

I. INTRODUCTION

The problems related to stresses and vibrations in blades and disks of axial compressors depend very much on the use which is foreseen for these machines. Therefore, instead of trying to present all possible cases and to define the common problems, it seemed preferable to concentrate the study on the jet engines used by the new generation of civil airplanes for subsonic transport. This will allow us to cover precisely the demands on the designer in a particularly complex case, and to see how he is equipped for their solution.

We will start with a technological description of a unit, which is well adapted to our objective, but which represents an imaginary synthesis of different existing engines and not a copy of one of them.

2. DESCRIPTION OF A COMPRESSOR FOR A JET ENGINE (Fig.1)

The compressor is composed of the following parts, in the direction of the flow :

- a one-stage fan
- a low pressure compressor
- an intermediate casing for the primary flow and outlet casing for the secondary flow
- a high pressure compressor
- a central casing containing at its downstream end the second bearing of the rotor of the high pressure compressor.

The intermediate casing contains the two bearing of the low pressure compressor and the thrust-bearing of the high pressure compressor.

2.1 Fan

The rotor includes a disk of titanium alloy and blades of the same material. A bullet nose, fixed to the disk, forms the inner part of the intake. It can be heated for de-icing by air

coming from the HP-compressor and passing through the hollow fan shaft of the low pressure part.

The stator of the fan includes a cylindrical steel casing, which is reinforced in order to contain eventually broken blades. The outer ends of the guide vanes for the secondary flow are inserted in the rear part of this casing. These vanes are forged to tolerances from titanium and held at their inner end by the casing of the low pressure compressor. Hoops of titanium alloy lead the secondary flow into the atmosphere.

2.2 Low pressure compressor

The rotor assembly of this six stage compressor is fixed to a pin shaft supporting also the fan rotor. This shaft is driven by the low pressure turbine set. All the rotors are mounted on a cylinder cast in one piece. This cylinder contains longitudinal slots where the dovetail blades are separated from one another by intermediate dovetail members. The cylinder, the disks and the blades are made of titanium alloy.

The stator contains six stages of blades fabricated by drawing and punched and brazed into their inner and outer shrouds. These stages are stacked in the interior of the compressor casing, which contains in his front part the inlet guide vane fabricated in a similar way.

2.3 Intermediate casing

The casing is cast in one piece of light alloy and forms a swan necked connection between the low pressure and the high pressure flow channels.

The periphery of the casing is provided with connections which allow to fix the case of accessories and the points of the front suspension of the engine. The supports of the bearings are fixed at both ends of the casing.