Introduction

1. Gas Flow. Thrust is developed by a continuous cycle of compression, combustion, expansion and exhaust, applied to the product of combustion. In the gas turbine we are interested in the following conditions:-

(a) Entry and delivery of the compressor.

(b) Before and after combustion.

(c) Entry and discharge of turbine.

(d) Discharge from exhaust nozzle.

Air entering the compressor is accelerated at each rotor stage and diffused at each stator stage, resulting pressure increase with an attendant temperature increase. On leaving the compressor the air is diffused so that its velocity is reduced before entering the combustion chambers. As a result of combustion, expansion takes place at constant pressure so that Gas velocity is increased. The greater portion of the air delivered to the flame tube enters after the primary zone in order that the gas temperature is reduced before entering the turbine region. The gas flows through the turbine unit, where both temperature and pressure fall, work is being done to drive the compressor. On leaving the turbine the gas is slightly diffused before reaching the jet orifice. Expansion across the jet pipe causes sonic velocity to be achieved at the nozzle and the reaction to the high velocity jet of gas produces a large thrust in a forward direction. This engine employs compound axial compressors individually driven by separate turbines in conjunction with an annular combustion chamber with eight separate flame tubes.

2. Advantages of Two Spool Compressor.

(a) High pressure ratio - resulting in:-

(i) Lower specific fuel consumption.

(ii) Efficient burning to higher altitudes.

(iii) Smaller frontal area for same thrust.

(b) Improved Acceleration.

(c) Easier Starting.

(d) Weight saving by:-

(i) Separate compressor, different materials.

(ii) Fewer stages, faster rotation.

(e) Improved high altitude performance.

(f) Ease of mounting accessories.

3. Reference Data and Limitations. Full details of fuel and oil specifications together with engine r.p.m. and jet pipe temperature limitations are listed in the Air Publications and Aircraft Ground Handling Notes.