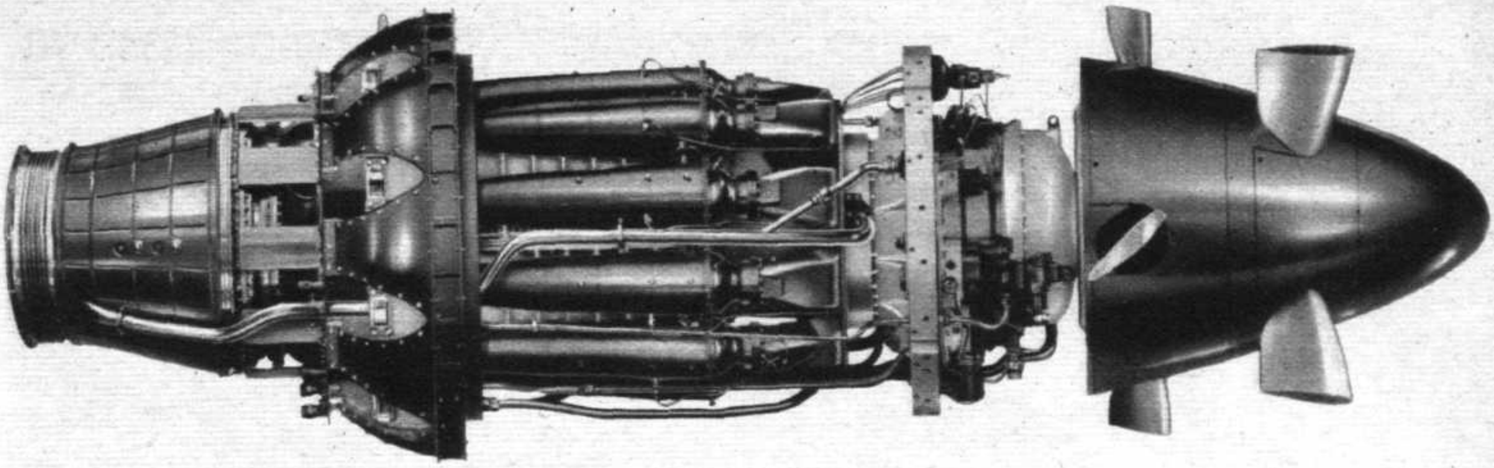

PYTHON

Design Details of the Larger Armstrong Siddeley Turboprop

IN the *Jungle Book*, Rudyard Kipling saved Mowgli from the Grey Apes by the speed and enormous power of Kaa, the python. The power of the Python created by Armstrong Siddeleys is such that it, too, is one of the most powerful of its kind in the world. Kaa was old, and although we cannot carry the analogy very far in this direction, it is perhaps pertinent to observe that the Coventry constrictor is by no means new. That details of the Python turboprop have been withheld for so long must be attributed to the mysterious laws of "security."

During the latter half of 1942, the A.S.X. turbojet with axial compressor was developed by Armstrong Siddeley Motors, Ltd., and shortly after, in common with the general trend of investigations at that period, studies were made of ducted-fan versions of the engine. As a result of these, the gas-turbine design department at the Parkside works came to the conclusion that as good, if not better, performance could be obtained by modifying the A.S.X. somewhat, adding a reduction gear and fitting an airscrew. Design studies were made and the proposal put up to the Ministry, as a result of which a development contract was given to the company. Such is the Python's lineage.

Since its birth, during the summer of 1943, the engine has undergone no major change in its development life, although many detail modifications and refinements have naturally been made, but it was not until April, this year, that information was issued that the Python was to provide the urge for the Westland T.F.2 Wyvern torpedo-strike fighter. With 3,670 s.h.p. available for take-off, and a sea-level maximum *continuous cruise* output of 4,000 h.p. at 465 m.p.h., the Python/Wyvern combination should prove a formidable naval weapon.

The essential physical form of the Python is clearly shown in the main drawing, it being immediately apparent that a reverse-flow compressor/combustion system is employed. Although this design was established for the A.S.X. in the days when knowledge of the essential requirements of combustion systems was somewhat scanty, and it was thought that a considerable length of trunk was required between the combustion chamber proper and the turbine, the fact remains that, even if the most modern straight-flow system were used for the Python, the overall length of the engine would necessarily be increased by some quite considerable (and unwarranted) amount. As it is, the reverse-flow system makes the Python a relatively compact engine, considering that the compressor is of 14 stages, and in front of it is accommodated a compound reduction and contra-rotation gear for the airscrew.

From the centre-line of the rear bank of airscrew blades to the air inlet casing annulus is a fraction over 6ft 4in, this distance—in the flight test engines installed in the outboard nacelles of a Lancaster flying test bed—being closely cowled so as to bring the initial intake aperture close up behind the airscrew. It has, however, been established that no intake disadvantages attend the cropping of this outer cowl back to a point 4ft 9in rearward of its original position. On the contrary, some increase may be realized in ram effect from the airscrew, quite aside from the perhaps no less important advantages accruing from reducing cowling weight and rendering accessibility considerably easier.

The air inlet casing is a semi-torus divided radially into eleven convergent throats through which the entrained air is swept inward through 180 deg to the entry annulus of the compressor. The first five (low-pressure) stages each have 36 blades, whilst the remaining nine (high-pressure) stages employ 70 blades each. From the compressor, the air is delivered into an annular angle-section trunk with a concentric tier of guide vanes at the elbow, thence being divided into 11 separate combustion-chamber inlet ducts, again with rectifying vanes across the angle, so that the air is once more turned through 180 deg.

Each combustion chamber encloses a fabricated flame-tube embodying a vaporizing volute, and the burnt gases, together with the diluent air, are carried from each chamber down relatively long, slightly tapering extension trunks which terminate at a transfer ring, the eleven ports through which are circumferentially divergent so as to direct the gases into the turbine nozzle ring in an annular stream. After expanding through the two-stage turbine, the gases are exhausted to atmosphere in the usual way.

In dealing with the structural build-up of the Python, it is logical to start with the engine mounting. This is made at four points to a massive box-section ring which bolts up at eleven points on its forward face to the air intake casing. This latter is actually in two parts, the cast ring of eleven entry throats being bolted to an inner cast diaphragm pierced at its core for passage of the compressor driving shaft, then pierced with the ring of eleven ports for passage of the inlet air to the compressor, and

Pythons installed in the outboard nacelles of a Lancaster.