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RESEARCH MEMORANDUM

EFFECT OF WINDSHIELD SHAPE OF A PILOT'S CANOPY ON THE DRAG OF AN NACA RM-2 DRAG RESEARCH MODEL IN FLIGHT AT TRANSONIC SPEEDS

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EFFECT OF WINDSHIELD SHAPE OF A PILOT'S CANOPY ON THE DRAG OF AN NACA RM-2 DRAG RESEARCH MODEL IN FLIGHT AT TRANSONIC SPEEDS

By Sidney R. Alexander

SUMMARY

Results of flight tests of an NACA RM-2 drag research model equipped with a pilot's canopy having a vee windshield are presented for a Mach number range from 0.75 to 1.43. Comparison is made with test results of a similar canopy having a flat windshield. The vee-windshield canopy produced lower drag-coefficient values than the flat-windshield canopy for Mach numbers from 0.85 to about 1.2. From $M = 1.2$ to 1.4 both canopies produced the same drag coefficient.

INTRODUCTION

Flight tests have been conducted at the NACA Pilotless Aircraft Research Test Station, Wallops Island, Va., to determine the drag of NACA RM-2 drag research models equipped with a pilot's canopy having a vee-type windshield. Data have been obtained from previous tests of similar models having flat windshields. These canopies were similar to those used on present-day, high-speed aircraft and had a fineness ratio of about 7.0, based on maximum width, and added about 10 percent to the maximum frontal area of the basic RM-2 body. Results of tests of the flat-windshield-canopy arrangement have been reported in reference 1. There are herein presented data obtained from tests of two models of the vee-windshield-canopy arrangement for a Mach number range from 0.75 to 1.43 which corresponds to a range of Reynolds number, based on overall body length (64 in.), from 22 to 50 million. Details of the basic body and the flat-windshield canopy have been presented in reference 1. A general-arrangement drawing of the basic body equipped with the vee-type-windshield canopy is presented in figure 1. A comparison of the two canopy types is presented in figure 2.

RESULTS AND DISCUSSION

The data were obtained by means of the standard NACA RM-2 technique (reference 2) and are presented in figure 3 as a plot of drag coefficient C_D (based on basic body frontal area, 0.1364 ft^2) against Mach

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number M. A general discussion of the accuracy of the testing technique is presented in reference 2. In the Mach number range from 0.75 to 0.9 the curve is essentially flat giving a drag coefficient of about 0.27. The drag rise begins at $M \cong 0.93$ and at $M = 1.09$ the highest drag-coefficient value of 0.56 is obtained. Beyond this point the drag-coefficient values decrease slightly to a value of $C_D = 0.53$ at $M = 1.43$, the highest Mach number reached in the tests.

For comparison the faired curve of figure 3 is replotted in figure 4 together with the curves presented in reference 1. Since the drag coefficients are based on a constant area, figure 4 is fundamentally a comparison of the drag forces experienced by each of the three models. From the lowest Mach number for which the data can be compared $(M = 0.85)$ to $M \cong 1.2$, the drag for the vee-windshield canopy was lower than that of the flat-windshield canopy. Above this point the drag coefficients for the two models were approximately equal. The addition of either canopy to the basic body added an almost constant increment in drag coefficient of about 0.07 between $M = 1.1$ and 1.4.

In spite of the inaccuracies present in the data below $M = 1.0$ (see reference 2) there are indications of a possible favorable interference effect caused by the addition of either canopy as evidenced by the lower slopes obtained for the canopy models between $M = 0.9$ to 1.0.

Langley Memorial Aeronautical Laboratory
National Advisory Committee for Aeronautics
Langley Field, Va.

REFERENCES

1. Purser, Paul E.: Effect of a Pilot's Canopy on the Drag of an NACA RM-2 Drag Research Model in Flight at Transonic and Supersonic Speeds. NACA RM No. L7L22, 1947.

2. Alexander, Sidney R., and Nelson, Robert L.: Flight Tests to Determine the Effect of Taper on the Zero-Lift Drag of Wings at Low Supersonic Speeds. NACA RM No. L7E26, 1947.

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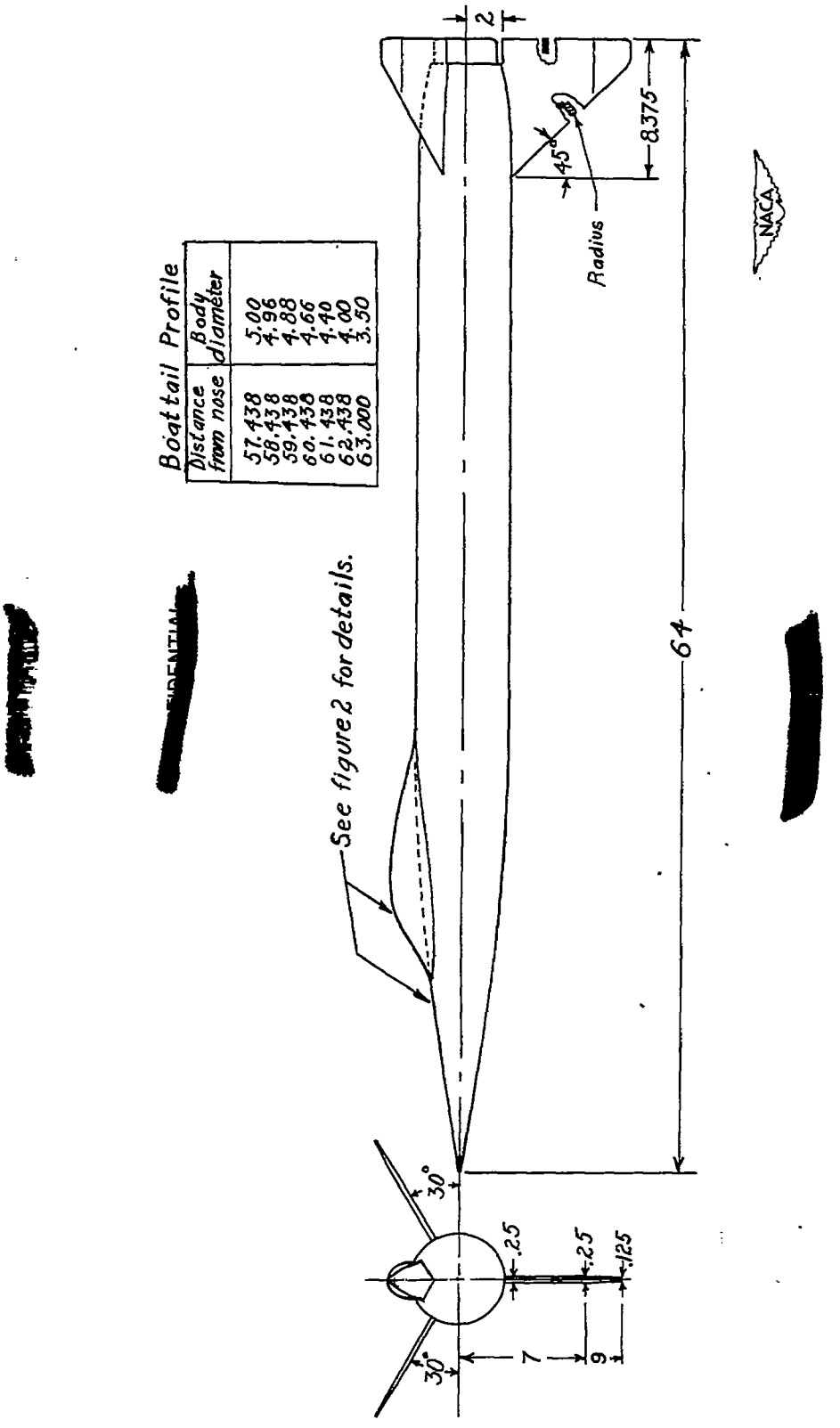

Boat tail Profile

Distance from nose	Body diameter
57.438	5.00
58.438	4.96
59.438	4.88
60.438	4.66
61.438	4.40
62.438	4.00
63.000	3.50

Figure 1.-General arrangement of NACA RM-2 model equipped with pilot's canopy. All dimensions are inches.

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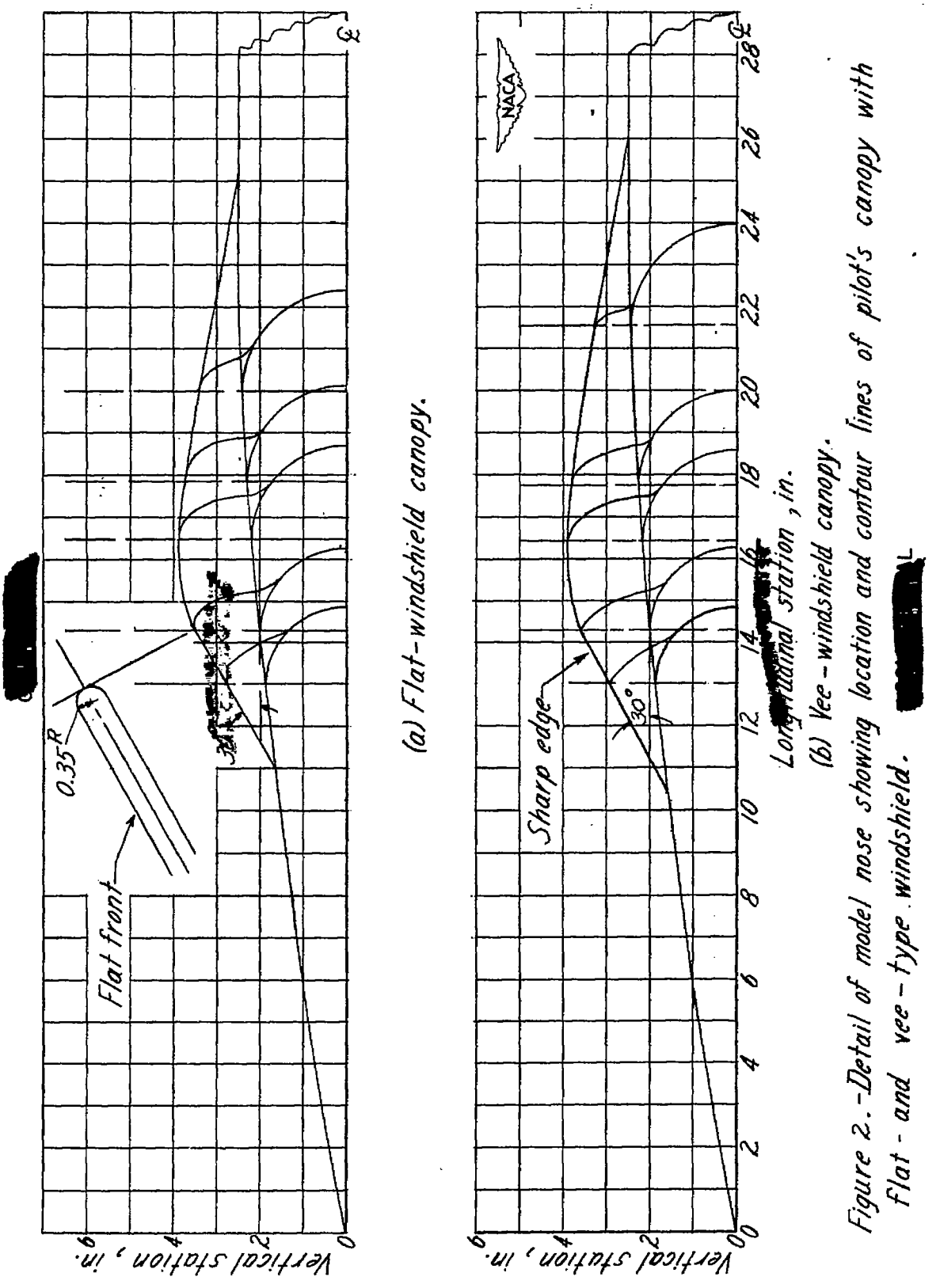

(a) Flat-windshield canopy.

(b) Vee-windshield canopy.

Figure 2.-Detail of model nose showing location and contour lines of pilot's canopy with flat- and vee-type windshield.

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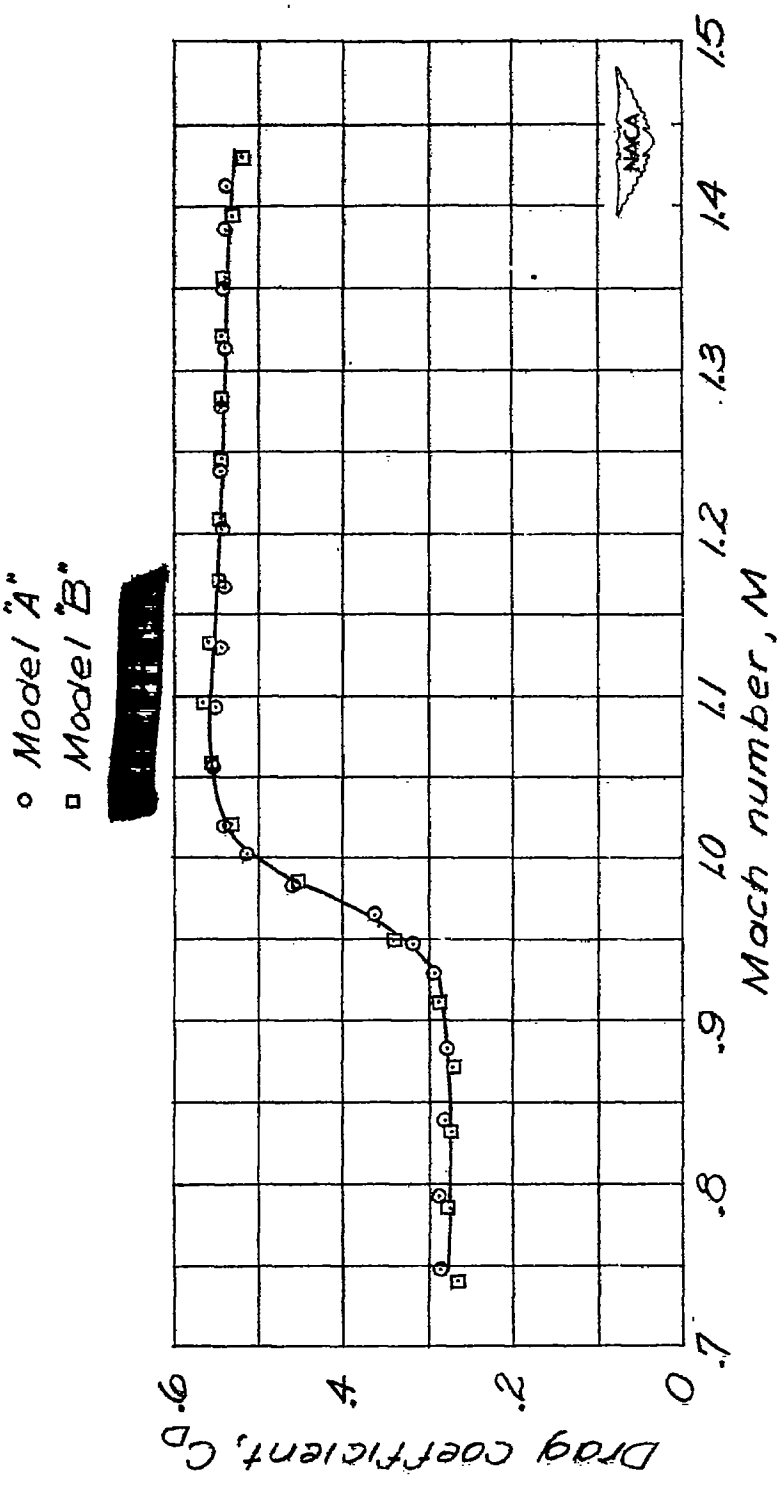

Figure 3.— Drag data. NACA RM-2 model with pilot's canopy [redacted] having vee-type [redacted]d. C_D based on basic body frontal area of 0.1364 sq ft. [redacted]

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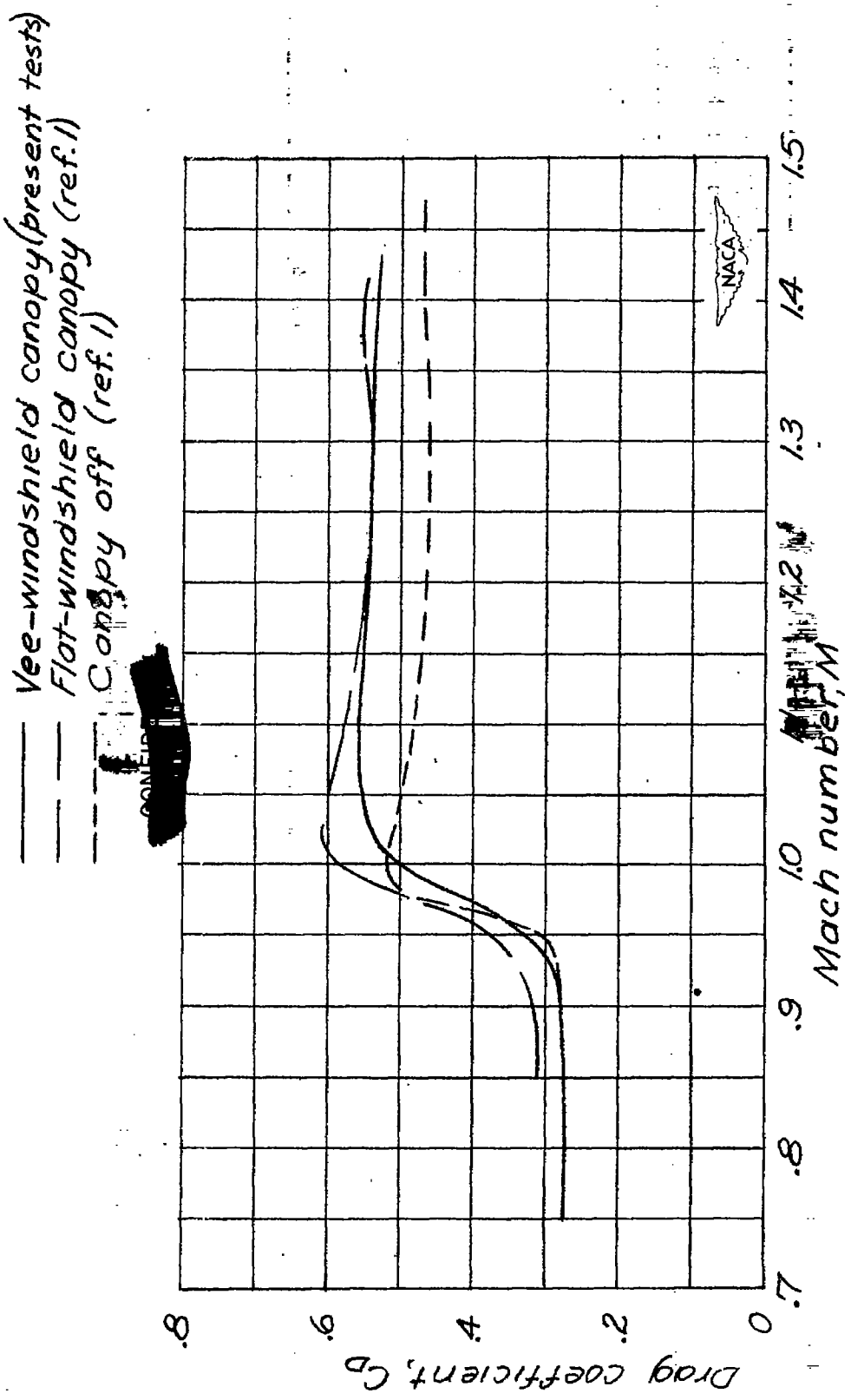

Figure 4.- Comparison of drag data from present tests and those of reference 1. C_D based on basic body frontal area of 0.1364 sq ft.