BRISTOL SIDDELEY

AERO ENGINE SCHOOL

SECTION 11

11.1 AIRBORNE AUXILIARY POWER PLANT

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The airborne auxiliary power plant consists essentially of a Rover 1S/60 gas turbine engine coupled to a Rotax 40 KVA alternator. The alternator is mounted on the auxiliaries mounting plate at the front of the engine and is driven from the compressor shaft through a double stage of helical spur gearing.

The power plant is enclosed within six stainless steel panels forming a rectangular box; the turbine and alternator are suspended from the top panel or rail whilst the turbine 'trouser leg' air intake ducts are rigidly secured to the bottom panel so that these two panels, together with the front and rear end panels, form a chassis for the unit. The rear end panel carries an outlet duct which pipes the turbine gases to atmosphere.The two side panels are secured by locking peg fasteners and are detachable for servicing purposes.

The power plant has two main operational functions. Firstly, it is intended to provide an emergency electrical power supply for driving essential services should the main engine alternators fail during flight. Secondly, it is to provide a supply of compressed air bled from the compressor side of the engine for ground starting the aircraft main engines. The power plant may also be used for ground servicing.

Basically the engine consists of a single- sided centrifugal compressor driven by a single stage axial turbine mounted on a common shaft supported in two bearings. Air is admitted from the underside of the power plant and ducted through side intakes to the compressor rotor where it is compressed and passed to the single, reverse-flow combustion chamber. Fuel is injected from a Lucas spill burner and the resultant mixture is initially ignited by an igniter plug fitted in the side of the combustion chamber. Combustion gases pass from the chamber downwards through a volute to a fixed nozzle ring assembly which directs them against the blades of the turbine rotor. The combustion gases

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are then exhausted to atmosphere via a fabricated exhaust cone and cylinder assembly to the outlet duct attached to the rear panel of the power plant.

A self-contained fuel control unit is fitted to the auxiliaries mounting plate to provide automatic control for starting, maximum speed and temperature. The unit consists of a Plessey dual fuel pump, containing separate metering and re-circulating pumps, a Lucas temperature control, and an overspeed governor. In addition, the system is provided with a Lucas air/fuel ratio control, a combined metering and pressurizing unit and a fuel pressure transmitter. The supply to the metering pump is taken from the aircraft fuel tanks via a booster pump in the aircraft and a low pressure filter mounted on the exterior of the power plant front end panel.

As the application of the engine requires it to be operated at a pre-selected constant speed, no throttle valve is necessary, the fuel flow being controlled automatically by spill valves in the air/fuel ratio control unit, the governor and the temperature control.

Engine lubrication is provided by a gear type pressure pump which draws its supply from an oil sump formed by the lower part of the compressor casing. The capacity of the oil sump is $4\frac{1}{2}$ pints.

The alternator and engine oil cooler are supplied with cold air ducted from a high efficiency blower unit mounted immediately below the alternator. The air intake to the oil cooler is controlled by an electrically actuated butterfly. The engine is also equipped with a sump heater to assist starting at altitude.

Two starting systems are provided, an electrical starter for normal conditions and a cartridge starter for emergency conditions. A 24-volt battery mounted in the aircraft provides the power for a Rotax electrical starter motor. The cartridge system which provides for two emergency starts is mounted vertically beneath the power

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plant and consists of two 600 gram cartridges discharging via two pipes directly on to the blades of the turbine rotor.

The power plant is also provided with oxygen enrichment equipment to assist starting at extreme altitudes. The equipment consists of two oxygen bottles together with a reducing valve mounted on the exterior of the rear end panel. When the controlling solenoid is operated oxygen is piped to the combustion chamber via the burner.

The fire prevention system of the power plant consists of a series of fire detector heads mounted on the interior of the chassis which, in the event of fire, energizes a warning device in the aircraft. A methyl bromide bottle controlled by a button in the aircraft discharges into the power plant through two nozzles mounted on the interior of the forward end panel.

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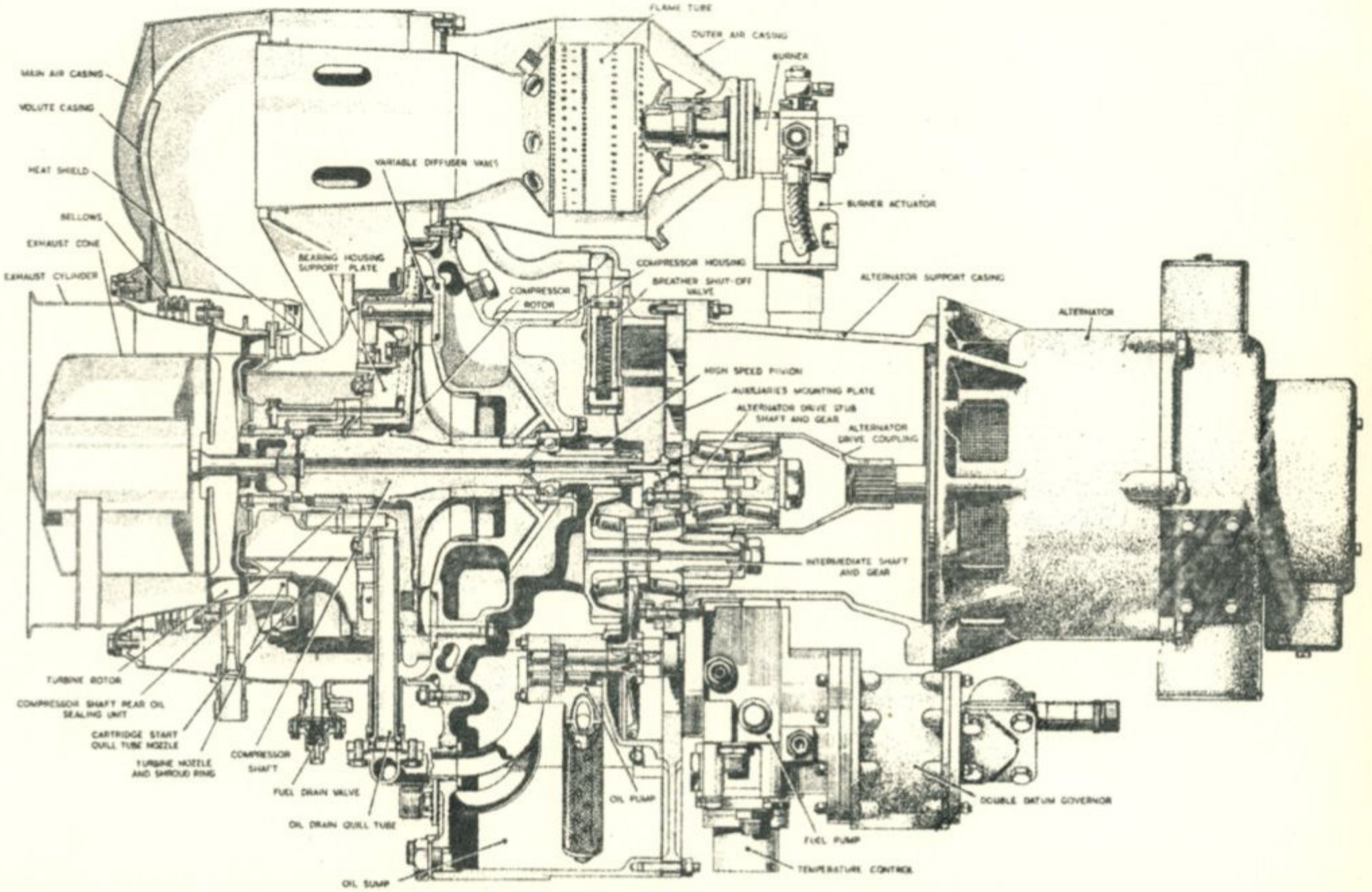
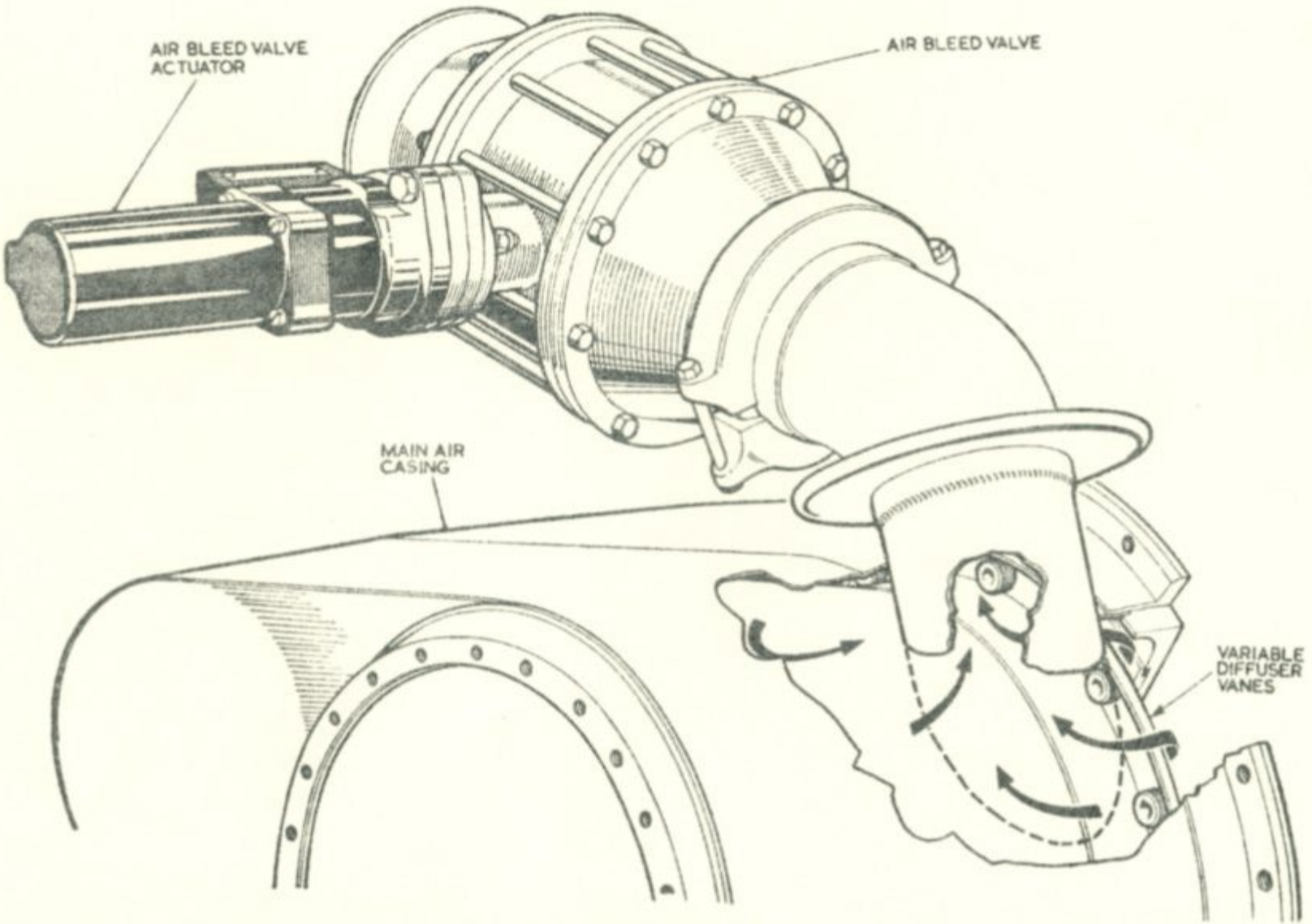
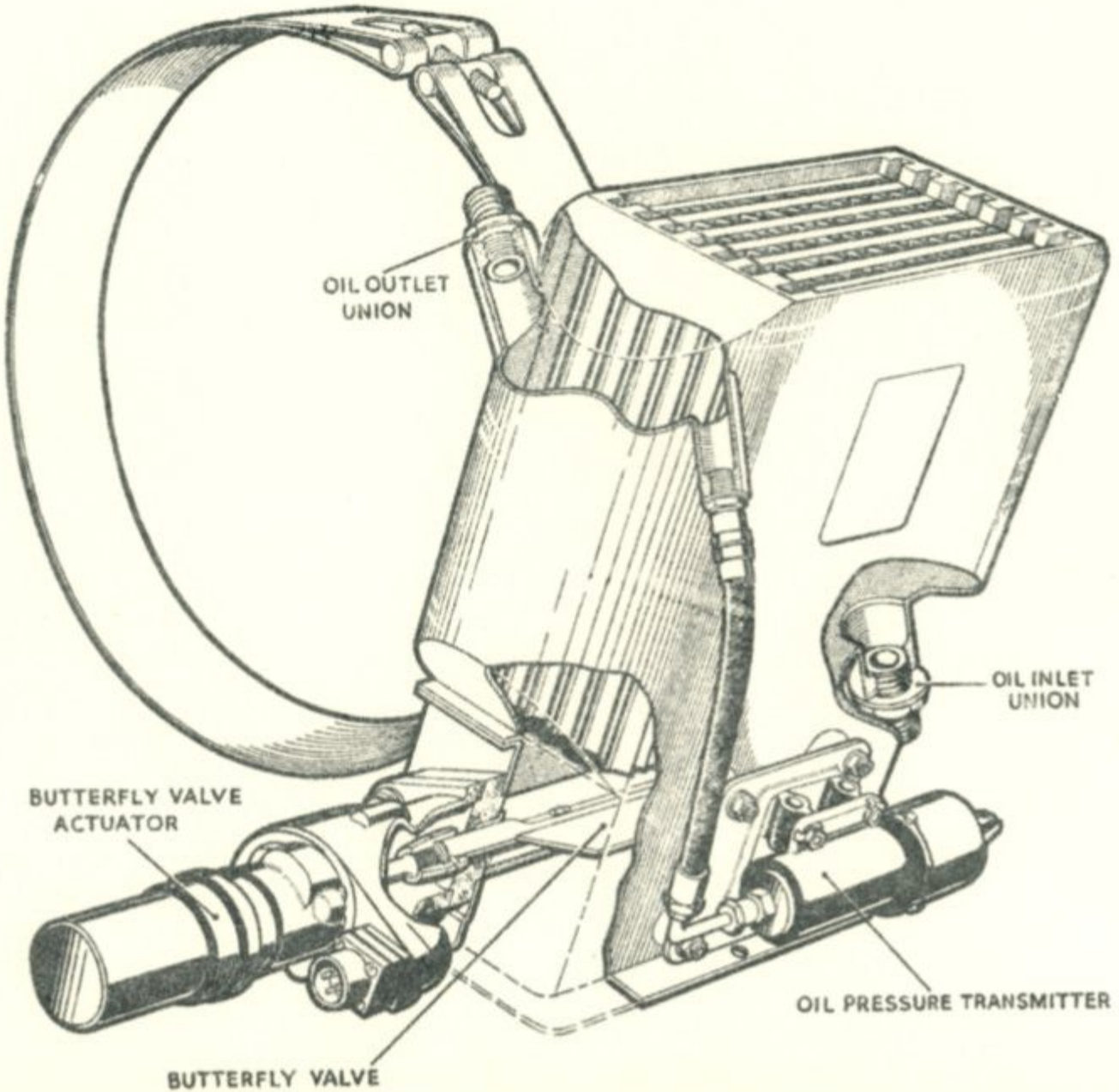


Sectioned view of engine (starboard side) showing alternator and support casing fitted



Air bleed valve.



Oil cooler and oil pressure transmitter