

TEST FACILITY AND TEST STAGE

General Description

The installation of the holographic apparatus on the fan test stage is shown in fig. 1. The laser power source and control panel were located immediately outside of the test cell and, therefore, do not appear in this figure. As seen, the holocamera assembly is mounted beneath the test stage. The entire holocamera assembly is supported by a steel structure that bridges the test stage and bed-plate and is mounted on vibration isolation pads fastened to three piers anchored to the floor. The holocamera assembly is thus independently supported and free from vibration.

The holographic layout originally conceived transmitted the laser beam into the centerbody through a forward strut, directed it axially along the fixed centerbody, reflected it outboard through a window in the centerbody, through the blade tip region, and onto the holographic plate. This approach had several inherent disadvantages. One disadvantage was that the optics would have to be packaged within the fixed centerbody and supported independently of the test stage via the struts. More importantly, however, the field of view was limited primarily to the blade leading edge area, whereas the area of greatest interest is within the blade passage.

This scheme was therefore abandoned in favor of a system whereby the scene beam was directed diagonally across the fan inlet as shown schematically in fig. 2. In the final configuration, the scene beam enters through a large Plexiglas "scene" window in the outer casing forward of the rotor. The scene beam transmits diffused light diagonally across the inlet, beneath the fixed centerbody, through the blade tip region, and through a Plexiglas "viewing" window onto the holographic plate. By reorienting the scene beam from the centerbody to the outer wall, the unobstructed viewing area was greatly improved. The installation and relative location of the two windows are shown in fig. 3.

Transonic Fan Stage Description

The test stage utilized for this program was a high-tip-speed, low-loading, transonic fan stage designed and tested by the AiResearch Manufacturing Company, a Division of The Garrett Corporation, under NASA Contract NAS 3-13498. The fan stage (described in detail in ref. 5) was designed with weak oblique shocks in the rotor tip region to minimize losses. The inlet and outlet relative velocities

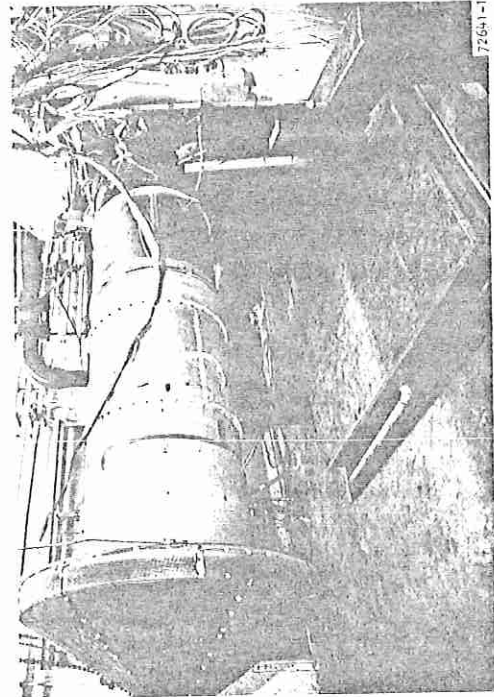
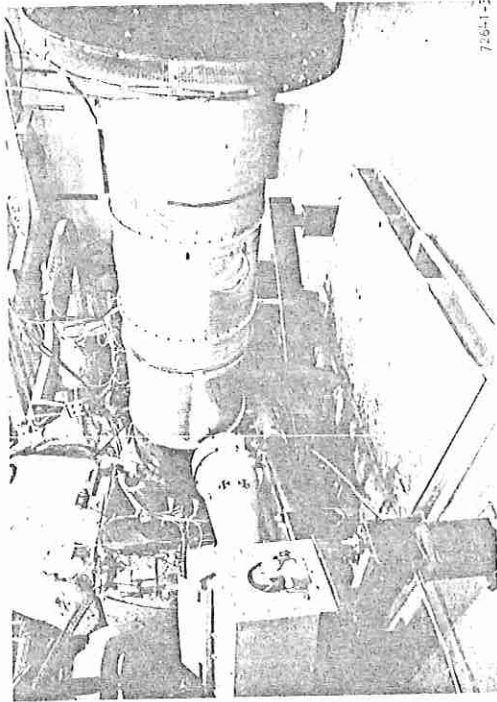


Figure 1.--Holocamera and Transonic Fan Stage Test Installation.