ENGINEERING RESEARCH INSTITUTE
UNIVERSITY OF MICHIGAN
ANN ARBOR

PROGRESS REPORT NO. 3

(Covering Period November 1, 1951, to January 31, 1952)

BY

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Approved By

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Projects M937 and M937-A

WRIGHT AIR DEVELOPMENT CENTER
CONTRACT NO. AF 33(038)-19747, E. O. NO. 460-31-12-11 SR-1g
DAYTON, OHIO

February, 1952

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The final drawings of the wing-body interference model have been completed, checked, and sent to the shop. An assembly drawing of the model is presented in Fig. 1. The body will be a 2-inch diameter cylindrical tube with a 4-inch section between the trailing edge of the wing and the supporting strut. These distances were chosen in order to insure that all distrubances from the nose of the body will have died out at the region of the wing and in order to give a sufficiently long afterbody to test the downstream effects of the wing. The nose of the body is detachable so that it can be altered if it proves unsatisfactory for any reason, and also if at some later time it is of interest to put fins or other wings there.

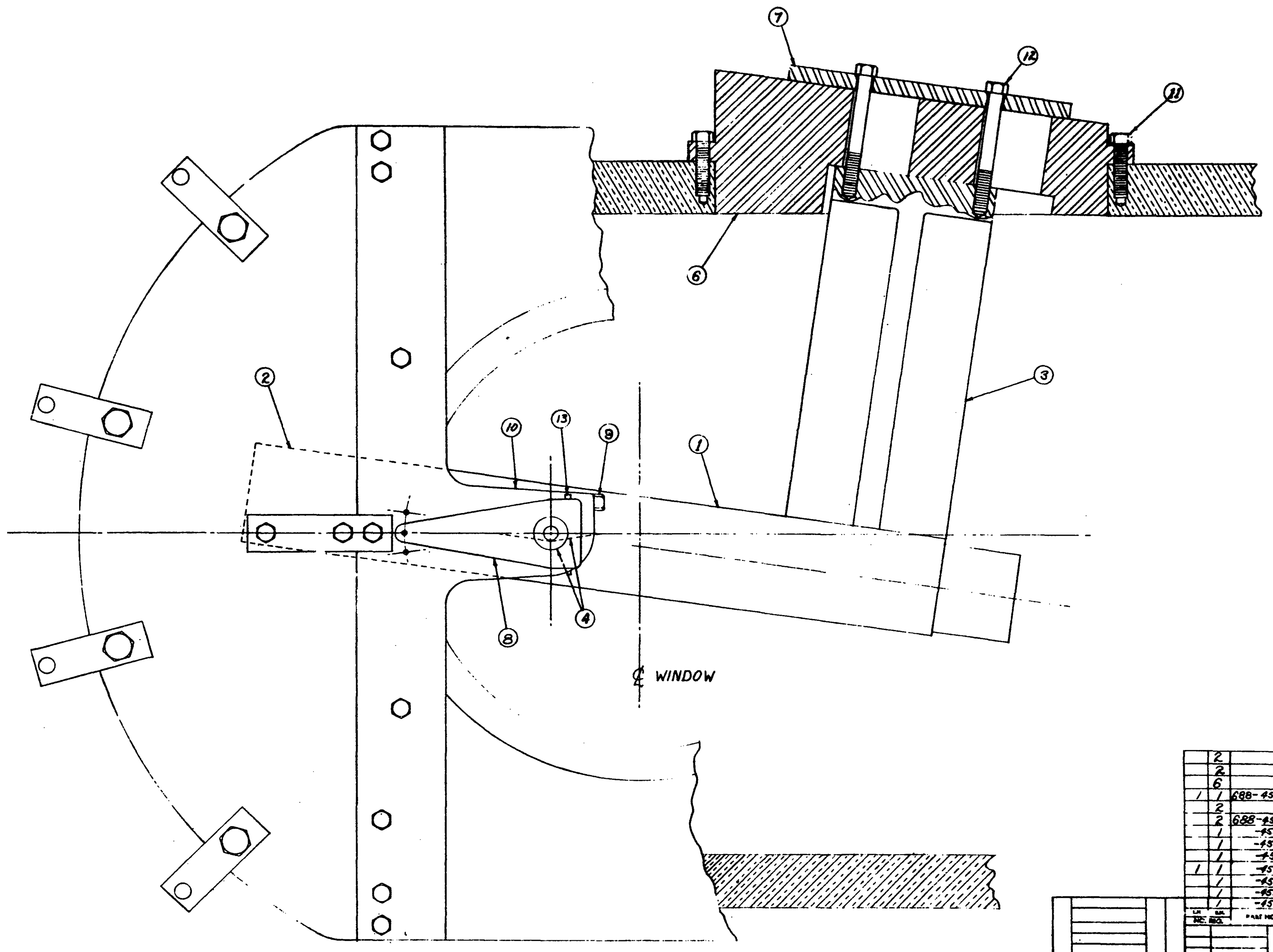
The orifices will be located on the body in "rings" swept back at 40°. These rings will be located at 1/2-inch intervals with alternate rings having orifices at 5°, 15°, 30°, 50°, 75°, and 0°, 10°, 20°, 40°, 60°, 90°. With a fore-aft motion of the body of 1 inch in steps of 0.1 inch, an essentially continuous pressure distribution can be obtained for all the angular stations around the body.

The wings are of 2-inch chord, flat on one side and double wedge on the other. By turning the wings over, a comparison of the flat plate and camber effects can be made. Twelve orifices are provided on the wing in the juncture region so that theory and experiment can be compared at these points.

Computations of the solution for the shock-cylinder intersection study have been started using the Nielsen-Matteson Theory (given in NACA RM A 9E19). According to this theory, the cylindrical body is divided into rings of width 1/5 the diameter of the cylinder. These rings in turn are divided into eight equal areas around the surface. In order to cancel the normal velocity induced by the shock wave at these areas, the areas are imagined to have wedges located on them that slope in the axial direction. The wedge slope at any station is adjusted so as to cancel the normal velocity induced by the shock wave at that station plus the total effect of all the wedges upstream of that wedge. Nielsen and Matteson give the tables and data necessary to compute the wedge slopes everywhere on the body. This part of the computation has been completed and checked.

In order to compute the velocity components induced on the surface of the cylinder due to the wedges, it is necessary to know what tangential and axial velocities are induced by each of the wedges at the other stations. The tables necessary to compute these were not given by Nielsen and Matteson, since they were interested in the effects in the wing plane and not on the surface of the body. It is, however, not too difficult to calculate these influence effects from the data compiled by Nielsen and Matteson for the calculation of the normal velocities induced by the wedges. These data were obtained from Nielsen at Ames Laboratory and part of the calculations of the tangential-velocity influence of the wedges have been completed.

Still remaining to be completed are the calculations of the axial velocities induced by the wedges, and finally the axial velocity distribution and pressure distribution.



L.H. REQ.	R.H. REQ.	PART NO.	DASH NO.	NAME	SIZE	MATERIAL
	2		13	TAPER PIN		
	2		12	TAP BOLTS	5/16 - 2½	
	6		11	TAP BOLTS	5/16 - 1	
1	1	688-455	10	SUPPORT BR		1040
	2		9	TAP BOLT	¼ - 1½	
	2	688-4558	8	POS. ARM		1040
	1	-4556	7	TOP PLATE		1040
	1	-4556	6	PLUG - 8°		BRASS
	1	-4558	5	PLUG - 0°	NOT SHOWN	BRASS
1	1	-4558	4	WING		6150
	1	-4557	3	STRUT		B&S
	1	-4557	2	NOSE		1020
	1	-4557	1	BODY		1020

NONE

SCALE FULL SIZE

AERONAUTICAL RESEARCH CENTER

UNIV. OF MICHIGAN WILLOW RUN

WING-BODY INTERACTION MODEL - ASSEMBLY

688-4559