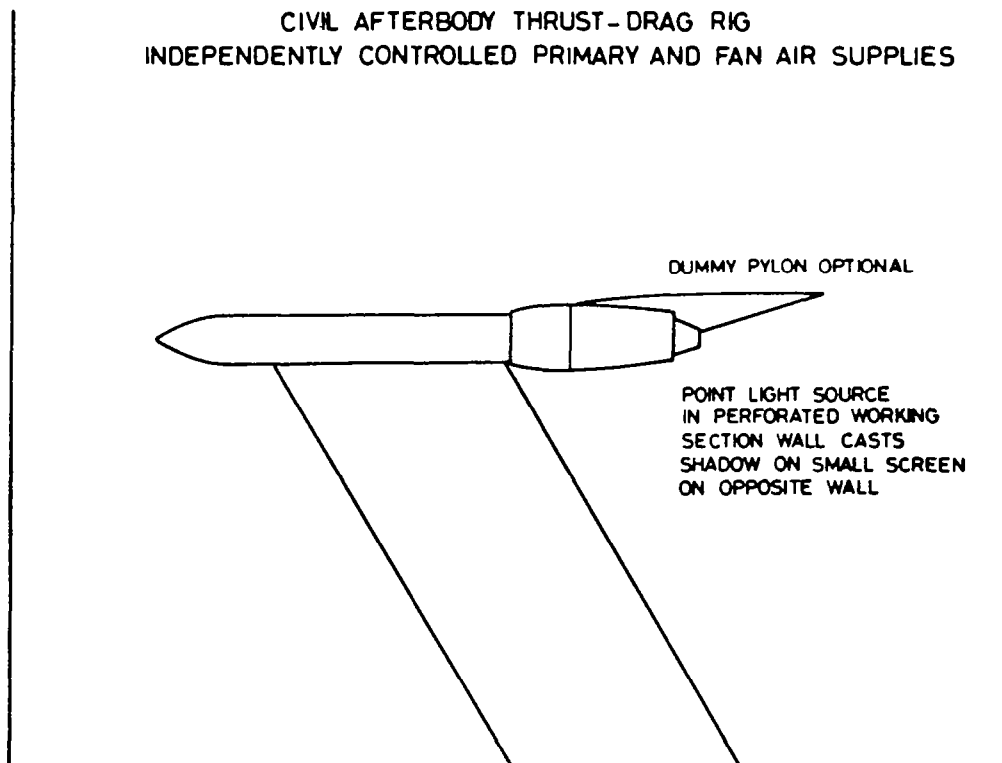


SHADOWGRAPH TECHNIQUES  
IN TRANSONIC TESTS WITH  
POWERED NACELLES

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The ARA 9' x 8' transonic tunnel has a working section with four perforated walls with normal holes of  $\frac{1}{2}$ " diameter. In the application of the shadowgraph technique to this tunnel, one of the wall perforations is used to accommodate a high intensity point light source. The shadow showing shock wave patterns is then cast onto a suitable surface, normally the opposite wall.

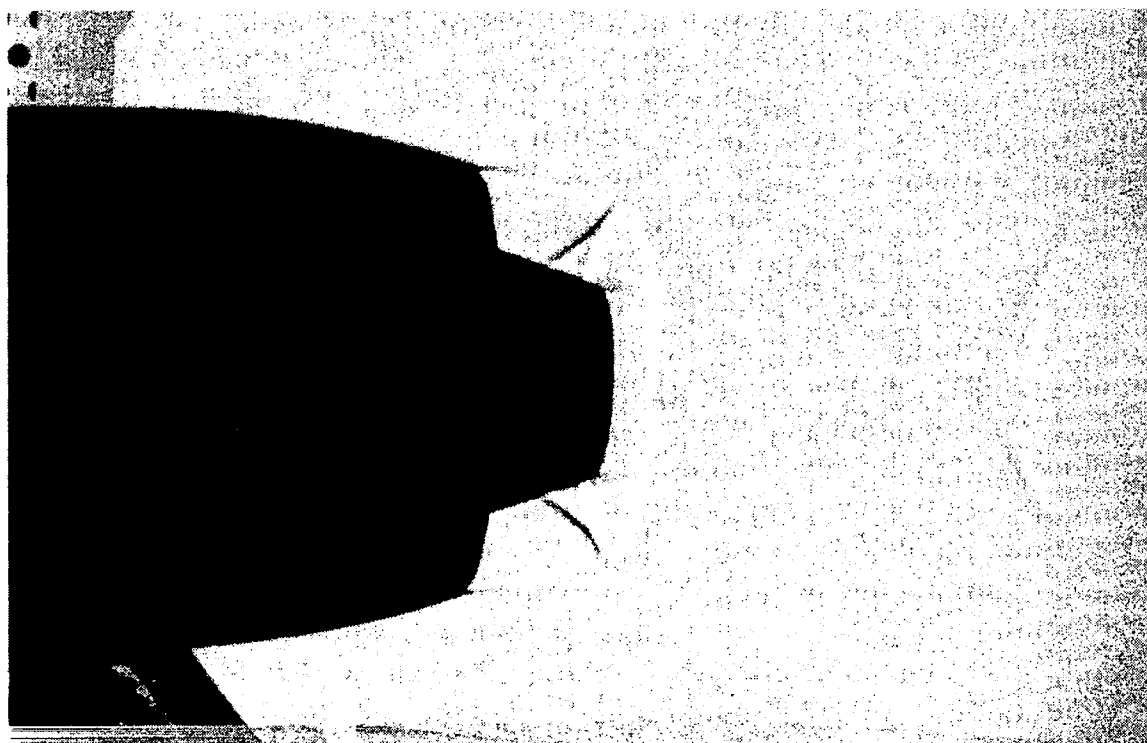
This system has been used in a number of tests with powered nacelle rigs to visualise the shock wave patterns in the exhaust flow. A blown rig on which the technique has been used is shown in this diagram.



This is a photograph taken during a test with the rig shown in the previous illustration, in this case without a dummy pylon.

A remote camera behind the perforated wall in which the light was installed was used to photograph a small screen attached to the opposite wall.

As an alternative to the photographic technique, a television camera and video recorder have been used successfully. The TV camera is mounted behind a small glass window near the aft end of the perforated wall.



The shadowgraph technique has also been used successfully for installed nacelle tests on a floor-mounted half model with a turbine powered fan-engine simulator.

In this case the light source was positioned in one of the roof perforations so that the shadow was projected onto the floor which is solid in this area. This, of course, shows the shock wave pattern near a plane normal to the wing.

To visualise the flow near a plane parallel to the wing it is proposed to use a light source in the side wall and project onto the opposite wall and/or the wing.

