Thrust distribution (in lb) and cooling-air diagram for a comparatively early mark in the 200 series, the RA.14. Effective forward thrust is 9,500 lb. Vertical arrows indicate points at which aerodynamic measurements are commonly taken; light arrows show airflow.

ROLLS-ROYCE AVON 200 SERIES...

modulates the forward end of the turbine shaft; and a screw thread is used to locate the two together and precisely adjust the length of the whole assembly. The splined coupling transmits the torque from turbine to compressor shaft.

Low-pressure air passing inside the rear shaft is deflected outward through holes in the shaft into the chamber inside the "milk churn" by a blanking plate which seals off the rear end of the shaft. At this point the turbine assembly is bolted to the shaft by appropriate flanges on each unit. The two turbine discs, forged in stainless steel, are held together by a large hollow bolt which is suitably perforated to pass high-pressure air into the space between the two turbine discs. This air is led by pipes from the double wall of the "milk churn" to the front face of the high-pressure turbine disc and thence into the hub through holes in the main attachment flange. Some air then passes between the discs, as previously stated, while the remainder passes right through the bolt and is constrained to pass over the rear face of the low-pressure turbine by the sealing plate on the exhaust cone. All turbine blades have fin-tree root fittings. The high-pressure stage units are in Nimonic 95A and the low-pressure in Nimonic 80A.

Held together by the central bolt, the two turbine discs are located axially by flanges, and torque is transmitted from one to the other by bushes connecting two further flanges which hold the interstage labyrinth seals.

The lubrication system, which works at a pressure of 35 to 40 lb/sq in, differs from that of the 100 series only in having a scavange pump, instead of a gravity drain, for the centre bearing. This has the effect of metering the leakage of low-pressure air through the seals and preventing the airflow into the sump from overloading the centrifugal breather pump located there. The usable oil capacity is nine pints; and replenishment is from under- and supercharging the centrifugal breather, the governor pump, the tachometer generator and the fuel pump.

The right-hand auxiliary drive from the engine is turned through 90 deg from top down through what is termed the drive tower, at the bottom of which is the sump containing the six pumps and their filters. Further drives taken from the tower serve the centrifugal breather, the governor pump, the tachometer generator and the fuel pump.

The fuel system is controlled by variations in flow, as opposed to the variations in pressure used on earlier types of Avon, and a proportion of the main engine flow is fed from upstream of the throttle valve and by-passed to the pump inlet. This forms the proportional circuit which controls the main flow under varying conditions of altitude, jet-pipe temperature and engine speed. Pump pressure thus varies directly with engine fuel demand, so that the pump operating pressure at low engine speeds is considerably less than is the case with pressure systems. Since the metering is confined to the small proportional flow, the range of flow control required is much less; the pump metering were applied directly to the engine main flow. Any undesirable pressure variations downstream of the unit do not affect the flow supply to the main engine.

Mounted on the external wheelcase, the high-pressure fuel pump is of the dual type with two multi-piston, variable-swashplate units directly connected and accommodated in the same case. A hydromechanical governor unit is driven by pump-delivery fuel; and the delivery also passes through the fuel-cooled oil cooler.

The throttle and all automatic controlling mechanisms, except the pump governor and servo pistons, are contained in the proportional flow control unit, mounted under the left side of the engine, which varies fuel flow according to power lever position, altitude, j.p.t., r.p.m. and compressor delivery pressure. The unit includes the combined throttle valve and b.p. cock, acceleration-control unit, barometric control, pressurizing valve, j.p.t. datum control, r.p.m. datum control, altitude idling valve, ground idling adjustment and automatic drain valves.

This, then, is the Avon which is the most widely used axial engine in the R.A.F. It is safe to assume that it is the standard unit for the Valiant and Hunter. The Avons which power the English Electric P.1B are of the more powerful afterburning RA.24 type. As for future development of the Avon series—an ultimate power of about 14,000 lb can probably be expected—it seems logical to suppose that the high-mass-flow RA.29 compressor might be widened to the "A.1" combination section of its military counterparts. Another line of development which was exhibited and demonstrated at the S.B.A.C. Show is the combined silencer and thrust reverser installation which, on the Comet, will be the first to go into service, and will also be applied to the Conway destined for Comet and Boeing 707. The Comet 4 development aircraft, which flew during the S.B.A.C. Show, is already fitted with production silencers.

Thus the Avon bids fair to become almost as ubiquitous as its great reciprocating predecessor, the Merlin. The power of both has increased by around 100 per cent during their service life and both engines have powered a wide variety of military and civil aircraft.

C.M.L.

FORTHCOMING EVENTS


