

ENGINEERING RESEARCH INSTITUTE  
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PROGRESS REPORT 5

WING BODY INTERFERENCE  
(1 May to 31 July)

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Blocking tests for the circular body alone have been made and they show that with the original nose piece the hollow body will not swallow the shock wave. In order to avoid the resulting detached bow wave in front of the body it was necessary to make a new nose piece with a decreased inlet area. Some tests have been run on the body alone with the new nose piece in order to determine the uniformity of the flow over the body in the testing region. The results of these tests have not yet been processed, but a rough estimate of the results indicates that:

- 1) the flow in the testing region is relatively uniform; and
- 2) great care will have to be exercised during future tests to eliminate the effects of the various wing pin holes on the flow over the body.

The uniformity of the flow is born out by calculations on the basis of linearized theory which indicates that the pressure variation is less than 4 per cent. Also the results of the china film technique show that the nose shock wave reflects from the side wall and strikes the body about 1 inch aft of the trailing edge of the wing when it is in its aft position. This reflected wave does not seem to be serious compared to the disturbances which will undoubtedly be caused by the wing supports.

The china film pattern caused by the support strut for the body shows that relatively large boundary layer effects due to the wing can be expected on the succeeding tests where the wings will probably produce effects similar to those caused by the strut (see Fig. 1).

Some runs were made using the vapor screen technique, and some runs were made to check out the total head probe. It was found that the boundary layer on the model was so thin that it could not be studied by these methods except when the body was at  $8^\circ$  angle of attack and then only at points well back from the nose, where the boundary layer starts to thicken.

The vapor technique was able to pick up the "conical" shock from the nose of the body so that it may be used to study the form of the shock from the wing.

The second model to be tested on this project, namely the intersection of two flat plates, is approximately 50 per cent designed. The large flat plate which is used to simulate the body and which extends from the floor to the ceiling of the tunnel has been fabricated without orifices, and blocking tests have been performed with satisfactory results. The blocking tests were run with the configuration as closely approximating that of the final design as possible. The support for the wing and an existing model resembling the wing were run with the body plate so that the blocking characteristics could be established. The useable region of uniform flow on the body plate which is undisturbed by the supports was determined so that the orifice pattern on the body could be placed in a region of uniform flow.

The design of the "wing" plate, installation of the orifices and final machining of the body plate has been started.

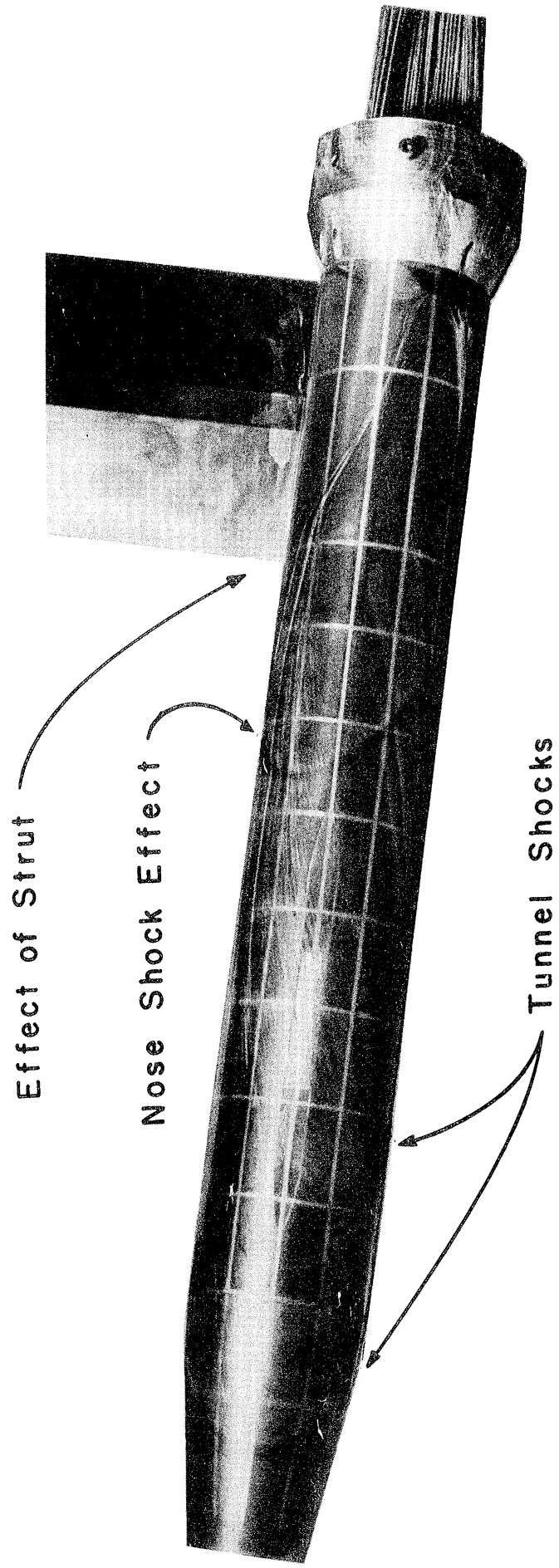


Figure 1 Body at 8°.

