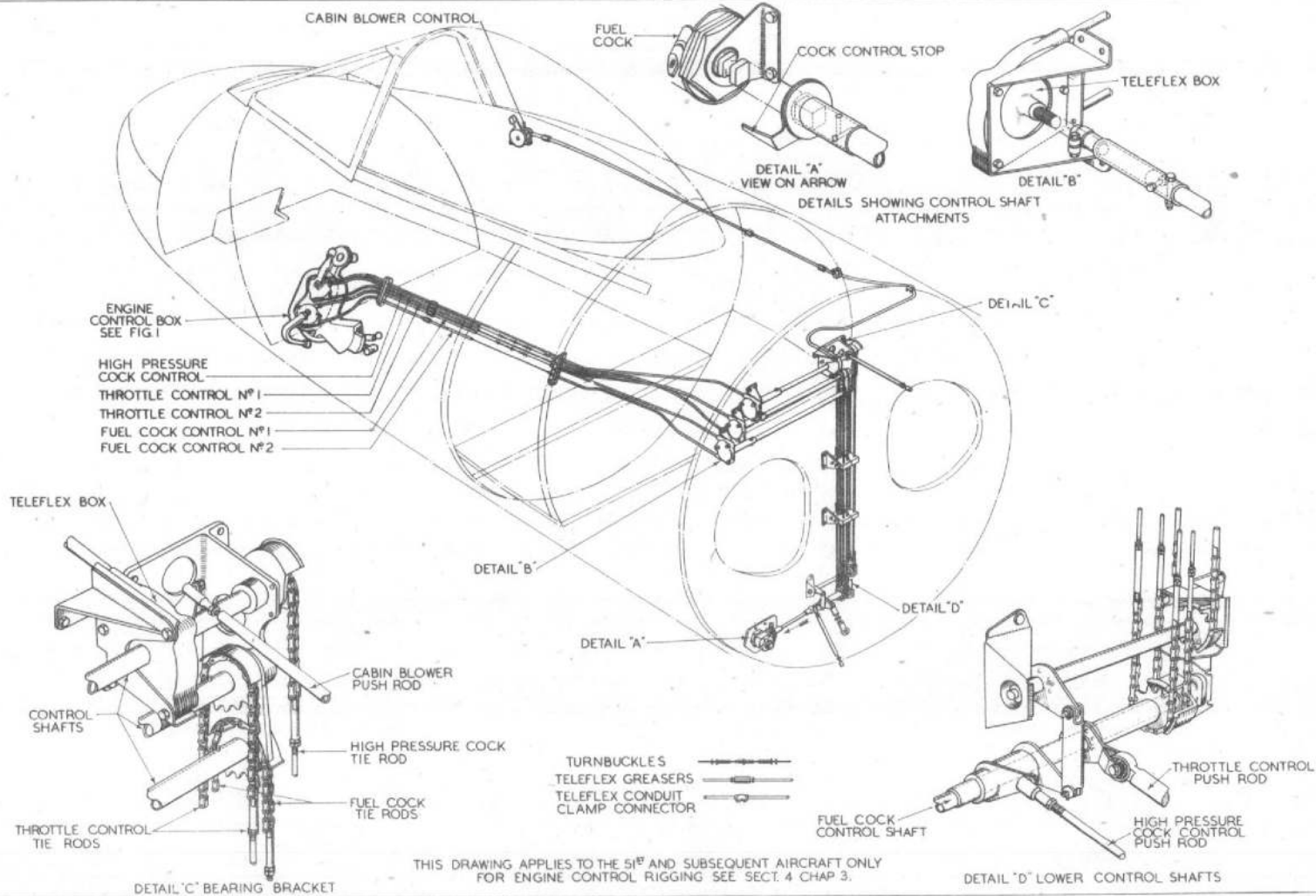
- H TORQUE TUBE LEVER
- J RUDDER CABLE
- K SUMP (IN COCKPIT FLOOR)
- L REVERSAL LEVER
- M RUDDER SUPPORT BRACKET
- N RUDDER PEDALS
- O ELEVATOR TRIM WHEEL
- P ENGINE CONTROL BOX
- Q BRAKE
- R GUN-FIRING BUTTON & CAMERA SWITCH

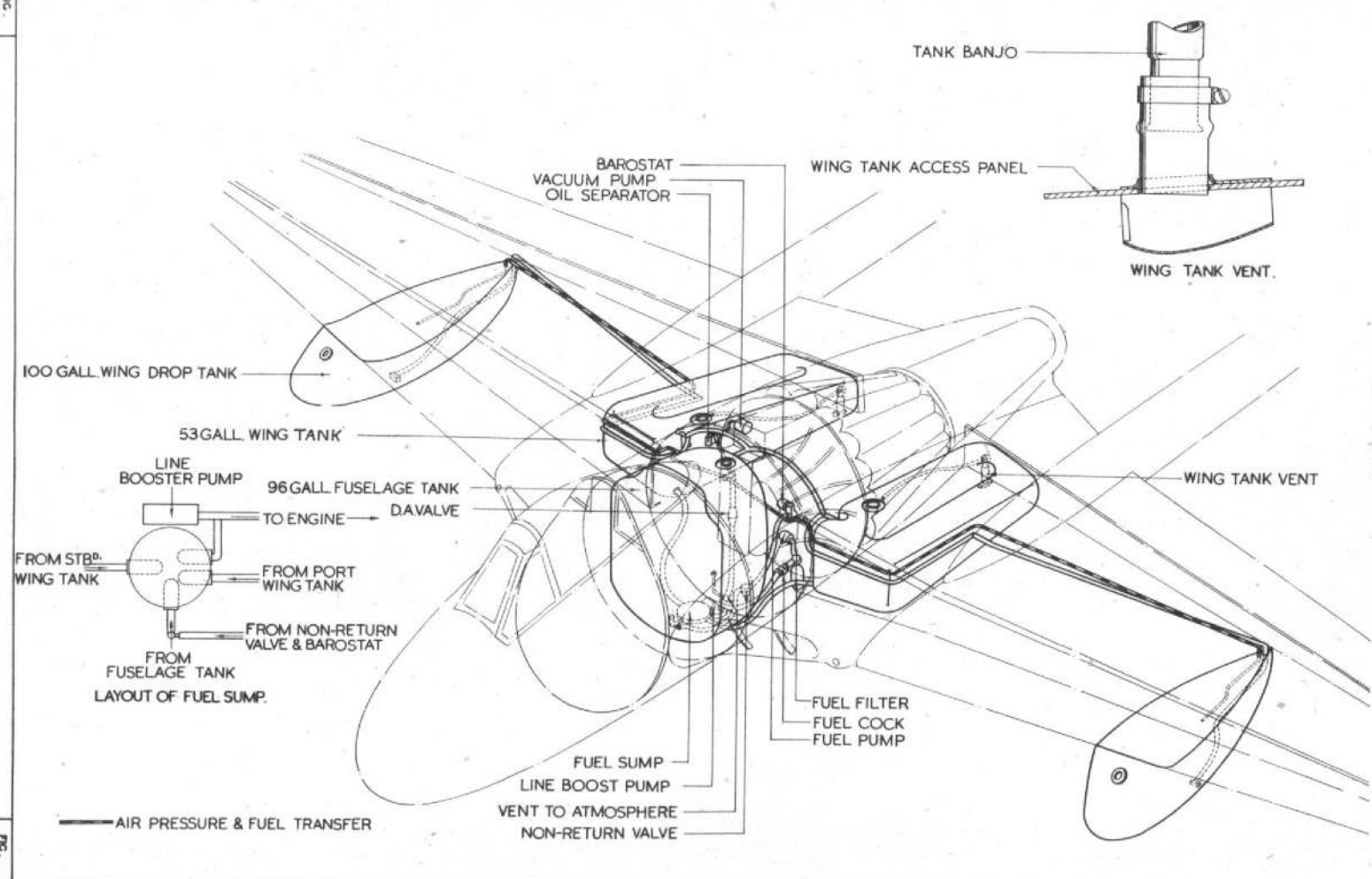
- S CONTROL COLUMN
(CABLE GUARD & DUST COVER AT BASE NOT SHOWN)
- T BRACKET FOR MOUNTING HYDRAULIC UNITS.
- U ELEVATOR BIAS WEIGHT

ENGINE CONTROLS. (III)

FIG 3

FIG 3





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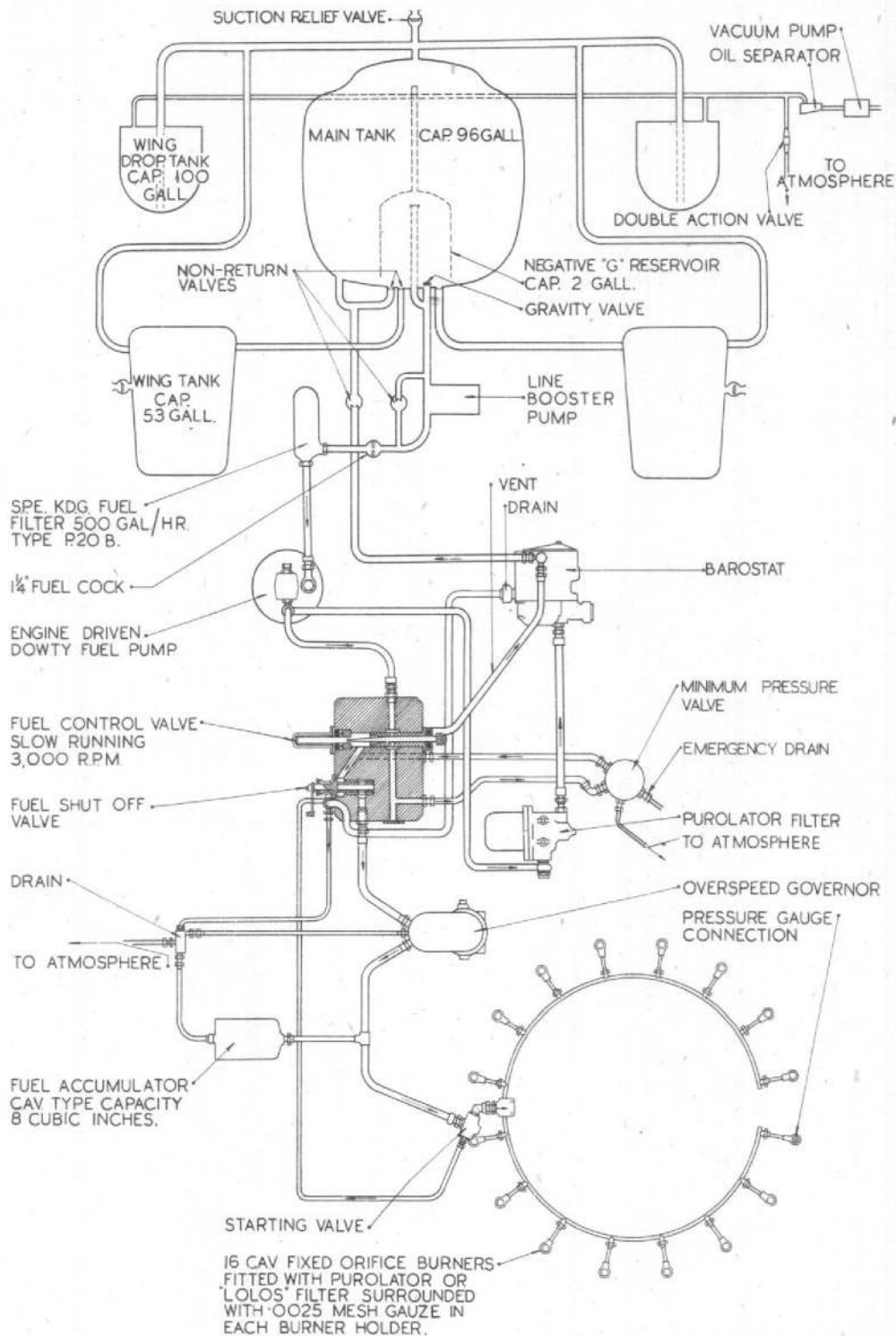


FIG 5

DIAGRAMMATIC ARRANGEMENT OF FUEL SYSTEM.

FIG 5

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