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TECHNICAL MEMORANDUM

X-491

SUMMARY OF WIND-TUNNEL INVESTIGATIONS OF THE STATIC LONGITUDINAL STABILITY CHARACTERISTICS OF THE PRODUCTION MERCURY CONFIGURATIONS AT MACH NUMBERS FROM 0.05 TO 20

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TECHNICAL MEMORANDUM X-491

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ABSTRACT

Investigations were conducted in various NASA and AEDC wind tunnels. The test Reynolds numbers generally approximated the estimated Mercury flight Reynolds numbers. Results indicated that the escape configuration is statically stable near an angle of attack of 0°, the exit configuration is statically unstable, and the reentry configuration is statically stable.

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SUMMARY OF WIND-TUNNEL INVESTIGATIONS OF THE STATIC LONGITUDINAL STABILITY CHARACTERISTICS OF THE PRODUCTION MERCURY CONFIGURATIONS AT MACH NUMBERS FROM 0.05 TO 20*

By Steve W. Brown and William C. Moseley, Jr.

SUMMARY

Wind-tunnel investigations have been made to determine the static longitudinal stability characteristics of the Mercury capsule configurations. These tests were conducted on the escape, exit, and reentry configurations of the production version of the Mercury capsule at the NASA Langley and Ames Research Centers and at the USAF Arnold Engineering and Development Center.

The test results indicate that the production escape configuration (capsule plus escape tower) is statically stable near an angle of attack of 0° throughout the Mach number range from 0 to 6.80. The production exit configuration (capsule with small end forward) is statically unstable throughout the Mach number range from 0 to 6.82. The desired instability was obtained by the addition of the destabilizer flap. This instability assures that the capsule would enter the earth's atmosphere from orbital flight with heat shield forward. (The exit configuration without flap is neutrally stable or slightly stable over a limited angle-of-attack range near 0° for Mach numbers greater than about 4.) The reentry configuration (capsule with blunt end forward) is statically stable throughout the Mach number range from 0 to 20.

INTRODUCTION

Numerous wind-tunnel investigations have been made by the National Aeronautics and Space Administration during the various stages of development of the Project Mercury capsule. Different shapes of blunt nonlifting

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bodies were tested in an effort to find the one best suited for the requirements of a manned orbital vehicle. (See refs. 1 to 12.) From these early studies evolved the present production Mercury configurations.

The Mercury configurations are defined as the escape, exit, and reentry configurations. The capsule with the escape tower attached is referred to as the escape configuration. With the small end forward and tower removed, the capsule is referred to as the exit configuration, whereas with the blunt end forward the capsule is known as the reentry configuration. Some results of the early wind-tunnel tests on the Mercury configurations are given in references 13 to 17. During the development of the production Mercury configurations, many minor modifications and refinements were made to the configurations. See for example, refs. 18 to 20.) The purpose of this paper is to present the results of wind-tunnel investigations made at the Langley and Ames Research Centers and the Arnold Engineering and Development Center (AEDC) to determine the static longitudinal stability of the production Mercury configurations. Also included are results for the exit configuration without the destabilizer flap. Tests were made at Mach numbers from 0.05 to 20 for a range of Reynolds numbers.

SYMBOLS

General arrangement of the configurations showing positive directions of forces and moments is given in figure 1. The symbols and coefficients used in the presentation are defined as follows:

C_A axial-force coefficient, $\frac{\text{Total axial force}}{qS}$

C_D drag coefficient, $C_A \cos\alpha + C_N \sin\alpha$

$C_{D,\alpha=0}$ drag coefficient at $\alpha = 0^\circ$

C_L lift coefficient, $C_N \cos\alpha - C_A \sin\alpha$

C_{L_α} lift-curve slope per degree at $\alpha \approx 0^\circ$, $\frac{\partial C_L}{\partial \alpha}$

C_m pitching-moment coefficient, $\frac{\text{Pitching moment}}{qSd}$

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C_{m_α}	pitching-moment-curve slope per degree at $\alpha \approx 0^\circ$, $\frac{\partial C_m}{\partial \alpha}$
C_N	normal-force coefficient, $\frac{\text{Normal force}}{qS}$
C_{N_α}	normal-force-curve slope per degree at $\alpha \approx 0^\circ$, $\frac{\partial C_N}{\partial \alpha}$
d	capsule maximum diameter, ft
M	free-stream Mach number
p	free-stream static pressure, lb/sq ft
q	free-stream dynamic pressure, $0.7pM^2$, lb/sq ft
R	Reynolds number (based on capsule maximum diameter)
S	capsule cross-sectional area at station of maximum diameter, sq ft
α	angle of attack of model center line, deg

TEST FACILITIES

The aerodynamic tests on the production Mercury configurations were conducted in the following NASA and AEDC facilities. Except where otherwise noted, the models were sting-mounted on an internal electrical strain-gage balance.

Low Subsonic

The tests at low subsonic speeds were made in the Langley free-flight tunnel which has an octagonal test section with a maximum diameter of 12 feet and is housed in a steel sphere. The tunnel operates at a stagnation pressure of 1 atmosphere over a Mach number range from 0 to 0.1.

Transonic

The Langley 8-foot transonic pressure tunnel is a single-return, closed-circuit, pressure-type tunnel capable of operating from 1/4 to 1 atmosphere and over a Mach number range from 0.3 to 1.14. The test section is rectangular in cross section and has a cross-sectional area of approximately 50 square feet. The upper and lower walls of the test

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section are slotted to permit continuous operation through the transonic speed range.

The AEDC 16-foot transonic circuit of the propulsion wind tunnel is a continuous-flow closed-circuit facility capable of operation from a pressure level which approaches a vacuum to a stagnation pressure of 2.5 atmospheres and over a Mach number range from 0.5 to 1.6. The test section is 16 feet square (in cross section) and 40 feet long. The walls of the test section are perforated and enclosed in a large plenum chamber. A pumping system connected to the plenum chamber, together with the perforated walls, provides a means of unchoking the test section when it is operating at or near sonic speeds and for the attenuation of disturbance waves when it is operating above sonic speeds. (See ref. 21.)

Supersonic

The 9- by 7-foot supersonic test section of the Ames Unitary Plan wind tunnel is of the asymmetric sliding-block type in which the variation of the test-section Mach number from 1.4 to 2.6 is achieved by translating in the streamwise direction the fixed contour block which forms the floor of the nozzle. The stagnation pressure can be varied from about 2 to 30 lb/sq in. abs. (See ref. 22.)

The Langley Unitary Plan wind tunnel is of the asymmetric sliding-block, closed-working-section type. The low range test section has a Mach number range from 1.5 to 2.9 and the high range test section, from 2.3 to 5. The working sections are 4 feet high, 4 feet wide, and approximately 7 feet long. The maximum stagnation pressure is approximately 60 lb/sq in. abs for the low range test section and approximately 150 lb/sq in. abs for the high range test section. (See ref. 22.)

Hypersonic

One of the tunnels used for the tests at hypersonic speeds was a 2-foot low-density hypersonic tunnel at the Langley Research Center which is a continuous-flow, two-dimensional, closed-circuit, ejector-type tunnel. The operating pressure can be varied from 1/4 to 4 atmospheres and Mach number, from 3 to 7.

The Langley 20-inch hypersonic tunnel is of the continuous blow-down type and is designed to operate at a Mach number of 6. The tunnel has a stagnation-pressure range from 300 lb/sq in. abs to 400 lb/sq in. abs.

The Langley 11-inch hypersonic tunnel is an intermittent blow-down-type tunnel and was designed to operate at Mach numbers of 7 and 10.

This tunnel utilizes interchangeable test sections and is capable of operating from a pressure level of about 5 atmospheres to 45 atmospheres. (See refs. 24 and 25.)

The AEDC tunnel HS-2 is a 50-inch-diameter, arc-driven, Hotshot type tunnel. Air, initially confined to an arc chamber by a diaphragm located near the throat of an attached convergent-divergent nozzle, is heated and compressed by an electric-arc discharge and expanded by the conical nozzle to the test section and vacuum tank. A useful run duration of about 20 milliseconds is obtained. (See ref. 25.) The tunnel HS-2 operates at Mach numbers from 9.9 to 20.

The Ames pressurized ballistic range and the Ames supersonic free-flight tunnel launch the model as a projectile down an instrumented range of recording stations. Analysis of a series of records obtained at these stations determine the model characteristics during flight. The ballistic range is equipped with 24 spark-shadowgraph stations located at various intervals along its 203-foot length. Chronographs record the time intervals between shadowgraphs taken as the model passes each station. The wind tunnel is similar to the range except that the models are fired through a counter-current airstream. The test section of this wind tunnel is equipped with 9 spark-shadowgraph stations spaced at 3-foot intervals. (See refs. 17 and 26.)

MODEL DESCRIPTION

The general dimensions and various components of the production Mercury configurations are presented in figure 2. The models were made principally of steel and aluminum except the model tested in the free-flight tunnel, which was constructed of wood.

Escape Configuration

Some of the escape models tested did not have all the components of the production version. The minor components, which were expected to have small effects on the aerodynamic characteristics, were not on some of the small models. The $\frac{1}{4}$-scale model tested in the Langley free-flight tunnel, the $\frac{1}{9}$-scale model tested in the Langley 8-foot transonic pressure tunnel, and the 5.37-percent-scale model tested in a 2-foot low-density tunnel at the Langley Research Center did not have the igniter-cable conduits and junction boxes, the igniter-cable-fairing strap turnbuckles, and the ramp at the base of the rocket. Also the 5.37-percent-scale model did not have the tangential igniter-cable fairings and igniter-cable junction boxes.

The $\frac{1}{9}$-scale model tested in both the Ames and Langley Unitary Plan wind tunnels did not have the igniter-cable-fairing strap turnbuckles. One version of the $\frac{1}{9}$-scale escape model tested in Langley Unitary Plan wind tunnel had a full-scale parachute-housing diameter of 30 inches.

Exit and Reentry Configurations

Most exit models tested were scale models of the production exit configuration shown in figure 2. The model tested in the Langley 20-inch hypersonic tunnel had a full-scale parachute-housing diameter of 30 inches instead of 32 inches. In addition to the models tested with a destabilizer flap, tests were made in the 20-inch hypersonic and 8-foot transonic pressure tunnels for models without destabilizer flaps and with a parachute-housing diameter of 30 inches.

The reentry models tested were scale models of the basic capsule with a parachute-housing diameter of 30 inches and without the destabilizer flap on the face of the antenna housing.

TEST CONDITIONS AND ACCURACY

A comparison of the test Reynolds numbers with typical flight Reynolds numbers is given in figure 3. The test Reynolds numbers generally approximated the flight Reynolds numbers with the exception of the high Reynolds numbers of the exit phase. The test conditions are summarized in table I.

The available accuracy estimates for the test data are given in table II.

PRESENTATION OF RESULTS

The results of the investigation are presented in the following figures:

DISCUSSION

General Comments

For some Mach numbers of the tests made in the Langley 8-foot transonic pressure tunnel of the escape configuration, the Reynolds number was not held constant throughout the range of angle of attack. It was necessary to lower the dynamic pressure at the higher angles of attack because of balance load limitations. The Reynolds numbers for the different angle-of-attack ranges are noted in the figures. Two escape configurations were tested in the Langley Unitary Plan wind tunnel. The production escape configuration (with the full-scale parachute-housing diameter of 32 inches) was tested only for the positive angle-of-attack range. The other configuration, which had a full-scale parachute-housing diameter of 30 inches, was tested for both the positive and negative angle-of-attack ranges.

Summary data from the Ames pressurized ballistic range, the Ames supersonic free-flight tunnel, and the AEDC tunnel HS-2 are included on the summary plot for the reentry configuration (fig. 22). The data is presented only in summary form because the tests in these facilities were conducted over a limited angle-of-attack range. In correlating the summary data of tunnel HS-2, it might be well to point out that the estimated accuracy of the data was on the order of ±15 percent.

The data of figures 23, 24, and 25 are comprehensive plots of the variation of the aerodynamic characteristics of the escape and reentry configurations with angle of attack and Mach number. (Figures 23, 24, and 25 can be found in a pocket at the back of the report.) Also given in tables III, IV, and V are tabulations of the aerodynamic data determined from the faired plots of figures 23, 24, and 25. It has been necessary to extrapolate and estimate over considerable portions of the angle-of-attack range.

Escape Configuration

The production escape configuration is statically stable at $\alpha \approx 0^\circ$, the trim point. This is shown by the pitching-moment coefficient curves in figure 4. For subsonic, transonic, and low supersonic Mach numbers ($M = 0.05$ to 1.80) the configuration is stable over a limited angle-of-attack range ($\alpha = 0^\circ$ to 20° at $M = 0.05$ and $\alpha = 0^\circ$ to 25° at $M = 1.80$). For the high supersonic and the hypersonic Mach numbers ($M = 2.01$ to 6.80), the configuration is stable up to the maximum test angle of attack ($\alpha \approx 25^\circ$).

In developing the production Mercury capsule, several modifications have been made to the escape configuration. The modifications, except for the addition of the 45° flow separator, had only small effects on the stability. The flow separator causes a substantial increase in the stability of the escape configuration. (See ref. 19.) At angle of attack, the flow separator creates unsymmetrical flow separation over the capsule in the pitch plane. This unsymmetrical flow separation affects a rearward shift of the center of pressure and hence an increase in the stability of the configuration. The flow separator caused a greater increase in the stability at the subsonic and transonic Mach numbers than it did at the higher Mach numbers. This increase can be seen by the curve for C_{m_α} in figure 20 where the basic and production configurations are compared (refs. 13, 15, and 19). The basic configuration (which did not have a flow separator) had marginal stability at the subsonic and transonic Mach numbers. (See ref. 13.) The (d) parts of figures 4 to 8 show data at supersonic speeds for both the 30- and 32-inch parachute housings. Although there was some effect of increasing the housing size the effect was generally small.

The variations of the normal-force coefficient and the lift coefficient with angle of attack are generally linear only up to $\alpha \approx 5^\circ$.

(See figs. 5 and 7.) The normal-force-curve slope and the lift-curve slope at $\alpha = 0^\circ$ are both positive, and they vary slightly with Mach number. (See fig. 20.)

The axial-force coefficient and the drag coefficient for the escape configuration have a nonlinear variation with angle of attack. (See figs. 6 and 8.) The drag coefficient at $\alpha = 0^\circ$ $\left(C_{D,\alpha=0}\right)$ increases with increasing Mach number in the subsonic and transonic regions to a maximum near $M = 1$, whereas at the supersonic and hypersonic Mach numbers it decreases with increasing Mach number. (See fig. 20.)

The longitudinal aerodynamic characteristics of the production escape configuration were not affected by variation in Reynolds number from 3.3×10^6 to 9×10^6 at $M = 2.5$. (See fig. 9.)

Exit Configuration

The production exit configuration is statically unstable throughout the test Mach number and angle-of-attack ranges. (See fig. 10.) This desired instability was obtained by the addition of the destabilizer flap. The instability assures that the capsule will enter the earth's atmosphere from orbital flight with the heat shield forward. The exit configuration without the flap became neutrally stable or slightly stable over a limited angle-of-attack range near 0° for Mach numbers greater than about 4. (See fig. 10.) The effect of the destabilizer flap was an incremental shift in the pitching-moment-coefficient curve near $\alpha = 0^\circ$. This shift eliminated the trim point near $\alpha = 0^\circ$. The production exit models were tested with the destabilizer flap rotated 180° in roll from its normal location during exit. (See fig. 2 for normal location.)

The variations of the normal-force coefficient and the lift coefficient with angle of attack are generally linear over a limited angle-of-attack range near $\alpha = 0^\circ$. (See figs. 11 and 13.) The normal-force-curve slope and the lift-curve slope at $\alpha = 0^\circ$ are both positive and they are generally constant with Mach number. (See fig. 21.)

The axial-force coefficient and the drag coefficient have a nonlinear variation with angle of attack. (See figs. 12 and 14.) The plot of $C_{D,\alpha=0}$ against Mach number for the exit configuration (fig. 21) is similar to that for the escape configuration.

Reentry Configuration

The reentry data presented in this paper are for the basic Mercury reentry configuration which had a full-scale parachute-housing diameter of 30 inches (refs. 13 and 15 to 17). The production Mercury capsule has not been tested in the reentry mode. However, the small increase in parachute-housing diameter should have little or no effect on the stability of the reentry model. The effect of the destabilizer flap on the reentry stability is unknown but the effect is expected to be small.

The reentry configuration is statically stable throughout the test Mach number and angle-of-attack ranges. (See fig. 15.) The variation of C_m with angle of attack is linear over a limited angle-of-attack range near $\alpha = 0^\circ$. The summary plot (fig. 22) shows that C_{M_α} is negative and generally constant throughout the Mach number range investigated.

The variations of the normal-force coefficient and the lift coefficient with angle of attack are linear over a limited angle-of-attack range near $\alpha = 0^\circ$. (See figs. 16 and 18.) In the subsonic and transonic Mach number ranges, the normal-force coefficient is zero or slightly negative up to $\alpha \approx 10^\circ$. The summary plot (fig. 22) shows C_{N_α} has slight negative values at subsonic and transonic speeds and becomes slightly positive at supersonic and hypersonic speeds. The lift-curve slope at $\alpha = 0^\circ$ is negative and generally constant with Mach number throughout the test Mach number range. The negative lift coefficient and hence negative lift-curve slope at low positive angles of attack is the result of the reeentry configuration having a relatively low normal force and a high axial force. The negative lift-curve slope (or low normal force) is desirable, because the resultant force vector of lift and drag rotates with angle of attack so as to be primarily in the axial direction and the astronaut is positioned to withstand high axial loads. On the other hand, the negative lift-curve slope has an undesirable effect since it contributes to capsule dynamic instability.

The axial-force coefficient and the drag coefficient have a nonlinear variation with angle of attack. (See figs. 17 and 19.) With increase in Mach number, $C_{D,\alpha=0}$ increases up to about $M \approx 4$, and above this Mach number it remains constant.

SUMMARY OF RESULTS

Tests have been conducted over a Mach number range of 0.05 to 20 to determine the static stability characteristics of the production Mercury escape, exit, and reentry configurations. The results are summarized as follows:

1. The production escape configuration is statically stable near an angle of attack of 0° throughout the Mach number range from 0 to 6.80.

2. The production exit configuration is statically unstable throughout the Mach number range from 0 to 6.82. The desired instability was obtained by the addition of the destabilizer flap. This instability assures that the capsule would enter the earth's atmosphere from orbital flight with the heat shield forward. (The exit configuration without flap is neutrally stable or slightly stable over a limited angle-of-attack range near 0° for Mach numbers greater than about 4.)

3. The reentry configuration tested is statically stable throughout the Mach number range from 0 to 20.

Goddard Space Flight Center, Space Task Group,
National Aeronautics and Space Administration,
Langley Field, Va., October 3, 1960.

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TABLE I.- TEST CONDITIONS

Facility	Configuration	Mach number	Stagnation pressure, lb/sq in. abs	Dynamic pressure, lb/sq ft	Stagnation temperature, °F	Reynolds number
Langley free-flight tunnel	Escape and reentry, $\frac{1}{4}$-scale model	0.05	14.7	3.7	75	0.60×10^6
Langley 8-foot transonic pressure tunnel	Escape, $\frac{1}{9}$-scale model	0.30	14.8	126.0	125	1.21×10^6
		.50	14.7	313	125	1.89
		.80	14.7	623	125	2.58
			8.7	367		1.52
			8.3	352		1.46
		1.00	14.7	784	125	2.81
			7.0	372		1.32
			5.6	296		1.06
		1.14	14.7	860	125	2.87
			6.4	375		1.25
			4.9	288		.97
	Exit, $\frac{1}{9}$-scale model	0.50	14.7	313	125	1.89×10^6
		.80	14.7	623	125	2.58
		1.00	14.7	784	125	2.81
			13.5	719		2.59
		1.14	14.7	860	125	2.87
	Exit without destabilizer flap, $\frac{1}{7}$-scale model	0.50	14.7	312	125	2.42×10^6
		.80	14.7	623	125	3.30
		1.00	14.7	783	125	3.61
		1.14	14.7	858	125	3.68
	Reentry, $\frac{1}{7}$-scale model	0.50	14.7	312	125	2.42×10^6
		.60	14.7	418	125	2.77
		.70	14.7	524	125	3.06
		.80	14.7	623	125	3.30
		.90	14.7	710	125	3.50
		.95	14.7	750	125	3.56
		.98	14.7	770	125	3.60
		1.00	14.7	783	125	3.61
		1.03	14.7	801	125	3.62
		1.14	14.7	858	125	3.68
AEDC 16-foot transonic circuit	Escape and exit, 32-percent scale model	0.50	16.05	340	120	6.0×10^6
		.70	12.7	450	120	6.0
		.90	11.2	540	120	6.0
		1.14	10.6	619	120	6.0
		1.30	10.6	652	120	6.0
		1.50	10.4	645	145	6.0
			11.35	700	140	
Ames Unitary Plan wind tunnel	Escape, $\frac{1}{9}$-scale model	1.55	---	---	---	2.4×10^6
		1.80	---	---	---	2.4
		2.01	---	---	---	3.3
		2.50	---	---	---	3.1
	Escape, 32-percent scale model	2.50	---	---	---	3.3×10^6
						6.0
						9.0

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TABLE I.- TEST CONDITIONS - Concluded

Facility	Configuration	Mach number	Stagnation pressure, lb/sq in. abs	Dynamic pressure, lb/sq ft	Stagnation temperature, °F	Reynolds number
Langley Unitary Plan wind tunnel	Escape, $\frac{1}{9}$-scale model	2.50	21 38	785 1385	150	2.50×10^6 4.40
		2.87	26 54	712 1480	150	2.50 5.21
		3.94	48	540	175	2.50
		4.65	65	412	175	2.50
	Exit, $\frac{1}{9}$-scale model	2.30	18	798	150	2.45×10^6
		2.87	24	680	150	2.39
		3.94	42	475	175	2.20
	Reentry, $\frac{1}{9}$-scale model	1.60	14.6	885	125	2.69×10^6
		2.06	16.2	805	150	2.50
		2.87	24.7 38.0	678 1051	150	2.39 3.67
		3.94	55.8	624	175	2.20
		4.65	55.0	343	175	2.05
2-foot low-density hypersonic tunnel	Escape, 5.37-percent scale model	3.15	14.97	326	263	0.75×10^6
		3.92	14.88	169	280	.51
		4.72	24.49	145	310	.35
		5.73	39.60	110	332	.39
		6.80	56.92	77	327	.29
	Exit, 5.37-percent scale model	3.02	14.41	350	262	0.80×10^6
		3.96	15.02	165	265	.50
		4.70	24.61	148	282	.36
		5.75	40.16	110	310	.40
		6.82	56.15	75	332	.29
Langley 20-inch hypersonic tunnel	Exit, 5.37-percent scale model	5.98	267	622	410	1.60×10^6
	Reentry, 5.37-percent scale model	5.98	295	687	410	1.80×10^6
Langley 11-inch hypersonic tunnel	Reentry 3.20-percent scale model	6.66	132	171	675	0.20×10^6
		9.60	412	113	1200	.13
Ames pressurized ballistic range	Reentry, 2.21-percent scale model	3.0	11.8	---	---	2.2×10^6
Ames supersonic free-flight tunnel	Reenty, 0.60-percent scale model	9.5	---	---	---	1.4×10^6
		14.0	---	---	---	1.9
AEDC tunnel HS-2	Reentry, 5.24-percent scale model	19.0	---	0.05	---	0.06×10^6

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TABLE II.- ACCURACIES

Facility	Configuration	M	Accuracy of –						
			M	α, deg	C_m	C_N	C_A	C_L	C_D
Langley 8-foot transonic pressure tunnel	Escape	0.3	±0.01	±0.2	±0.03	±0.15	±0.15	±0.15	±0.15
		.5	±.01	±.2	±.016	±.06	±.06	±.06	±.06
		1.14	±.004	±.2	±.016	±.06	±.06	±.06	±.06
	Exit	0.5	±0.01	±0.2	±0.016	±0.06	±0.06	±0.06	±0.06
		1.14	±.004	±.2	±.006	±.02	±.02	±.02	±.02
	Reentry	0.5	±0.01	±0.2	±0.008	±0.04	±0.014	±0.04	±0.04
		1.14	±.004	±.2	±.003	±.014	±.014	±.014	±.014
AEDC 16-foot transonic circuit	Escape and exit	0.5	±0.003	±0.1	±0.007	±0.011	±0.018	±0.011	±0.017
		1.5	±.005	±.1	±.003	±.005	±.01	±.005	±.009
Langley Unitary Plan wind tunnel	Escape, exit and reentry	2.3 to 4.65	±0.05	±0.1	±0.005	±0.024	±0.021	±0.024	±0.021
Langley 11-inch hypersonic tunnel	Reentry	6.66	±0.03	±0.1	±0.007	±0.02	±0.008	±0.020	±0.008
		9.6	±.03	±.1	±.007	±.02	±.008	±.020	±.008
Ames Unitary Plan wind tunnel	Escape, $\frac{1}{9}$-scale model	1.55 to 2.5	---	---	±0.05	±0.007	±0.0035	±0.007	±0.0035
	Escape, 32-percent scale model	1.55 to 2.5	---	---	±.0013	±.005	±.0032	±.005	±.0032
2-foot low-density tunnel	Escape and exit	3.02 to 6.82	±0.1	±0.2	±0.02	±0.04	±0.03	±0.04	±0.03

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TABLE III.- AERODYNAMIC COEFFICIENTS FOR ESCAPE CONFIGURATION

(a) C_m

α, deg	C_m at –											
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.15	M = 1.5	M = 2	M = 3	M = 5	M = 7	M = 9.6
0	0	0	0	0	0	0	0	0	0	0	0	0
5	-.05	-.052	-.052	-.055	-.06	-.06	-.055	-.045	-.035	-.06	-.065	-.06
10	-.056	-.07	-.075	-.08	-.09	-.085	-.092	-.08	-.05	-.105	-.12	-.145
15	-.04	-.056	-.062	-.07	-.07	-.065	-.06	-.055	-.07	-.155	-.16	-.16
20	-.017	-.015	-.03	-.025	-.015	-.01	-.015	-.04	-.11	-.175	-.18	-.125
25	.025	.02	-.01	.02	.04	.065	.03	-.01	-.11	-.17	-.15	-.095
30	.07	.072	.075	.1	.11	.11	.08	.02	-.1	-.128	-.105	-.04
35	.12	.14	.14	.16	.16	.15	.115	.055	-.035	-.058	-.04	.01
40	.18	.2	.21	.22	.2	.19	.155	.09	.018	.015	.02	.05
45	.252	.27	.268	.26	.255	.24	.2	.13	.055	.08	.08	.09
50	.33	.325	.32	.31	.3	.28	.24	.18	.095	.138	.135	.12
55	.36	.365	.37	.355	.345	.32	.275	.225	.145	.188	.185	.165
60	.38	.405	.42	.395	.38	.36	.32	.27	.2	.235	.235	.225
65	.393	.44	.445	.43	.415	.42	.385	.325	.255	.28	.29	.28
70	.43	.47	.47	.47	.47	.47	.44	.37	.315	.325	.34	.34
75	.5	.5	.53	.53	.53	.51	.47	.41	.375	.37	.375	.415
80	.525	.502	.56	.575	.565	.55	.495	.44	.415	.41	.42	.455
85	.5	.475	.542	.585	.575	.57	.507	.44	.425	.442	.47	.5
90	.46	.44	.512	.57	.58	.595	.515	.45	.43	.47	.5	.53
95	.43	.42	.478	.555	.575	.62	.52	.455	.438	.48	.515	.555
100	.415	.4	.455	.53	.568	.62	.52	.46	.445	.482	.525	.57
105	.408	.39	.44	.51	.55	.595	.505	.455	.448	.482	.53	.58
110	.405	.39	.43	.485	.53	.585	.495	.455	.45	.482	.525	.58
115	.405	.39	.43	.465	.51	.565	.49	.455	.45	.48	.52	.57
120	.405	.395	.44	.445	.5	.555	.485	.452	.445	.475	.51	.55
125	.41	.4	.45	.445	.5	.55	.48	.45	.44	.465	.495	.52
130	.422	.41	.465	.465	.52	.545	.475	.44	.43	.45	.47	.48
135	.435	.412	.48	.475	.495	.54	.462	.42	.41	.43	.44	.43
140	.435	.412	.47	.475	.48	.53	.445	.4	.385	.395	.39	.37
145	.42	.4	.44	.46	.47	.50	.415	.37	.355	.35	.33	.305
150	.395	.38	.415	.445	.45	.465	.37	.33	.31	.305	.28	.225
155	.352	.335	.38	.4	.405	.415	.315	.275	.26	.255	.23	.16
160	.3	.285	.325	.335	.34	.38	.25	.215	.2	.2	.17	.12
165	.225	.22	.23	.25	.23	.21	.18	.165	.135	.13	.115	.075
170	.145	.142	.14	.145	.14	.12	.105	.09	.08	.08	.08	.04
175	.068	.06	.06	.07	.055	.045	.04	.035	.03	.03	.03	.03
180	0	0	0	0	0	0	0	0	0	0	0	0

[redacted]

TABLE III.- AERODYNAMIC COEFFICIENTS FOR ESCAPE CONFIGURATION - Continued

(b) C_L

α, deg	C_L at –											
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.15	M = 1.5	M = 2	M = 3	M = 5	M = 7	M = 9.6
0	0	0	0	0	0	0	0	0	0	0	0	0
5	.09	.09	.045	.11	.09	.07	.1	.1	.13	.16	.18	.2
10	.17	.17	.17	.17	.16	.14	.2	.2	.23	.30	.33	.3
15	.23	.24	.24	.24	.23	.18	.28	.3	.34	.39	.42	.4
20	.29	.30	.31	.3	.28	.23	.36	.38	.44	.48	.48	.47
25	.36	.36	.39	.39	.37	.33	.44	.5	.55	.52	.52	.52
30	.42	.41	.45	.5	.5	.48	.56	.58	.57	.56	.54	.53
35	.47	.48	.54	.65	.66	.64	.68	.64	.58	.54	.54	.52
40	.49	.55	.63	.78	.78	.76	.72	.7	.62	.51	.49	.48
45	.5	.61	.78	.84	.83	.79	.72	.66	.56	.44	.44	.43
50	.49	.65	.76	.79	.78	.76	.66	.59	.48	.38	.38	.38
55	.46	.62	.76	.64	.66	.66	.52	.46	.39	.3	.3	.28
60	.38	.56	.7	.55	.53	.52	.38	.35	.3	.21	.21	.21
65	.15	.47	.58	.44	.4	.34	.23	.22	.18	.12	.1	.08
70	-.1	.38	.4	.3	.23	.15	.08	.05	.02	-.01	-.02	-.04
75	-.1	.2	.18	.03	.06	-.05	-.06	-.07	-.08	-.09	-.1	-.14
80	-.09	-.38	-.38	-.27	-.24	-.21	-.16	-.14	-.14	-.15	-.17	-.24
85	-.08	-.36	-.44	-.39	-.33	-.28	-.22	-.19	-.2	-.21	-.24	-.31
90	-.08	-.34	-.47	-.45	-.38	-.32	-.25	-.24	-.24	-.27	-.3	-.37
95	-.085	-.35	-.49	-.48	-.41	-.35	-.28	-.25	-.26	-.28	-.32	-.38
100	-.1	-.36	-.48	-.47	-.42	-.36	-.29	-.27	-.275	-.27	-.3	-.37
105	-.13	-.32	-.49	-.45	-.38	-.36	-.3	-.28	-.28	-.28	-.3	-.35
110	-.14	-.26	-.39	-.43	-.39	-.34	-.29	-.29	-.29	-.29	-.29	-.31
115	-.14	-.18	-.3	-.38	-.36	-.32	-.27	-.26	-.25	-.25	-.24	-.25
120	-.09	-.09	-.2	-.3	-.3	-.26	-.21	-.19	-.18	-.18	-.18	-.18
125	-.02	-.02	-.1	-.18	-.22	-.19	-.14	-.12	-.1	-.1	-.09	-.08
130	.06	.08	0	-.08	-.1	-.12	-.06	-.03	-.02	0	.02	.015
135	.13	.13	.08	.04	0	-.04	.03	.05	.07	.12	.14	.22
140	.18	.18	.14	.13	.1	.04	.12	.12	.15	.21	.27	.42
145	.22	.23	.2	.18	.17	.18	.21	.21	.24	.28	.35	.47
150	.24	.26	.25	.24	.24	.25	.28	.28	.3	.34	.39	.48
155	.28	.28	.28	.28	.28	.28	.33	.32	.34	.37	.4	.475
160	.29	.3	.28	.3	.3	.3	.34	.34	.35	.37	.4	.44
165	.28	.28	.27	.28	.27	.28	.32	.32	.32	.34	.35	.38
170	.22	.24	.2	.22	.22	.23	.25	.255	.25	.27	.28	.29
175	.14	.14	.12	.15	.12	.13	.14	.14	.15	.16	.15	.24
180	0	0	0	0	0	0	0	0	0	0	0	0

[redacted]

[redacted]

TABLE III.- AERODYNAMIC COEFFICIENTS FOR ESCAPE CONFIGURATION - Continued

(c) C_D

α, deg	C_D at -											
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.15	M = 1.5	M = 2	M = 3	M = 5	M = 7	M = 9.6
0	0.63	0.64	0.64	0.72	0.92	0.9	0.78	0.66	0.46	0.3	0.23	0.18
5	.66	.66	.7	.76	.99	.93	.82	.68	.5	.32	.3	.2
10	.7	.7	.75	.82	1.03	.99	.88	.75	.57	.38	.42	.4
15	.73	.73	.78	.82	1.03	1.05	.98	.85	.68	.53	.54	.5
20	.75	.75	.8	.84	1.03	1.1	1.07	.96	.82	.62	.67	.6
25	.78	.78	.82	.92	1.05	1.12	1.12	1.08	.96	.86	.78	.71
30	.84	.85	.87	.97	1.08	1.18	1.24	1.19	1.11	.98	.9	.83
35	.86	.9	.92	1.04	1.16	1.3	1.42	1.4	1.26	1.12	1.02	.96
40	.88	.92	.98	1.16	1.27	1.46	1.6	1.58	1.42	1.26	1.16	1.1
45	.92	.97	1.06	1.31	1.32	1.6	1.74	1.74	1.58	1.42	1.31	1.24
50	.98	1.03	1.16	1.44	1.56	1.72	1.85	1.85	1.73	1.58	1.45	1.41
55	1.02	1.08	1.28	1.52	1.62	1.81	1.94	1.94	1.82	1.7	1.6	1.55
60	1.04	1.12	1.37	1.57	1.66	1.86	2.0	2.02	1.9	1.8	1.73	1.67
65	1.05	1.15	1.41	1.6	1.68	1.92	2.06	2.08	1.98	1.88	1.82	1.76
70	1.06	1.16	1.42	1.62	1.7	2.0	2.08	2.09	2.2	1.95	1.88	1.84
75	1.08	1.15	1.39	1.64	1.74	2.11	2.09	2.05	2.05	1.98	1.89	1.87
80	1.1	1.08	1.34	1.64	1.8	2.16	2.07	2.01	2.03	1.94	1.9	1.85
85	1.05	.99	1.28	1.64	1.8	2.1	2.04	1.97	1.98	1.87	1.85	1.79
90	.96	.95	1.26	1.63	1.78	2.02	1.98	1.93	1.9	1.8	1.75	1.72
95	.92	.93	1.24	1.6	1.74	1.96	1.92	1.87	1.82	1.74	1.64	1.63
100	.9	.92	1.2	1.55	1.69	1.88	1.85	1.81	1.74	1.66	1.55	1.53
105	.9	.9	1.13	1.48	1.63	1.81	1.78	1.74	1.67	1.58	1.46	1.4
110	.9	.88	1.07	1.4	1.56	1.74	1.72	1.68	1.6	1.45	1.34	1.27
115	.88	.86	1.03	1.35	1.49	1.68	1.67	1.61	1.53	1.36	1.25	1.17
120	.86	.85	1.0	1.3	1.43	1.61	1.62	1.57	1.47	1.27	1.16	1.1
125	.86	.83	1.	1.26	1.38	1.54	1.59	1.55	1.43	1.23	1.14	1.08
130	.87	.84	1.	1.24	1.33	1.46	1.57	1.55	1.43	1.23	1.15	1.08
135	.89	.85	1.	1.22	1.32	1.42	1.57	1.56	1.46	1.26	1.18	1.11
140	.92	.88	1.	1.22	1.31	1.4	1.57	1.58	1.48	1.32	1.22	1.16
145	.95	.92	1.01	1.22	1.31	1.4	1.58	1.6	1.5	1.36	1.27	1.21
150	.97	.94	1.02	1.22	1.31	1.4	1.59	1.62	1.52	1.41	1.32	1.27
155	.98	.95	1.03	1.22	1.31	1.4	1.6	1.64	1.53	1.46	1.38	1.34
160	1.0	.98	1.04	1.22	1.31	1.4	1.61	1.65	1.56	1.49	1.44	1.4
165	1.01	.99	1.04	1.22	1.31	1.4	1.62	1.66	1.58	1.52	1.46	1.44
170	1.02	1.0	1.04	1.22	1.31	1.4	1.62	1.66	1.6	1.54	1.49	1.46
175	1.02	1.01	1.04	1.22	1.31	1.4	1.62	1.66	1.61	1.55	1.51	1.49
180	1.02	1.02	1.04	1.22	1.31	1.4	1.63	1.66	1.6	1.56	1.53	1.5

[redacted]

[redacted]

TABLE III.- AERODYNAMIC COEFFICIENTS FOR ESCAPE CONFIGURATION - Continued

(d) C_N

α, deg	C_N at –											
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.15	M = 1.5	M = 2	M = 3	M = 5	M = 7	M = 9.6
0	0	0	0	0	0	0	0	0	0	0	0	0
5	.147	.147	.106	.176	.176	.151	.171	.159	.17	.19	.21	.22
10	.289	.289	.298	.310	.336	.310	.350	.327	.33	.36	.4	.36
15	.411	.421	.434	.444	.489	.446	.524	.510	.5	.51	.55	.52
20	.529	.538	.565	.569	.615	.592	.704	.685	.69	.66	.68	.65
25	.656	.656	.7	.742	.779	.772	.872	.910	.9	.83	.8	.77
30	.784	.780	.825	.918	.973	1.006	1.105	1.097	1.05	.97	.92	.87
35	.878	.909	.970	1.129	1.206	1.270	1.372	1.327	1.2	1.08	1.03	.98
40	.941	1.013	1.113	1.343	1.414	1.521	1.580	1.552	1.39	1.20	1.12	1.07
45	1.004	1.117	1.301	1.520	1.520	1.690	1.739	1.697	1.51	1.32	1.24	1.18
50	1.066	1.207	1.377	1.611	1.696	1.806	1.841	1.796	1.63	1.45	1.35	1.32
55	1.099	1.240	1.485	1.612	1.706	1.861	1.888	1.853	1.71	1.56	1.48	1.43
60	1.091	1.250	1.536	1.635	1.703	1.871	1.922	1.924	1.8	1.66	1.6	1.55
65	1.015	1.241	1.523	1.450	1.692	1.884	1.964	1.978	1.87	1.75	1.69	1.63
70	.962	1.220	1.471	1.625	1.676	1.931	1.982	1.981	2.07	1.83	1.76	1.72
75	1.017	1.163	1.389	1.592	1.696	2.025	2.003	1.962	1.96	1.89	1.8	1.77
80	1.068	.998	1.254	1.568	1.731	2.091	2.011	1.955	1.97	1.88	1.84	1.78
85	1.039	.955	1.237	1.600	1.764	2.068	2.013	1.946	1.96	1.84	1.82	1.76
90	.96	.95	1.26	1.63	1.78	2.02	1.98	1.93	1.9	1.8	1.75	1.72
95	.924	.957	1.278	1.636	1.769	1.983	1.937	1.88	1.84	1.76	1.67	1.66
100	.904	.969	1.265	1.608	1.737	1.914	1.872	1.83	1.76	1.68	1.58	1.57
105	.903	.952	1.218	1.546	1.673	1.841	1.797	1.75	1.69	1.60	1.49	1.44
110	.894	.916	1.139	1.463	1.599	1.751	1.715	1.68	1.6	1.46	1.36	1.3
115	.857	.855	1.060	1.384	1.503	1.658	1.628	1.57	1.49	1.34	1.23	1.17
120	.790	.781	.966	1.276	1.388	1.524	1.508	1.45	1.36	1.19	1.09	1.04
125	.716	.691	.877	1.135	1.257	1.371	1.383	1.34	1.23	1.06	.99	.93
130	.628	.592	.766	1.001	1.083	1.195	1.241	1.21	1.11	.94	.87	.82
135	.537	.509	.651	.834	.933	1.032	1.089	1.07	.98	.81	.74	.63
140	.453	.428	.536	.685	.765	.869	.917	.92	.84	.69	.58	.42
145	.365	.339	.415	.552	.612	.656	.734	.75	.66	.55	.44	.31
150	.277	.245	.294	.402	.447	.484	.553	.57	.5	.41	.32	.22
155	.160	.148	.182	.262	.300	.338	.377	.4	.34	.28	.22	.14
160	.069	.053	.093	.135	.166	.197	.231	.24	.2	.16	.12	.07
165	-.009	-.014	.008	.045	.078	.092	.110	.12	.1	.06	.04	.01
170	-.040	-.063	-.016	-.005	.011	.017	.035	.04	.03	0	-.02	-.03
175	-.051	-.051	-.029	-.043	-.005	-.007	.002	.01	-.01	-.02	-.02	-.11
180	0	0	0	0	0	0	0	0	0	0	0	0

[redacted]

[redacted]

TABLE III.- AERODYNAMIC COEFFICIENTS FOR ESCAPE CONFIGURATION - Concluded

(e) C_A

α, deg	C_A at -											
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.15	M = 1.5	M = 2	M = 3	M = 5	M = 7	M = 9.6
0	0.63	0.64	0.64	0.72	0.92	0.90	0.78	0.66	0.46	0.30	0.23	0.18
5	.65	.65	.69	.75	.98	.92	.81	.67	.49	.30	.28	.18
10	.66	.66	.71	.78	.99	.95	.83	.70	.52	.32	.36	.34
15	.65	.64	.69	.73	.94	.97	.87	.74	.57	.41	.41	.38
20	.61	.60	.65	.69	.87	.96	.88	.77	.62	.42	.47	.40
25	.55	.55	.58	.67	.80	.88	.83	.77	.64	.56	.49	.42
30	.52	.53	.53	.59	.69	.78	.79	.74	.68	.57	.51	.45
35	.43	.46	.44	.48	.57	.70	.77	.78	.70	.61	.53	.49
40	.36	.35	.35	.39	.47	.63	.76	.76	.69	.64	.57	.53
45	.30	.25	.20	.33	.35	.57	.72	.76	.72	.69	.62	.57
50	.25	.16	.16	.32	.41	.52	.68	.74	.74	.72	.64	.62
55	.21	.11	.11	.35	.39	.50	.69	.74	.72	.73	.67	.66
60	.23	.08	.08	.31	.37	.48	.67	.71	.69	.72	.68	.65
65	.31	.06	.07	.28	.45	.50	.66	.68	.67	.69	.68	.67
70	.46	.04	.11	.27	.37	.54	.64	.67	.73	.68	.66	.67
75	.38	.10	.19	.40	.39	.59	.60	.60	.61	.60	.59	.62
80	.28	.56	.61	.55	.55	.58	.52	.49	.49	.48	.50	.56
85	.17	.44	.55	.53	.49	.46	.40	.36	.37	.37	.40	.46
90	.08	.34	.47	.45	.38	.32	.25	.24	.24	.27	.30	.37
95	.01	.27	.38	.34	.26	.18	.11	.09	.10	.13	.18	.24
100	-.06	.19	.26	.19	.12	.03	.04	-.05	-.03	-.02	.03	.10
105	-.11	.08	.18	.05	-.05	-.12	-.17	-.18	-.16	-.14	-.09	-.02
110	-.18	-.06	0	-.07	-.17	-.28	-.32	-.30	-.27	-.22	-.19	-.14
115	-.25	-.20	-.16	-.23	-.30	-.42	-.46	-.44	-.42	-.35	-.31	-.27
120	-.35	-.35	-.33	-.39	-.46	-.58	-.63	-.62	-.58	-.48	-.42	-.39
125	-.48	-.46	-.49	-.58	-.61	-.73	-.80	-.79	-.74	-.62	-.58	-.55
130	-.61	-.60	-.64	-.86	-.74	-.85	-.96	-.97	-.90	-.79	-.75	-.81
135	-.72	-.69	-.76	-.89	-.93	-.98	-1.13	-1.14	-1.08	-.98	-.93	-.94
140	-.82	-.79	-.86	-1.02	-1.07	-1.10	-1.28	-1.29	-1.23	-1.15	-1.11	-1.16
145	-.90	-.89	-.94	-1.10	-1.17	-1.25	-1.41	-1.43	-1.37	-1.27	-1.24	-1.26
150	-.96	-.94	-1.01	-1.18	-1.25	-1.34	-1.52	-1.54	-1.47	-1.39	-1.34	-1.34
155	-1.01	-.98	-1.05	-1.22	-1.31	-1.39	-1.59	-1.62	-1.53	-1.48	-1.42	-1.42
160	-1.04	-1.02	-1.07	-1.25	-1.33	-1.42	-1.63	-1.67	-1.59	-1.53	-1.49	-1.47
165	-1.05	-1.03	-1.07	-1.25	-1.34	-1.42	-1.65	-1.69	-1.61	-1.56	-1.50	-1.49
170	-1.04	-1.03	-1.06	-1.24	-1.33	-1.42	-1.64	-1.68	-1.62	-1.56	-1.52	-1.49
175	-1.03	-1.02	-1.05	-1.23	-1.32	-1.41	-1.63	-1.67	-1.62	-1.56	-1.52	-1.51
180	-1.02	-1.02	-1.04	-1.22	-1.31	-1.40	-1.63	-1.66	-1.60	-1.56	-1.53	-1.50

[redacted]

TABLE IV.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITH DESTABILIZER FLAP

(a) C_m

α, deg	C_m at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.3	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
-0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5	.01	.01	.01	.01	.01	.01	.01	.01	.01	.02	.025	.02	.012	.012
-10	.02	.02	.02	.02	.02	.02	.02	.015	.038	.045	.04	.035	.03	.03
-15	.035	.03	.03	.03	.03	.03	.037	.03	.052	.06	.055	.05	.045	.045
-20	.065	.048	.045	.04	.052	.07	.078	.07	.092	.075	.07	.06	.06	.06
-25	.095	.088	.085	.08	.12	.148	.128	.13	.118	.09	.085	.075	.075	.075
-30	.15	.125	.11	.13	.192	.188	.175	.16	.13	.102	.095	.095	.1	.1
-35	.18	.16	.16	.17	.21	.2	.18	.165	.15	.12	.12	.12	.125	.125
-40	.19	.185	.175	.188	.208	.205	.195	.18	.165	.15	.153	.152	.155	.155
-45	.18	.17	.165	.175	.195	.195	.192	.195	.18	.18	.18	.178	.18	.18
-50	.155	.15	.155	.162	.192	.19	.19	.2	.195	.205	.205	.2	.2	.2
-55	.135	.13	.145	.165	.195	.195	.195	.208	.21	.225	.22	.22	.225	.225
-60	.12	.115	.13	.16	.194	.192	.12	.215	.22	.24	.24	.238	.238	.238
-65	.108	.11	.13	.165	.2	.205	.21	.22	.23	.248	.245	.245	.245	.245
-70	.095	.1	.125	.17	.21	.21	.215	.23	.24	.252	.245	.248	.245	.245
-75	.09	.1	.125	.175	.22	.22	.223	.24	.248	.26	.245	.25	.248	.248
-80	.085	.1	.125	.185	.225	.225	.23	.25	.25	.26	.248	.252	.25	.25
-85	.08	.1	.13	.19	.23	.235	.24	.258	.255	.26	.252	.258	.254	.254
-90	.078	.1	.13	.195	.235	.245	.258	.262	.265	.268	.26	.264	.258	.258
-95	.085	.093	.12	.19	.235	.25	.26	.272	.27	.27	.26	.265	.262	.262
-100	.095	.098	.105	.185	.235	.252	.27	.284	.28	.27	.26	.265	.265	.265
-105	.16	.163	.175	.22	.264	.27	.275	.288	.285	.276	.26	.268	.265	.265
-110	.23	.188	.235	.25	.285	.28	.29	.29	.29	.28	.258	.27	.26	.26
-115	.265	.24	.25	.27	.288	.29	.3	.305	.3	.285	.255	.27	.255	.255
-120	.275	.238	.26	.297	.31	.31	.31	.302	.295	.282	.252	.268	.25	.25
-125	.275	.24	.295	.342	.342	.34	.32	.298	.28	.265	.235	.238	.235	.235
-130	.26	.245	.31	.367	.36	.35	.33	.29	.265	.225	.2	.202	.205	.205
-135	.25	.245	.304	.36	.357	.338	.31	.27	.238	.19	.16	.165	.17	.17
-140	.233	.232	.28	.32	.32	.308	.28	.235	.195	.172	.13	.13	.145	.145
-145	.215	.212	.245	.28	.275	.27	.25	.215	.172	.155	.13	.115	.125	.125
-150	.19	.19	.21	.23	.23	.23	.22	.195	.158	.135	.11	.095	.1	.1
-155	.173	.17	.18	.19	.19	.19	.18	.155	.12	.11	.09	.07	.07	.07
-160	.155	.152	.157	.15	.152	.15	.15	.128	.103	.085	.065	.05	.05	.05
-165	.132	.125	.125	.115	.112	.11	.11	.1	.088	.065	.04	.035	.035	.035
-170	.105	.1	.095	.088	.08	.08	.07	.065	.065	.05	.03	.03	.03	.03
-175	.063	.065	.065	.06	.052	.05	.04	.045	.05	.048	.035	.04	.04	.04
-180	.025	.03	.035	.04	.03	.03	.025	.03	.04	.04	.04	.045	.045	.045

[redacted]

[redacted]

TABLE IV.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITH DESTABILIZER FLAP - Continued

(b) C_L

α, deg	C_L at -													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.3	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
-0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5	.09	.1	.1	.11	.12	.12	.12	.12	.11	.1	.1	.1	.1	.1
-10	.19	.19	.2	.22	.23	.24	.24	.22	.21	.2	.2	.18	.2	.2
-15	.25	.26	.27	.29	.32	.32	.31	.3	.3	.28	.28	.26	.28	.28
-20	.3	.31	.33	.36	.39	.39	.36	.36	.35	.34	.36	.32	.34	.34
-25	.33	.33	.37	.4	.42	.42	.41	.4	.39	.39	.41	.38	.4	.4
-30	.33	.33	.39	.41	.42	.42	.42	.39	.4	.4	.42	.44	.44	.44
-35	.3	.31	.36	.38	.4	.41	.4	.36	.36	.38	.4	.42	.42	.42
-40	.26	.28	.33	.36	.38	.37	.34	.3	.29	.35	.36	.36	.36	.36
-45	.2	.24	.28	.3	.3	.28	.26	.23	.22	.28	.29	.3	.28	.28
-50	.13	.18	.2	.2	.21	.2	.16	.14	.14	.18	.21	.2	.2	.2
-55	.07	.08	.1	.1	.12	.12	.1	.05	.03	.08	.1	.1	.1	.1
-60	.02	.01	-0	0	.02	.02	-.01	-.03	-.06	-.01	0	0	0	0
-65	0	-.06	-.09	-.08	-.05	-.06	-.08	-.11	-.13	-.09	-.08	-.08	-.08	-.08
-70	-.04	-.11	-.17	-.16	-.12	-.12	-.15	-.17	-.17	-.17	-.17	-.16	-.16	-.16
-75	-.1	-.16	-.25	-.23	-.22	-.21	-.21	-.22	-.22	-.23	-.26	-.25	-.26	-.26
-80	-.14	-.2	-.21	-.21	-.28	-.27	-.25	-.24	-.25	-.28	-.3	-.32	-.35	-.35
-85	-.16	-.22	-.31	-.38	-.36	-.35	-.31	-.27	-.27	-.29	-.32	-.31	-.34	-.34
-90	-.16	-.23	-.32	-.41	-.38	-.37	-.32	-.28	-.28	-.28	-.31	-.26	-.3	-.3
-95	-.16	-.22	-.31	-.38	-.4	-.37	-.32	-.29	-.29	-.27	-.26	-.2	-.27	-.27
-100	-.14	-.18	-.2	-.28	-.34	-.32	-.29	-.26	-.25	-.22	-.21	-.12	-.22	-.22
-105	.1	-.03	-.1	-.18	-.27	-.26	-.23	-.2	-.17	-.14	-.14	-.03	-.13	-.13
-110	.37	.14	.05	-.06	-.12	-.11	-.09	-.08	-.09	-.07	-.06	.06	.04	-.04
-115	.47	.27	.2	.1	.08	.05	.05	.04	.01	.02	.01	.16	.04	.04
-120	.52	.34	.3	.26	.24	.23	.2	.16	.1	.1	.09	.26	.14	.14
-125	.55	.38	.37	.41	.4	.4	.36	.28	.19	.18	.16	.35	.24	.24
-130	.55	.41	.44	.52	.54	.54	.49	.4	.27	.26	.23	.42	.34	.34
-135	.51	.43	.5	.61	.64	.64	.6	.5	.35	.34	.3	.46	.42	.42
-140	.45	.42	.47	.54	.56	.58	.59	.54	.42	.42	.25	.46	.45	.45
-145	.38	.4	.42	.48	.5	.52	.54	.5	.48	.46	.4	.45	.46	.46
-150	.36	.35	.38	.4	.4	.42	.54	.46	.49	.48	.44	.43	.44	.44
-155	.31	.33	.34	.35	.32	.33	.44	.4	.47	.46	.44	.4	.4	.4
-160	.29	.3	.28	.28	.25	.26	.35	.33	.4	.42	.41	.38	.37	.37
-165	.25	.26	.23	.22	.21	.22	.28	.25	.31	.32	.34	.34	.33	.33
-170	.21	.2	.2	.19	.18	.19	.2	.21	.22	.23	.24	.23	.23	.23
-175	.15	.15	.15	.15	.14	.14	.14	.14	.12	.14	.14	.14	.14	.14
-180	.06	.06	.06	.08	.06	.06	.05	.04	.04	.03	.03	.05	.05	.05

[redacted]

TABLE IV.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITH DESTABILIZER FLAP - Continued

(c) C_D

α, deg	C_D at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.3	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	1.	1.02	1.1	1.23	1.34	1.4	1.46	1.49	1.53	1.6	1.56	1.5	1.5	1.5
-5	1.01	1.02	1.1	1.23	1.34	1.39	1.45	1.48	1.52	1.59	1.54	1.5	1.48	1.48
-10	1.01	1.	1.1	1.23	1.33	1.38	1.44	1.47	1.5	1.58	1.52	1.44	1.44	1.44
-15	.99	.98	1.06	1.2	1.29	1.36	1.41	1.45	1.48	1.54	1.42	1.39	1.36	1.36
-20	.95	.95	1.01	1.14	1.26	1.33	1.38	1.42	1.44	1.48	1.34	1.34	1.28	1.28
-25	.92	.92	.96	1.1	1.25	1.33	1.38	1.36	1.36	1.4	1.25	1.24	1.2	1.2
-30	.89	.88	.92	1.04	1.24	1.34	1.38	1.32	1.26	1.3	1.14	1.14	1.12	1.12
-35	.85	.84	.89	1.01	1.22	1.29	1.3	1.25	1.18	1.21	1.02	1.04	1.03	1.03
-40	.81	.8	.84	.98	1.21	1.24	1.23	1.19	1.12	1.13	.91	.96	.96	.96
-45	.77	.76	.81	.94	1.16	1.19	1.2	1.14	1.08	1.08	.87	.88	.89	.89
-50	.73	.72	.78	.9	1.12	1.16	1.18	1.12	1.02	1.05	.85	.85	.84	.84
-55	.69	.67	.72	.9	1.1	1.14	1.16	1.	1.01	1.02	.85	.81	.81	.81
-60	.64	.62	.68	.9	1.09	1.14	1.15	1.08	1.04	1.03	.86	.78	.82	.82
-65	.6	.61	.69	.9	1.08	1.16	1.16	1.1	1.08	1.06	.9	.81	.84	.84
-70	.55	.61	.7	.9	1.1	1.16	1.18	1.14	1.12	1.09	.93	.88	.88	.88
-75	.52	.62	.73	.96	1.12	1.16	1.16	1.18	1.16	1.14	.98	.94	.92	.92
-80	.5	.65	.78	1.02	1.15	1.18	1.22	1.23	1.2	1.21	1.02	1.	.98	.98
-85	.49	.68	.85	1.11	1.2	1.23	1.25	1.27	1.26	1.26	1.12	1.07	1.06	1.06
-90	.51	.74	.9	1.16	1.26	1.29	1.31	1.33	1.3	1.3	1.18	1.14	1.13	1.13
-95	.55	.79	.94	1.18	1.32	1.33	1.35	1.36	1.33	1.34	1.25	1.21	1.2	1.2
-100	.62	.85	.97	1.17	1.35	1.36	1.37	1.38	1.38	1.36	1.3	1.27	1.26	1.26
-105	.72	.9	.99	1.19	1.33	1.34	1.36	1.38	1.42	1.38	1.34	1.34	1.32	1.32
-110	.76	.92	1.	1.2	1.32	1.35	1.37	1.43	1.45	1.4	1.36	1.36	1.36	1.36
-115	.79	.88	.96	1.2	1.31	1.34	1.38	1.44	1.46	1.42	1.34	1.36	1.37	1.37
-120	.8	.84	.92	1.23	1.31	1.33	1.36	1.41	1.46	1.42	1.32	1.34	1.35	1.35
-125	.8	.8	.88	1.24	1.39	1.39	1.38	1.41	1.44	1.4	1.27	1.28	1.3	1.3
-130	.79	.78	.84	1.19	1.42	1.41	1.38	1.39	1.4	1.36	1.23	1.2	1.24	1.24
-135	.77	.76	.77	1.08	1.31	1.29	1.29	1.34	1.36	1.31	1.18	1.12	1.16	1.16
-140	.75	.73	.74	.94	1.18	1.2	1.23	1.28	1.3	1.25	1.06	1.04	1.06	1.06
-145	.72	.7	.69	.8	1.05	1.16	1.18	1.18	1.22	1.17	.98	.96	.96	.96
-150	.69	.67	.69	.79	.99	1.1	1.14	1.12	1.14	1.07	.92	.88	.85	.85
-155	.66	.65	.69	.79	.96	1.03	1.09	1.06	1.02	.95	.82	.78	.76	.76
-160	.64	.64	.68	.79	.94	1.	1.04	.99	.9	.82	.7	.66	.64	.64
-165	.62	.61	.65	.78	.93	1.	1.	.92	.8	.7	.6	.55	.52	.52
-170	.61	.58	.62	.78	.93	1.	.98	.87	.73	.6	.5	.42	.4	.4
-175	.59	.56	.6	.75	.92	.99	.98	.86	.69	.52	.42	.32	.3	.3
-180	.56	.53	.56	.72	.88	.98	.96	.85	.67	.5	.34	.28	.26	.26

[redacted]

TABLE IV.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITH DESTABILIZER FLAP - Continued

(d) C_N

α, deg	C_N at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.3	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5	.01	.01	0	0	0	0	-.01	-.02	-.02	-.04	-.03	-.03	-.03	-.03
-10	.01	.02	.01	.01	0	0	-.01	-.04	-.05	-.08	-.06	-.07	-.05	-.05
-15	-.01	0	-.01	-.03	-.02	-.04	-.07	-.09	-.10	-.13	-.09	-.11	-.08	-.08
-20	-.04	-.03	-.04	-.05	-.06	-.09	-.13	-.15	-.16	-.18	-.12	-.16	-.11	-.11
-25	-.09	-.08	-.07	-.10	-.15	-.18	-.21	-.22	-.22	-.24	-.16	-.18	-.14	-.14
-30	-.16	-.15	-.12	-.17	-.27	-.31	-.33	-.32	-.28	-.30	-.21	-.19	-.18	-.18
-35	-.24	-.23	-.23	-.28	-.37	-.4	-.42	-.43	-.39	-.37	-.26	-.26	-.25	-.25
-40	-.32	-.30	-.29	-.35	-.49	-.51	-.53	-.53	-.50	-.46	-.30	-.34	-.34	-.34
-45	-.40	-.37	-.38	-.45	-.61	-.64	-.66	-.65	-.60	-.56	-.41	-.42	-.43	-.43
-50	-.48	-.43	-.47	-.57	-.73	-.76	-.8	-.77	-.64	-.68	-.52	-.52	-.51	-.51
-55	-.53	-.49	-.53	-.69	-.83	-.87	-.89	-.87	-.76	-.79	-.64	-.60	-.61	-.61
-60	-.55	-.54	-.59	-.78	-.92	-.98	-1.0	-.96	-.95	-.89	-.74	-.68	-.72	-.72
-65	-.54	-.58	-.67	-.85	-1.00	-1.08	-1.09	-1.05	-1.04	-.99	-.85	-.76	-.79	-.79
-70	-.53	-.61	-.72	-.89	-1.06	-1.13	-1.16	-1.13	-1.11	-1.08	-.93	-.88	-.88	-.88
-75	-.53	-.65	-.76	-.95	-1.13	-1.17	-1.17	-1.19	-1.17	-1.17	-1.02	-.97	-.96	-.96
-80	-.52	-.67	-.80	-1.04	-1.18	-1.21	-1.24	-1.25	-1.23	-1.24	-1.06	-1.04	-1.03	-1.03
-85	-.50	-.70	-.87	-1.14	-1.23	-1.26	-1.27	-1.29	-1.28	-1.28	-1.14	-1.09	-1.09	-1.09
-90	-.51	-.74	-.9	-1.16	-1.26	-1.29	-1.31	-1.33	-1.3	-1.3	-1.18	-1.14	-1.13	-1.13
-95	-.53	-.77	-.91	-1.14	-1.28	-1.29	-1.32	-1.33	-1.3	-1.31	-1.22	-1.19	-1.17	-1.17
-100	-.59	-.81	-.92	-1.10	-1.27	-1.28	-1.30	-1.31	-1.32	-1.3	-1.24	-1.23	-1.2	-1.2
-105	-.72	-.86	-.93	-1.10	-1.21	-1.23	-1.25	-1.28	-1.33	-1.3	-1.26	-1.29	-1.24	-1.24
-110	-.84	-.91	-.96	-1.11	-1.20	-1.23	-1.26	-1.32	-1.33	-1.29	-1.26	-1.30	-1.26	-1.26
-115	-.91	-.91	-.95	-1.13	-1.22	-1.24	-1.27	-1.32	-1.33	-1.30	-1.22	-1.30	-1.26	-1.26
-120	-.95	-.90	-.95	-1.20	-1.25	-1.27	-1.28	-1.30	-1.31	-1.28	-1.19	-1.29	-1.24	-1.24
-125	-.97	-.87	-.93	-1.25	-1.37	-1.37	-1.34	-1.32	-1.29	-1.25	-1.13	-1.25	-1.20	-1.20
-130	-.96	-.86	-.93	-1.25	-1.43	-1.43	-1.37	-1.32	-1.25	-1.21	-1.09	-1.19	-1.17	-1.17
-135	-.91	-.84	-.90	-1.19	-1.38	-1.36	-1.34	-1.3	-1.21	-1.17	-1.05	-1.12	-1.12	-1.12
-140	-.83	-.79	-.84	-1.02	-1.19	-1.22	-1.24	-1.24	-1.16	-1.13	-.87	-1.02	-1.03	-1.03
-145	-.72	-.73	-.74	-.85	-1.01	-1.09	-1.12	-1.09	-1.09	-1.05	-.89	-.92	-.93	-.93
-150	-.66	-.64	-.67	-.74	-.84	-.91	-1.04	-.96	-.99	-.95	-.84	-.81	-.81	-.81
-155	-.56	-.57	-.6	-.65	-.7	-.73	-.86	-.81	-.86	-.82	-.75	-.69	-.68	-.68
-160	-.49	-.5	-.5	-.53	-.56	-.59	-.68	-.65	-.68	-.68	-.62	-.58	-.57	-.57
-165	-.40	-.41	-.39	-.41	-.44	-.47	-.53	-.48	-.51	-.49	-.48	-.47	-.45	-.45
-170	-.31	-.3	-.3	-.32	-.34	-.36	-.37	-.36	-.34	-.33	-.32	-.3	-.3	-.3
-175	-.20	-.2	-.2	-.21	-.22	-.23	-.22	-.21	-.18	-.18	-.18	-.17	-.17	-.17
-180	-.06	-.06	-.06	-.08	-.06	-.06	-.05	-.04	-.04	-.03	-.03	-.05	-.05	-.05

[redacted]

[redacted]

TABLE IV.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITH DESTABILIZER FLAP - Concluded

(e) C_A

α, deg	C_A at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.3	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	1.00	1.02	1.10	1.23	1.34	1.4	1.46	1.49	1.53	1.60	1.55	1.49	1.50	1.50
-5	1.02	1.03	1.11	1.24	1.33	1.4	1.45	1.48	1.51	1.59	1.53	1.46	1.48	1.48
-10	1.02	1.01	1.11	1.25	1.35	1.4	1.46	1.49	1.52	1.60	1.52	1.45	1.45	1.45
-15	1.01	1.02	1.09	1.23	1.33	1.4	1.44	1.48	1.50	1.56	1.45	1.41	1.39	1.39
-20	.99	1.00	1.06	1.19	1.31	1.38	1.42	1.45	1.47	1.51	1.38	1.37	1.31	1.31
-25	.97	.96	1.04	1.17	1.31	1.38	1.42	1.41	1.39	1.43	1.30	1.28	1.26	1.26
-30	.94	.93	1.00	1.12	1.29	1.37	1.41	1.34	1.29	1.33	1.20	1.21	1.19	1.19
-35	.87	.87	.95	1.06	1.23	1.29	1.29	1.23	1.18	1.21	1.07	1.09	1.08	1.08
-40	.79	.79	.85	.98	1.16	1.19	1.16	1.10	1.05	1.09	.93	.97	.97	.97
-45	.68	.71	.78	.87	1.03	1.04	1.03	.97	.92	.96	.83	.84	.83	.83
-50	.57	.60	.65	.73	.88	.9	.88	.83	.72	.81	.71	.70	.69	.69
-55	.46	.45	.49	.60	.73	.75	.75	.67	.56	.66	.57	.54	.53	.53
-60	.35	.33	.34	.45	.58	.59	.57	.51	.48	.52	.43	.39	.40	.40
-65	.25	.21	.21	.31	.41	.44	.42	.36	.34	.36	.31	.27	.28	.28
-70	.15	.11	.08	.15	.26	.28	.26	.23	.22	.21	.16	.15	.15	.15
-75	.03	.01	-.05	.02	.09	.1	.1	.09	.09	.08	0	0	-.02	-.02
-80	-.05	-.08	-.07	-.03	-.08	-.06	-.03	-.02	-.04	-.07	-.12	-.14	-.17	-.17
-85	-.12	-.16	-.23	-.28	-.25	-.24	-.2	-.16	-.16	-.18	-.22	-.22	-.25	-.25
-90	-.16	-.23	-.32	-.41	-.38	-.37	-.32	-.28	-.28	-.28	-.31	-.26	-.3	-.3
-95	-.21	-.29	-.39	-.48	-.51	-.48	-.44	-.41	-.40	-.39	-.37	-.30	-.37	-.37
-100	-.25	-.32	-.37	-.48	-.57	-.55	-.52	-.5	-.49	-.45	-.43	-.34	-.44	-.44
-105	-.09	-.26	-.35	-.48	-.6	-.6	-.57	-.55	-.53	-.49	-.48	-.38	-.47	-.47
-110	.09	-.18	-.3	-.47	-.56	-.57	-.55	-.56	-.58	-.54	-.52	-.41	-.5	-.5
-115	.09	-.13	-.22	-.42	-.48	-.52	-.54	-.57	-.61	-.58	-.56	-.43	-.54	-.54
-120	.05	-.13	-.2	-.39	-.45	-.47	-.51	-.57	-.64	-.62	-.58	-.44	-.55	-.55
-125	-.01	-.15	-.2	-.38	-.47	-.47	-.5	-.58	-.67	-.66	-.6	-.45	-.55	-.55
-130	-.09	-.19	-.2	-.37	-.5	-.49	-.51	-.59	-.69	-.68	-.61	-.45	-.54	-.54
-135	-.18	-.23	-.19	-.33	-.47	-.46	-.49	-.59	-.71	-.69	-.62	-.47	-.52	-.52
-140	-.29	-.29	-.26	-.37	-.54	-.55	-.56	-.63	-.73	-.69	-.65	-.5	-.52	-.52
-145	-.37	-.34	-.32	-.38	-.57	-.65	-.66	-.68	-.72	-.69	-.57	-.53	-.52	-.52
-150	-.42	-.41	-.41	-.48	-.66	-.74	-.72	-.74	-.74	-.69	-.58	-.55	-.52	-.52
-155	-.47	-.45	-.48	-.57	-.73	-.79	-.8	-.79	-.73	-.67	-.56	-.54	-.52	-.52
-160	-.50	-.5	-.54	-.65	-.8	-.85	-.86	-.82	-.71	-.63	-.52	-.49	-.47	-.47
-165	-.53	-.52	-.57	-.7	-.84	-.91	-.89	-.82	-.69	-.59	-.49	-.44	-.42	-.42
-170	-.56	-.54	-.58	-.74	-.88	-.95	-.93	-.82	-.68	-.55	-.45	-.37	-.35	-.35
-175	-.57	-.54	-.58	-.73	-.9	-.97	-.96	-.84	-.68	-.51	-.41	-.31	-.29	-.29
-180	-.56	-.53	-.56	-.72	-.88	-.98	-.96	-.85	-.67	-.5	-.34	-.28	-.26	-.26

[redacted]

[redacted]

TABLE V.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITHOUT DESTABILIZER FLAP

(a) C_m

α, deg	C_m at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.2	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	-.010	-.011	-.011	-.011	-.012	-.011	-.010	-.009	-.011	-.022	-.023	-.019	-.014	-.014
10	-.021	-.019	-.019	-.019	-.020	-.018	-.018	-.016	-.038	-.045	-.040	-.035	-.031	-.031
15	-.035	-.031	-.030	-.030	-.031	-.032	-.035	-.026	-.051	-.060	-.054	-.050	-.046	-.046
20	-.055	-.047	-.044	-.040	-.056	-.071	-.079	-.070	-.093	-.075	-.067	-.062	-.061	-.061
25	-.096	-.087	-.092	-.066	-.125	-.145	-.130	-.130	-.113	-.089	-.082	-.078	-.077	-.077
30	-.150	-.127	-.109	-.117	-.204	-.185	-.178	-.153	-.127	-.103	-.097	-.096	-.100	-.100
35	-.179	-.162	-.156	-.169	-.205	-.199	-.185	-.168	-.149	-.123	-.121	-.124	-.127	-.127
40	-.191	-.184	-.176	-.189	-.203	-.203	-.198	-.181	-.166	-.150	-.154	-.155	-.156	-.156
45	-.182	-.169	-.163	-.174	-.197	-.197	-.192	-.193	-.182	-.180	-.182	-.181	-.182	-.182
50	-.157	-.150	-.153	-.162	-.194	-.190	-.188	-.201	-.196	-.205	-.203	-.202	-.204	-.204
55	-.136	-.132	-.143	-.161	-.194	-.194	-.190	-.208	-.208	-.227	-.224	-.222	-.224	-.224
60	-.121	-.114	-.132	-.160	-.193	-.198	-.192	-.214	-.220	-.239	-.238	-.238	-.238	-.238
65	-.107	-.107	-.128	-.164	-.201	-.204	-.201	-.222	-.231	-.247	-.245	-.245	-.245	-.245
70	-.096	-.100	-.124	-.169	-.210	-.210	-.210	-.230	-.242	-.253	-.246	-.245	-.246	-.246
75	-.090	-.100	-.125	-.177	-.217	-.218	-.217	-.240	-.247	-.257	-.247	-.248	-.248	-.248
80	-.085	-.100	-.126	-.186	-.225	-.227	-.224	-.249	-.252	-.260	-.249	-.250	-.250	-.250
85	-.081	-.099	-.128	-.191	-.231	-.236	-.238	-.257	-.258	-.262	-.253	-.254	-.254	-.254
90	-.077	-.098	-.130	-.195	-.238	-.246	-.252	-.265	-.265	-.265	-.257	-.258	-.258	-.258
95	-.074	-.092	-.118	-.191	-.237	-.249	-.256	-.274	-.272	-.268	-.261	-.262	-.262	-.262
100	-.075	-.086	-.106	-.186	-.236	-.253	-.260	-.284	-.280	-.271	-.265	-.265	-.265	-.265
105	-.136	-.156	-.168	-.215	-.250	-.256	-.259	-.296	-.288	-.270	-.269	-.269	-.268	-.268
110	-.225	-.224	-.225	-.240	-.268	-.275	-.274	-.306	-.292	-.270	-.266	-.269	-.268	-.268
115	-.294	-.278	-.275	-.249	-.304	-.309	-.310	-.310	-.293	-.262	-.258	-.263	-.262	-.262
120	-.303	-.315	-.315	-.264	-.337	-.338	-.331	-.306	-.288	-.250	-.241	-.243	-.244	-.244
125	-.271	-.320	-.349	-.330	-.360	-.347	-.332	-.298	-.277	-.232	-.216	-.217	-.218	-.218
130	-.239	-.305	-.361	-.361	-.368	-.348	-.320	-.285	-.257	-.210	-.184	-.184	-.186	-.186
135	-.211	-.278	-.344	-.372	-.353	-.325	-.304	-.265	-.229	-.176	-.144	-.150	-.151	-.151
140	-.191	-.272	-.299	-.343	-.315	-.293	-.280	-.230	-.195	-.143	-.111	-.122	-.123	-.123
145	-.174	-.212	-.244	-.287	-.270	-.259	-.248	-.190	-.156	-.109	-.093	-.098	-.103	-.103
150	-.160	-.178	-.196	-.232	-.223	-.215	-.205	-.152	-.120	-.080	-.075	-.075	-.083	-.083
155	-.143	-.150	-.160	-.179	-.166	-.164	-.157	-.119	-.086	-.058	-.052	-.053	-.062	-.062
160	-.121	-.122	-.125	-.126	-.121	-.120	-.117	-.088	-.065	-.039	-.029	-.032	-.036	-.036
165	-.096	-.091	-.089	-.085	-.083	-.078	-.071	-.060	-.049	-.021	-.012	-.011	-.011	-.011
170	-.068	-.060	-.057	-.054	-.052	-.043	-.038	-.034	-.029	-.013	.004	.007	.012	.012
175	-.037	-.030	-.030	-.028	-.028	-.018	-.012	-.011	-.011	-.004	.002	.010	.012	.012
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[redacted]

[redacted]

TABLE V.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITHOUT DESTABILIZER FLAP - Continued

(b) C_L

α, deg	C_L at -													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.2	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	-.10	-.10	-.10	-.11	-.12	-.12	-.12	-.11	-.11	-.10	-.10	-.10	-.10	-.10
10	-.19	-.19	-.20	-.22	-.23	-.23	-.23	-.22	-.21	-.20	-.20	-.18	-.20	-.20
15	-.25	-.26	-.27	-.29	-.32	-.32	-.32	-.30	-.29	-.28	-.29	-.26	-.28	-.28
20	-.30	-.31	-.33	-.36	-.39	-.40	-.40	-.36	-.35	-.35	-.36	-.32	-.34	-.34
25	-.33	-.33	-.37	-.40	-.42	-.40	-.40	-.40	-.39	-.39	-.41	-.38	-.41	-.41
30	-.33	-.33	-.39	-.41	-.42	-.40	-.40	-.39	-.40	-.40	-.42	-.44	-.44	-.44
35	-.30	-.31	-.36	-.38	-.40	-.39	-.38	-.36	-.36	-.39	-.40	-.42	-.42	-.42
40	-.26	-.28	-.33	-.36	-.37	-.38	-.36	-.30	-.29	-.35	-.36	-.36	-.36	-.36
45	-.20	-.24	-.28	-.30	-.30	-.29	-.27	-.23	-.22	-.28	-.29	-.29	-.28	-.28
50	-.13	-.18	-.20	-.20	-.21	-.18	-.16	-.14	-.14	-.18	-.21	-.20	-.20	-.20
55	-.07	-.08	-.10	-.10	-.12	-.12	-.12	-.05	-.03	-.08	-.10	-.10	-.09	-.09
60	-.02	-.01	0	0	-.04	-.06	-.08	.03	.06	0	0	0	.01	.01
65	0	.06	.09	.08	.05	.02	.01	.11	.13	.09	.08	.08	.08	.08
70	.04	.11	.17	.16	.12	.10	.10	.17	.17	.17	.17	.16	.16	.16
75	.10	.16	.25	.23	.21	.20	.20	.21	.22	.23	.26	.25	.27	.27
80	.14	.20	.30	.30	.29	.27	.25	.24	.25	.28	.30	.33	.35	.35
85	.16	.22	.40	.38	.36	.32	.30	.27	.27	.29	.32	.33	.34	.34
90	.16	.23	.38	.41	.38	.38	.36	.28	.28	.28	.31	.31	.30	.30
95	.16	.23	.42	.38	.35	.34	.33	.29	.29	.27	.26	.26	.27	.27
100	.14	.20	.30	.28	.24	.21	.20	.26	.25	.22	.20	.20	.22	.22
105	-.10	.03	-.05	-.02	.02	.07	.08	.20	.16	.14	.12	.12	.13	.13
110	-.37	-.31	-.28	-.21	-.15	-.13	-.08	.05	.06	.06	.01	.03	.04	.04
115	-.47	-.44	-.39	-.31	-.26	-.24	-.20	-.11	-.05	-.03	-.08	-.06	-.04	-.04
120	-.52	-.52	-.50	-.41	-.38	-.35	-.32	-.23	-.16	-.13	-.17	-.16	-.14	-.14
125	-.55	-.56	-.58	-.54	-.50	-.46	-.42	-.32	-.26	-.24	-.25	-.26	-.24	-.24
130	-.55	-.56	-.65	-.67	-.62	-.56	-.51	-.39	-.36	-.33	-.34	-.35	-.34	-.34
135	-.51	-.53	-.67	-.70	-.66	-.63	-.60	-.45	-.43	-.41	-.40	-.42	-.41	-.41
140	-.44	-.46	-.63	-.67	-.66	-.66	-.64	-.48	-.49	-.46	-.45	-.46	-.45	-.45
145	-.36	-.41	-.55	-.60	-.57	-.56	-.55	-.49	-.51	-.49	-.47	-.46	-.46	-.46
150	-.30	-.37	-.48	-.46	-.43	-.41	-.41	-.46	-.50	-.48	-.46	-.45	-.44	-.44
155	-.27	-.30	-.38	-.36	-.31	-.30	-.30	-.40	-.46	-.43	-.44	-.40	-.40	-.40
160	-.24	-.25	-.30	-.28	-.21	-.20	-.19	-.31	-.38	-.37	-.38	-.36	-.36	-.36
165	-.22	-.20	-.22	-.18	-.16	-.14	-.14	-.22	-.29	-.28	-.29	-.34	-.31	-.31
170	-.19	-.17	-.18	-.14	-.11	-.11	-.13	-.14	-.18	-.17	-.20	-.26	-.22	-.22
175	-.11	-.09	-.09	-.07	-.06	-.06	-.07	-.07	-.08	-.08	-.10	-.10	-.08	-.08
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[redacted]

[redacted]

TABLE V.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITHOUT DESTABILIZER FLAP - Continued

(c) C_D

α, deg	C_D at –													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.2	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	1.00	1.02	1.10	1.23	1.34	1.40	1.44	1.49	1.53	1.60	1.55	1.49	1.5	1.5
5	1.01	1.02	1.10	1.23	1.33	1.39	1.43	1.48	1.51	1.59	1.53	1.46	1.48	1.48
10	1.01	1.00	1.10	1.23	1.33	1.38	1.42	1.47	1.50	1.59	1.51	1.44	1.44	1.44
15	.98	.98	1.06	1.19	1.29	1.36	1.39	1.45	1.47	1.54	1.42	1.39	1.36	1.36
20	.95	.95	1.01	1.14	1.26	1.32	1.37	1.42	1.44	1.48	1.34	1.34	1.27	1.27
25	.92	.91	.97	1.10	1.25	1.33	1.38	1.37	1.36	1.40	1.25	1.24	1.20	1.20
30	.89	.88	.92	1.05	1.25	1.34	1.37	1.32	1.26	1.30	1.14	1.14	1.12	1.12
35	.85	.84	.90	1.02	1.22	1.28	1.31	1.25	1.18	1.21	1.03	1.04	1.03	1.03
40	.81	.80	.84	.98	1.20	1.23	1.24	1.19	1.12	1.13	.91	.96	.96	.96
45	.77	.76	.82	.94	1.16	1.19	1.21	1.15	1.08	1.08	.87	.89	.89	.89
50	.73	.72	.78	.91	1.12	1.16	1.18	1.12	.95	1.05	.85	.85	.84	.84
55	.69	.66	.72	.91	1.10	1.14	1.17	1.10	.95	1.03	.85	.81	.81	.81
60	.65	.63	.68	.90	1.09	1.14	1.16	1.08	1.06	1.03	.86	.78	.82	.82
65	.60	.61	.69	.90	1.08	1.15	1.17	1.10	1.09	1.05	.90	.81	.84	.84
70	.55	.61	.70	.89	1.09	1.16	1.18	1.14	1.12	1.09	.93	.88	.88	.88
75	.52	.63	.72	.92	1.12	1.17	1.20	1.18	1.15	1.15	.98	.94	.92	.92
80	.50	.64	.74	.96	1.18	1.18	1.22	1.24	1.22	1.21	1.02	1.00	.98	.98
85	.49	.61	.73	.98	1.21	1.24	1.28	1.30	1.27	1.26	1.11	1.07	1.06	1.06
90	.48	.60	.70	.99	1.24	1.30	1.33	1.36	1.32	1.31	1.18	1.14	1.13	1.13
95	.48	.61	.73	1.02	1.24	1.32	1.36	1.40	1.36	1.37	1.25	1.21	1.20	1.20
100	.49	.64	.77	1.04	1.25	1.34	1.39	1.44	1.40	1.42	1.30	1.27	1.26	1.26
105	.51	.70	.84	1.07	1.25	1.38	1.43	1.48	1.44	1.46	1.34	1.33	1.32	1.32
110	.55	.78	.91	1.10	1.26	1.40	1.45	1.50	1.46	1.48	1.36	1.36	1.36	1.36
115	.62	.83	.94	1.12	1.27	1.37	1.43	1.50	1.46	1.47	1.34	1.36	1.37	1.37
120	.71	.86	.96	1.14	1.28	1.35	1.40	1.47	1.45	1.46	1.31	1.34	1.35	1.35
125	.75	.86	.97	1.16	1.30	1.35	1.40	1.44	1.40	1.44	1.27	1.28	1.30	1.30
130	.75	.84	.96	1.14	1.31	1.36	1.40	1.39	1.35	1.41	1.23	1.20	1.24	1.24
135	.73	.80	.92	1.05	1.27	1.30	1.32	1.32	1.29	1.35	1.15	1.12	1.16	1.16
140	.71	.77	.84	1.00	1.16	1.21	1.25	1.24	1.24	1.28	1.06	1.04	1.07	1.07
145	.68	.73	.78	.93	1.06	1.13	1.16	1.17	1.14	1.19	.99	.96	.96	.96
150	.66	.70	.72	.86	.99	1.03	1.07	1.10	1.04	1.06	.92	.85	.84	.84
155	.63	.66	.68	.81	.93	.98	1.02	1.02	.94	.95	.82	.74	.70	.70
160	.61	.62	.66	.77	.90	.94	.98	.96	.84	.83	.70	.59	.55	.55
165	.59	.59	.63	.74	.89	.92	.94	.88	.74	.71	.60	.49	.45	.45
170	.58	.56	.59	.72	.88	.89	.90	.82	.66	.63	.50	.37	.37	.37
175	.58	.55	.58	.69	.88	.88	.88	.77	.62	.56	.43	.29	.30	.30
180	.60	.56	.57	.67	.88	.88	.86	.75	.62	.53	.34	.22	.23	.23

[redacted]

TABLE V.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITHOUT DESTABILIZER FLAP - Continued

(d) C_N

α, deg	C_N at -													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.2	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	-.01	-.01	0	0	0	0	0	.02	.02	.04	.03	.03	.03	.03
10	-.01	-.02	-.01	-.01	0	.01	.02	.04	.05	.08	.06	.07	.05	.05
15	.01	0	.01	.03	.02	.04	.05	.09	.10	.13	.09	.11	.08	.08
20	.04	.03	.04	.05	.06	.07	.09	.15	.16	.18	.12	.16	.11	.11
25	.09	.08	.07	.10	.15	.20	.22	.22	.22	.24	.16	.18	.14	.14
30	.16	.15	.12	.17	.27	.32	.34	.32	.28	.30	.21	.19	.18	.18
35	.24	.23	.23	.28	.37	.41	.44	.43	.39	.37	.26	.26	.25	.25
40	.32	.30	.29	.35	.49	.50	.52	.53	.50	.46	.30	.34	.34	.34
45	.40	.37	.38	.45	.61	.63	.67	.65	.60	.56	.41	.42	.43	.43
50	.48	.43	.47	.57	.73	.77	.80	.77	.64	.68	.52	.52	.51	.51
55	.53	.49	.53	.69	.83	.86	.89	.87	.76	.79	.64	.60	.61	.61
60	.55	.54	.59	.78	.92	.96	.96	.96	.95	.89	.74	.68	.72	.72
65	.54	.58	.67	.85	1.00	1.05	1.06	1.05	1.04	.99	.85	.76	.79	.79
70	.53	.61	.72	.89	1.06	1.12	1.14	1.13	1.11	1.08	.93	.88	.88	.88
75	.53	.65	.76	.95	1.13	1.18	1.21	1.19	1.17	1.17	1.02	.97	.96	.96
80	.51	.66	.78	1.00	1.21	1.21	1.24	1.26	1.24	1.24	1.05	1.04	1.03	1.03
85	.50	.63	.76	1.01	1.24	1.27	1.31	1.32	1.29	1.29	1.14	1.10	1.09	1.09
90	.48	.60	.70	.99	1.24	1.30	1.33	1.36	1.32	1.31	1.18	1.14	1.13	1.13
95	.47	.59	.69	.99	1.21	1.28	1.32	1.36	1.32	1.34	1.23	1.19	1.18	1.18
100	.46	.60	.71	.97	1.19	1.28	1.34	1.37	1.34	1.36	1.25	1.22	1.20	1.20
105	.52	.67	.82	1.04	1.20	1.31	1.36	1.38	1.35	1.37	1.26	1.25	1.25	1.25
110	.65	.84	.96	1.10	1.23	1.36	1.39	1.39	1.35	1.37	1.28	1.27	1.27	1.27
115	.76	.94	1.01	1.15	1.26	1.34	1.38	1.41	1.34	1.34	1.24	1.26	1.26	1.26
120	.87	1.00	1.08	1.20	1.30	1.35	1.37	1.39	1.34	1.33	1.22	1.24	1.24	1.24
125	.93	1.02	1.12	1.26	1.35	1.37	1.39	1.36	1.30	1.32	1.18	1.20	1.20	1.20
130	.92	1.00	1.16	1.30	1.40	1.40	1.40	1.31	1.26	1.29	1.16	1.14	1.17	1.17
135	.88	.94	1.12	1.23	1.37	1.37	1.35	1.25	1.21	1.24	1.09	1.09	1.11	1.11
140	.80	.84	1.02	1.15	1.26	1.29	1.29	1.17	1.18	1.17	1.02	1.02	1.03	1.03
145	.68	.76	.90	1.02	1.08	1.11	1.12	1.07	1.07	1.08	.96	.93	.93	.93
150	.59	.67	.78	.83	.87	.88	.90	.95	.95	.95	.86	.82	.80	.80
155	.51	.55	.63	.67	.67	.68	.70	.79	.82	.79	.75	.67	.66	.66
160	.44	.44	.51	.52	.51	.51	.52	.62	.65	.63	.60	.54	.53	.53
165	.36	.34	.37	.36	.38	.38	.38	.44	.47	.45	.44	.46	.42	.42
170	.29	.27	.28	.27	.26	.26	.29	.28	.29	.28	.29	.32	.28	.28
175	.16	.14	.14	.13	.14	.14	.15	.14	.13	.13	.14	.13	.11	.11
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE V.- AERODYNAMIC COEFFICIENTS FOR REENTRY CONFIGURATION WITHOUT DESTABILIZER FLAP - Concluded

(e) C_A

α, deg	C_A at -													
	M = 0	M = 0.5	M = 0.7	M = 0.9	M = 1.0	M = 1.1	M = 1.2	M = 1.6	M = 2.0	M = 3.0	M = 5.0	M = 7.0	M = 9.6	M = 20.0
0	1.00	1.02	1.10	1.23	1.34	1.40	1.44	1.49	1.53	1.60	1.55	1.49	1.50	1.50
5	1.02	1.03	1.11	1.24	1.33	1.39	1.43	1.48	1.51	1.59	1.53	1.46	1.48	1.48
10	1.02	1.01	1.11	1.25	1.35	1.40	1.44	1.49	1.52	1.60	1.52	1.45	1.45	1.45
15	1.01	1.02	1.09	1.23	1.33	1.39	1.42	1.48	1.50	1.56	1.45	1.41	1.39	1.38
20	.99	1.00	1.06	1.19	1.31	1.38	1.43	1.45	1.47	1.51	1.38	1.37	1.31	1.31
25	.97	.96	1.04	1.17	1.31	1.38	1.42	1.41	1.39	1.43	1.30	1.28	1.26	1.26
30	.94	.93	1.00	1.12	1.29	1.36	1.39	1.34	1.29	1.33	1.20	1.21	1.19	1.19
35	.87	.87	.95	1.06	1.23	1.27	1.29	1.23	1.18	1.21	1.07	1.09	1.08	1.08
40	.79	.79	.85	.98	1.16	1.18	1.18	1.10	1.05	1.09	.93	.97	.97	.97
45	.68	.71	.78	.87	1.03	1.05	1.05	.97	.92	.96	.83	.84	.83	.83
50	.57	.60	.65	.73	.88	.89	.88	.83	.72	.81	.71	.70	.69	.69
55	.46	.45	.49	.60	.73	.75	.77	.67	.56	.66	.57	.54	.53	.53
60	.35	.33	.34	.45	.58	.62	.65	.51	.48	.52	.43	.39	.40	.40
65	.25	.21	.21	.31	.41	.47	.48	.36	.34	.36	.31	.27	.28	.28
70	.15	.11	.08	.15	.26	.31	.31	.23	.22	.21	.16	.15	.15	.15
75	.03	.01	-.05	.02	.09	.11	.12	.11	.09	.08	0	0	-.02	-.02
80	-.05	-.09	-.17	-.13	-.09	-.07	-.04	-.02	-.04	-.07	-.12	-.15	-.17	-.17
85	-.12	-.17	-.34	-.29	-.25	-.21	-.19	-.16	-.16	-.18	-.22	-.24	-.25	-.25
90	-.16	-.23	-.38	-.41	-.38	-.38	-.36	-.28	-.28	-.28	-.31	-.31	-.30	-.30
95	-.20	-.28	-.48	-.47	-.46	-.46	-.45	-.41	-.41	-.39	-.37	-.37	-.37	-.37
100	-.23	-.31	-.43	-.46	-.46	-.44	-.44	-.51	-.49	-.47	-.43	-.42	-.44	-.44
105	-.03	-.21	-.17	-.26	-.34	-.43	-.45	-.57	-.52	-.52	-.47	-.46	-.47	-.47
110	.16	.02	-.05	-.18	-.29	-.36	-.42	-.56	-.56	-.57	-.48	-.50	-.51	-.51
115	.17	.05	-.05	-.19	-.30	-.36	-.42	-.53	-.57	-.59	-.50	-.52	-.54	-.54
120	.09	.02	-.05	-.21	-.31	-.38	-.42	-.54	-.59	-.62	-.51	-.53	-.56	-.56
125	.02	-.03	-.08	-.23	-.35	-.39	-.46	-.57	-.59	-.63	-.53	-.53	-.54	-.55
130	-.06	-.11	-.12	-.22	-.37	-.44	-.51	-.59	-.59	-.66	-.53	-.50	-.54	-.54
135	-.16	-.20	-.18	-.25	-.43	-.47	-.51	-.61	-.61	-.66	-.53	-.49	-.53	-.53
140	-.26	-.29	-.24	-.34	-.47	-.51	-.55	-.64	-.64	-.68	-.52	-.50	-.53	-.53
145	-.35	-.36	-.32	-.42	-.54	-.61	-.63	-.68	-.64	-.69	-.54	-.53	-.53	-.53
150	-.42	-.42	-.38	-.51	-.64	-.68	-.72	-.72	-.65	-.68	-.57	-.51	-.51	-.51
155	-.46	-.47	-.46	-.58	-.71	-.76	-.79	-.75	-.66	-.68	-.55	-.50	-.46	-.46
160	-.49	-.49	-.52	-.62	-.78	-.81	-.86	-.79	-.66	-.65	-.53	-.43	-.40	-.40
165	-.51	-.52	-.55	-.66	-.82	-.85	-.87	-.79	-.63	-.62	-.49	-.38	-.35	-.35
170	-.54	-.52	-.55	-.69	-.85	-.86	-.87	-.79	-.62	-.59	-.46	-.31	-.32	-.32
175	-.57	-.54	-.57	-.68	-.87	-.87	-.87	-.76	-.61	-.55	-.42	-.28	-.29	-.29
180	-.60	-.56	-.57	-.67	-.88	-.88	-.86	-.75	-.62	-.53	-.34	-.22	-.23	-.23

[redacted]

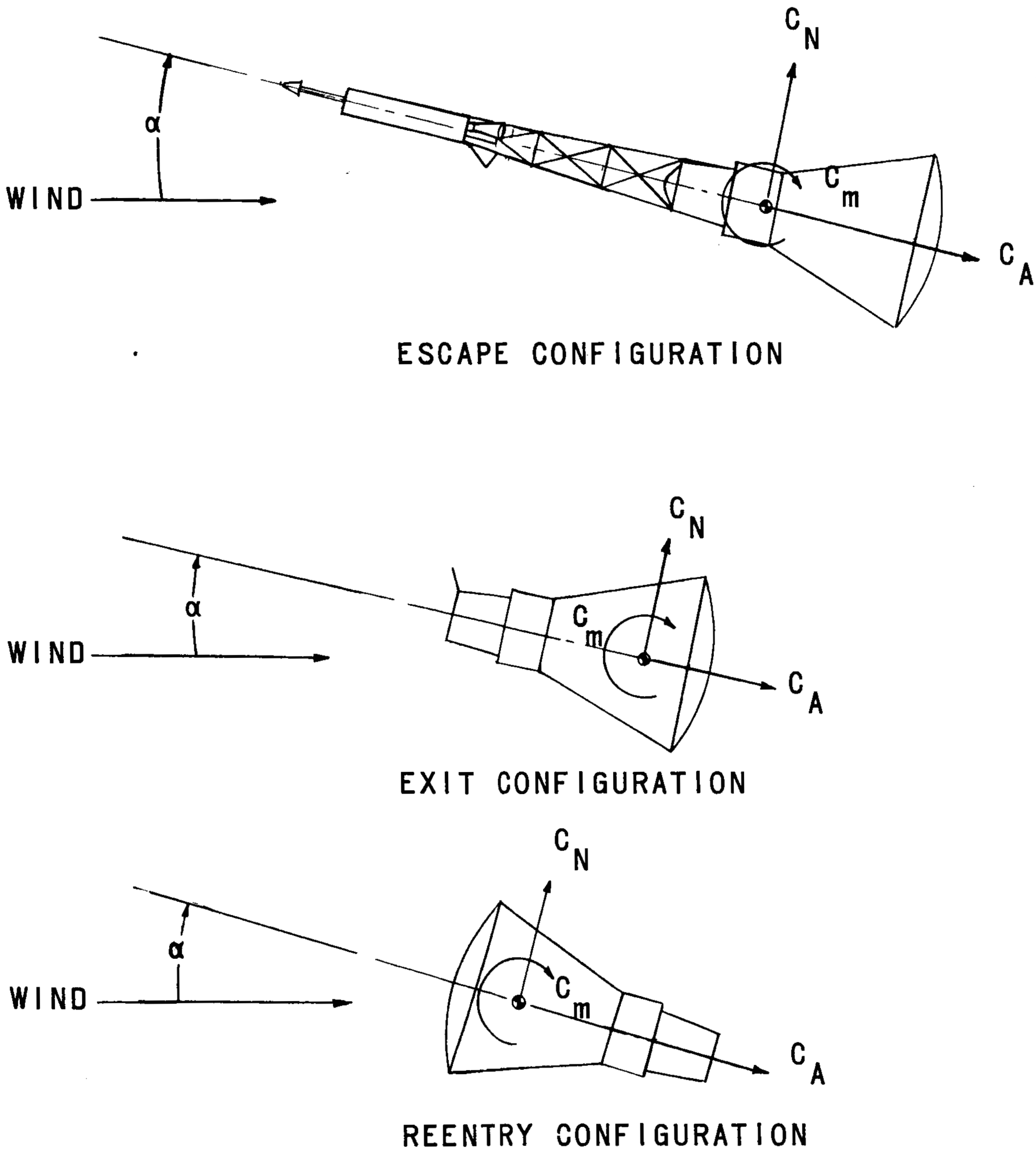


Figure 1.- General arrangement of the configurations showing positive directions of forces and moments.

[redacted]

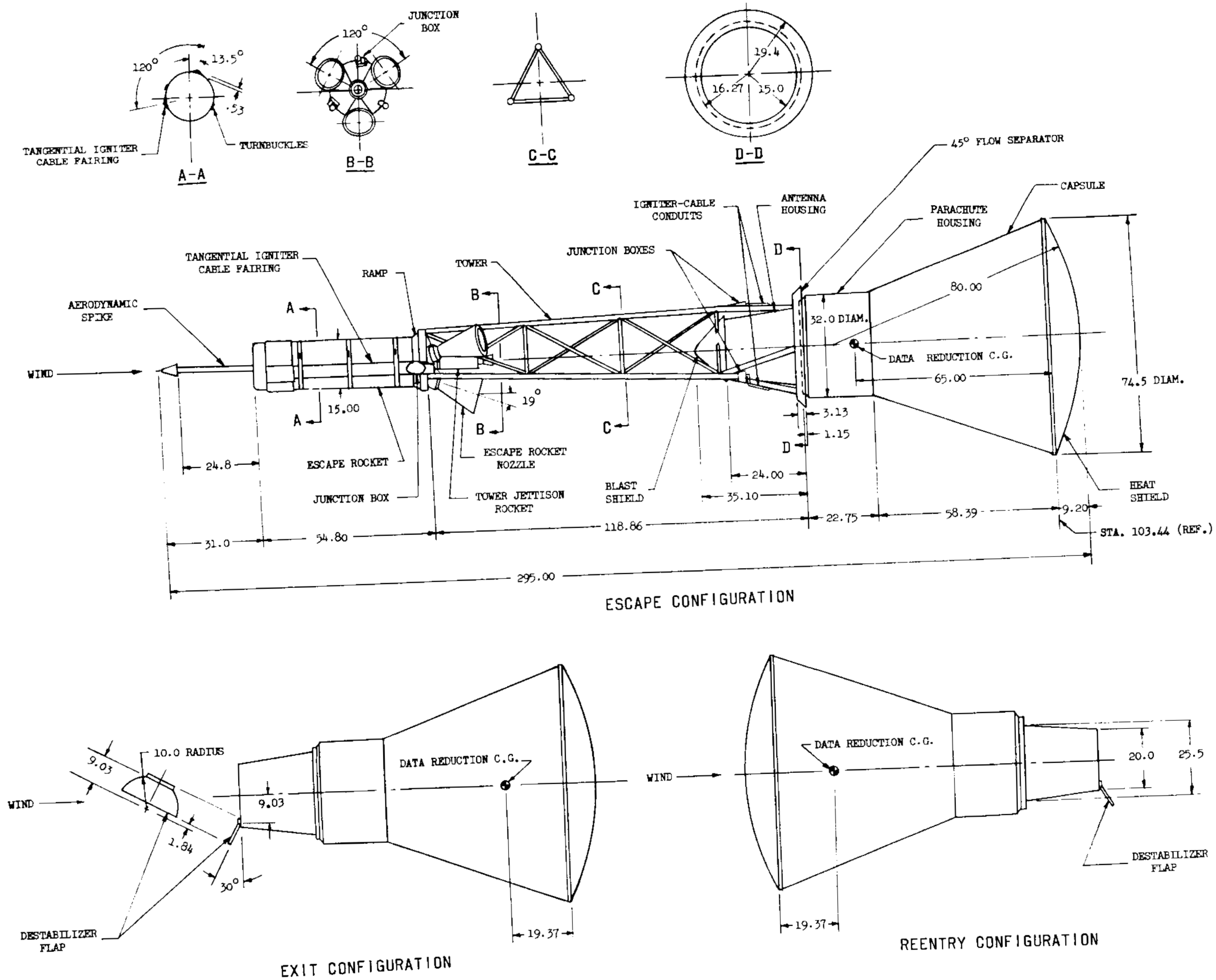


Figure 2.- General dimensions of the production Mercury configurations. All dimensions are in inches unless otherwise noted.

[redacted]

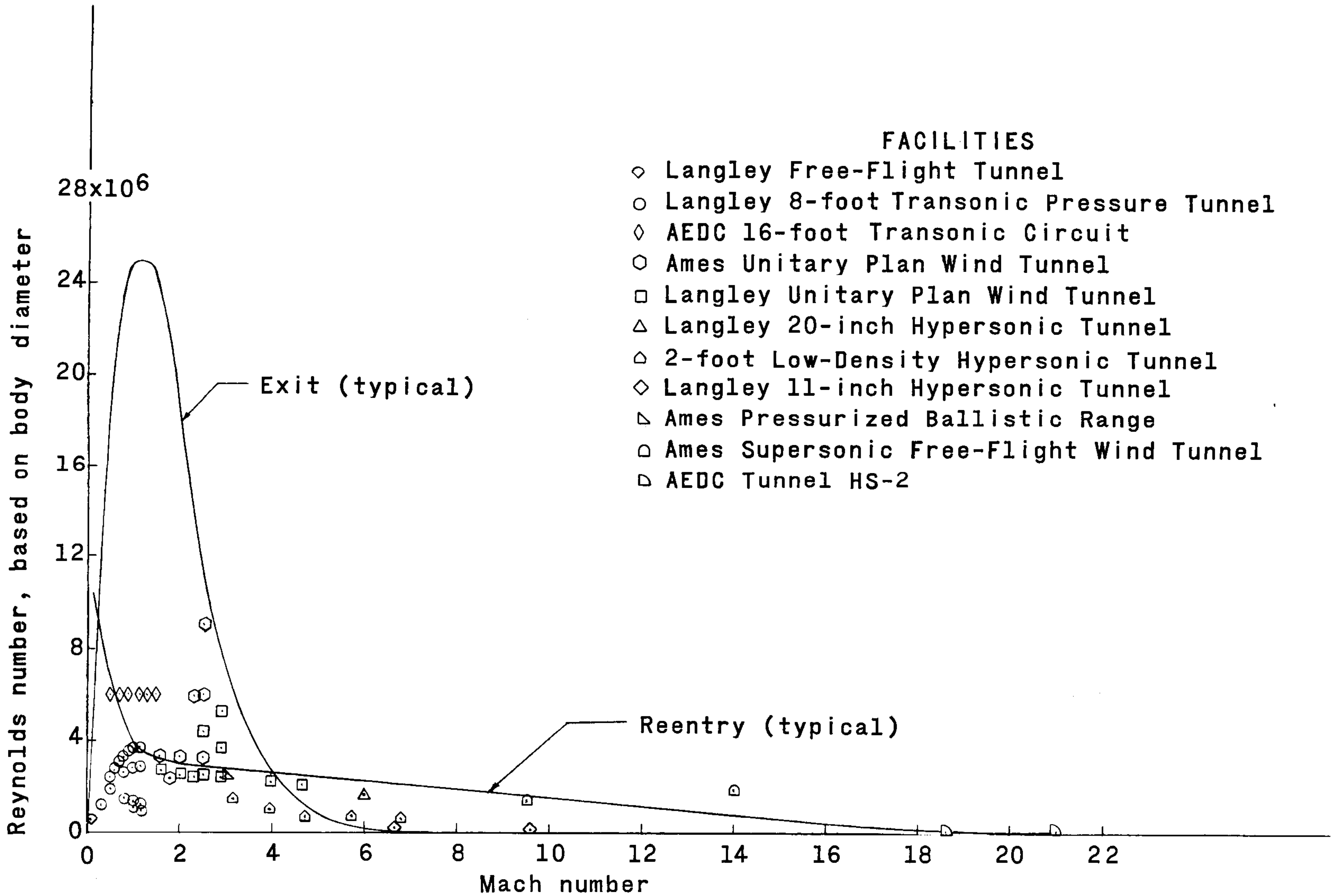
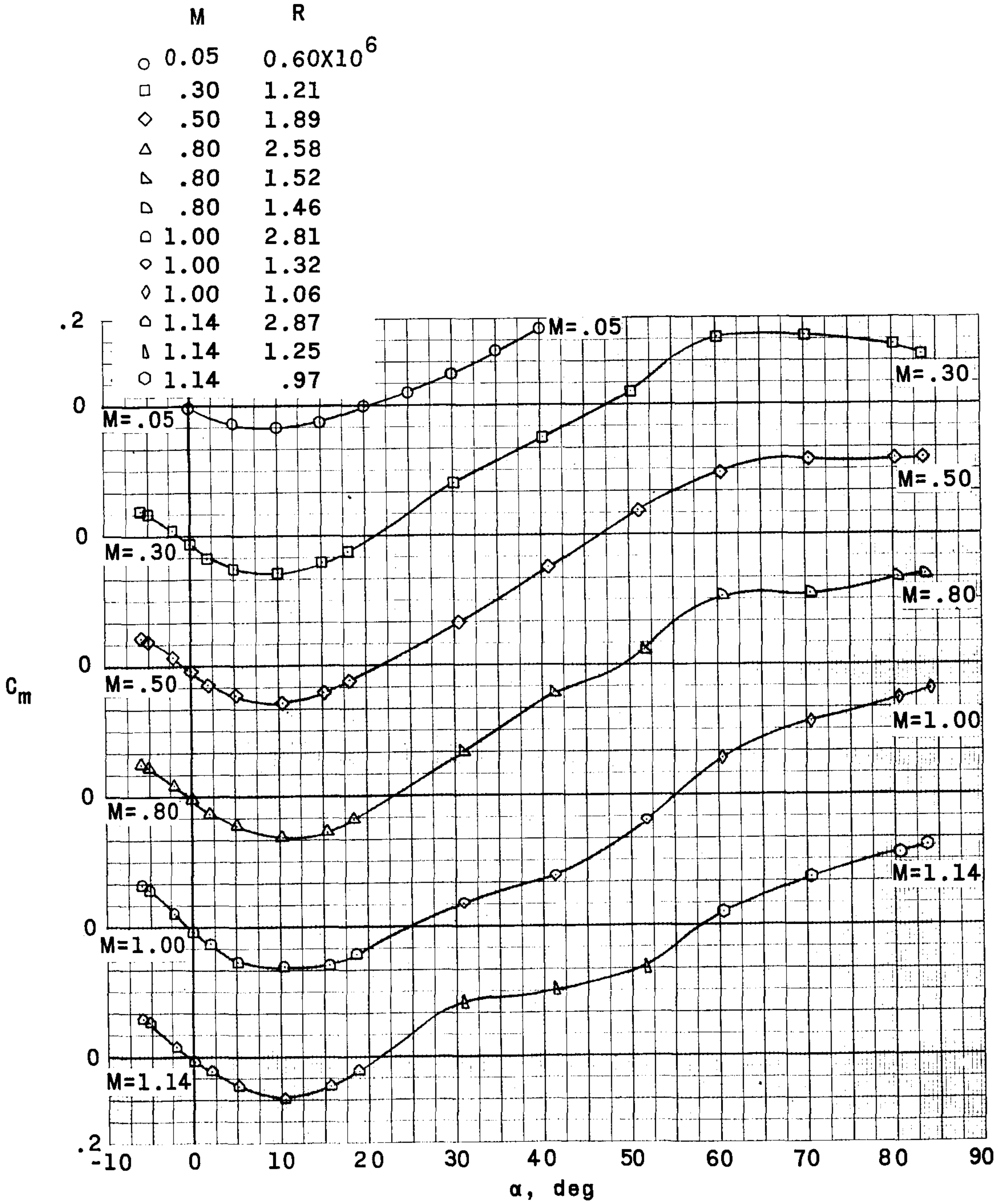


Figure 3.- Comparison of typical flight and wind-tunnel Reynolds numbers.

[redacted]

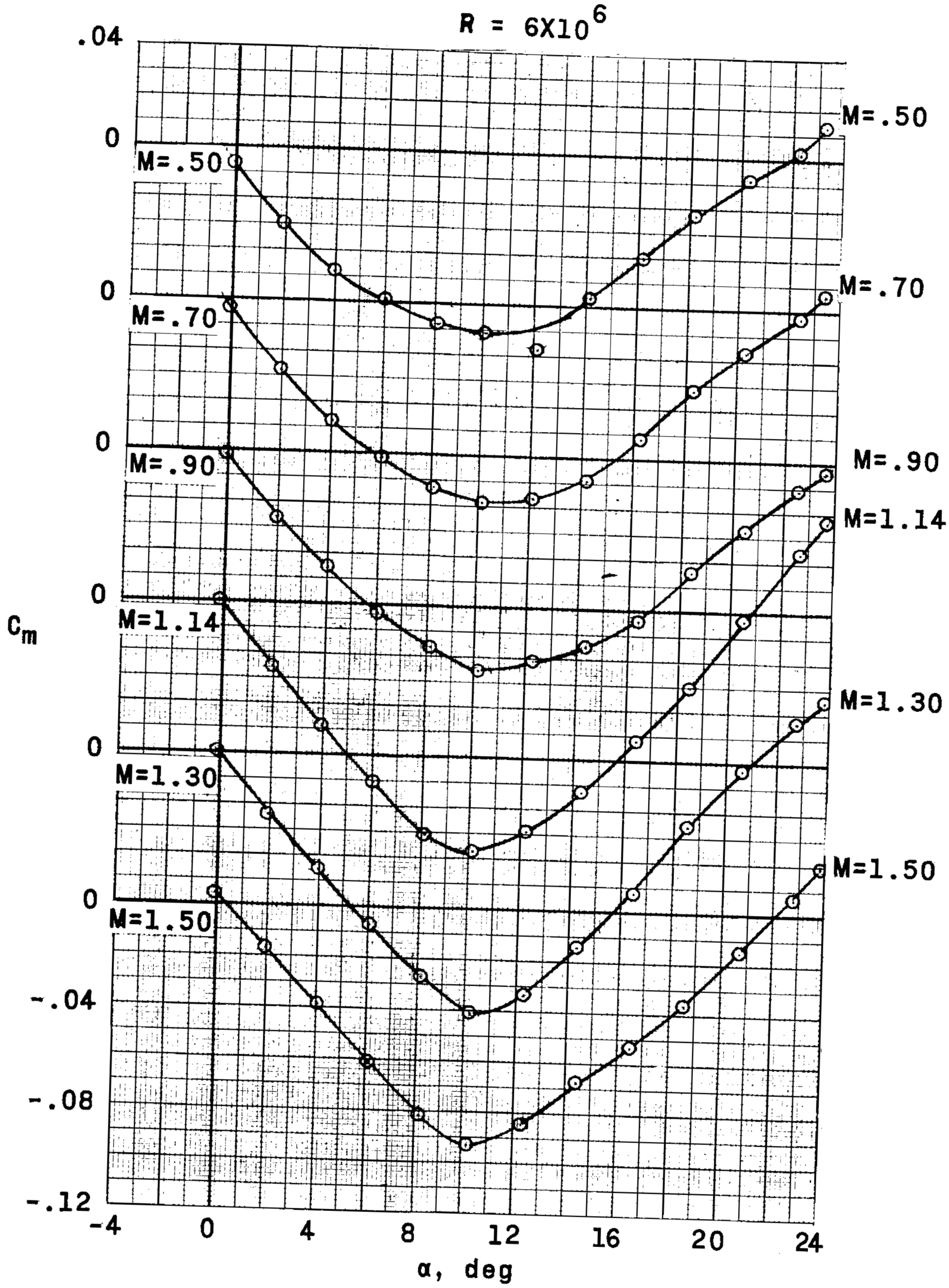
[redacted]



(a) M = 0.05 to 1.14.

Figure 4.- Variation of pitching-moment coefficient with angle of attack. Escape configuration.

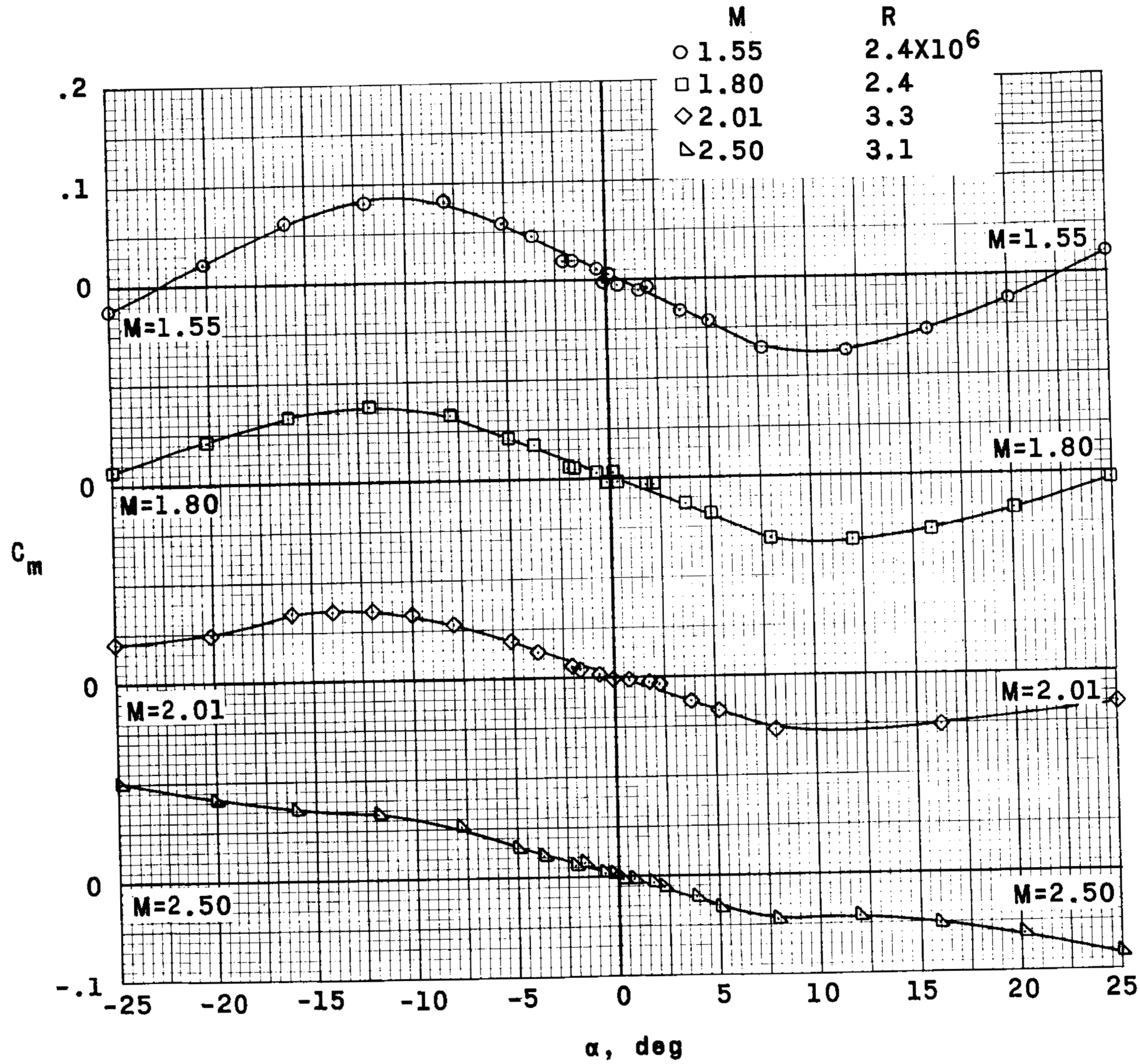
[redacted]



(b) M = 0.50 to 1.50.

Figure 4.- Continued.

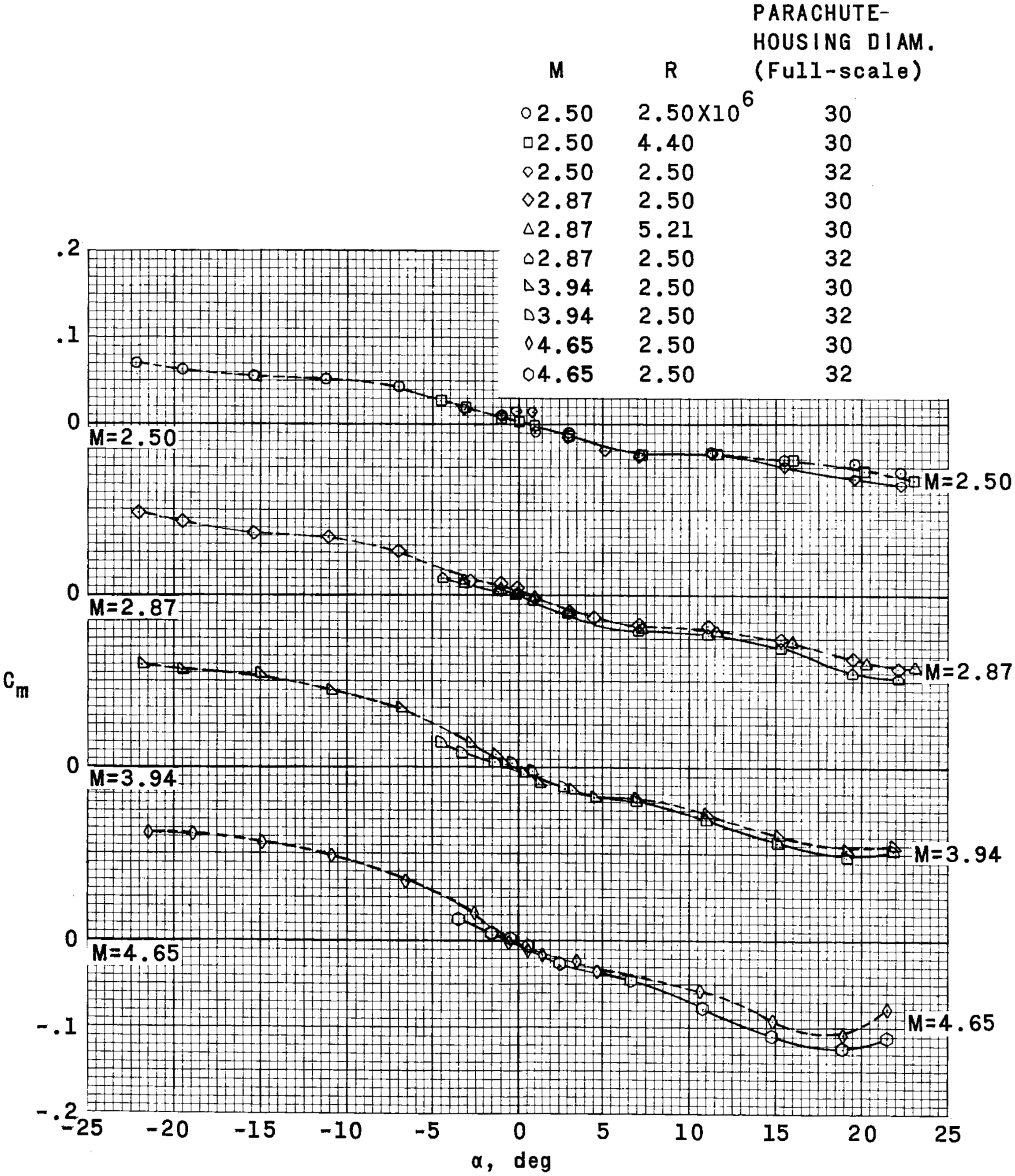
[redacted]



(c) M = 1.55 to 2.50.

Figure 4.- Continued.

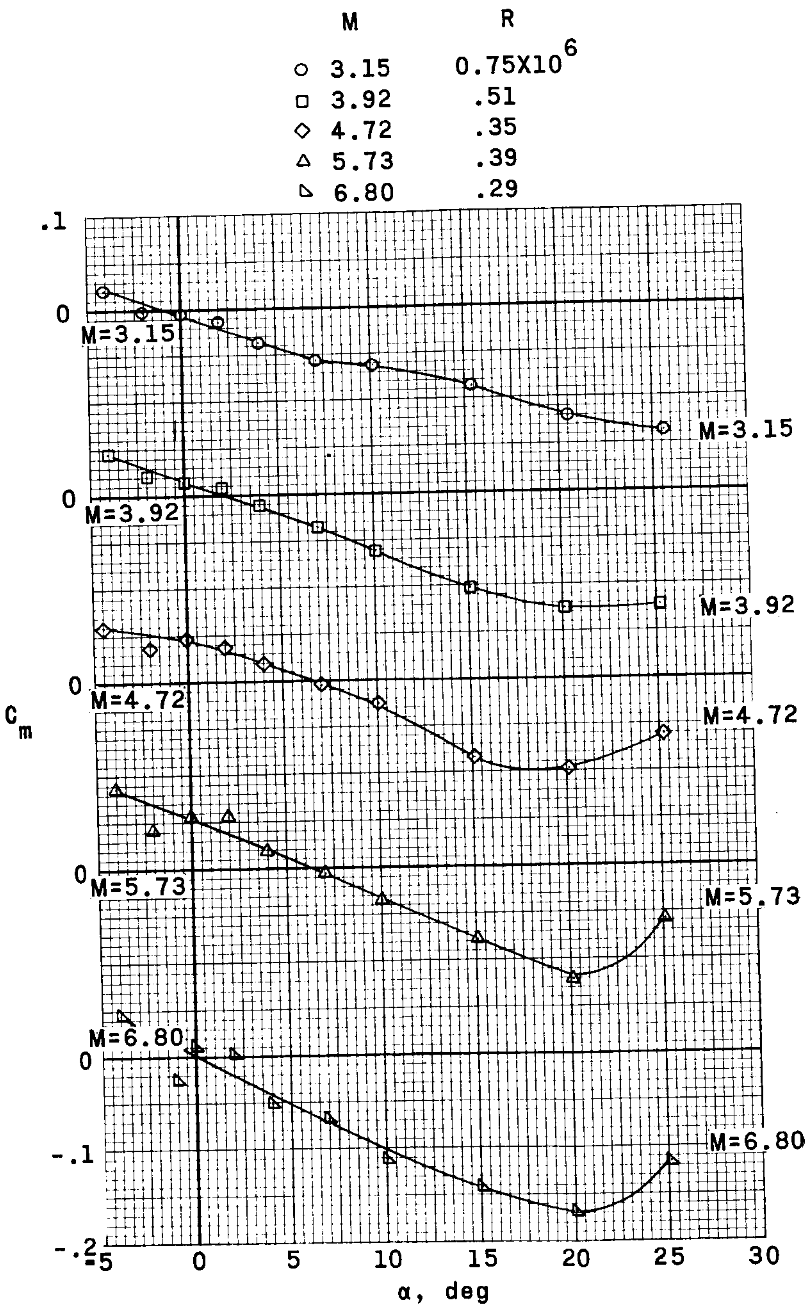
[redacted]



(d) M = 2.50 to 4.65.

Figure 4.- Continued.

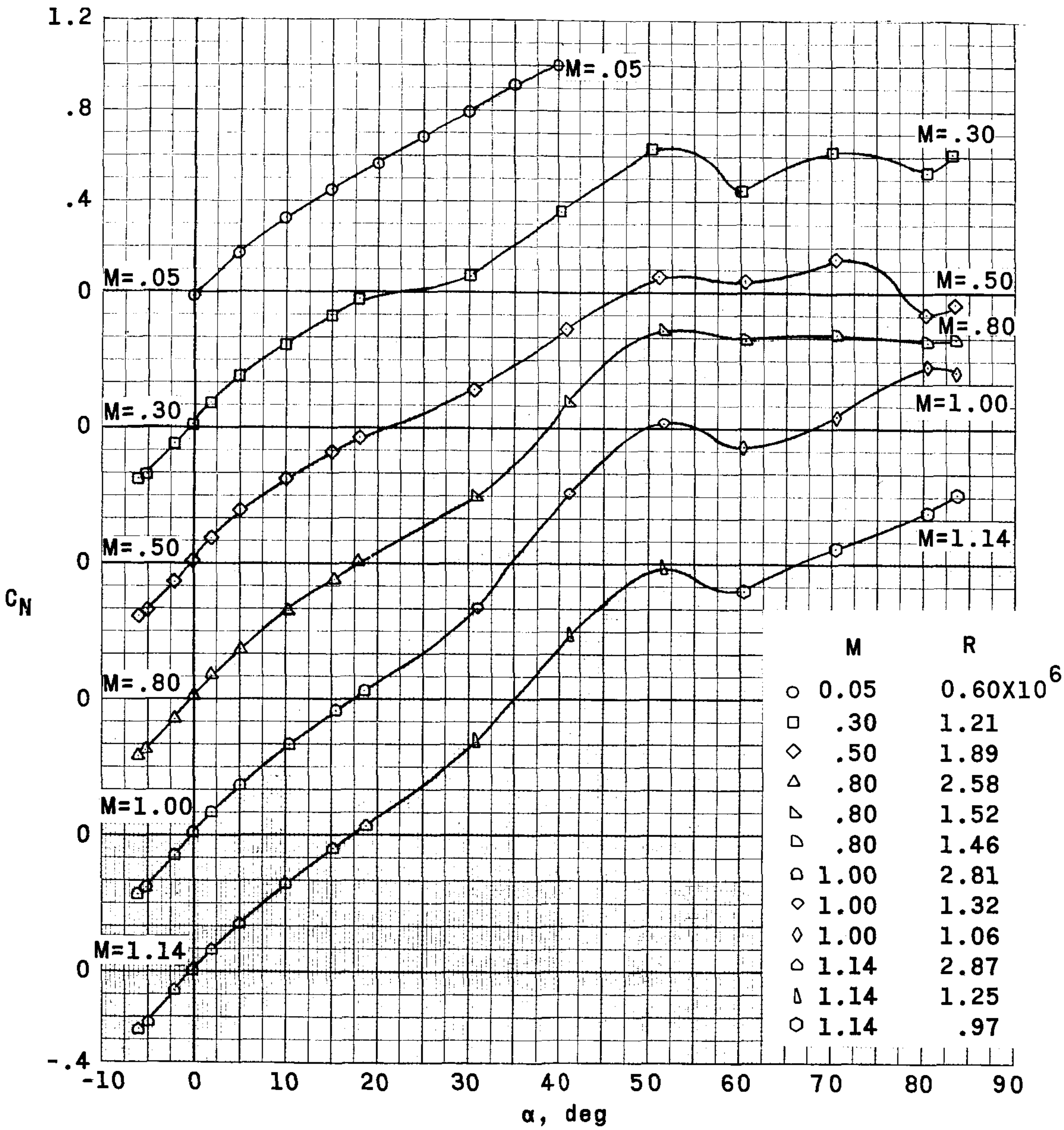
 [redacted]



(e) M = 3.15 to 6.80.

Figure 4.- Concluded.

[redacted]

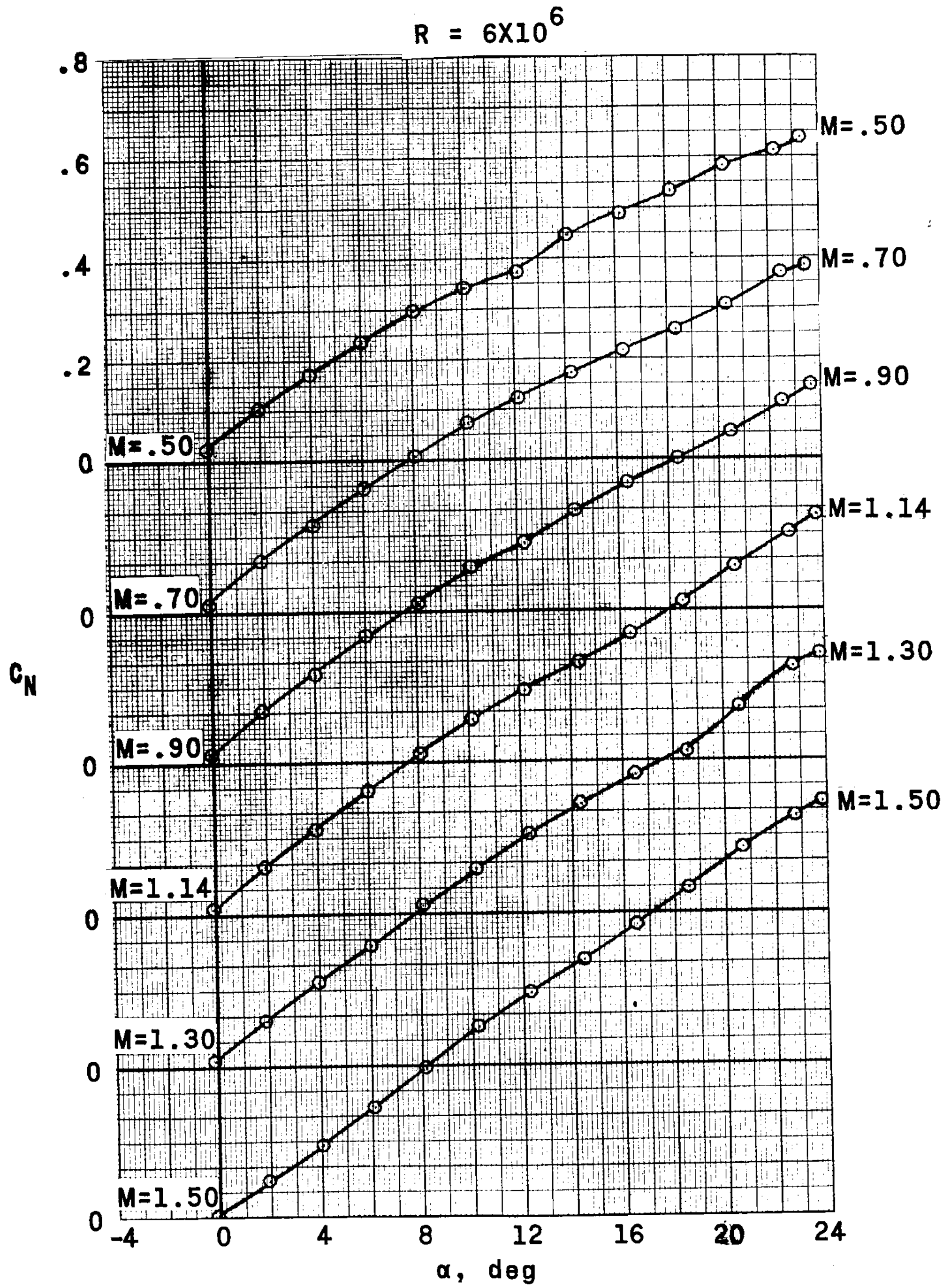


(a) M = 0.05 to 1.14.

Figure 5.- Variation of normal-force coefficient with angle of attack. Escape configuration.

[redacted]

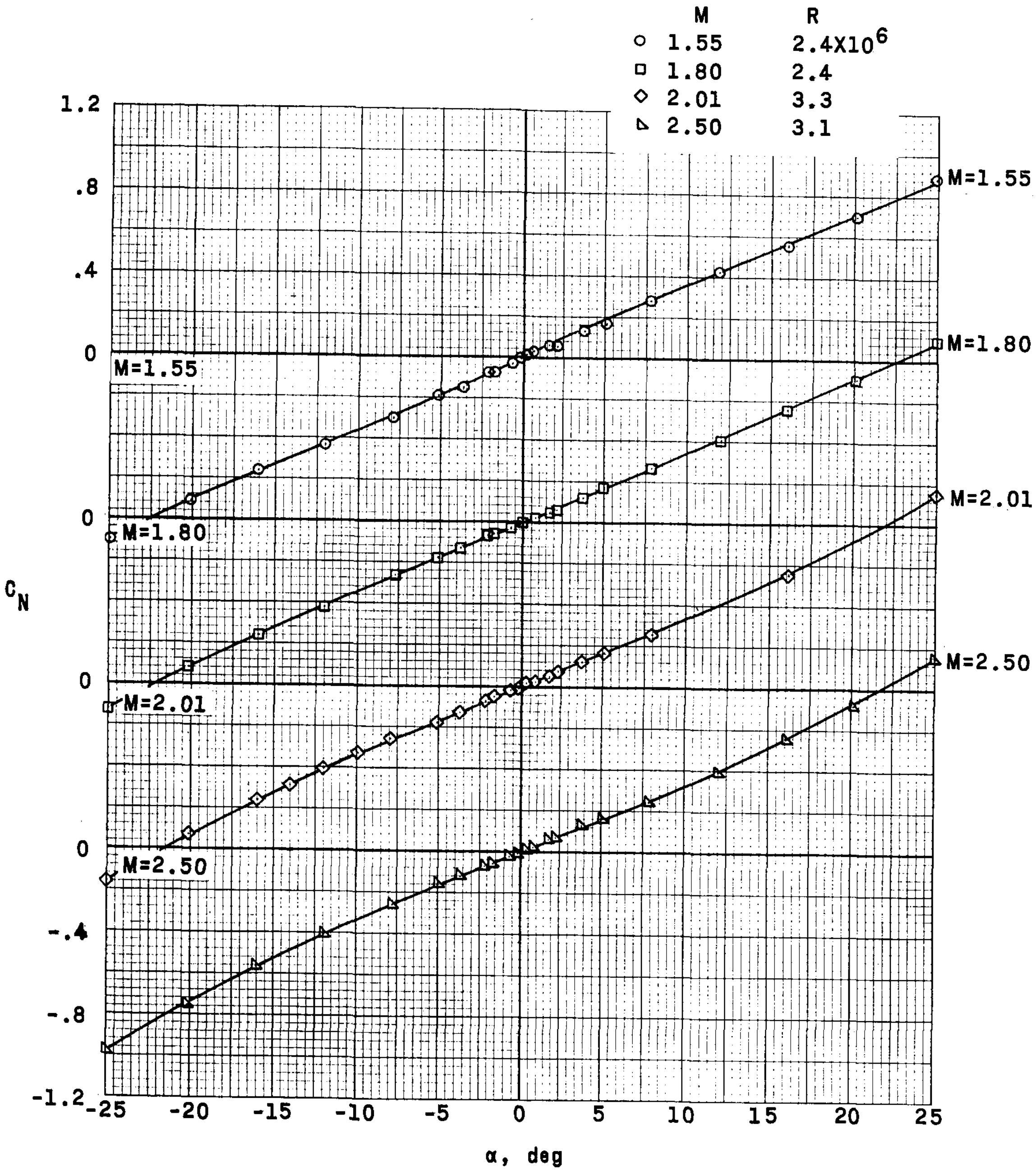
[redacted]



(b) M = 0.50 to 1.50.

Figure 5.- Continued.

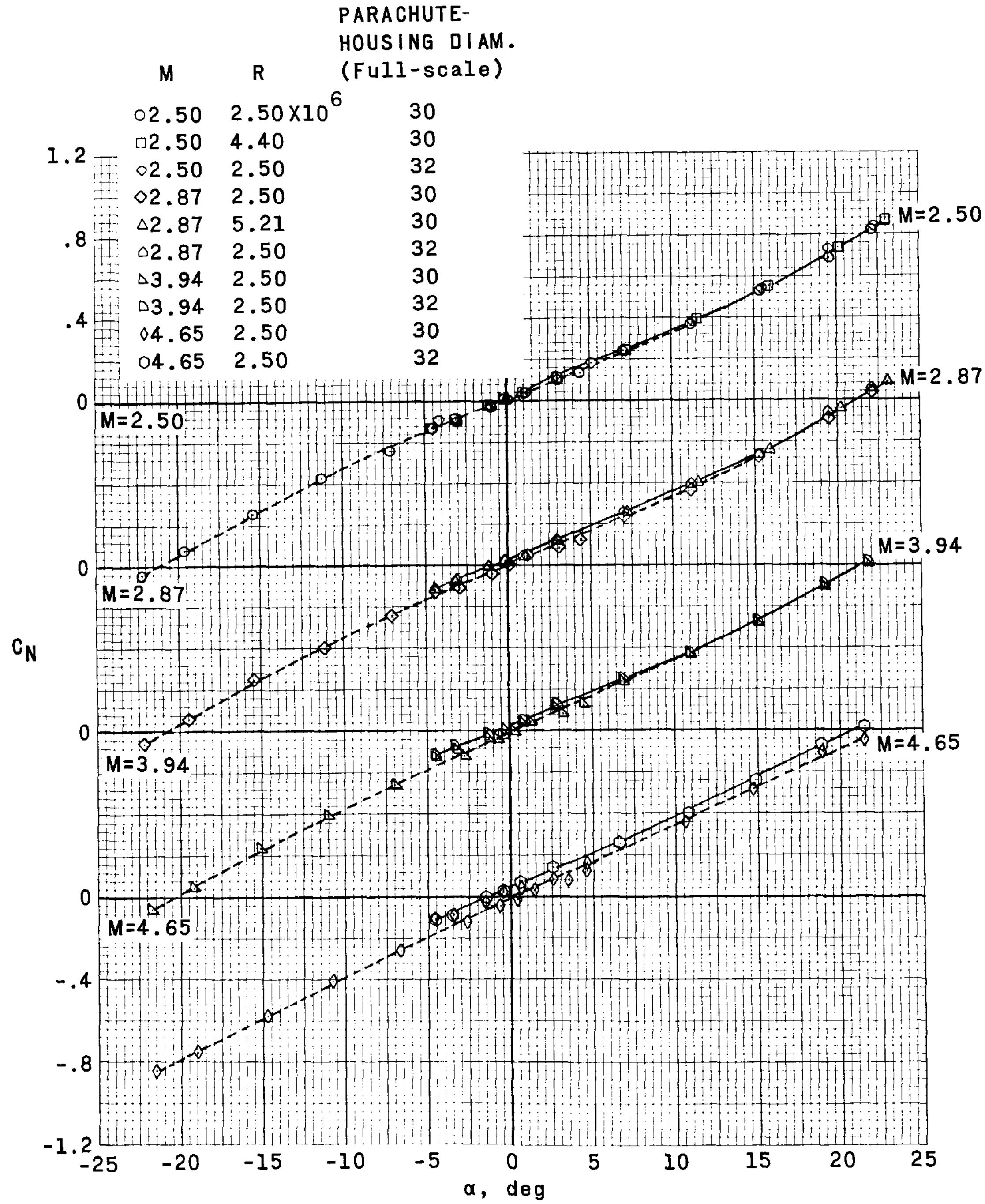
[redacted]



(c) M = 1.55 to 2.50.

Figure 5.- Continued.

[redacted]

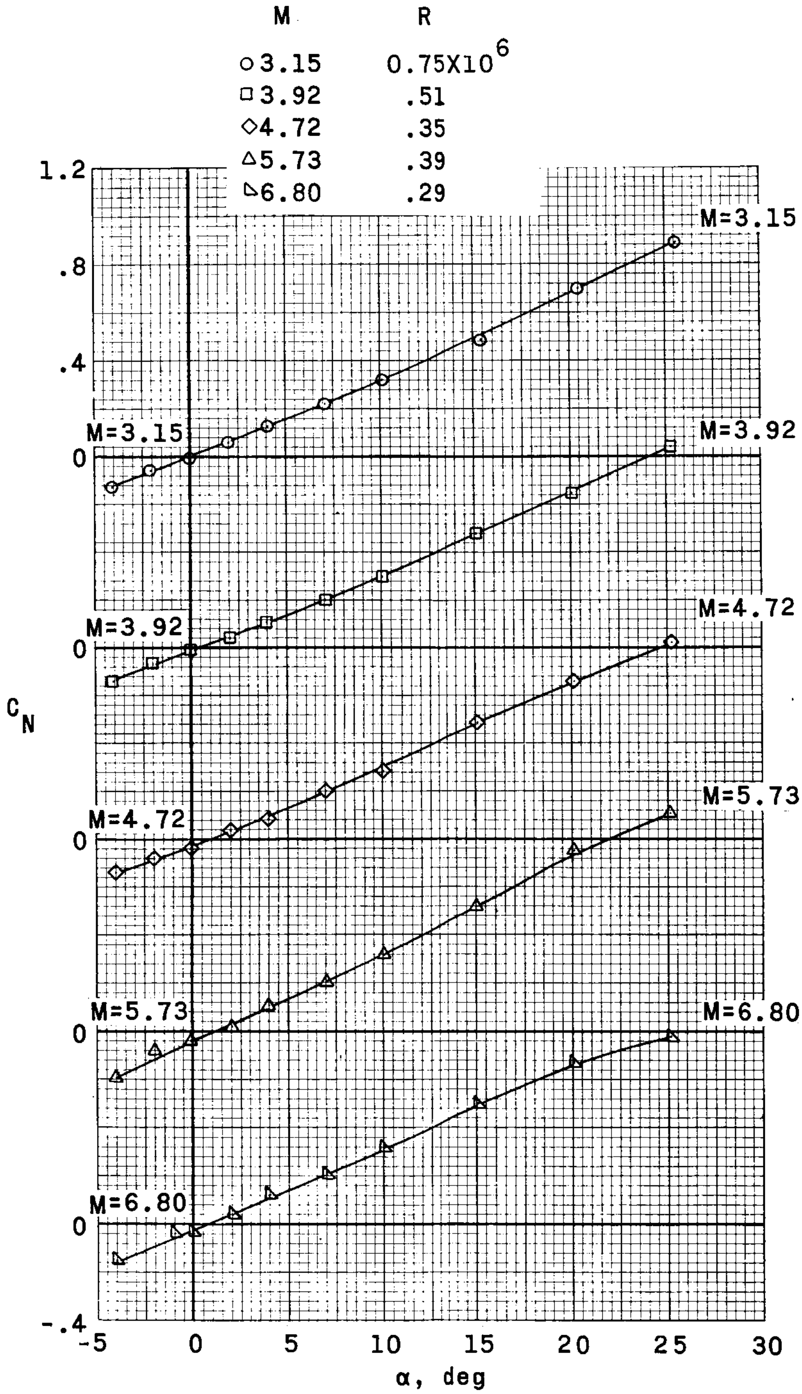


(d) M = 2.50 to 4.65.

Figure 5.- Continued.

[redacted]

[redacted]



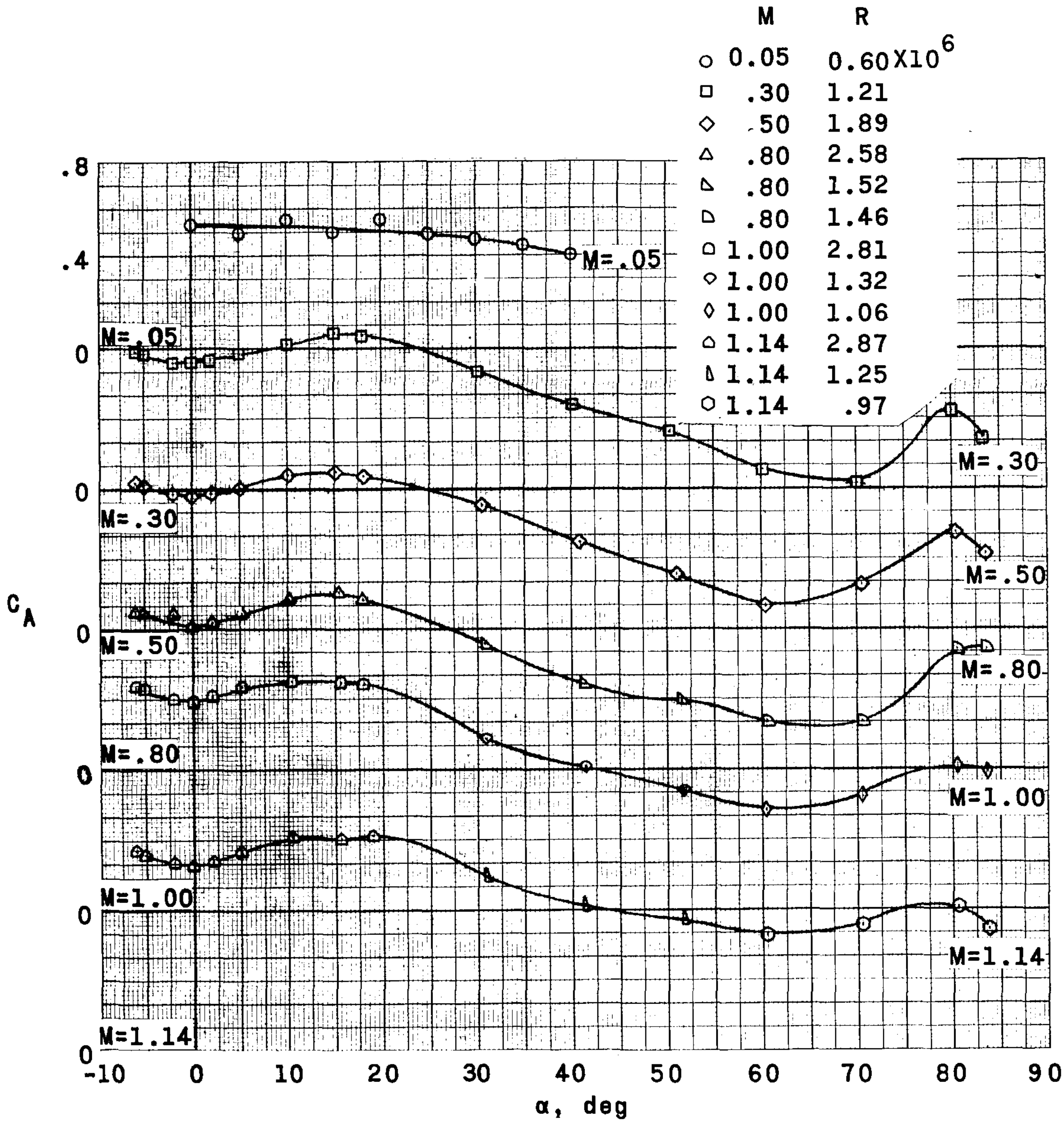
(e) M = 3.15 to 6.80.

Figure 5.- Concluded.

[redacted]

G-3

[redacted]

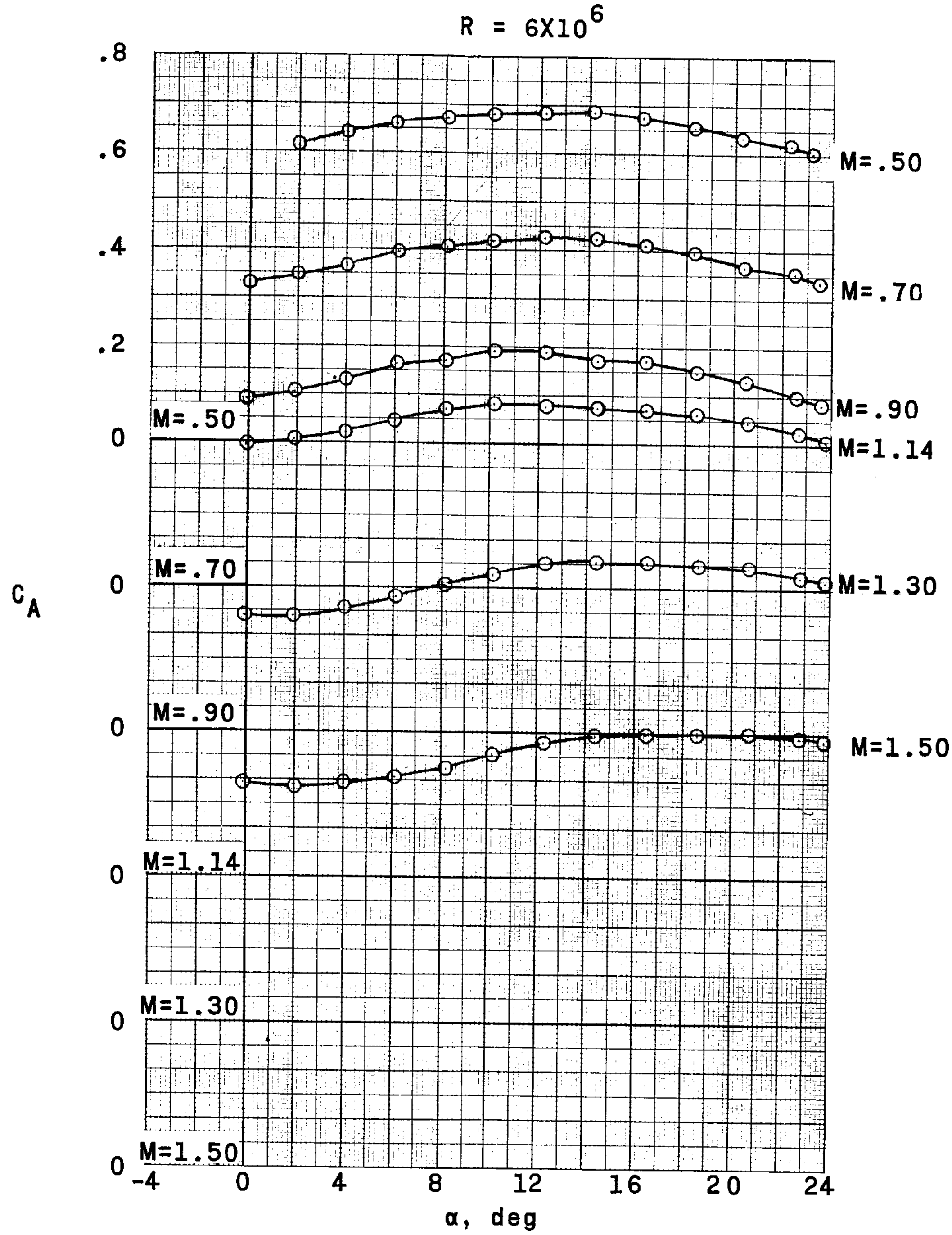


(a) M = 0.05 to 1.50.

Figure 6.- Variation of axial-force coefficient with angle of attack. Escape configuration.

[redacted]

[redacted]

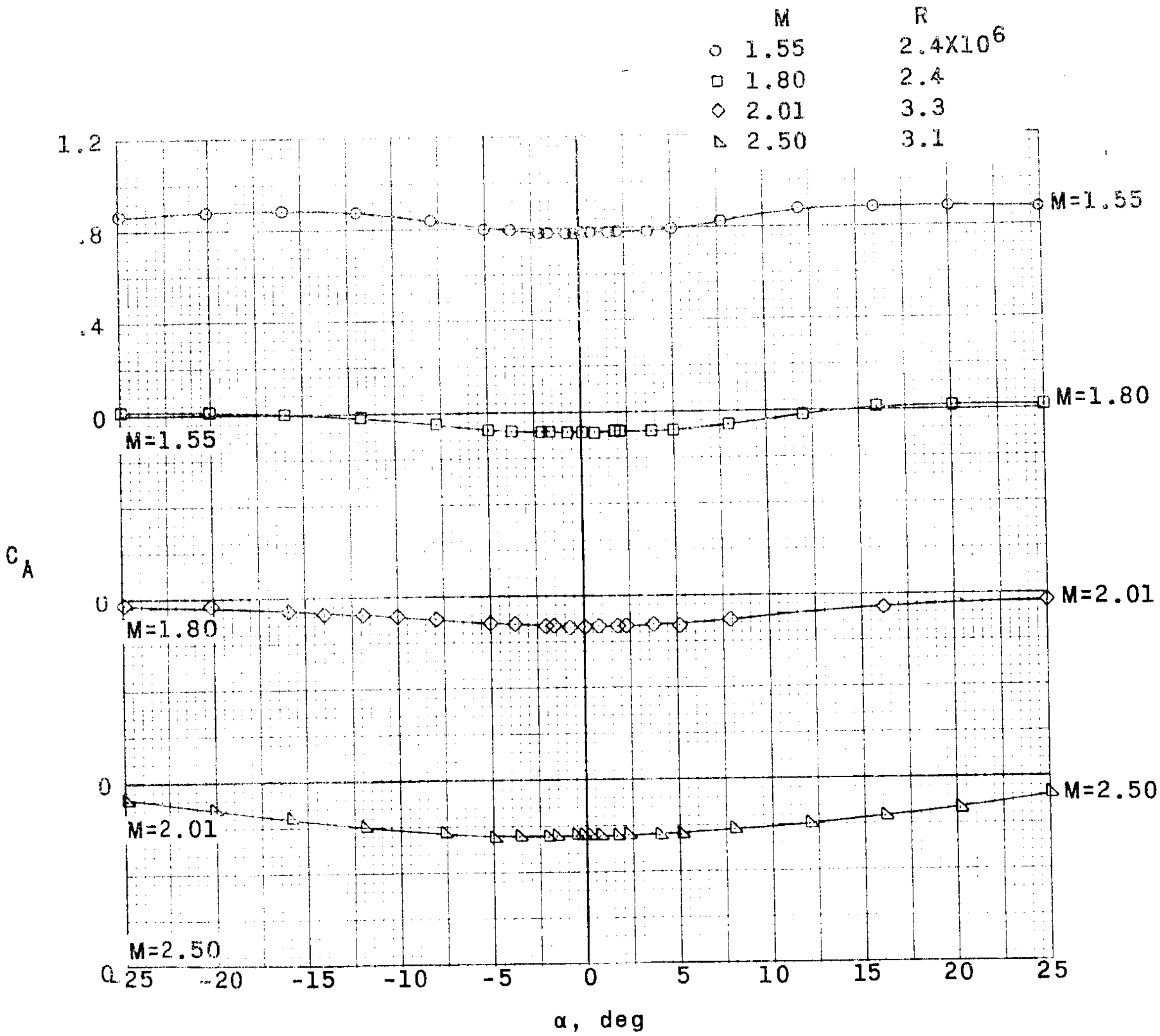


(b) M = 0.50 to 1.50.

Figure 6.- Continued.

[redacted]

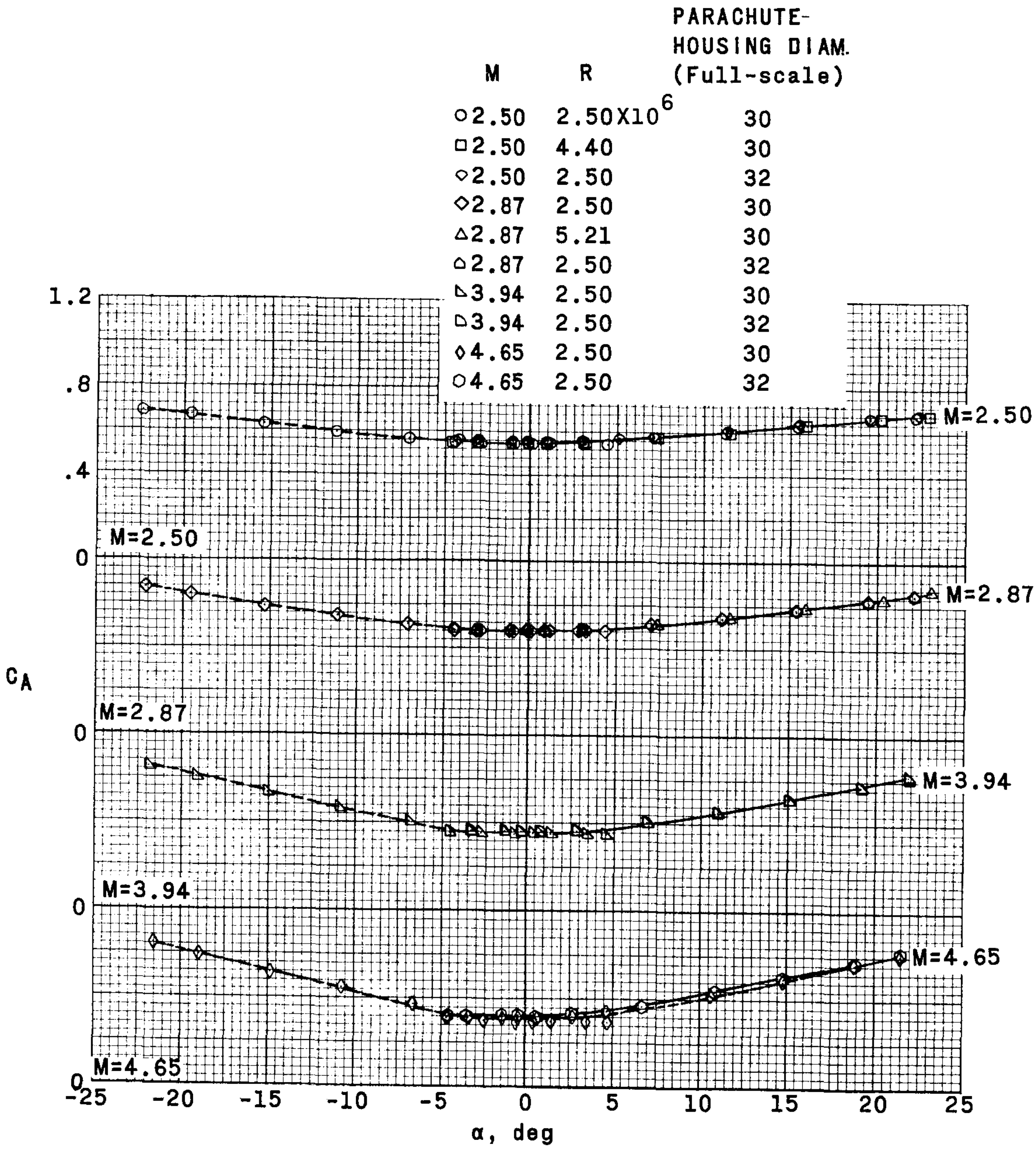
[redacted]



(c) M = 1.55 to 2.50.

Figure 6.- Continued.

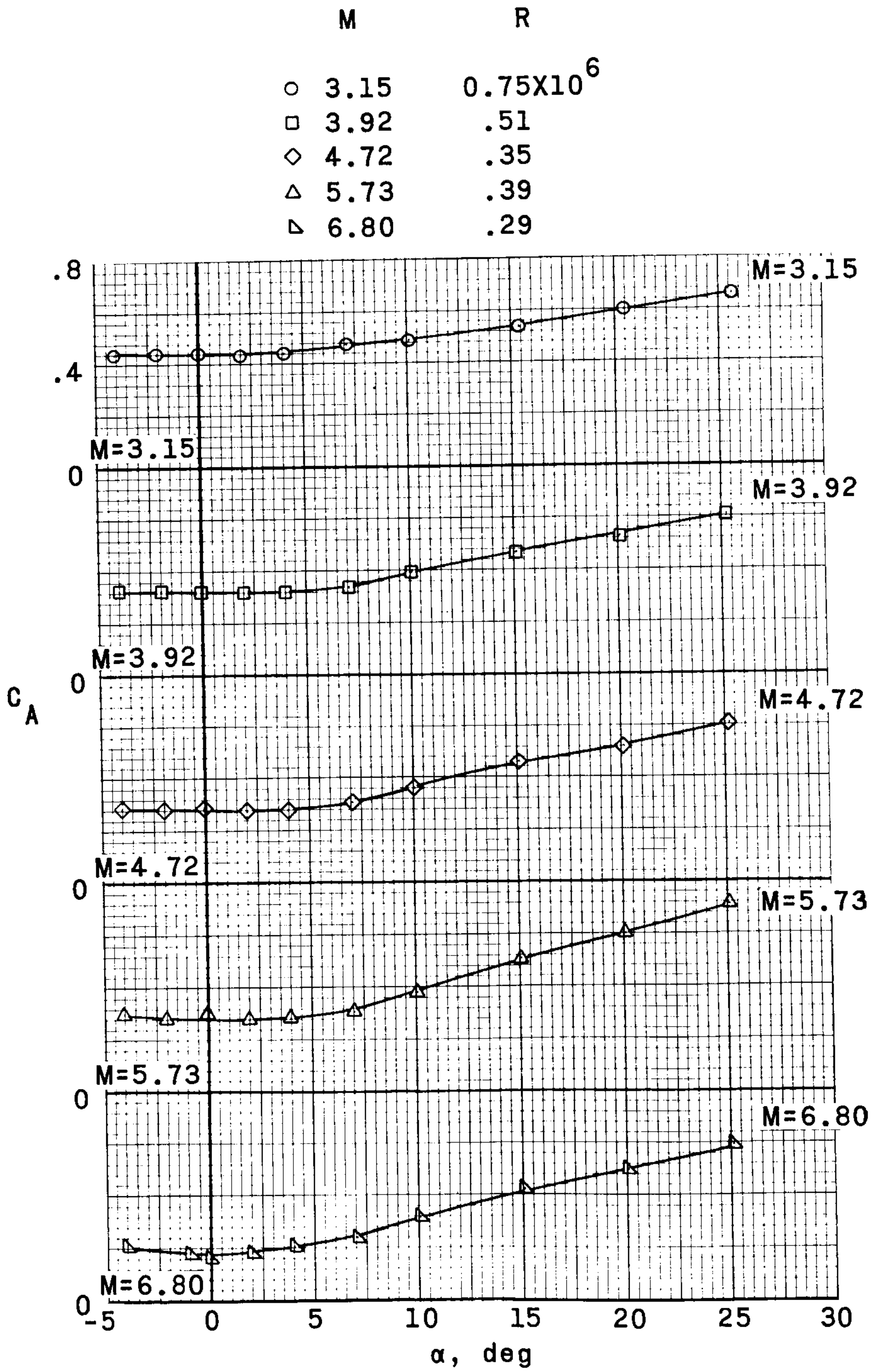
[redacted]



(d) M = 2.50 to 4.65.

Figure 6.- Continued.

[redacted]

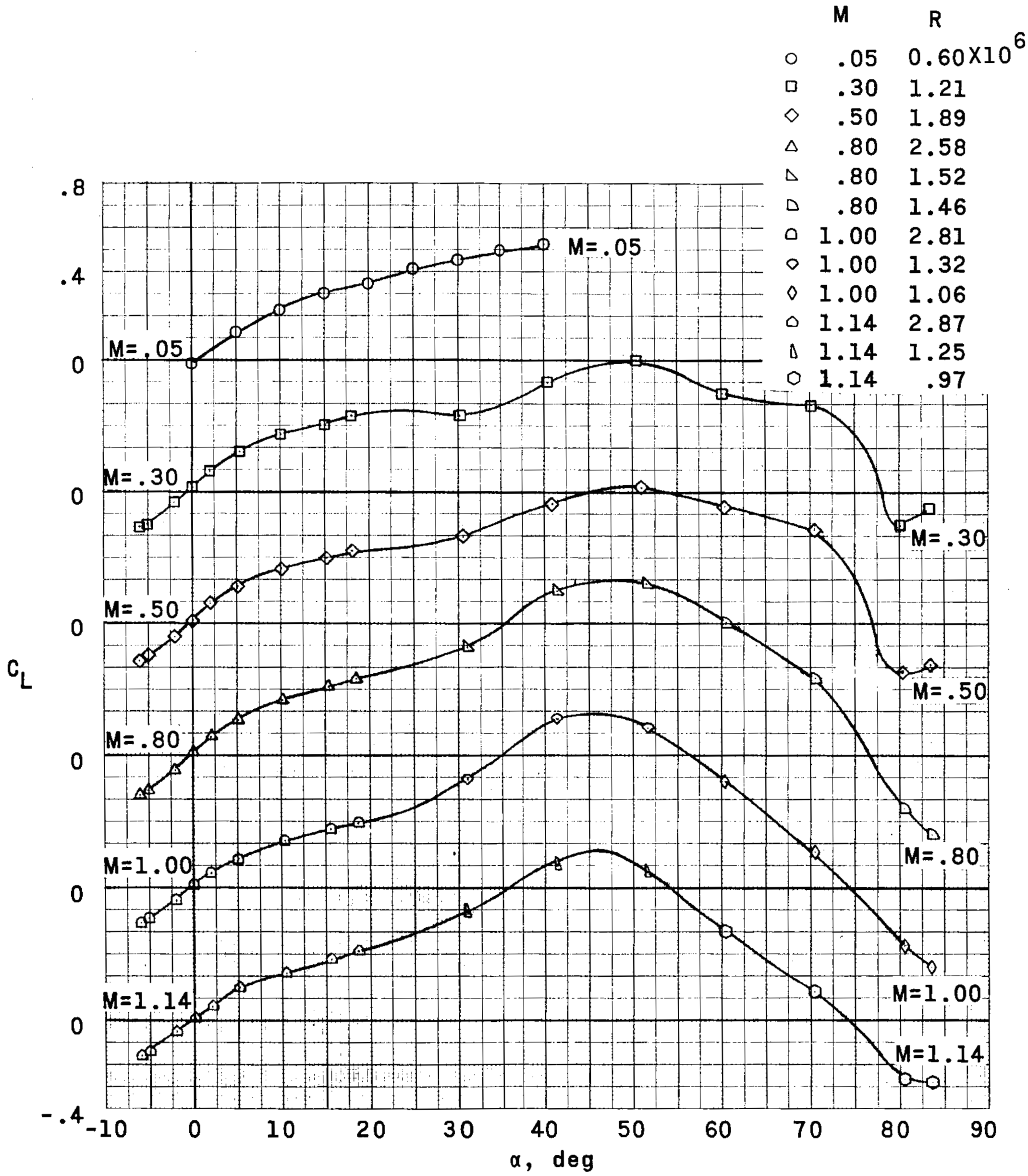


(e) M = 3.15 to 6.80.

Figure 6.- Concluded.

[redacted]

[redacted]

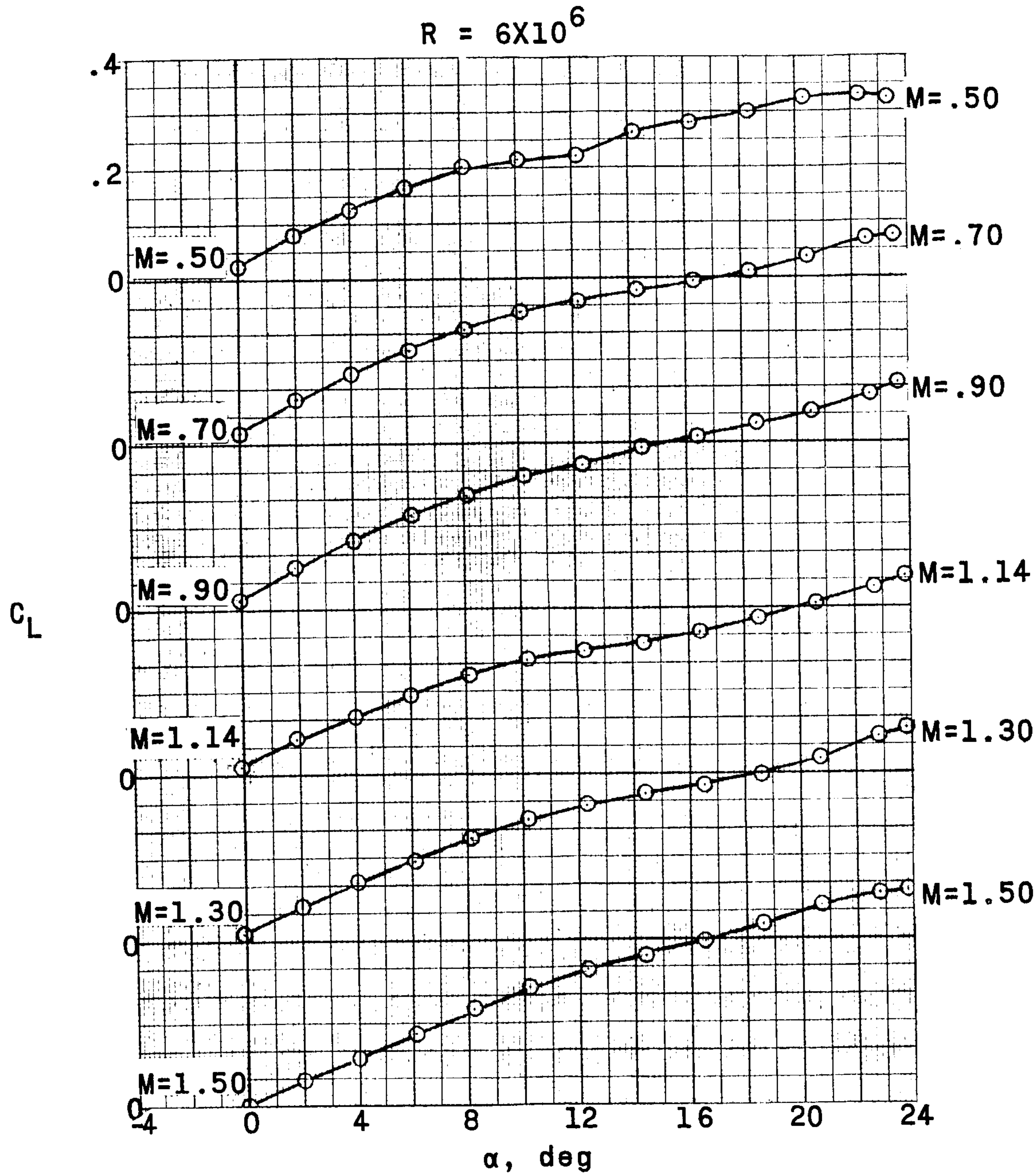


(a) M = 0.05 to 1.14.

Figure 7.- Variation of lift coefficient with angle of attack. Escape configuration.

[redacted]

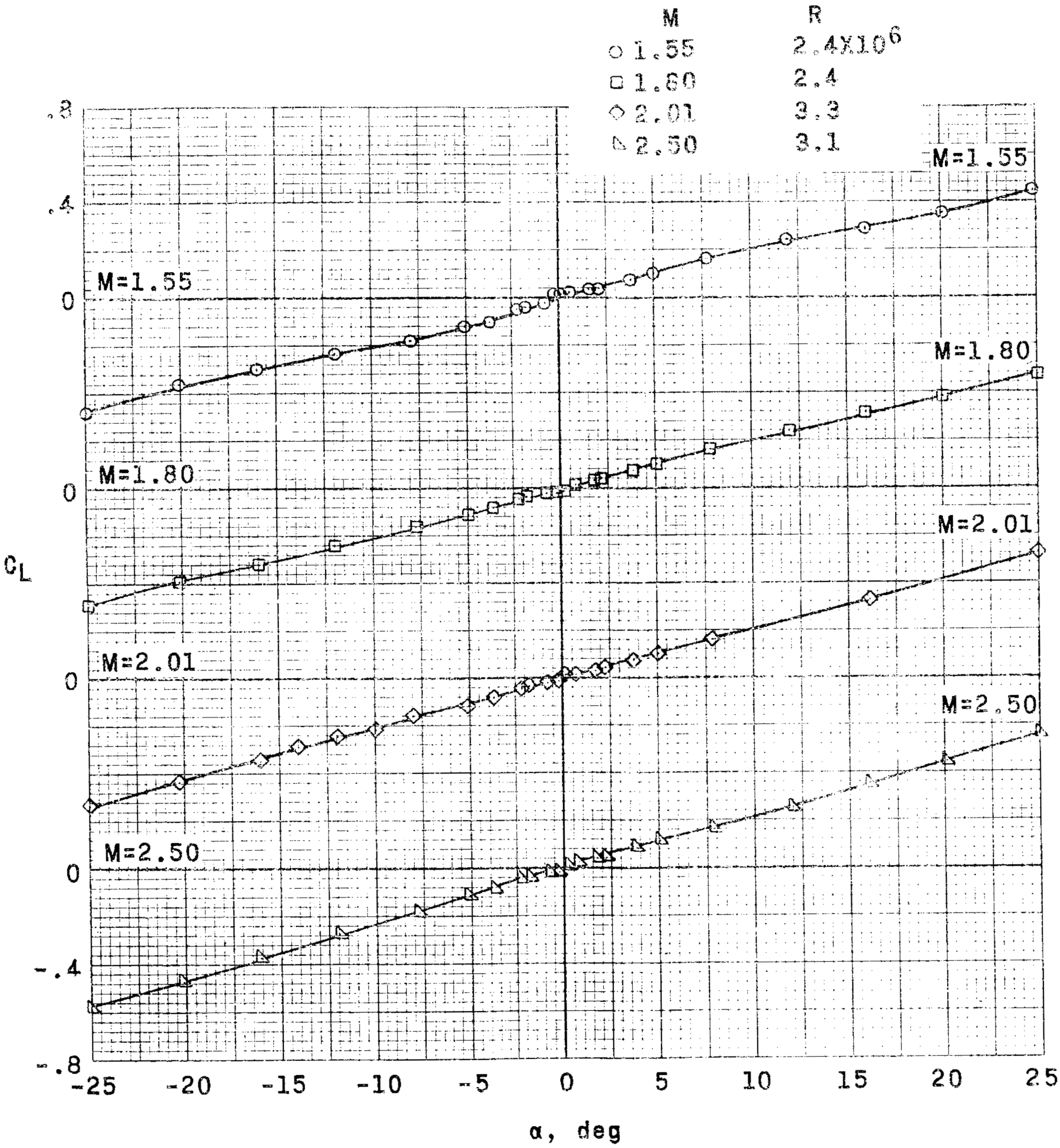
[redacted]



(b) M = 0.50 to 1.50.

Figure 7.- Continued.

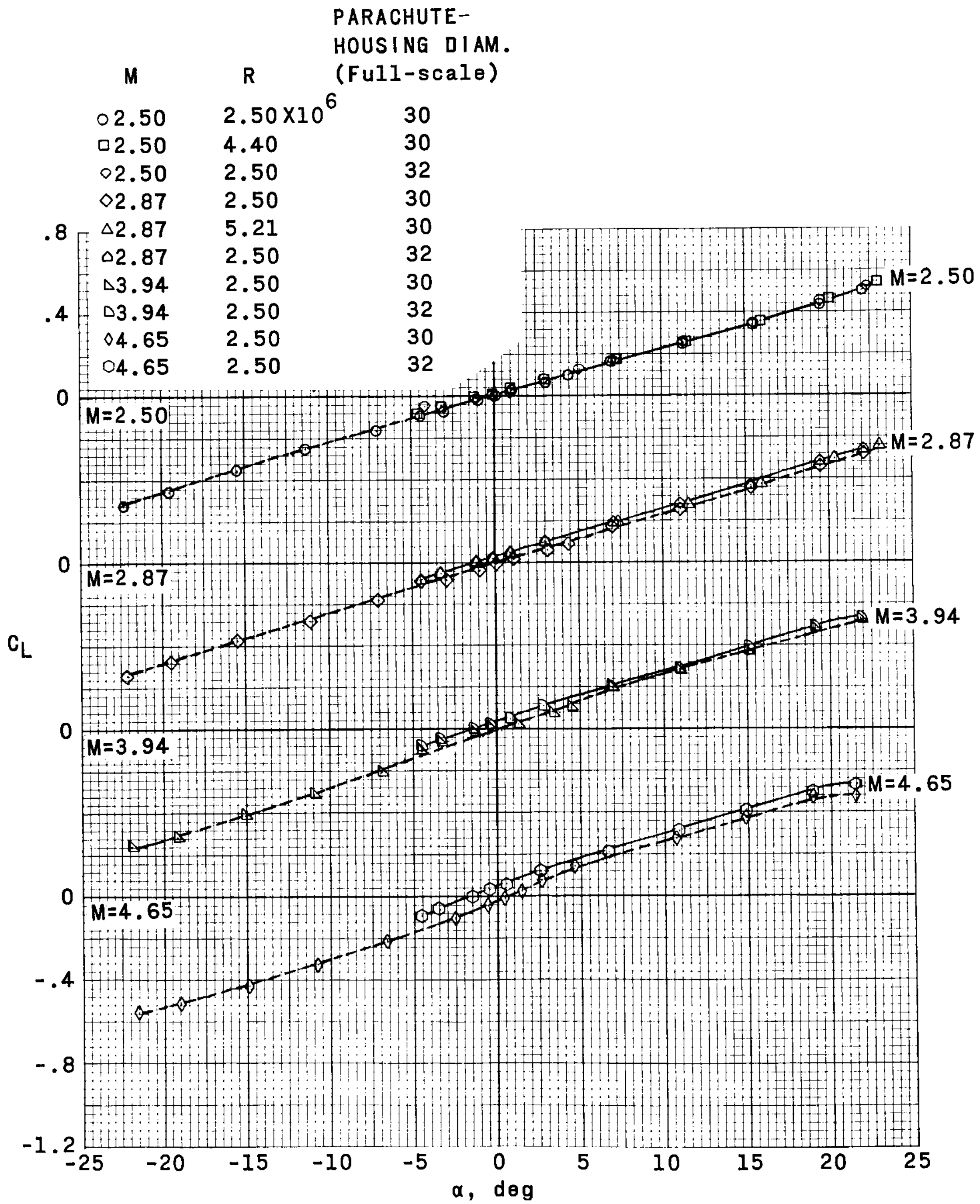
[redacted]



(c) M = 1.55 to 2.50.

Figure 7.- Continued.

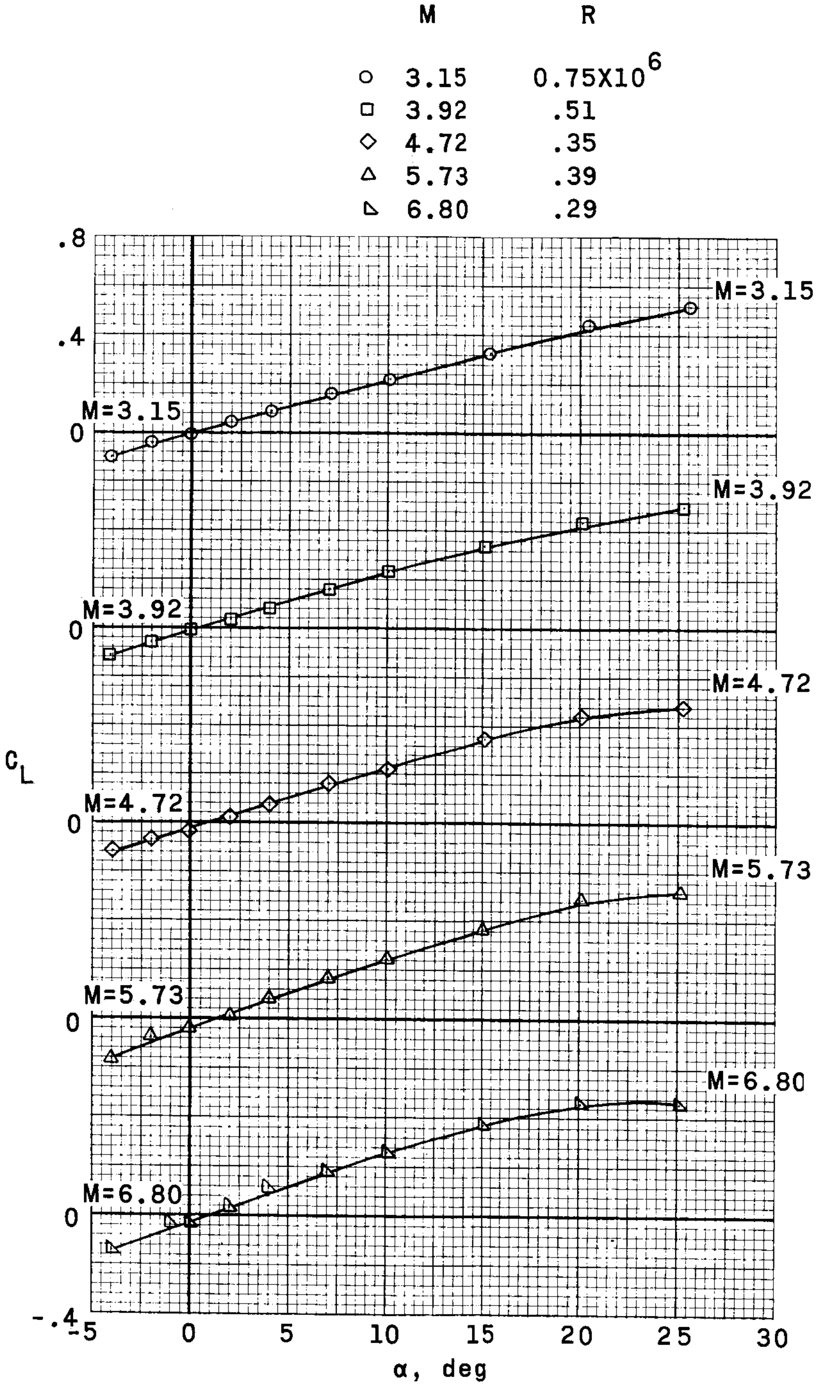
[redacted]



(d) M = 2.50 to 4.65.

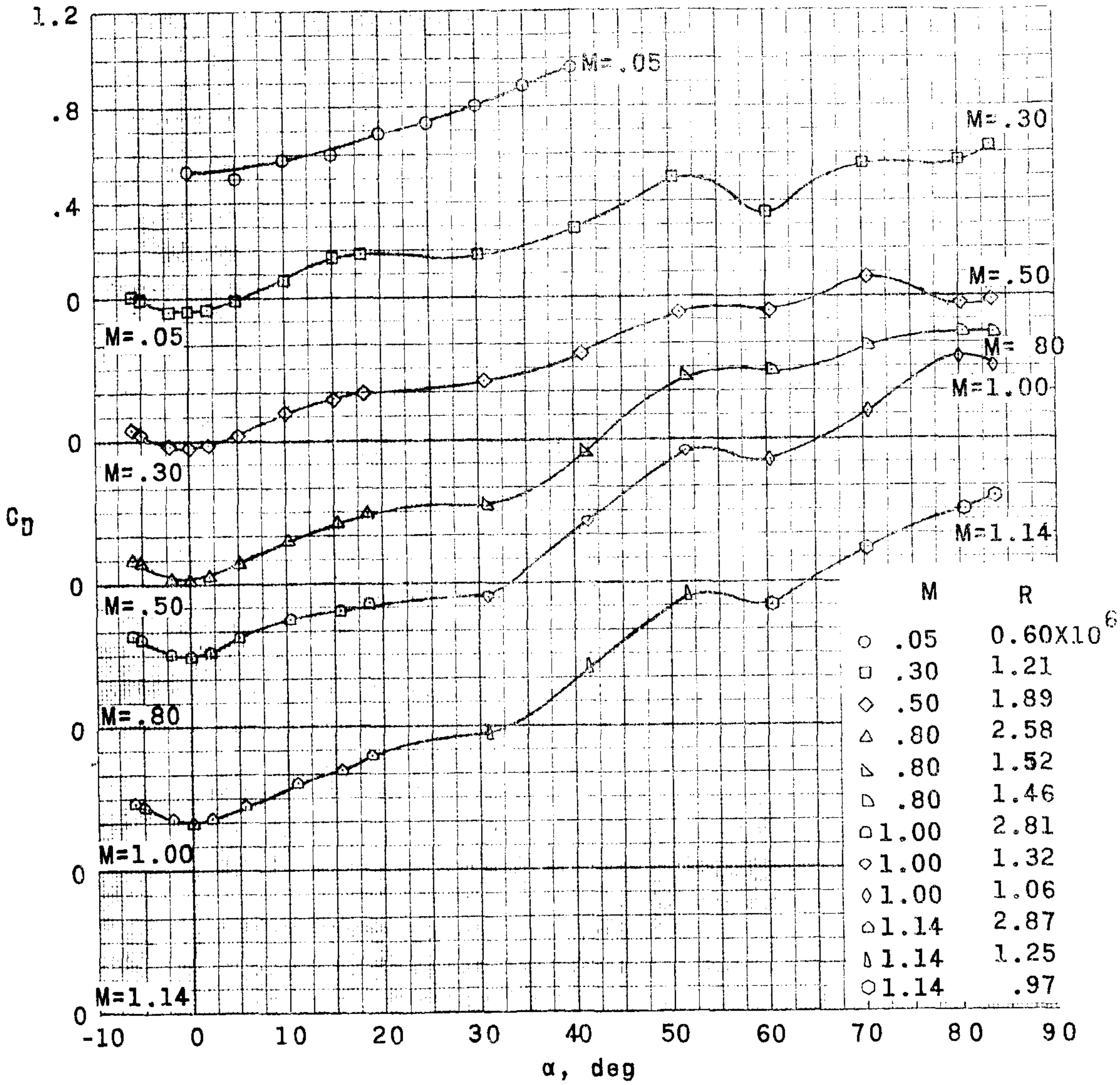
Figure 7.- Continued.

[redacted]



(e) M = 3.15 to 6.80.

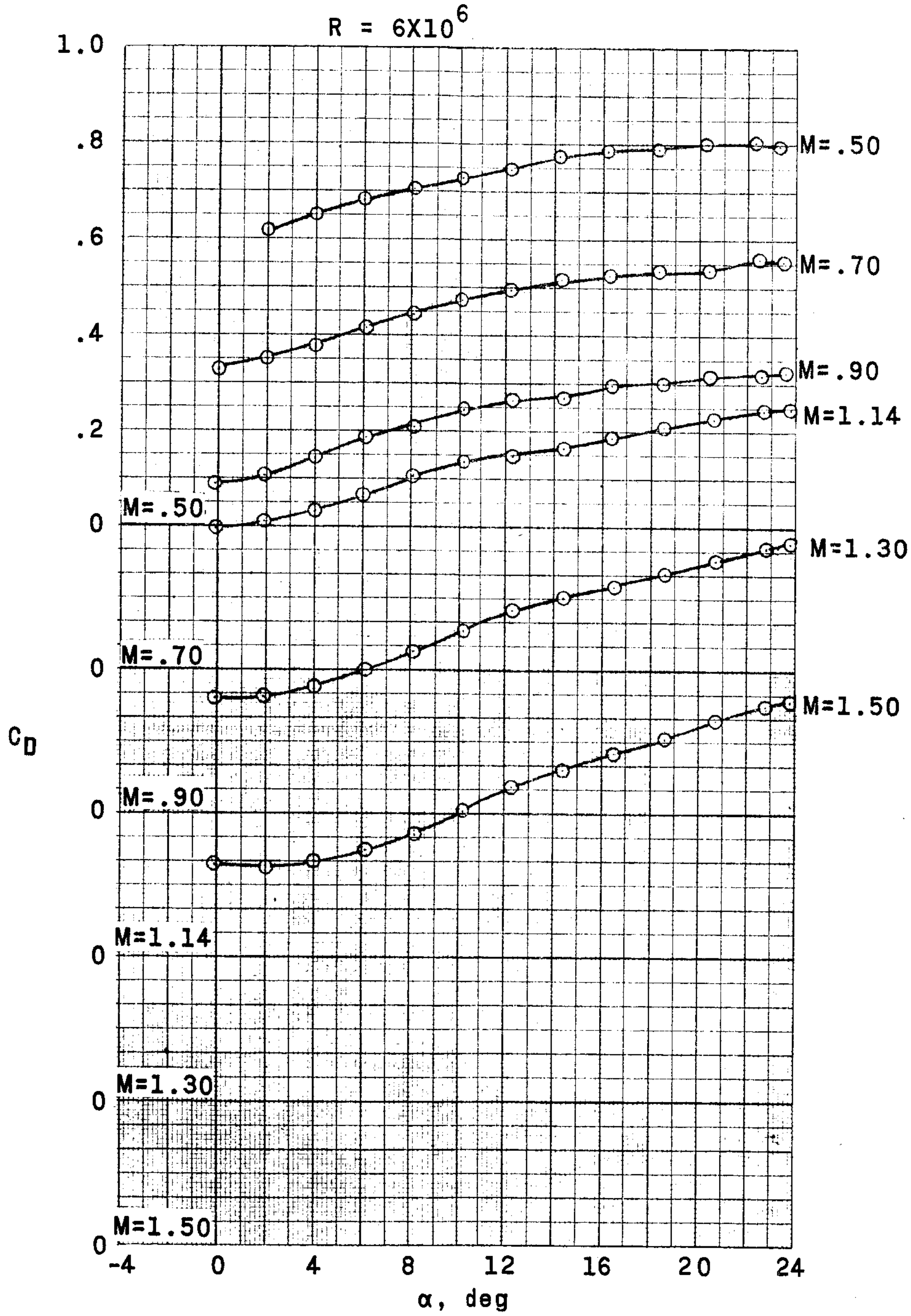
Figure 7.- Concluded.



(a) M = 0.05 to 1.14.

Figure 8.- Variation of drag coefficient with angle of attack. Escape configuration.

[redacted]

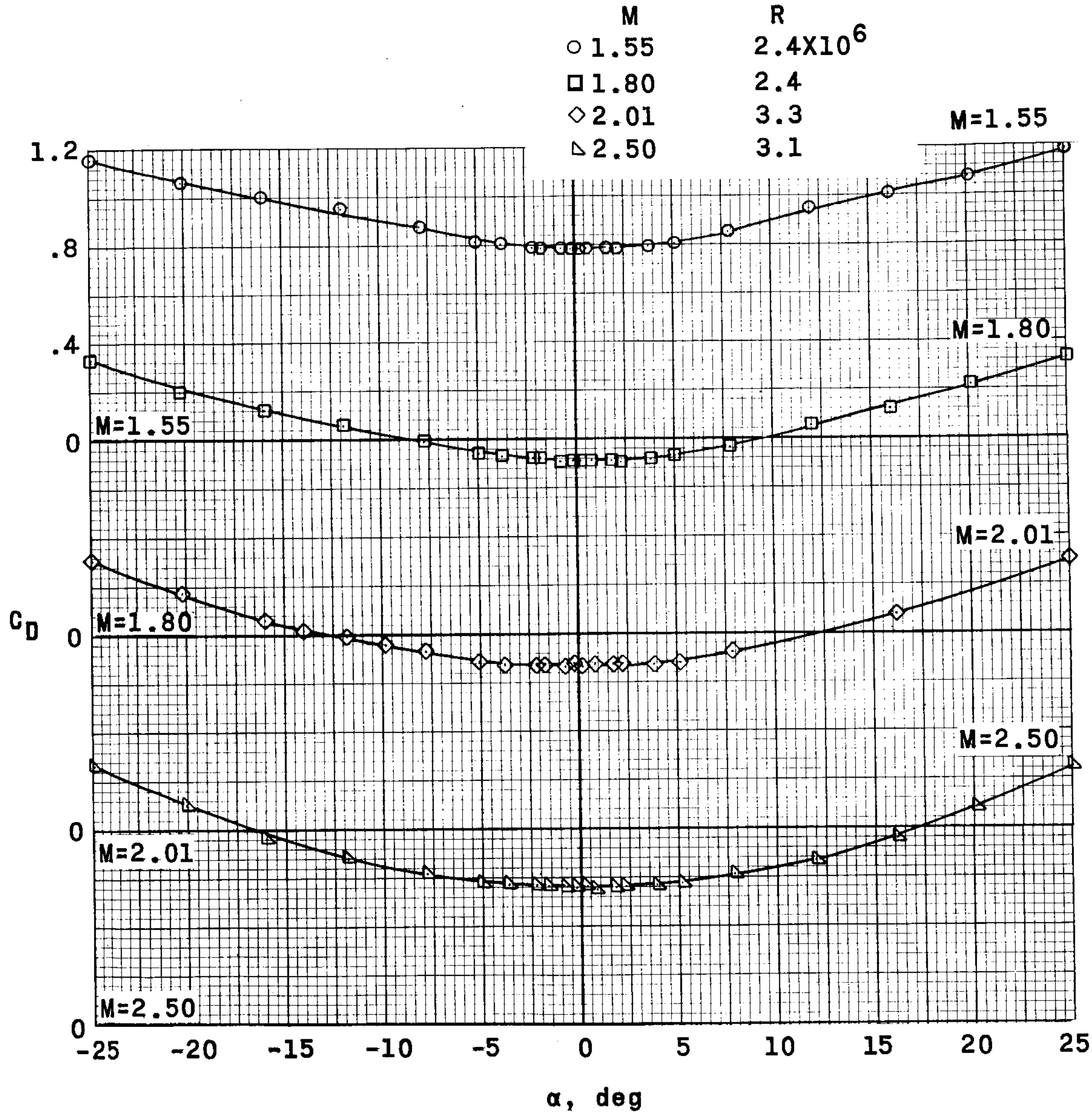


(b) M = 0.50 to 1.50.

Figure 8.- Continued.

[redacted]

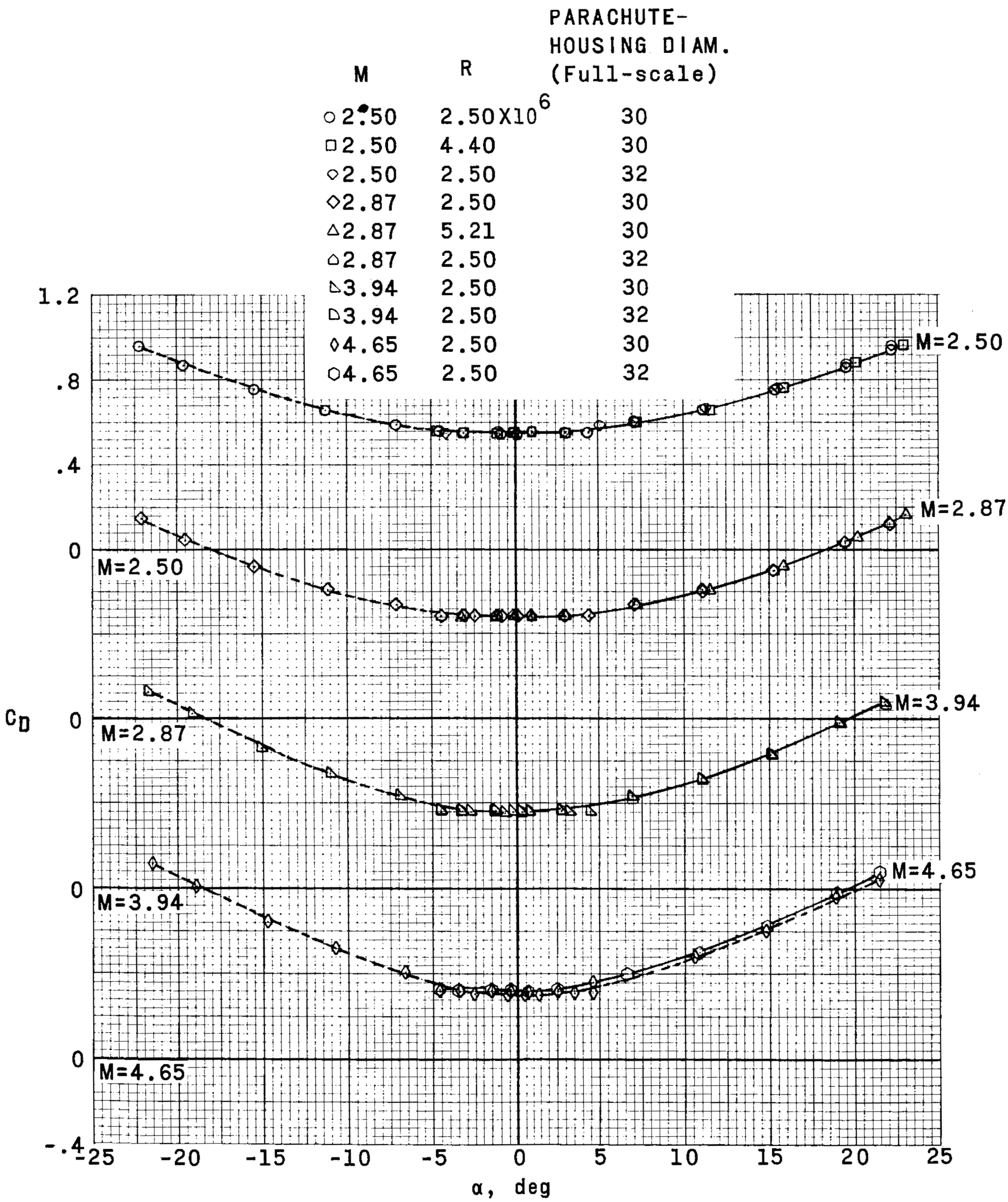
[redacted]



(c) M = 1.55 to 2.50.

Figure 8.- Continued.

[redacted]

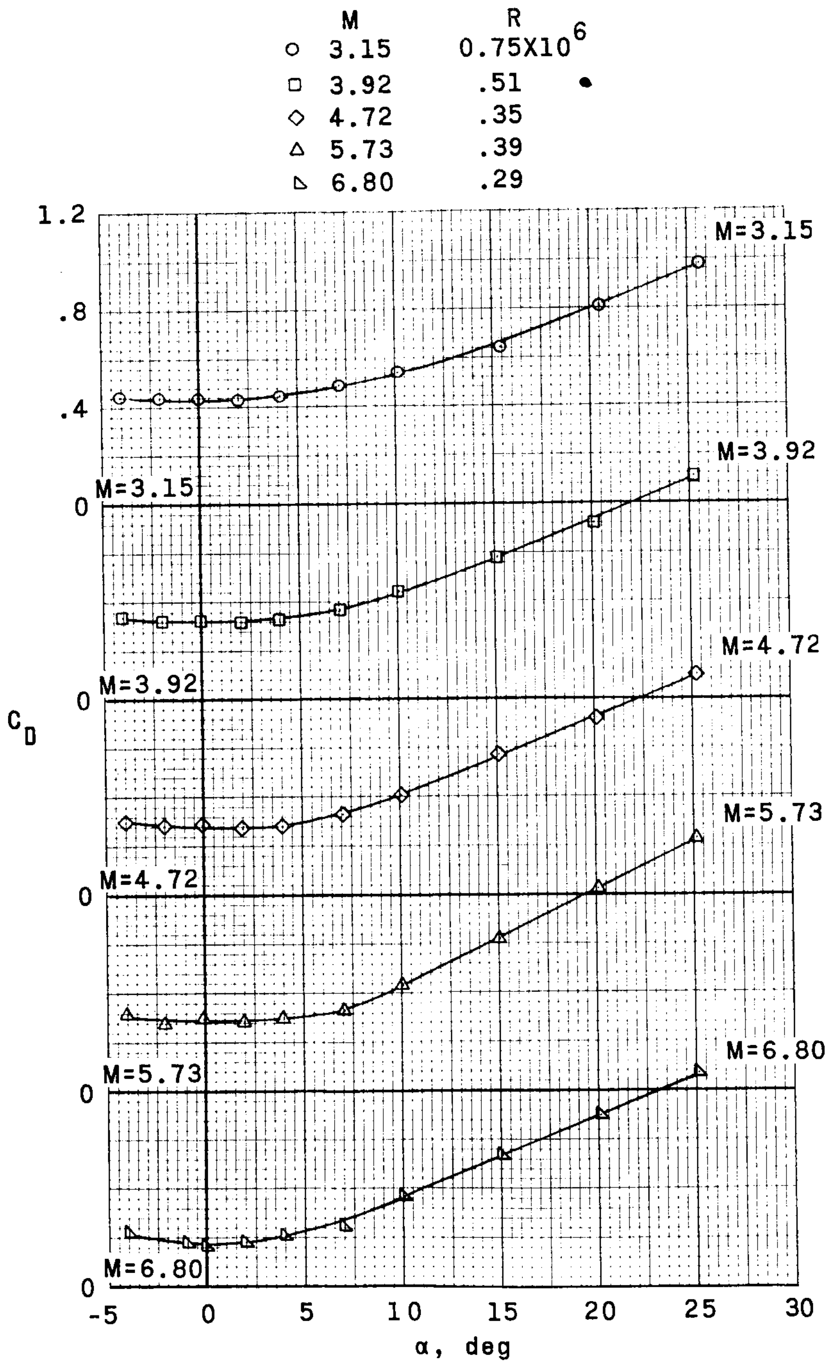


(d) M = 2.50 to 4.65.

Figure 8.- Continued.

[redacted]

[redacted]



(e) M = 3.15 to 6.80.

Figure 8.- Concluded.

[redacted]

[redacted]

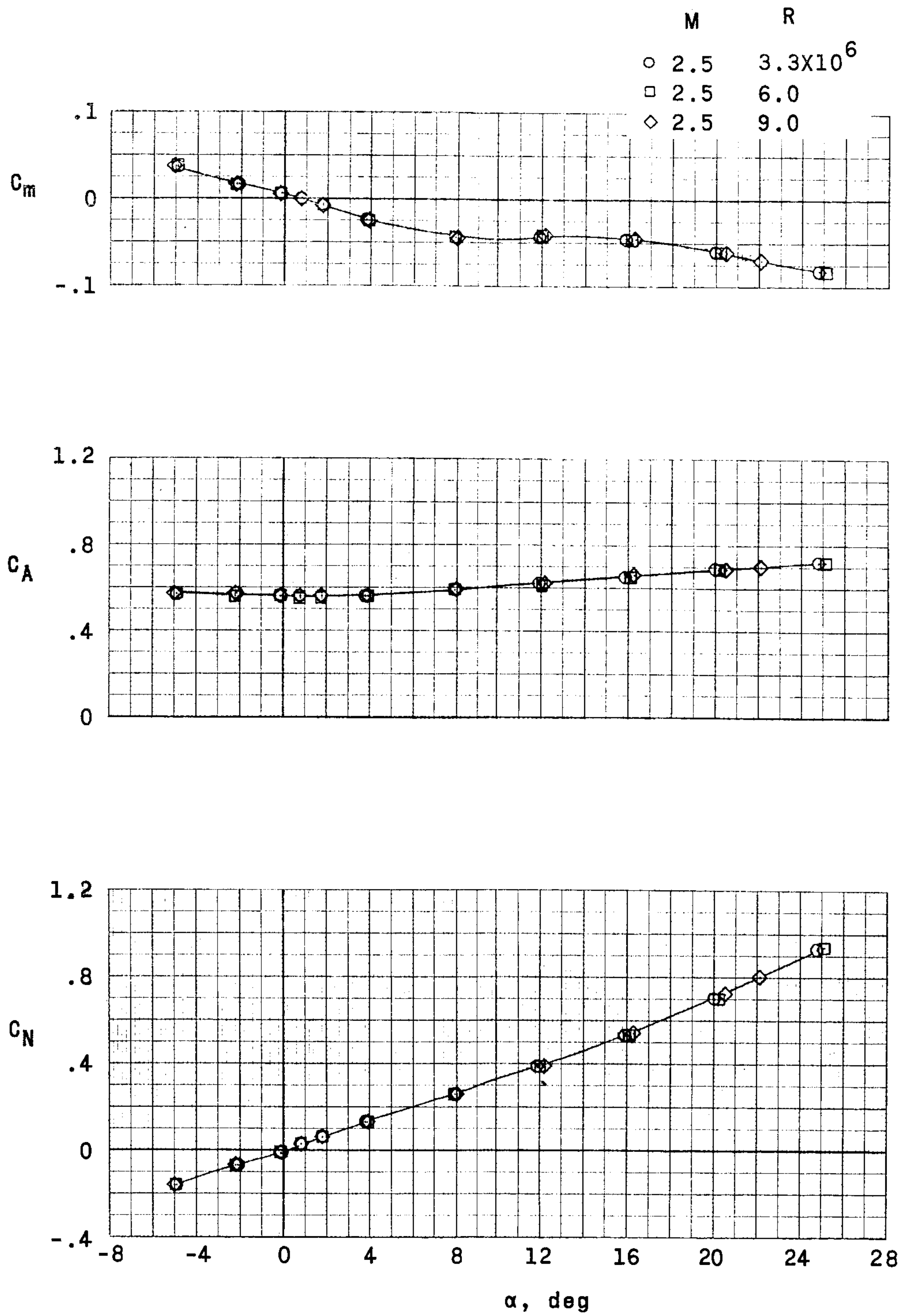


Figure 9.- Effect of Reynolds number on the longitudinal aerodynamic characteristics of the production escape configuration. M = 2.5.

[redacted]

[redacted]

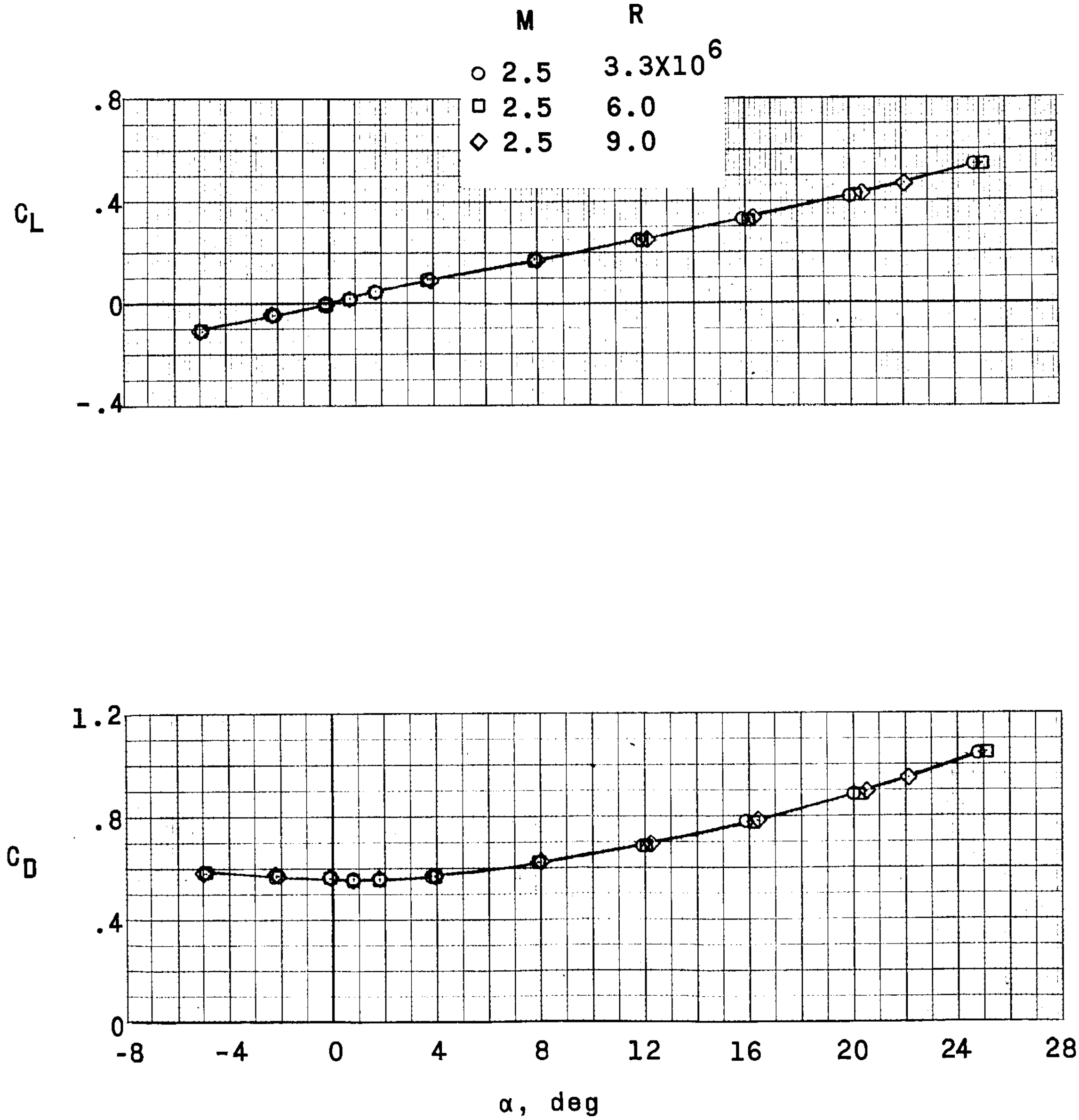
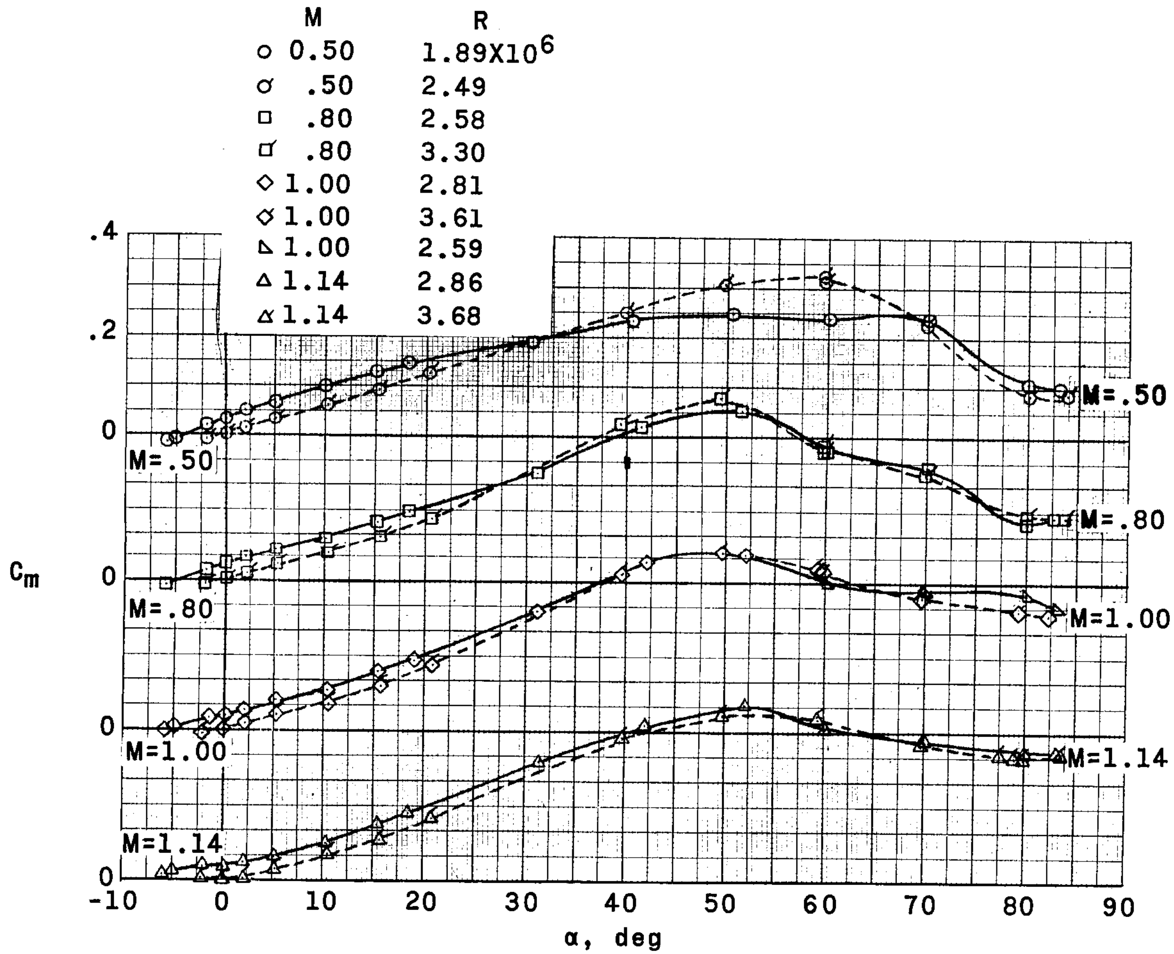


Figure 9.- Concluded.

G-3

[redacted]

[redacted]

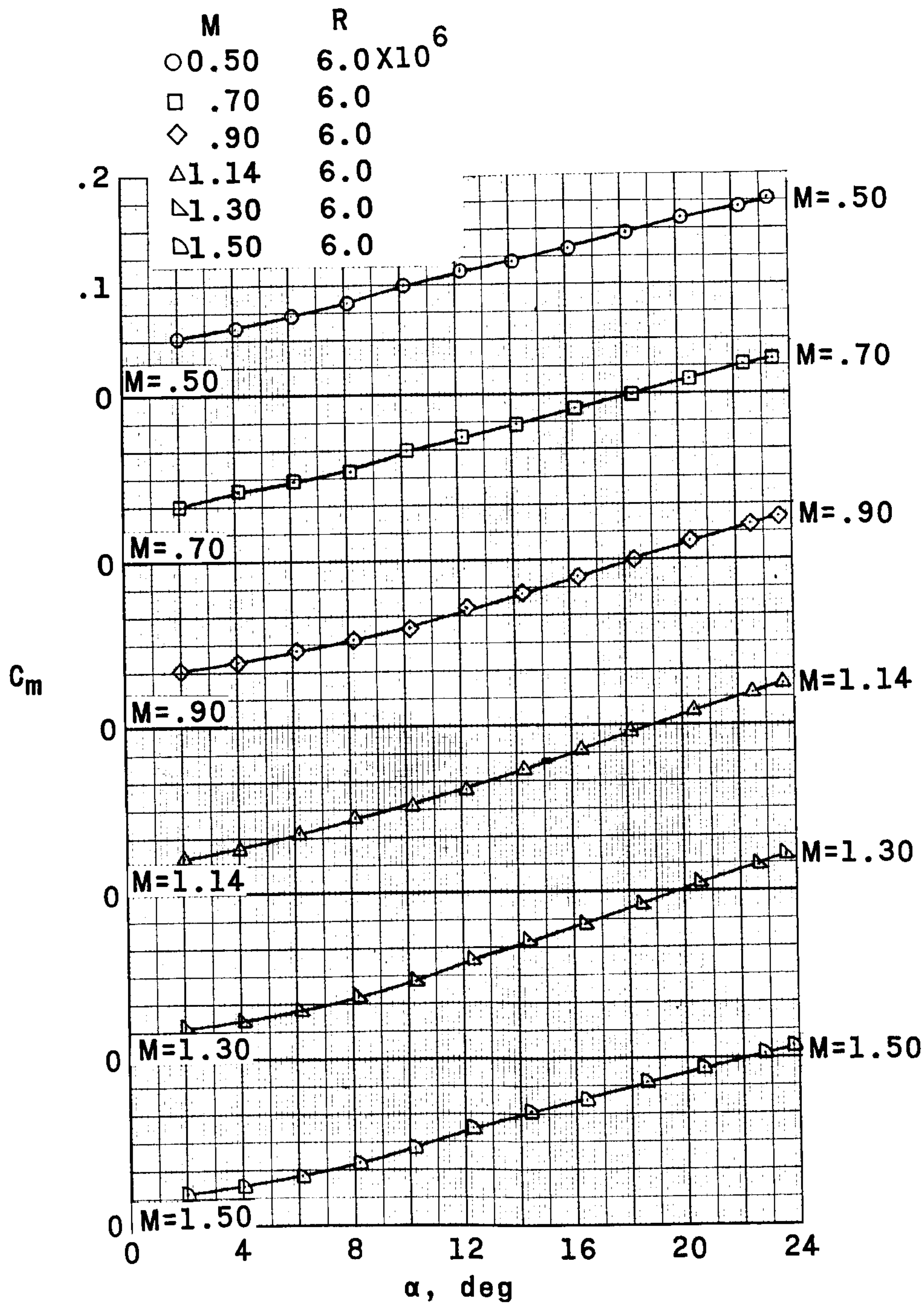


(a) M = 0.5 to 1.14.

Figure 10.- Variation of pitching-moment coefficient with angle of attack. Exit configuration; flagged symbols denote models without destabilizer flap.

[redacted]

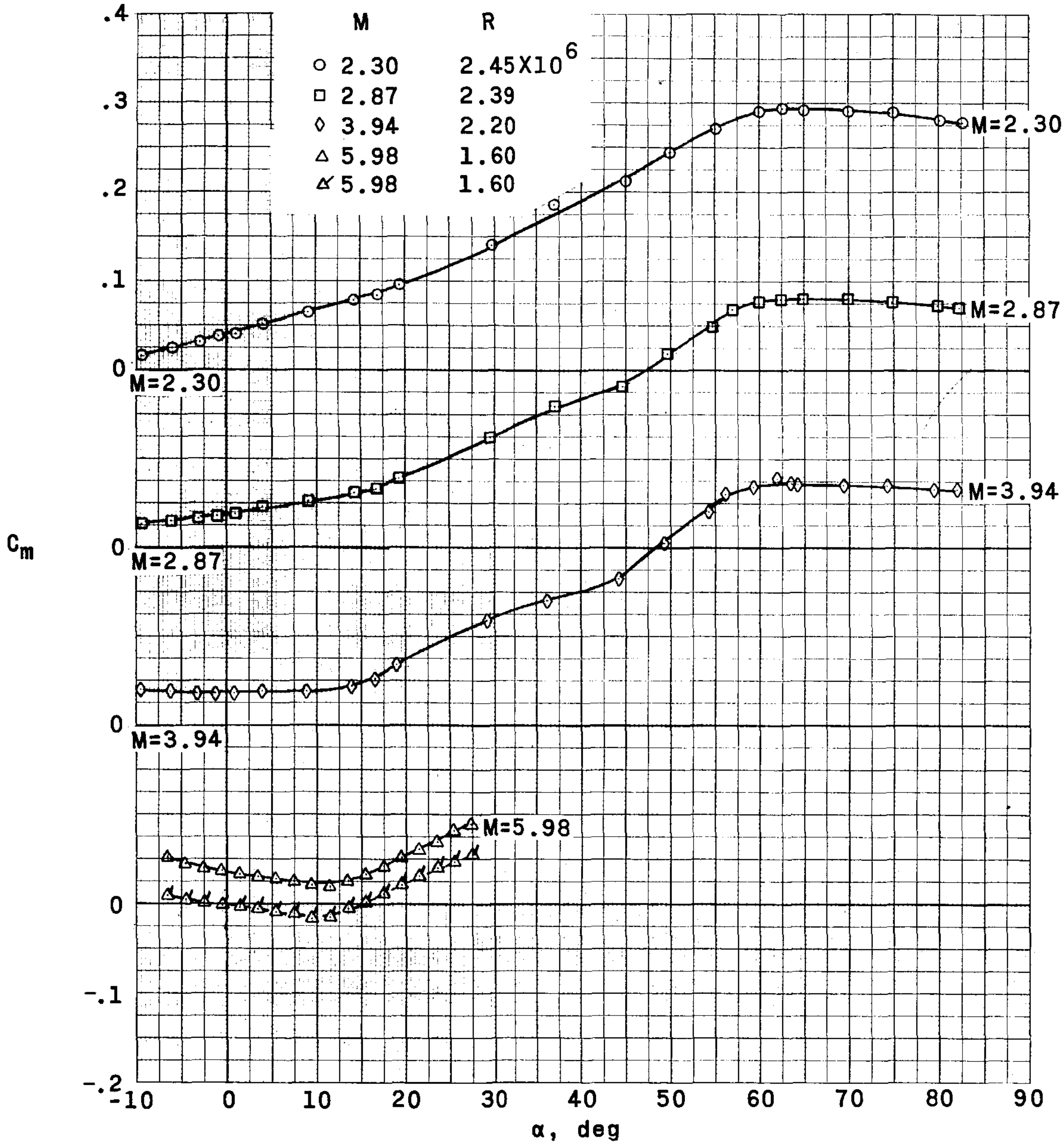
[redacted]



(b) M = 0.5 to 1.50.

Figure 10.- Continued.

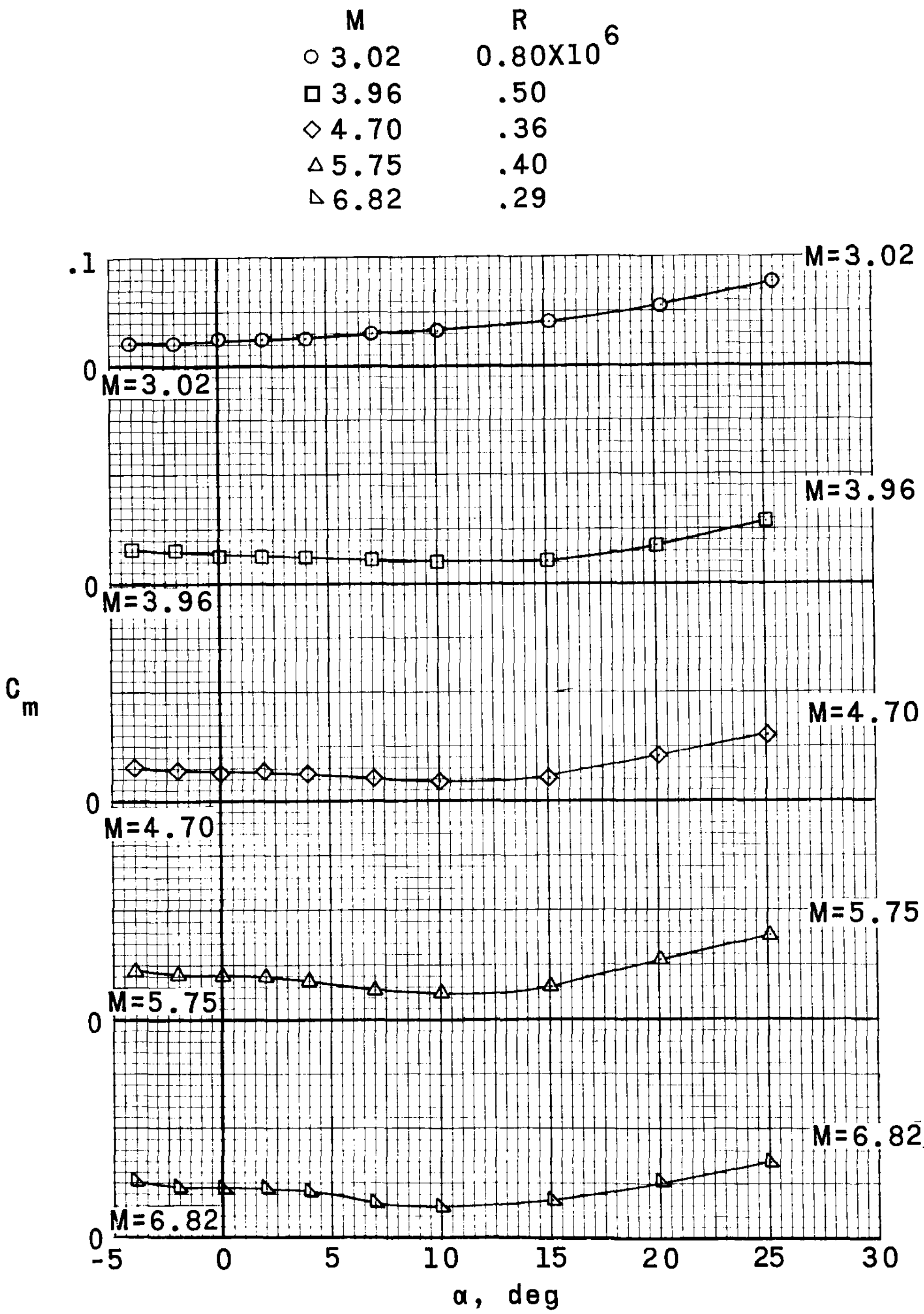
[redacted]



(c) M = 2.30 to 5.98.

Figure 10.- Continued.

[redacted]

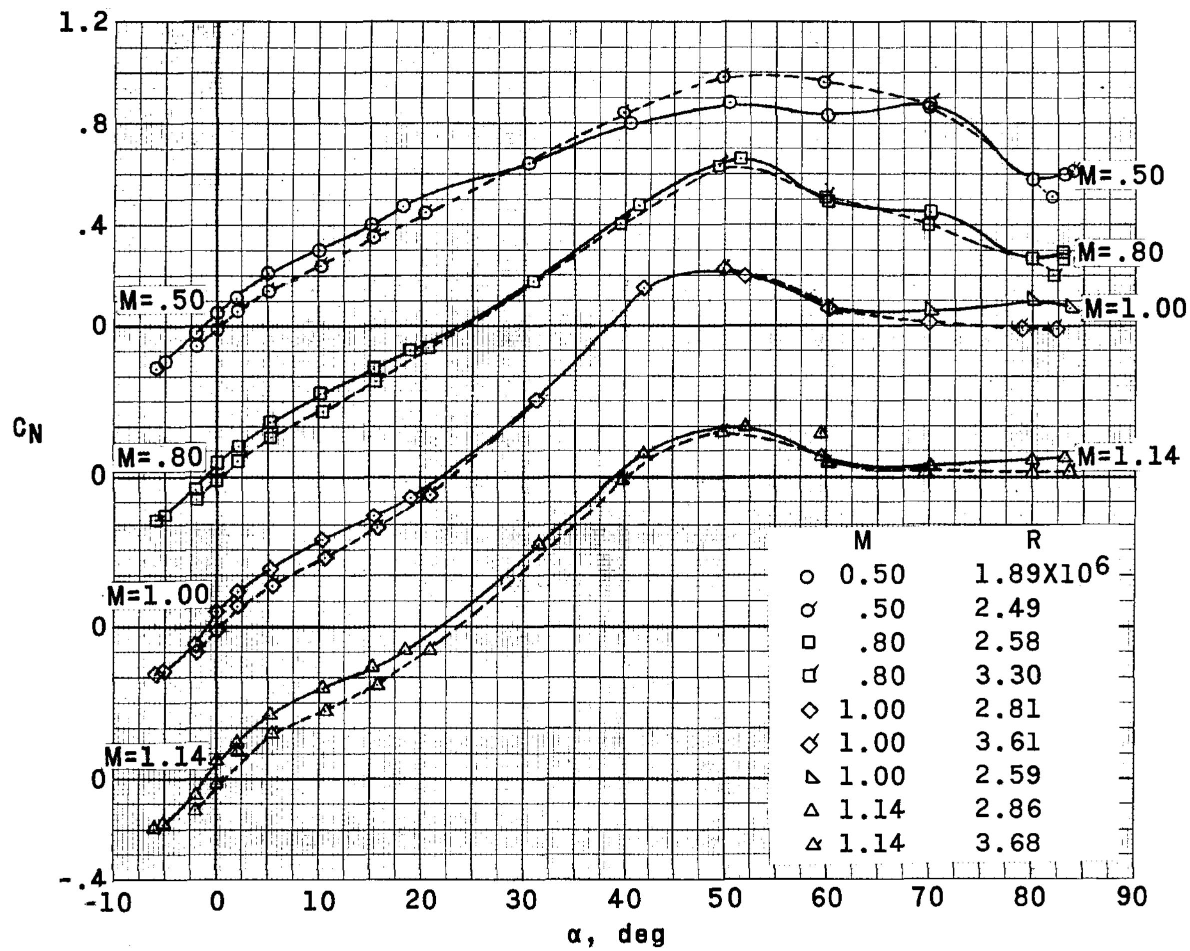


(d) M = 3.02 to 6.82.

Figure 10.- Concluded.

[redacted]

[redacted]

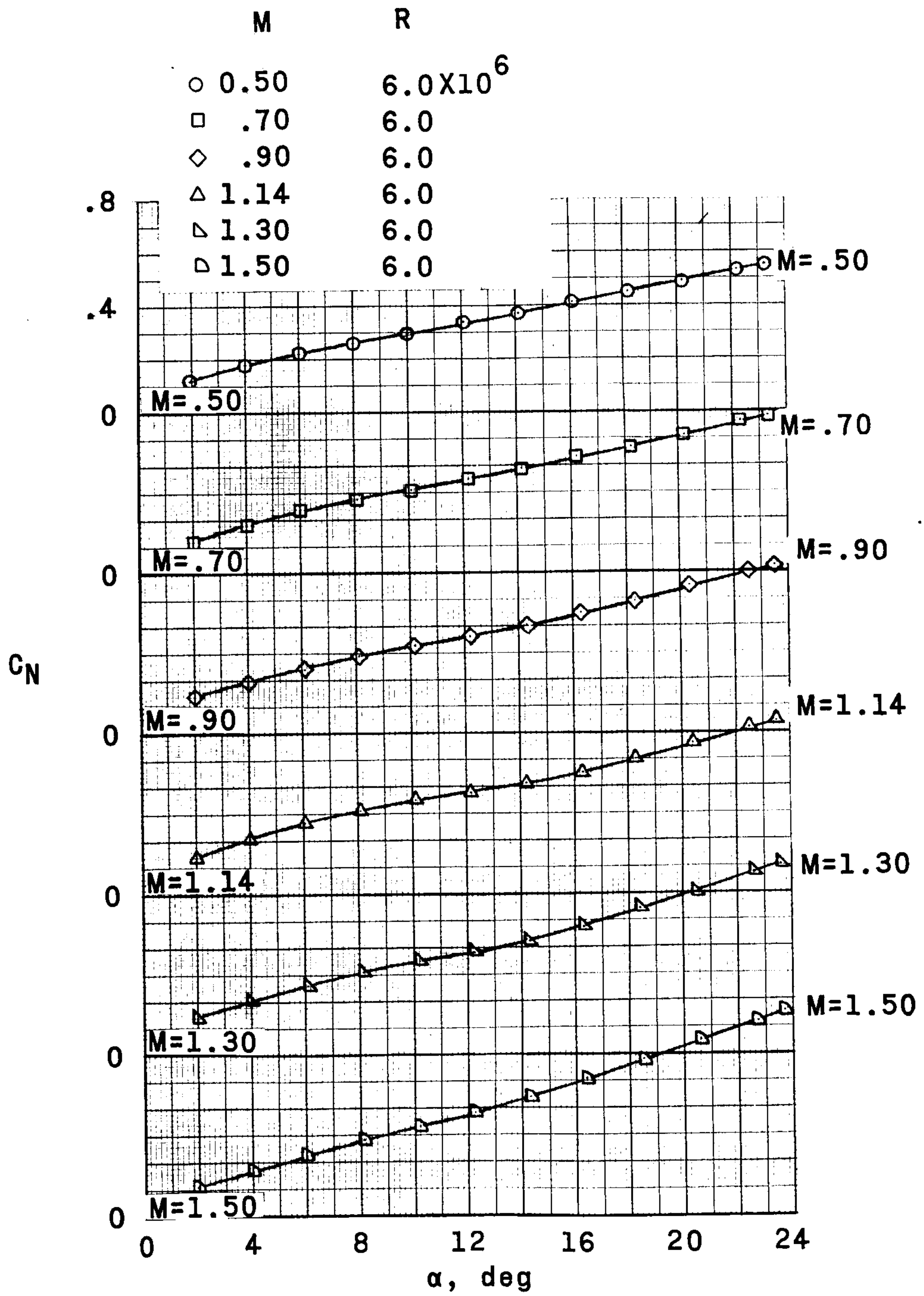


(a) M = 0.5 to 1.14.

Figure 11.- Variation of normal-force coefficient with angle of attack. Exit configuration; flagged symbols denote models without destabilizer flap.

[redacted]

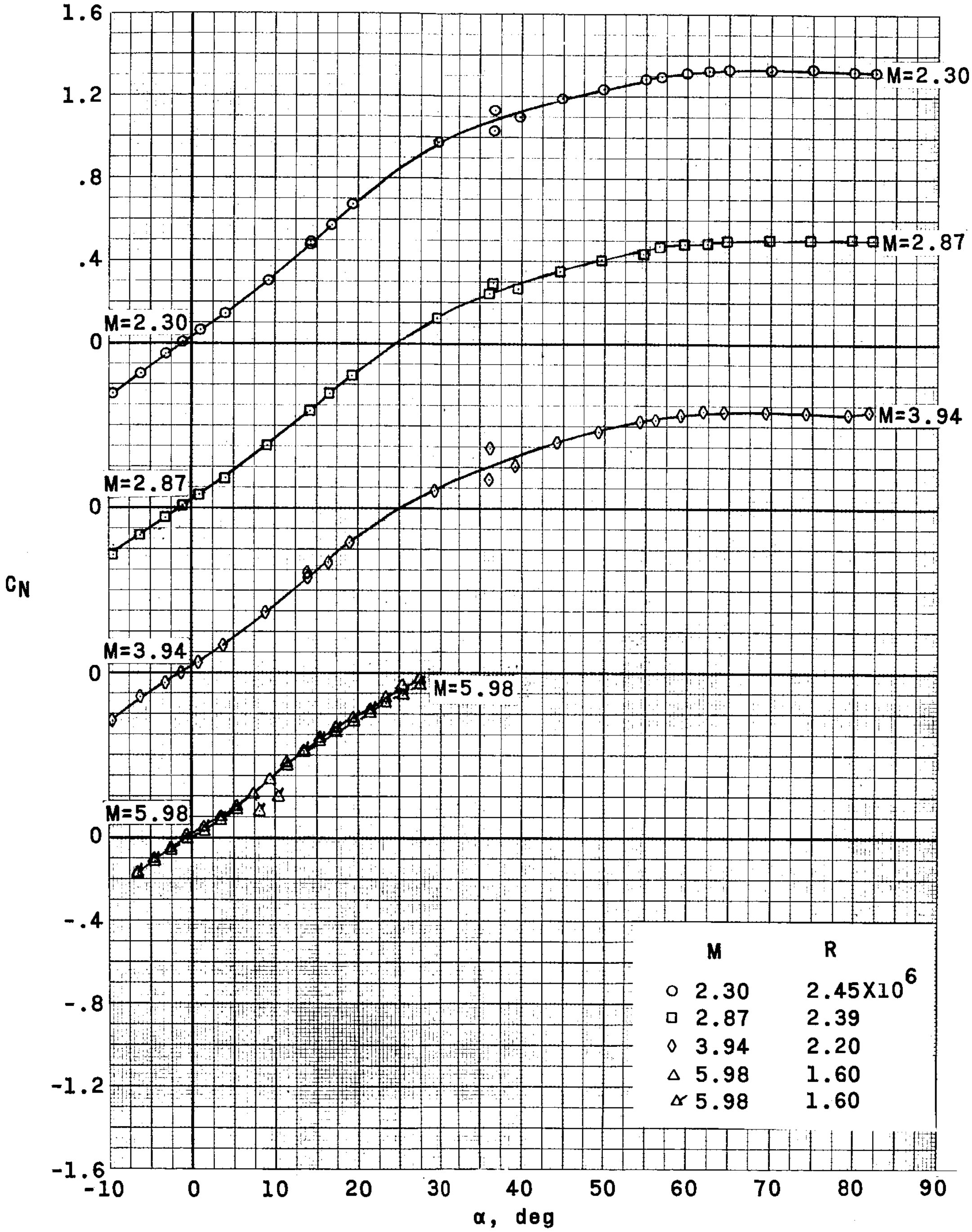
[redacted]



(b) M = 0.50 to 1.50.

Figure 11.- Continued.

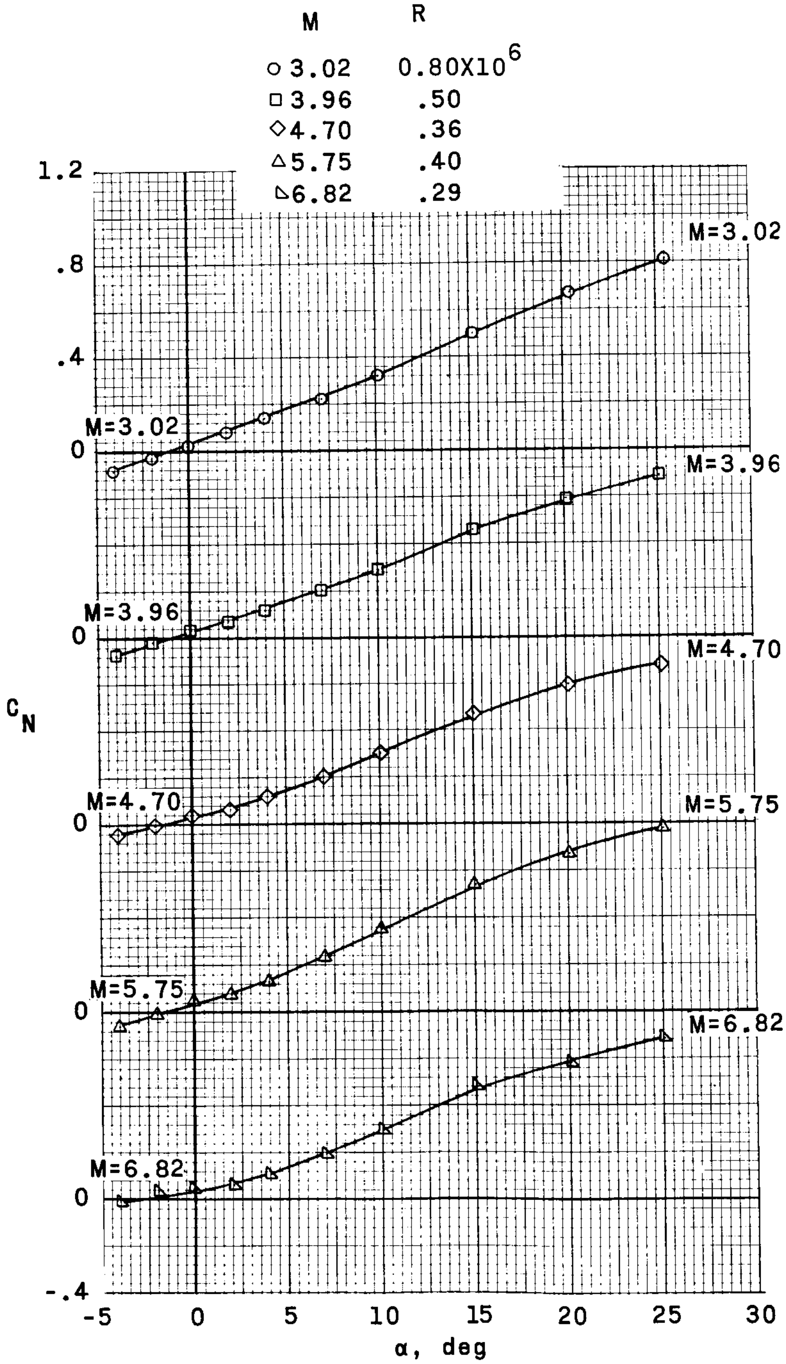
[redacted]



(c) M = 2.30 to 5.98.

Figure 11.- Continued.

[redacted]

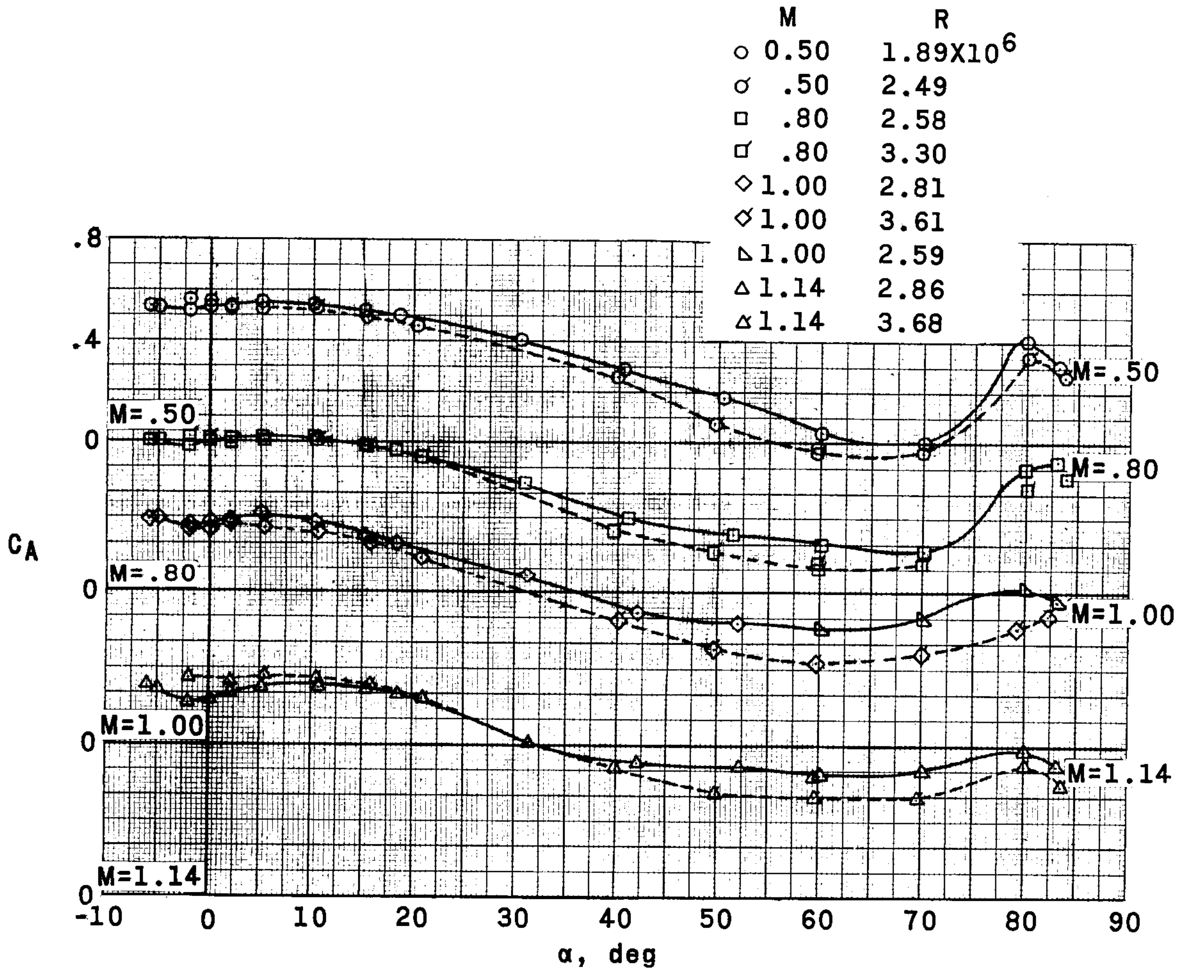


(d) M = 3.02 to 6.82.

Figure 11.- Concluded.

[redacted]

[redacted]

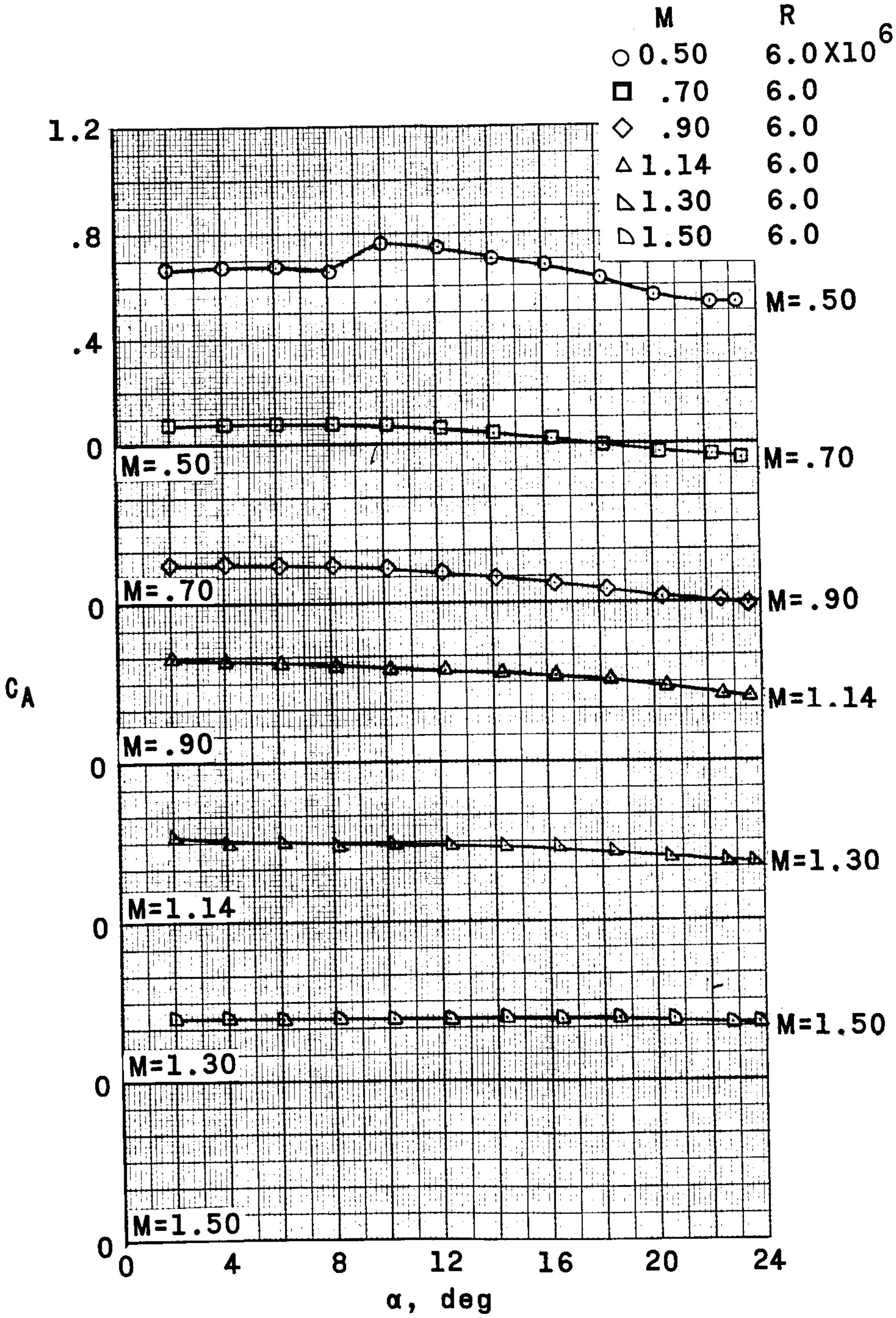


(a) M = 0.5 to 1.14.

Figure 12.- Variation of axial-force coefficient with angle of attack. Exit configuration; flagged symbols denote models without destabilizer flap.

[redacted]

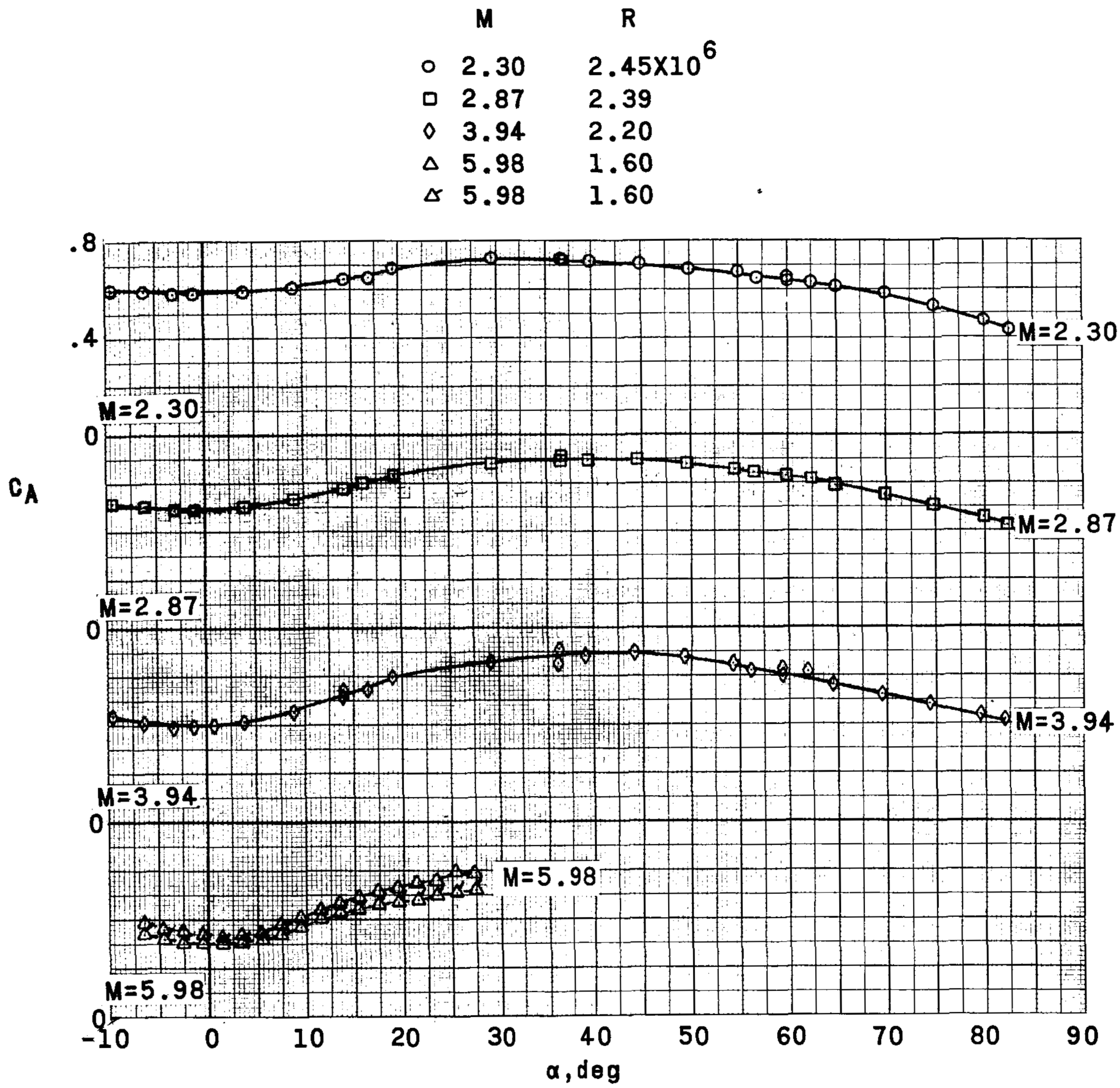
[redacted]



(b) M = 0.50 to 1.50.

Figure 12.- Continued.

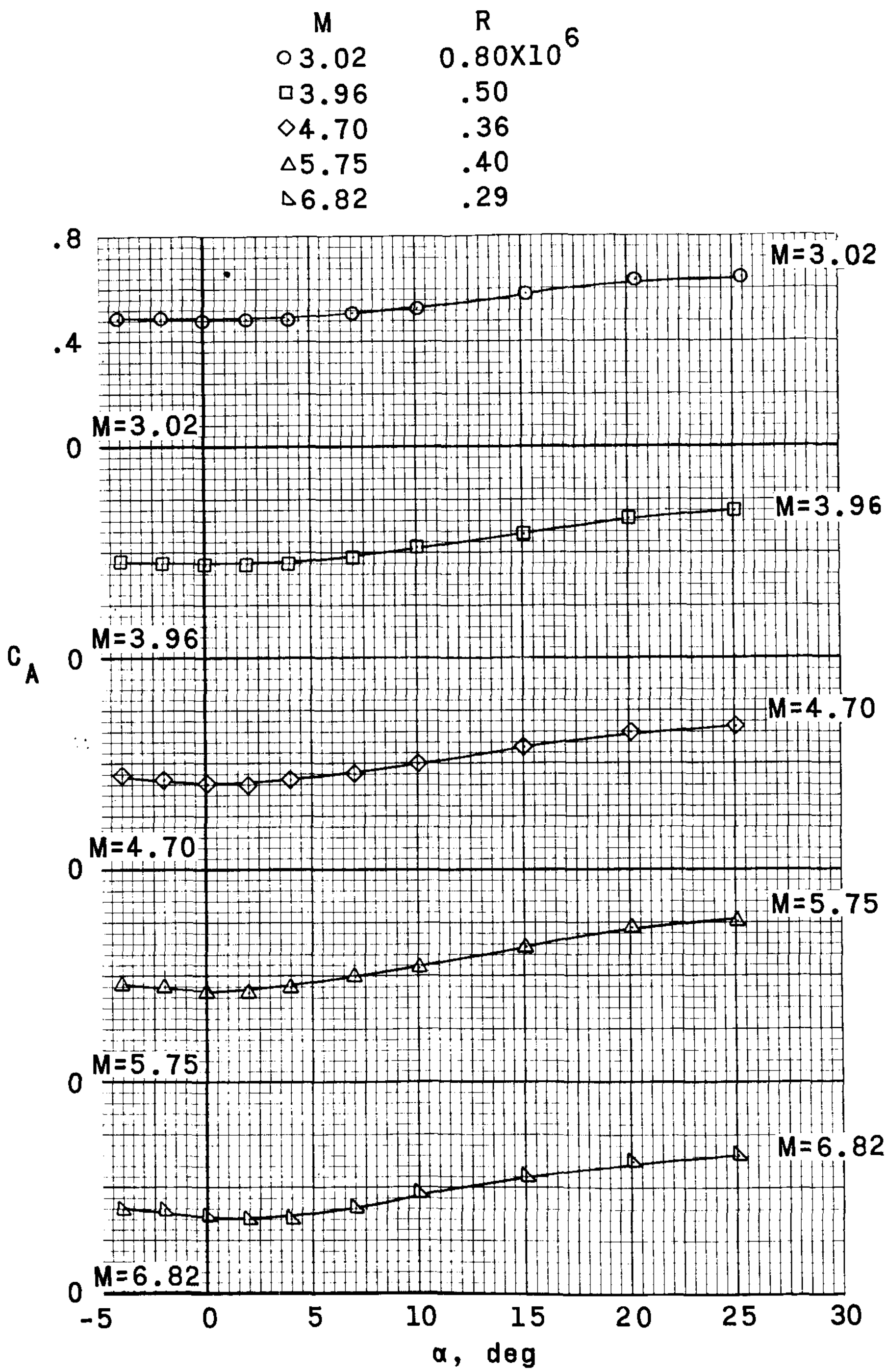
[redacted]



(c) M = 2.30 to 5.98.

Figure 12.- Continued.

[redacted]

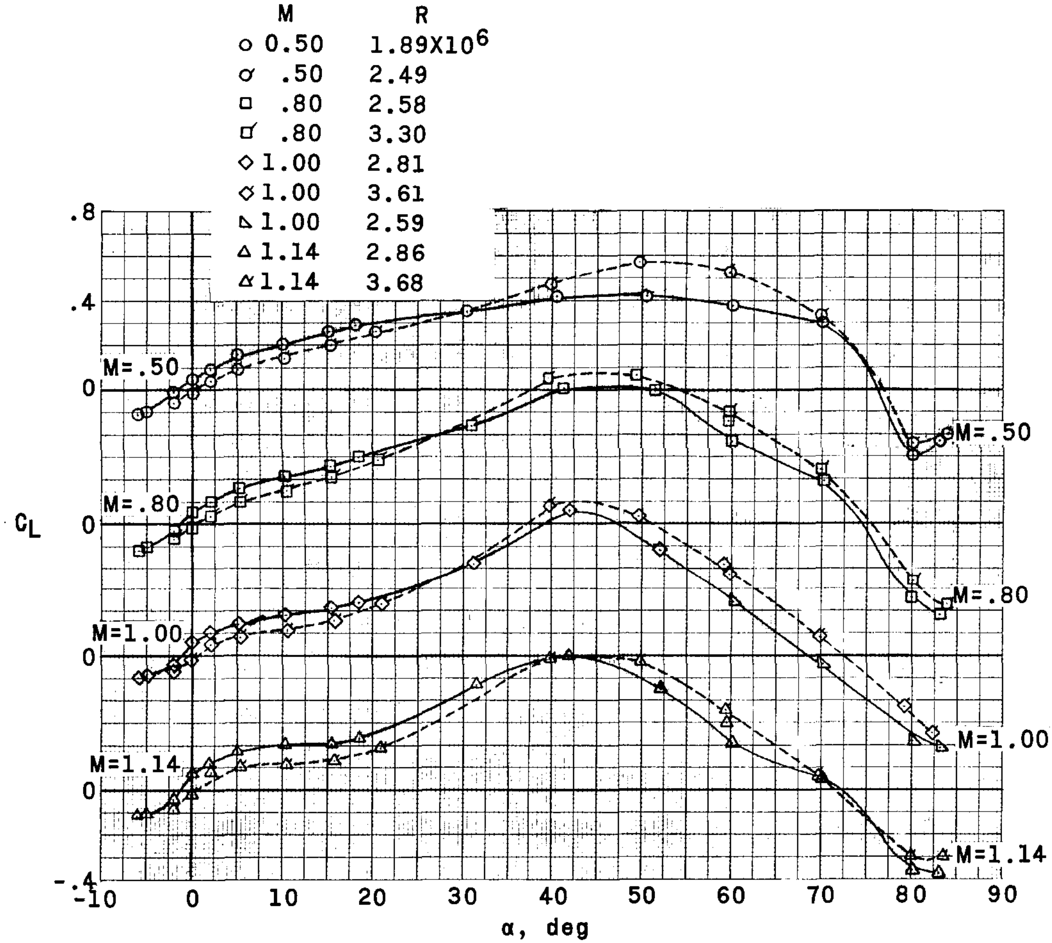


(d) M = 3.02 to 6.82.

Figure 12.- Concluded.

G-3

[redacted]

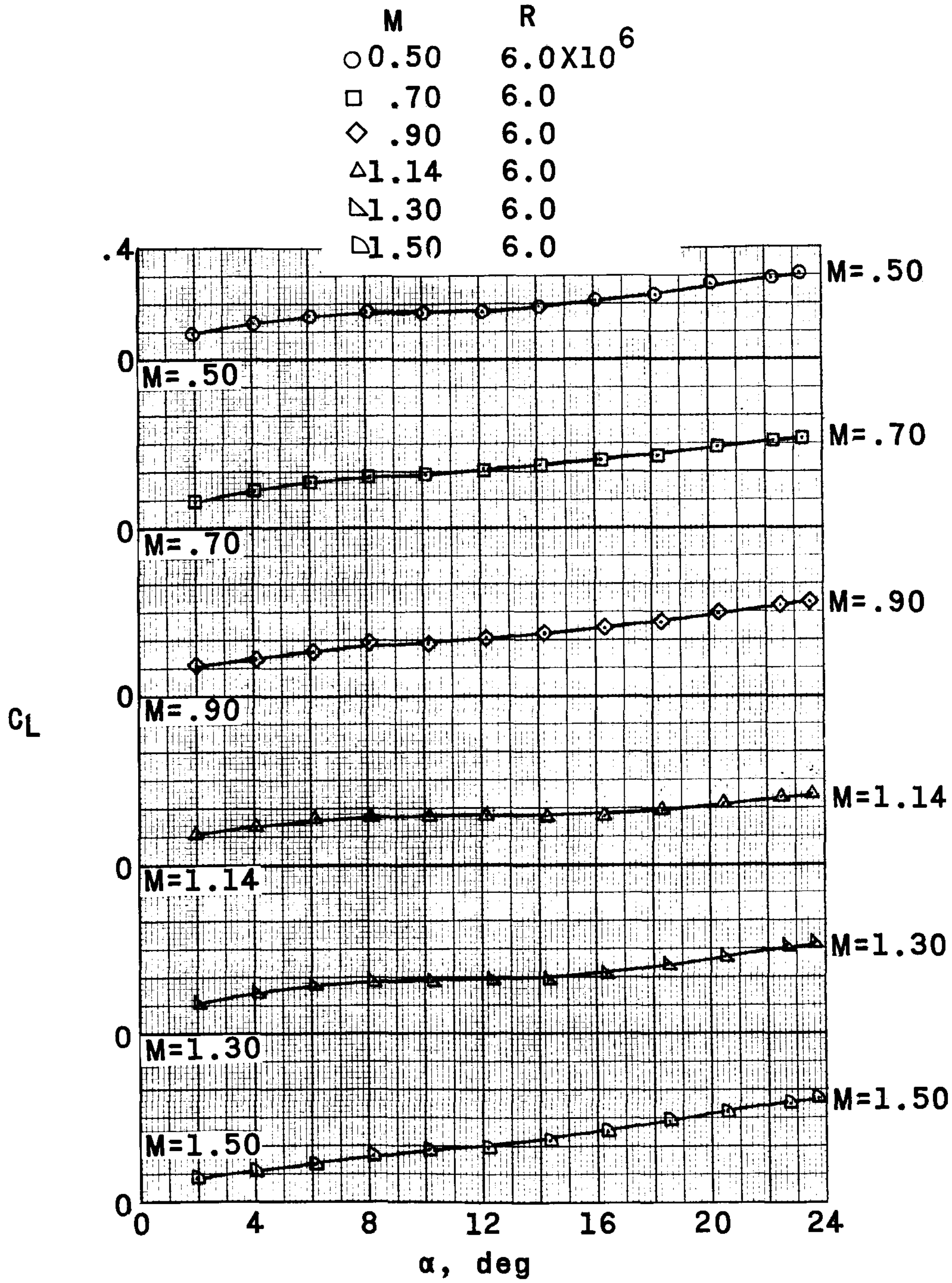


(a) M = 0.5 to 1.14.

Figure 13.- Variation of lift coefficient with angle of attack. Exit configuration; flagged symbols denote models without destabilizer flap.

[redacted]

[redacted]

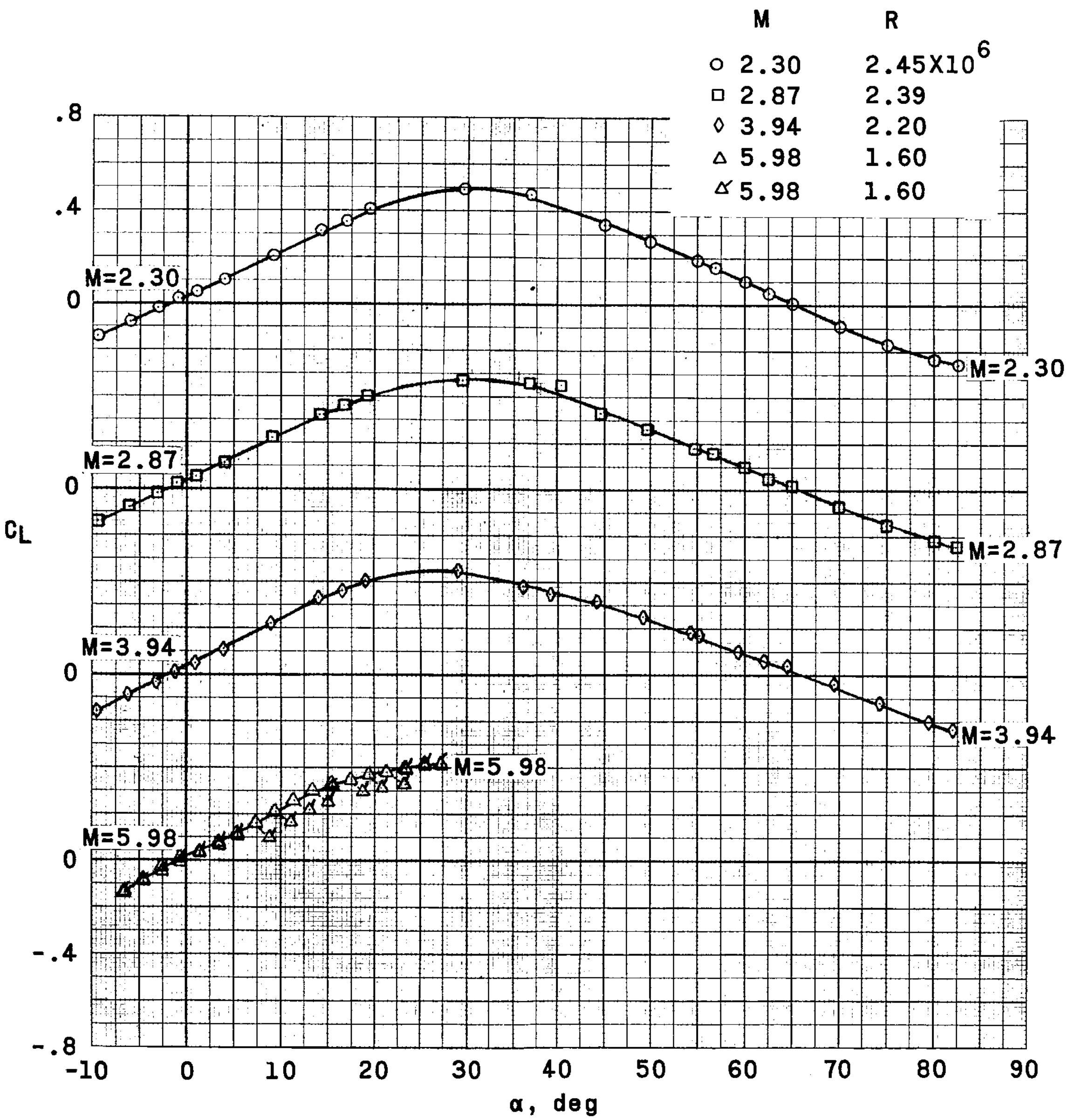


(b) M = 0.50 to 1.50.

Figure 13.- Continued.

G-3

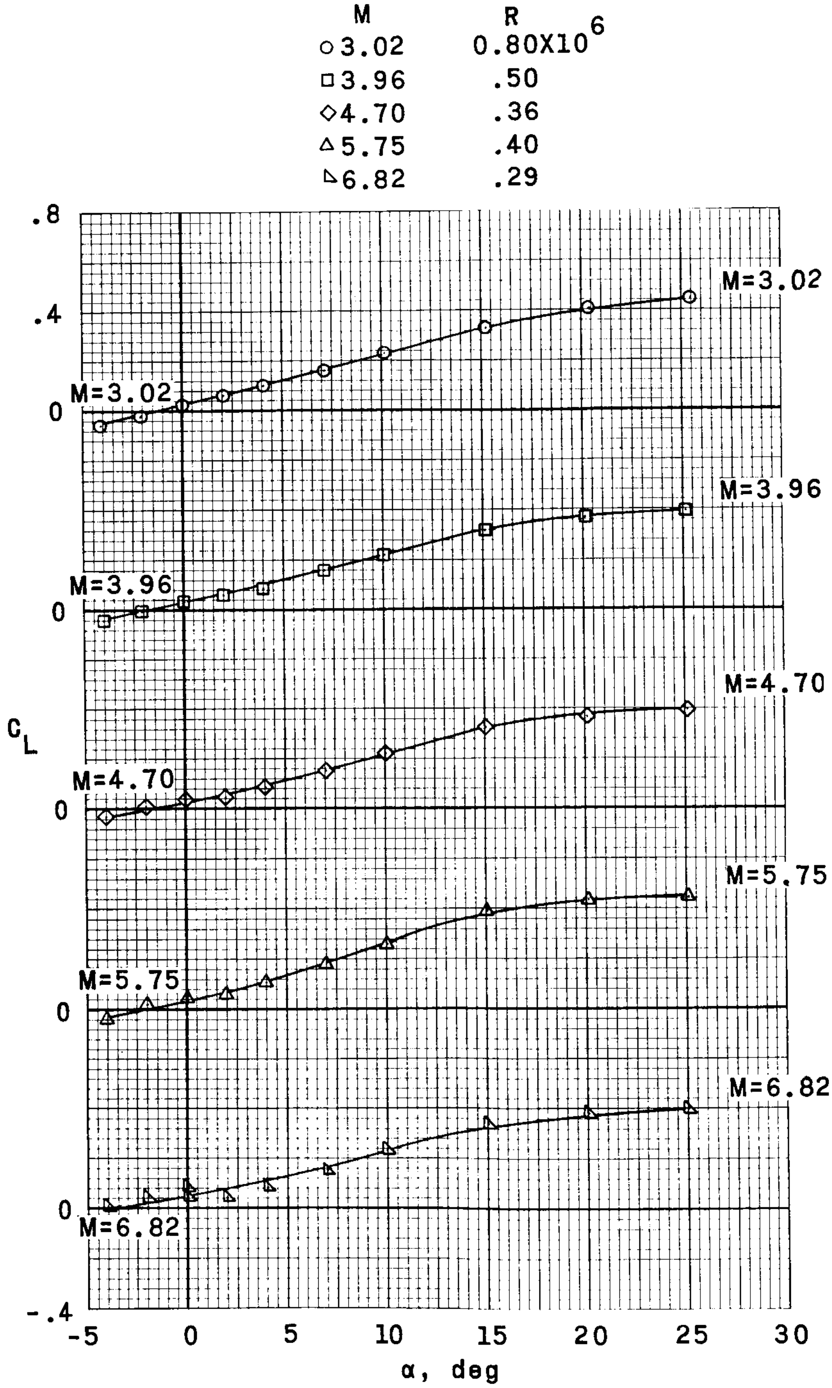
[redacted]



(c) M = 2.30 to 5.98.

Figure 13.- Continued.

[redacted]

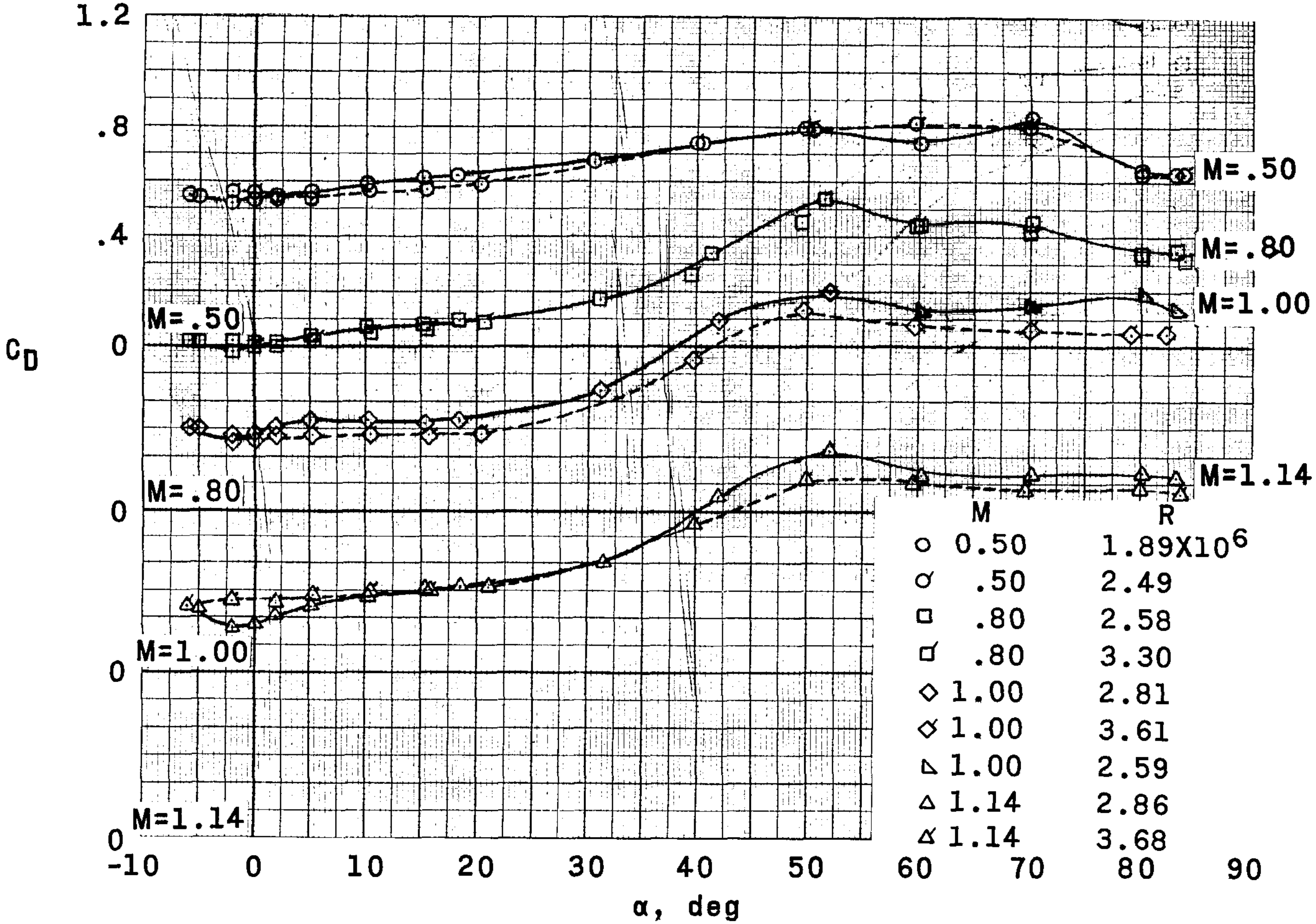


(d) M = 3.02 to 6.82.

Figure 13.- Concluded.

[redacted]

[redacted]

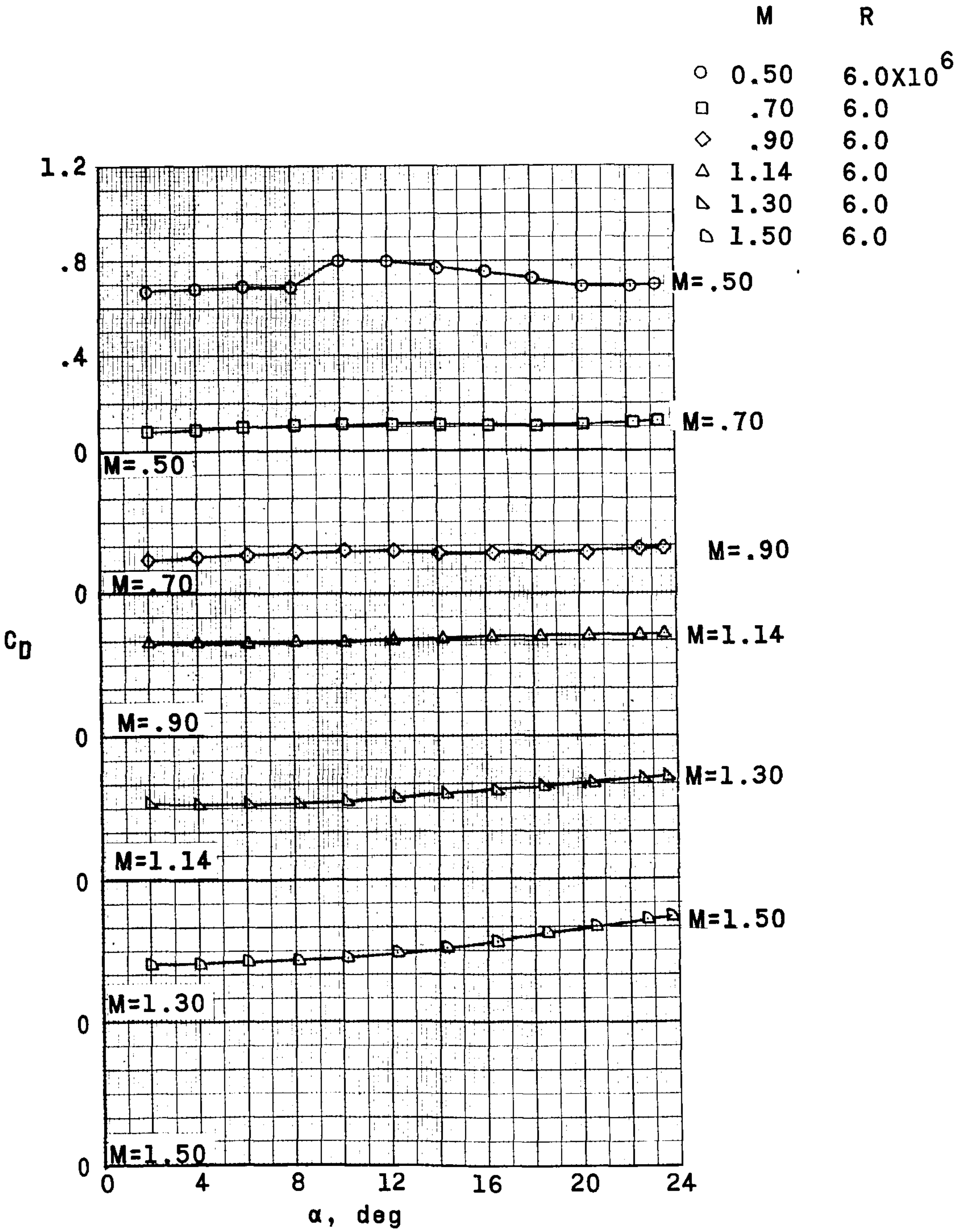


(a) M = 0.5 to 1.14.

Figure 14.- Variation of drag coefficient with angle of attack. Exit configuration; flagged symbols denote models without destabilizer flap.

[redacted]

[redacted]

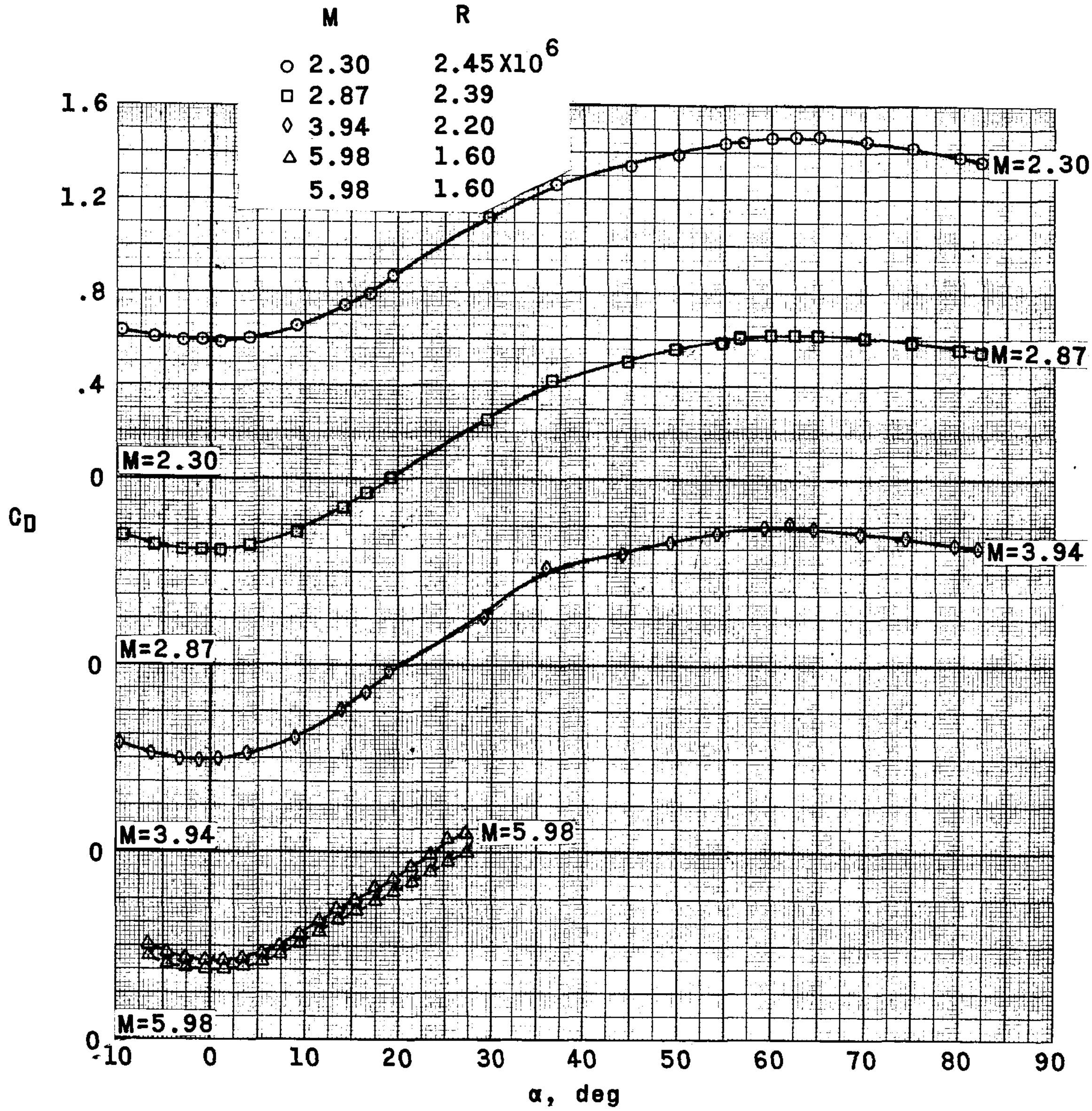


(b) M = 0.50 to 1.50.

Figure 14.- Continued.

[redacted]

[redacted]

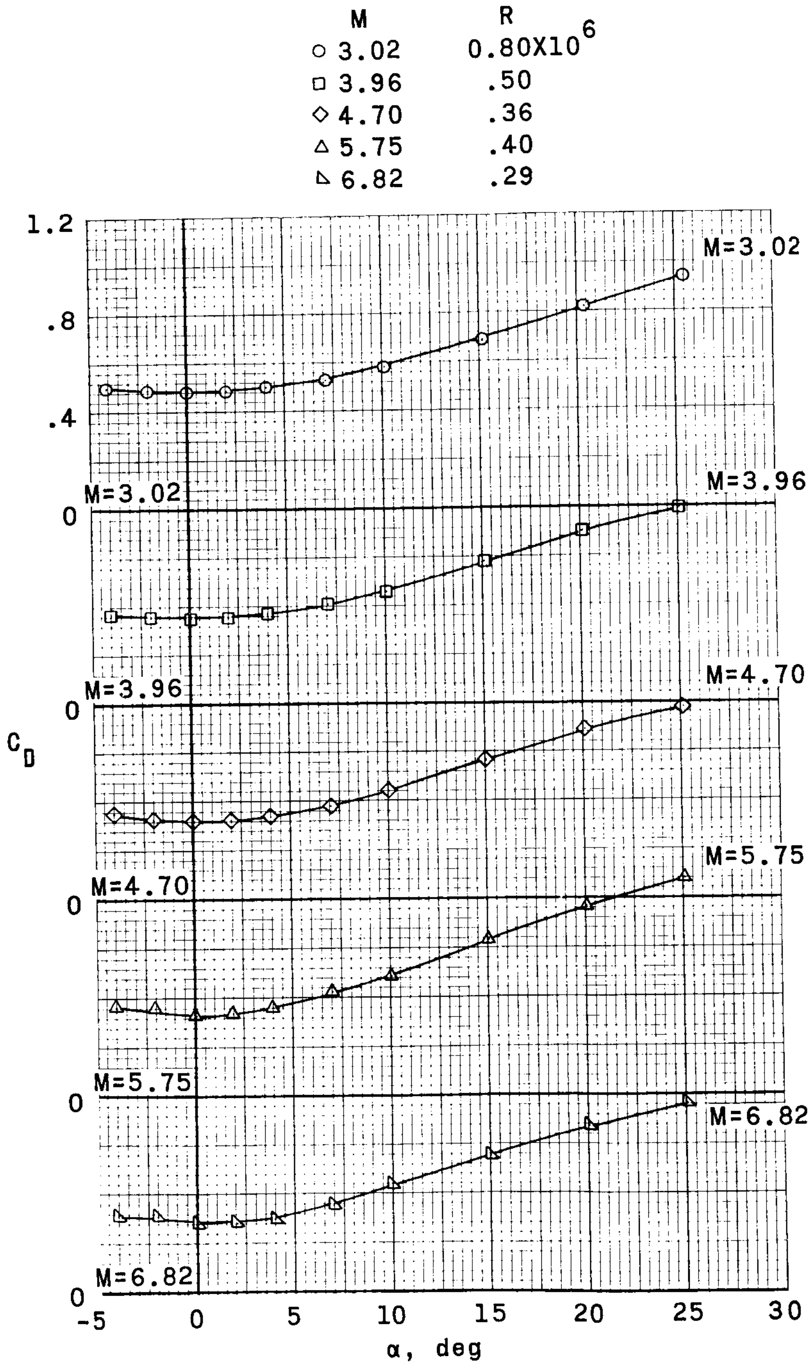


(c) M = 2.30 to 5.98.

Figure 14.- Continued.

[redacted]

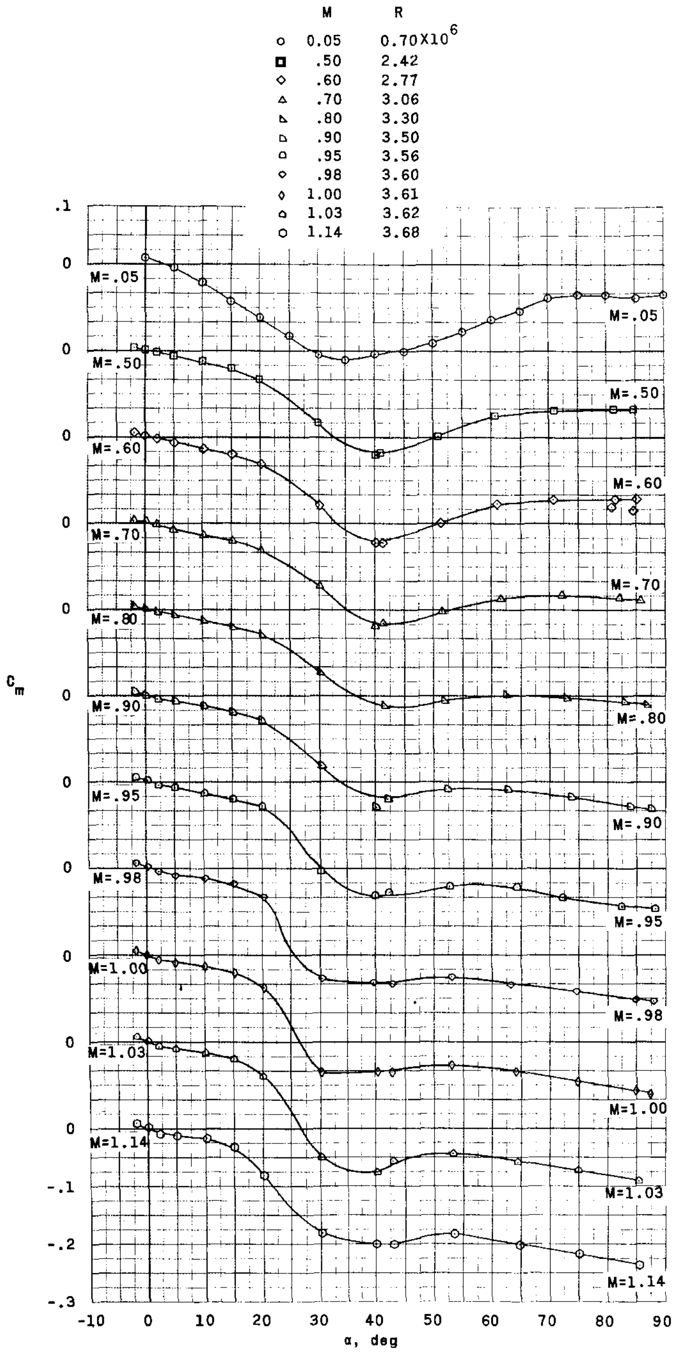
[redacted]



(d) M = 3.02 to 6.82.

Figure 14.- Concluded.

[redacted]

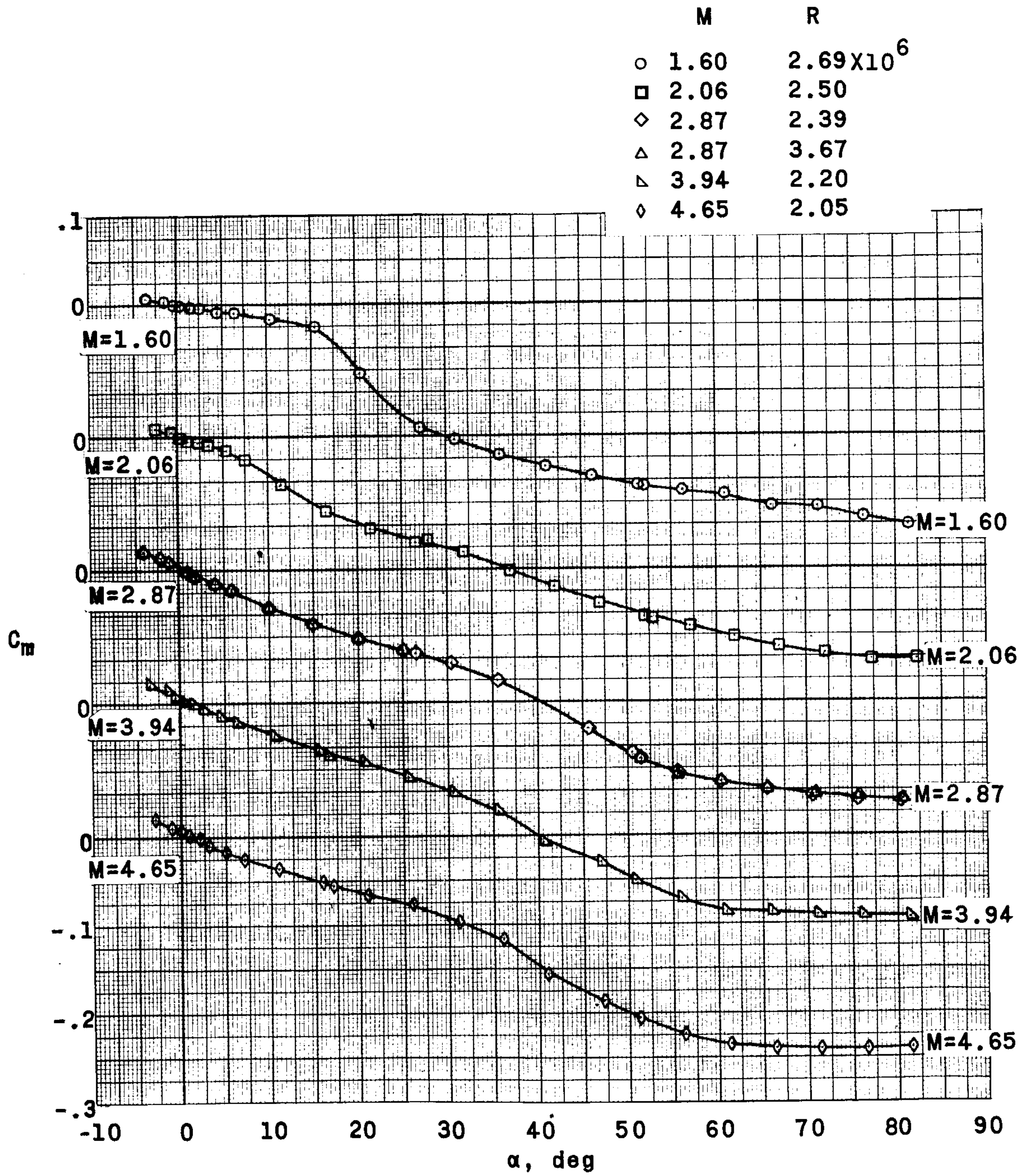


(a) M = 0.05 to 1.14.

Figure 15.- Variation of pitching-moment coefficient with angle of attack. Reentry configuration.

[redacted]

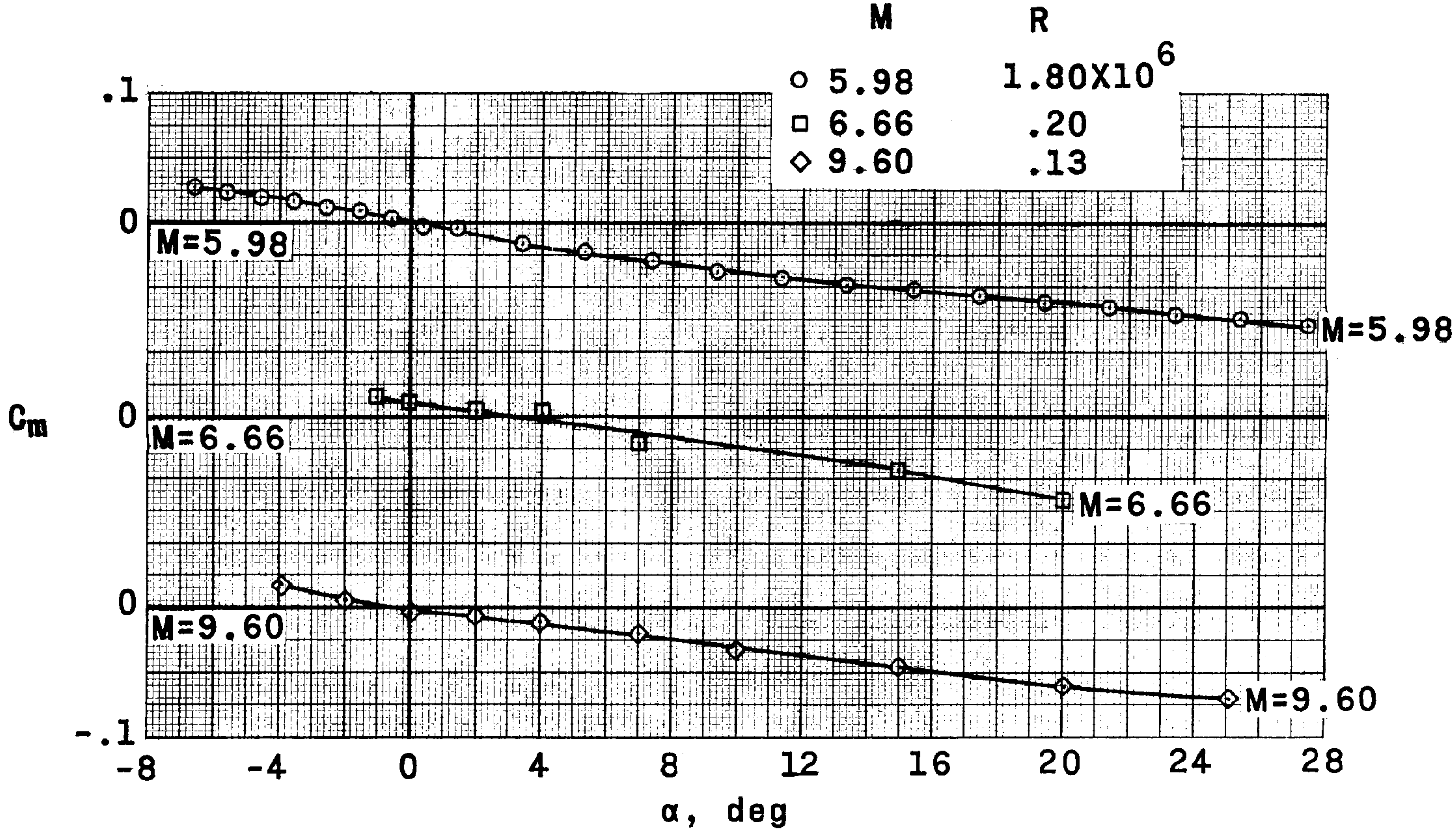
[redacted]



(b) M = 1.60 to 4.65.

Figure 15.- Continued.

[redacted]

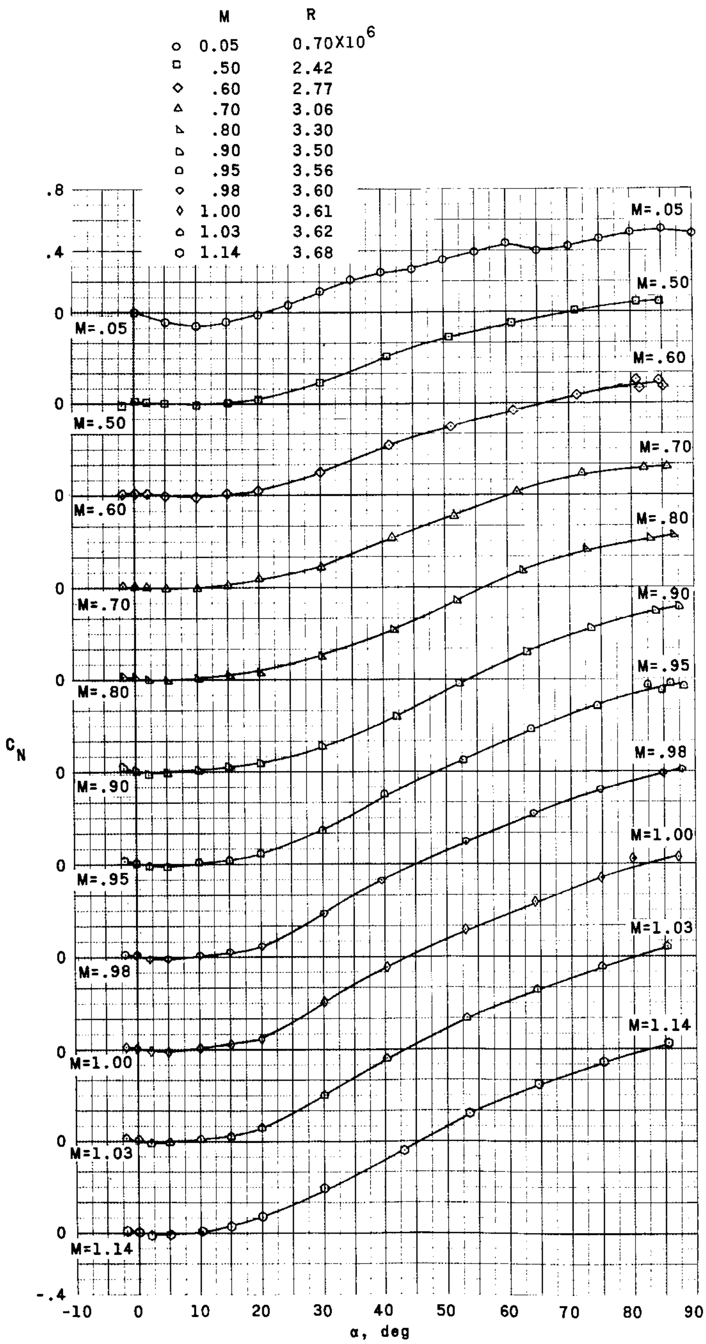


(c) M = 5.98 to 9.60.

Figure 15.- Concluded.

[redacted]

[redacted]

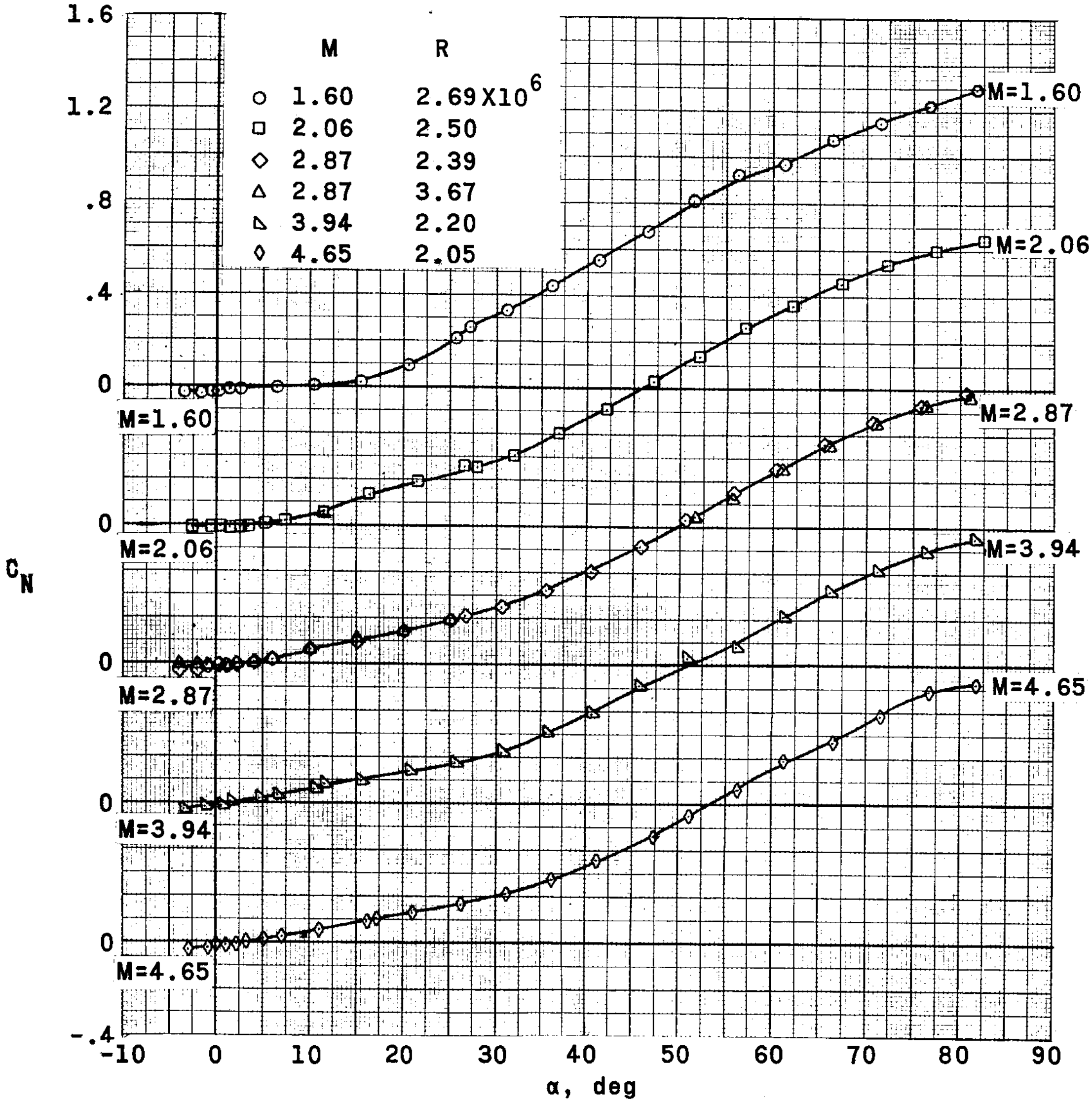


(a) M = 0.05 to 1.14.

Figure 16.- Variation of normal-force coefficient with angle of attack. Reentry configuration.

[redacted]

[redacted]

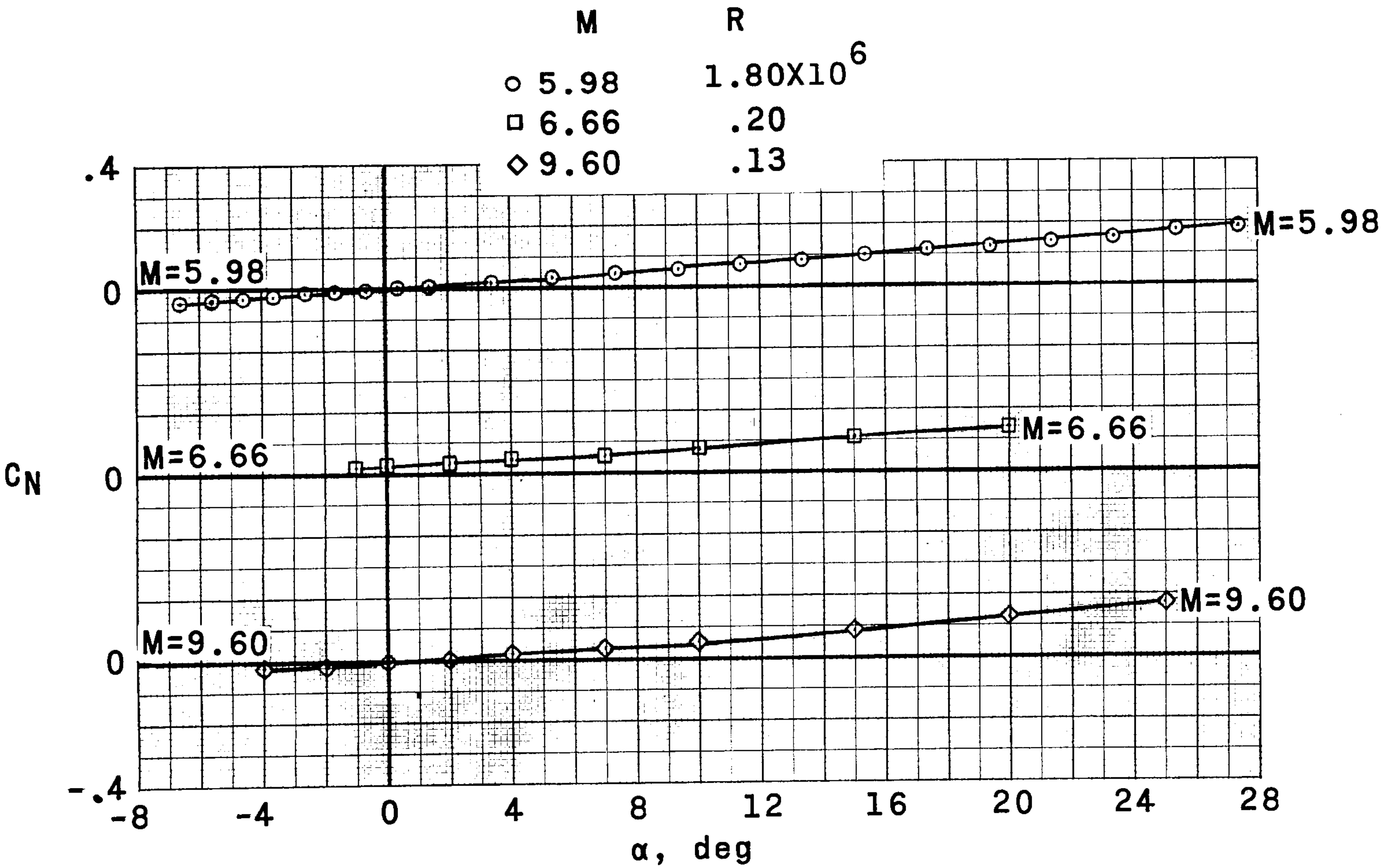


(b) M = 1.60 to 4.65.

Figure 16.- Continued.

[redacted]

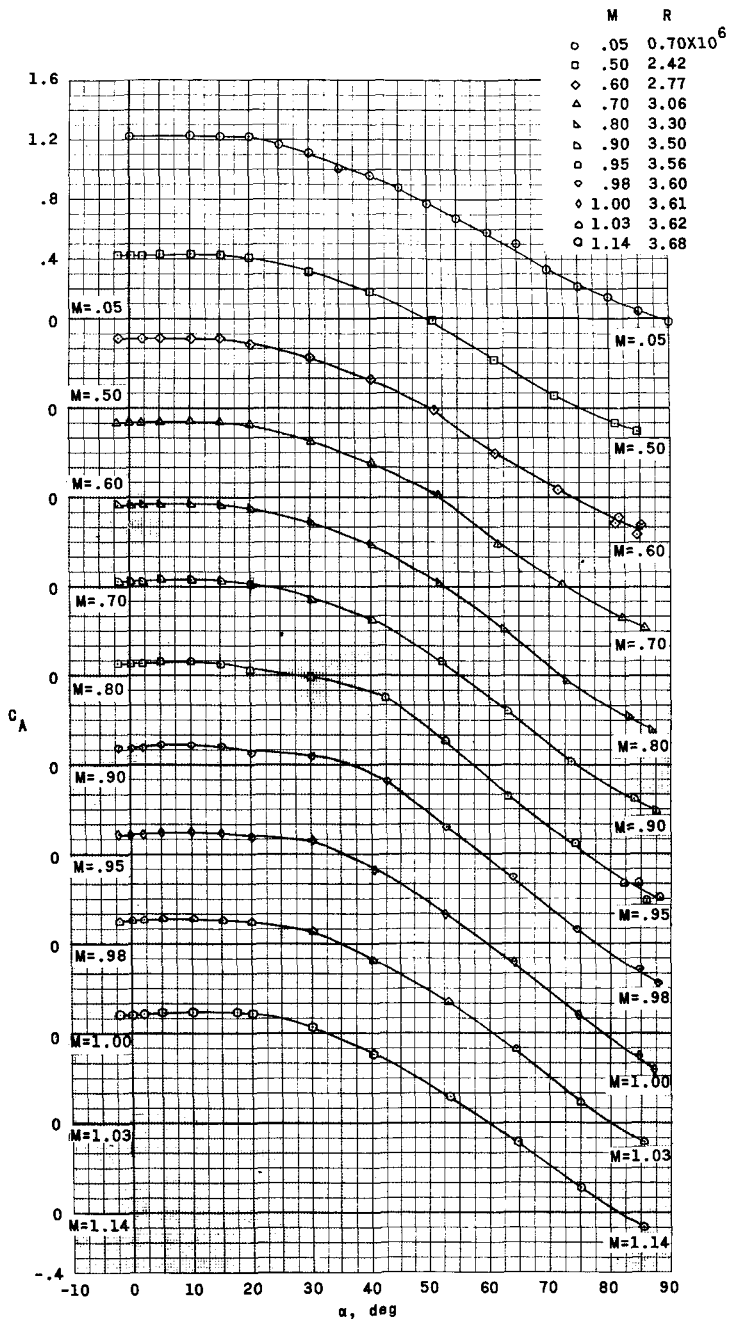
[redacted]



(c) M = 5.98 to 9.60.

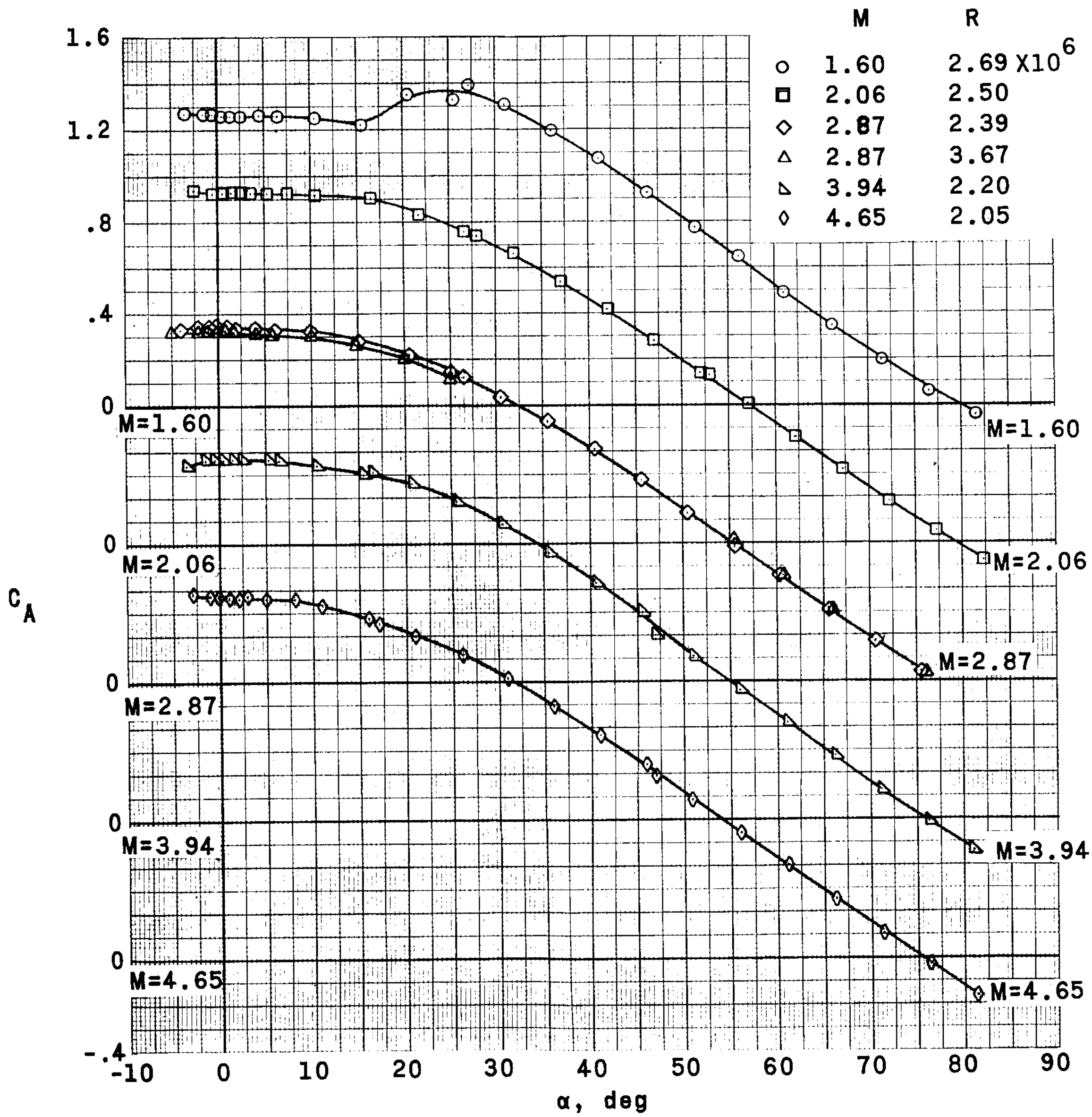
Figure 16.- Concluded.

[redacted]



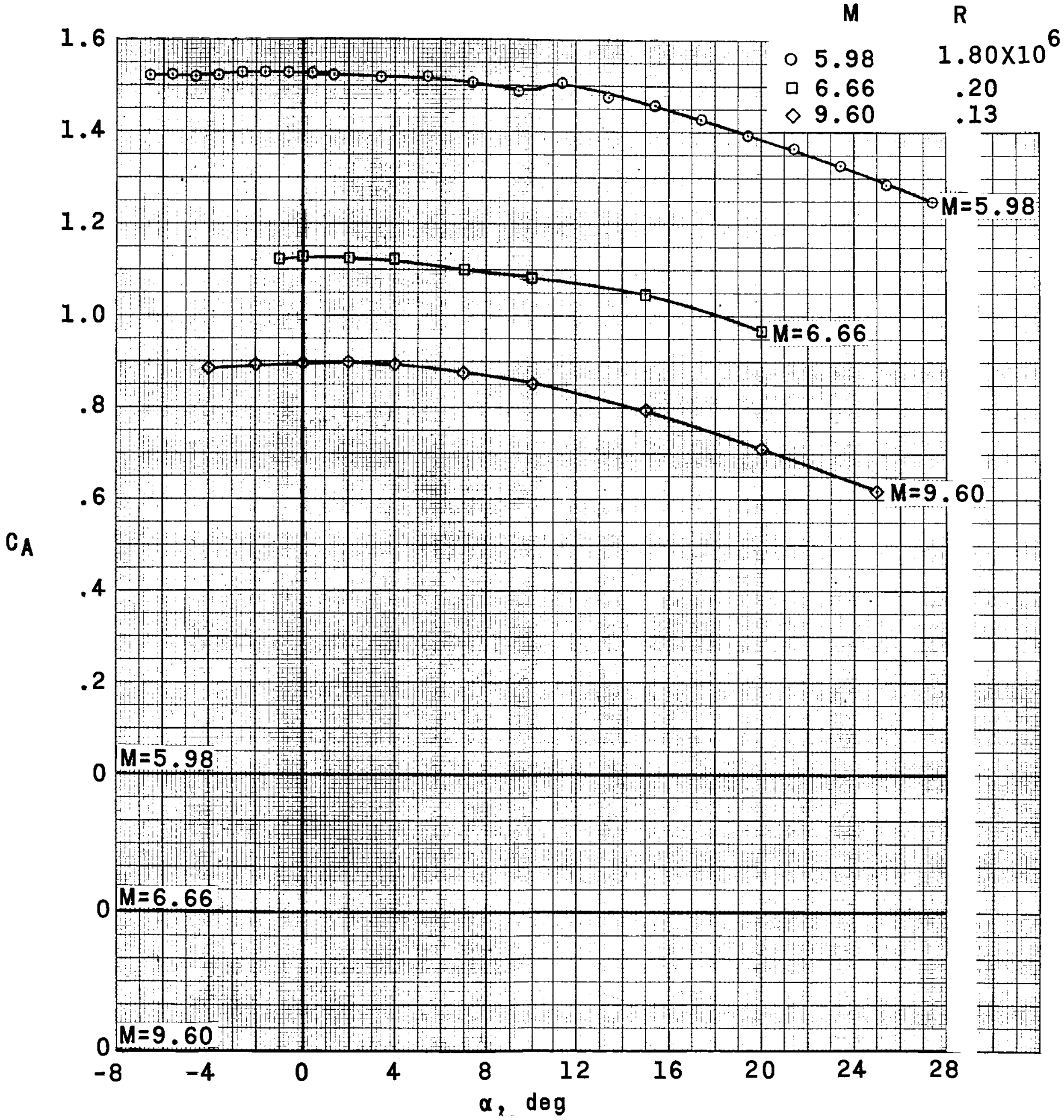
(a) M = 0.05 to 1.14.

Figure 17.- Variation of axial-force coefficient with angle of attack. Reentry configuration.



(b) M = 1.60 to 4.65.

Figure 17.- Continued.

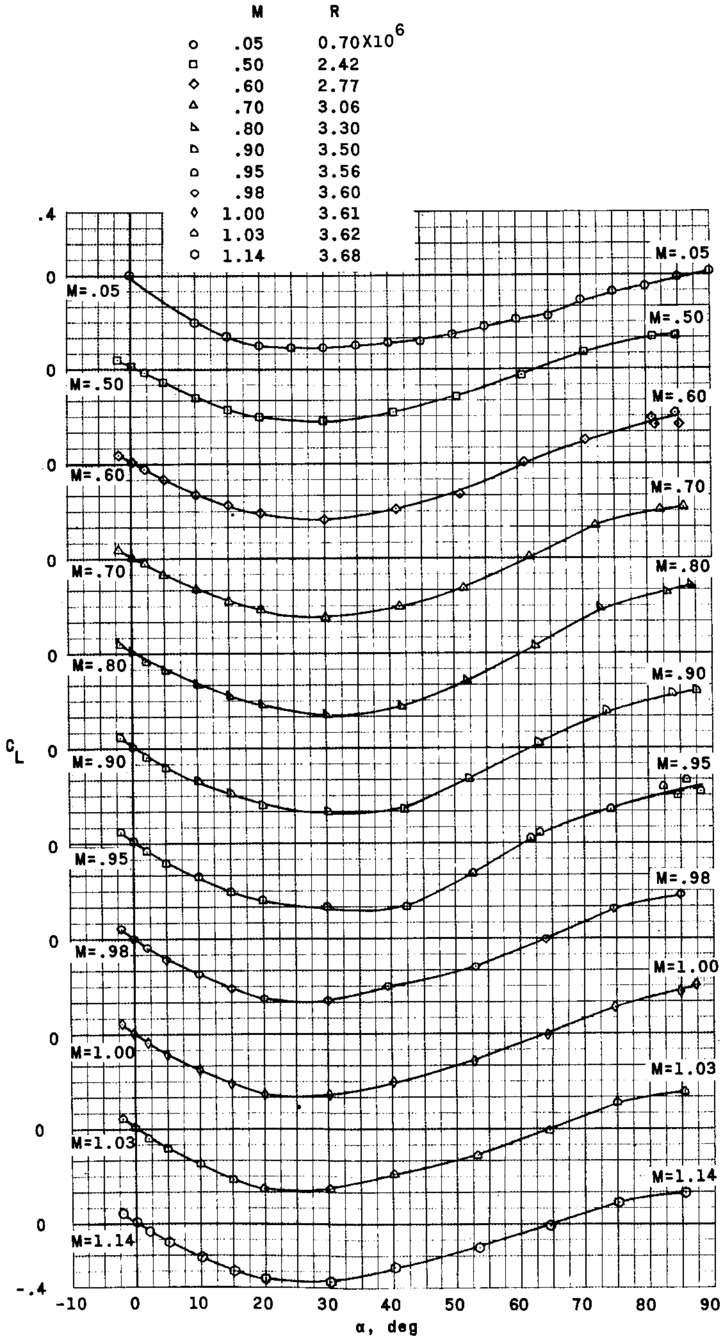


(c) M = 5.98 to 9.60.

Figure 17.- Concluded.

[redacted]

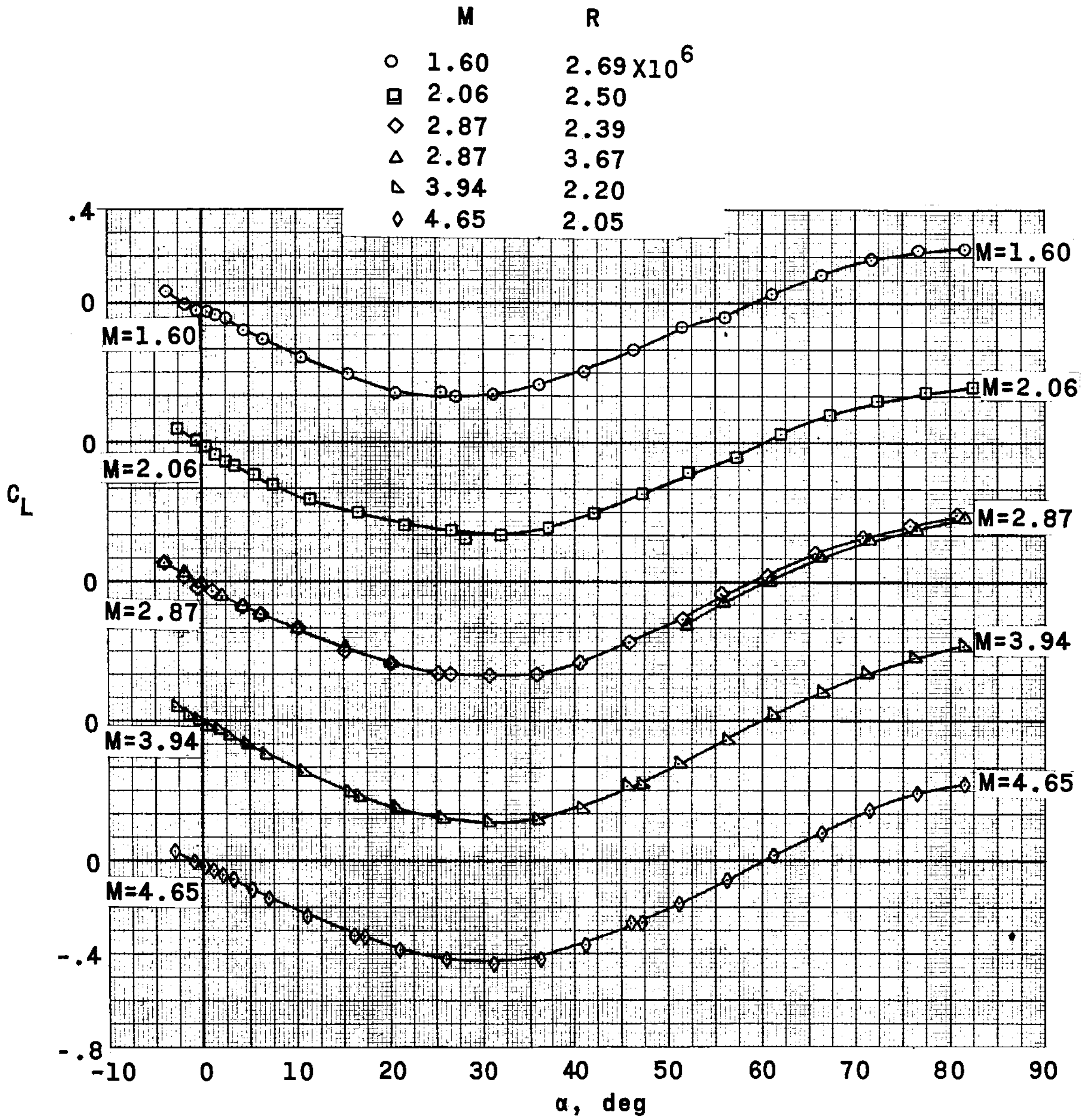
[redacted]



(a) M = 0.05 to 1.14.

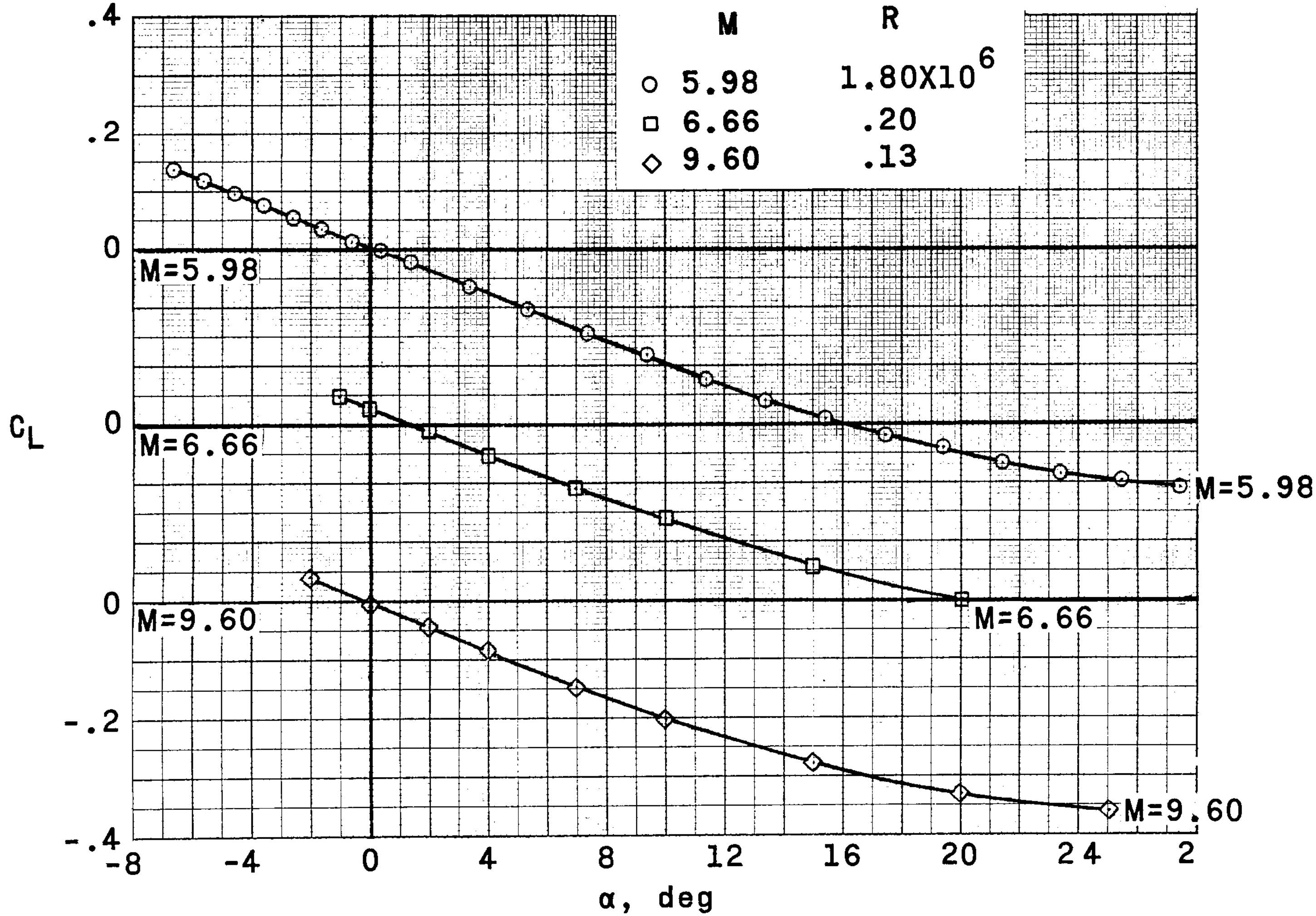
Figure 18.- Variation of lift coefficient with angle of attack. Reentry configuration.

[redacted]



(b) M = 1.60 to 4.65.

Figure 18.- Continued.



(c) M = 5.98 to 9.60.

Figure 18.- Concluded.

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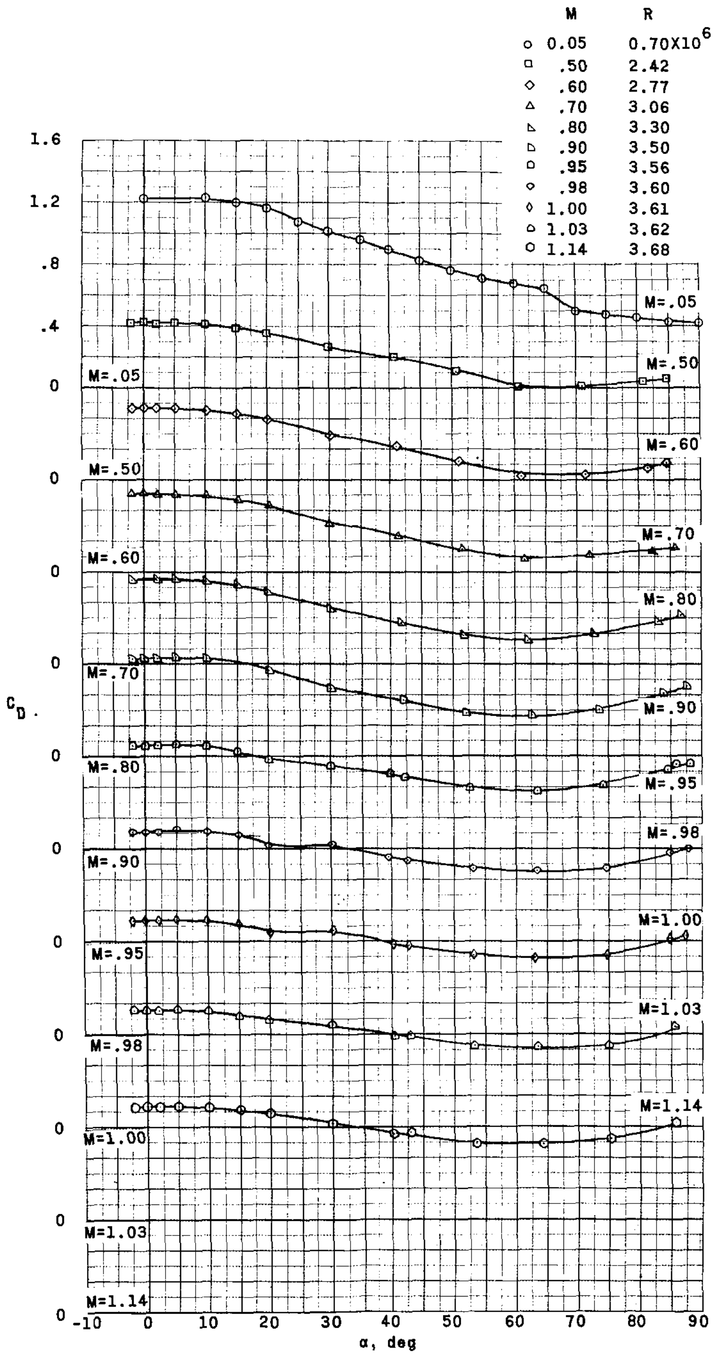
G-3

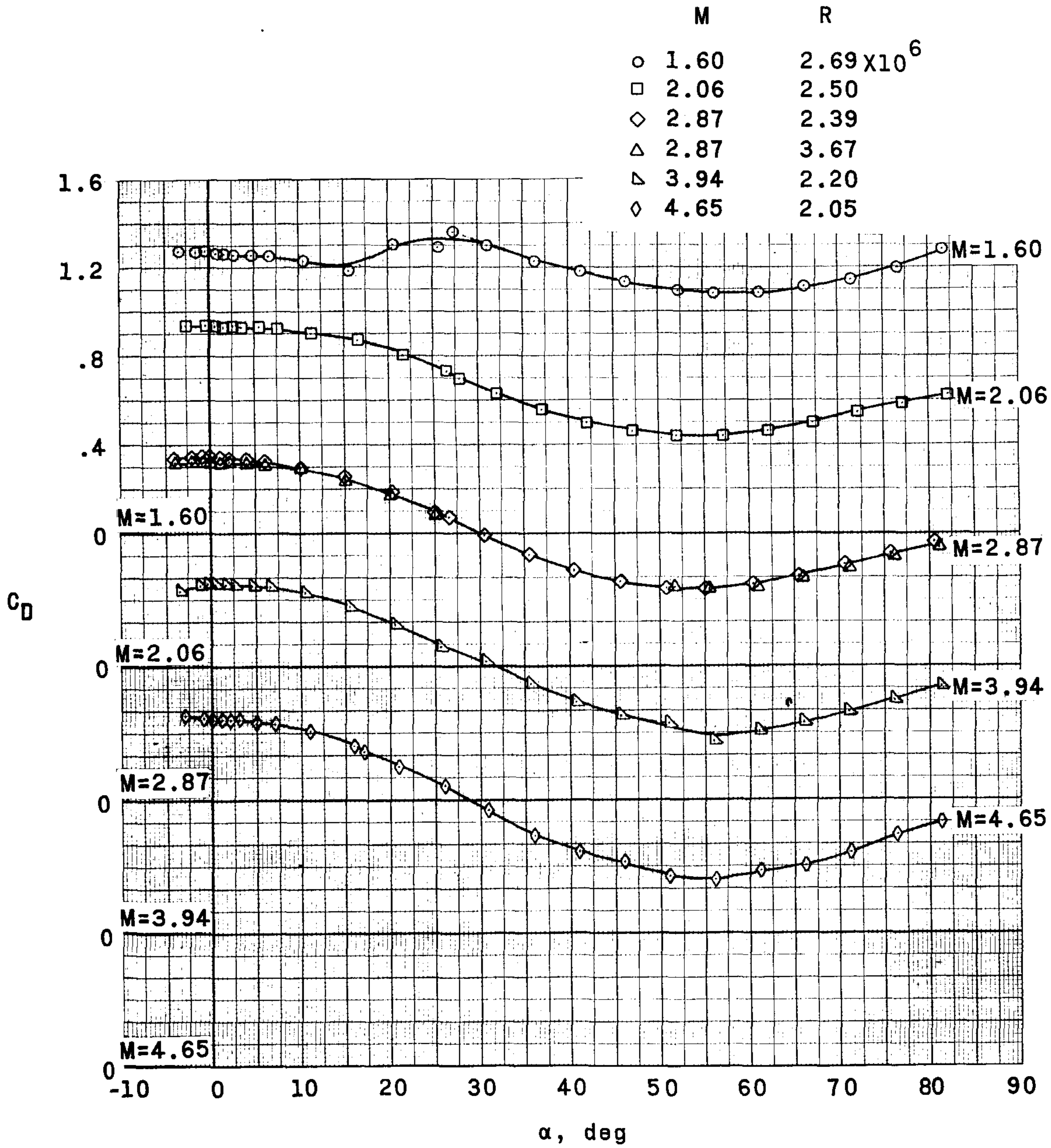


(a) M = 0.05 to 1.14.

Figure 19.- Variation of drag coefficient with angle of attack. Reentry configuration.

[redacted]

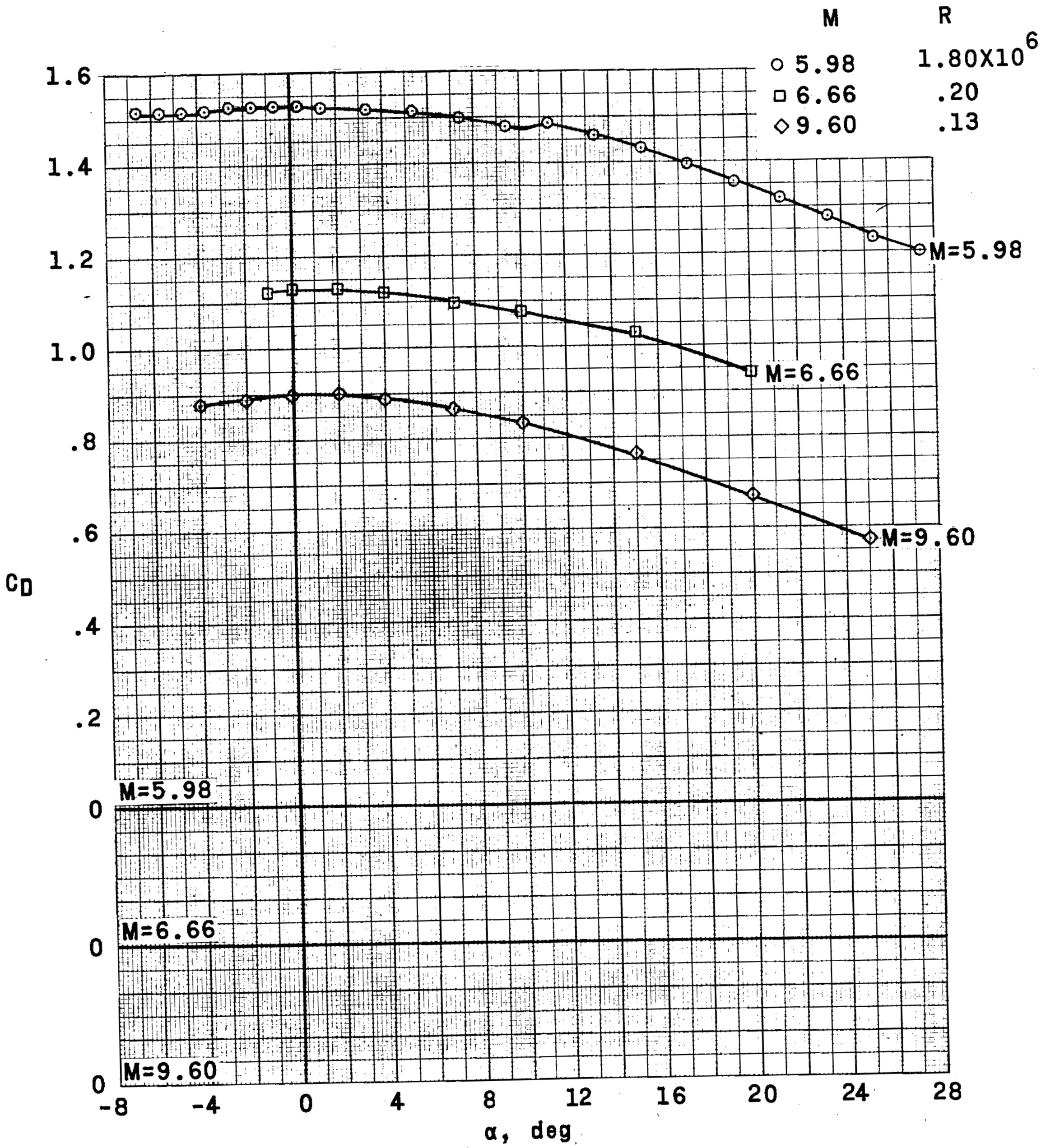
 [redacted]



(b) M = 1.60 to 4.65.

Figure 19.- Continued.

[redacted]



(c) M = 5.98 to 9.60.

Figure 19.- Concluded.

[redacted]

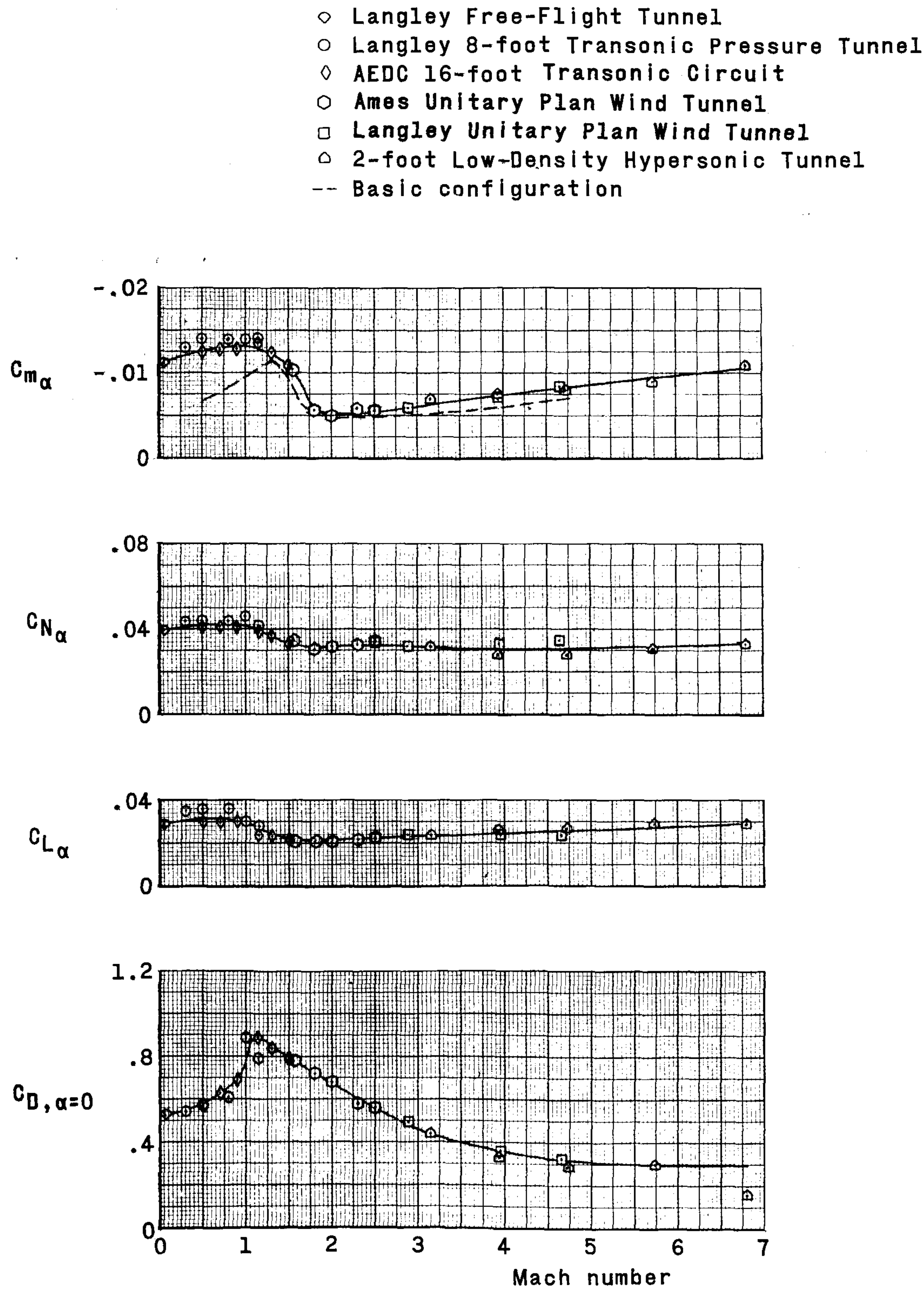


Figure 20.- Summary of longitudinal aerodynamic characteristics. Escape configuration.

[redacted]

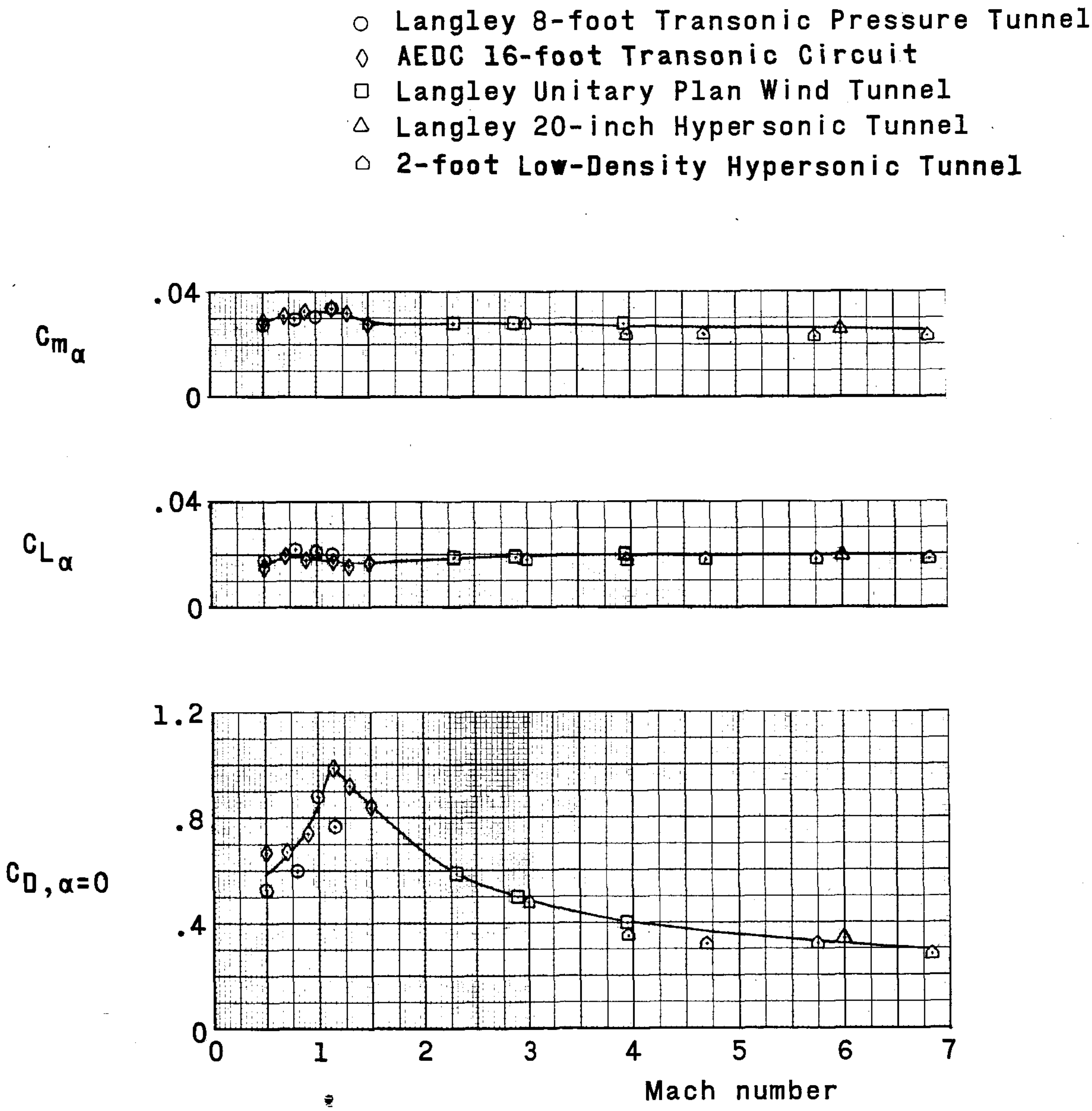


Figure 21.- Summary of longitudinal aerodynamic characteristics. Exit configuration.

[redacted]

[redacted]

G-3

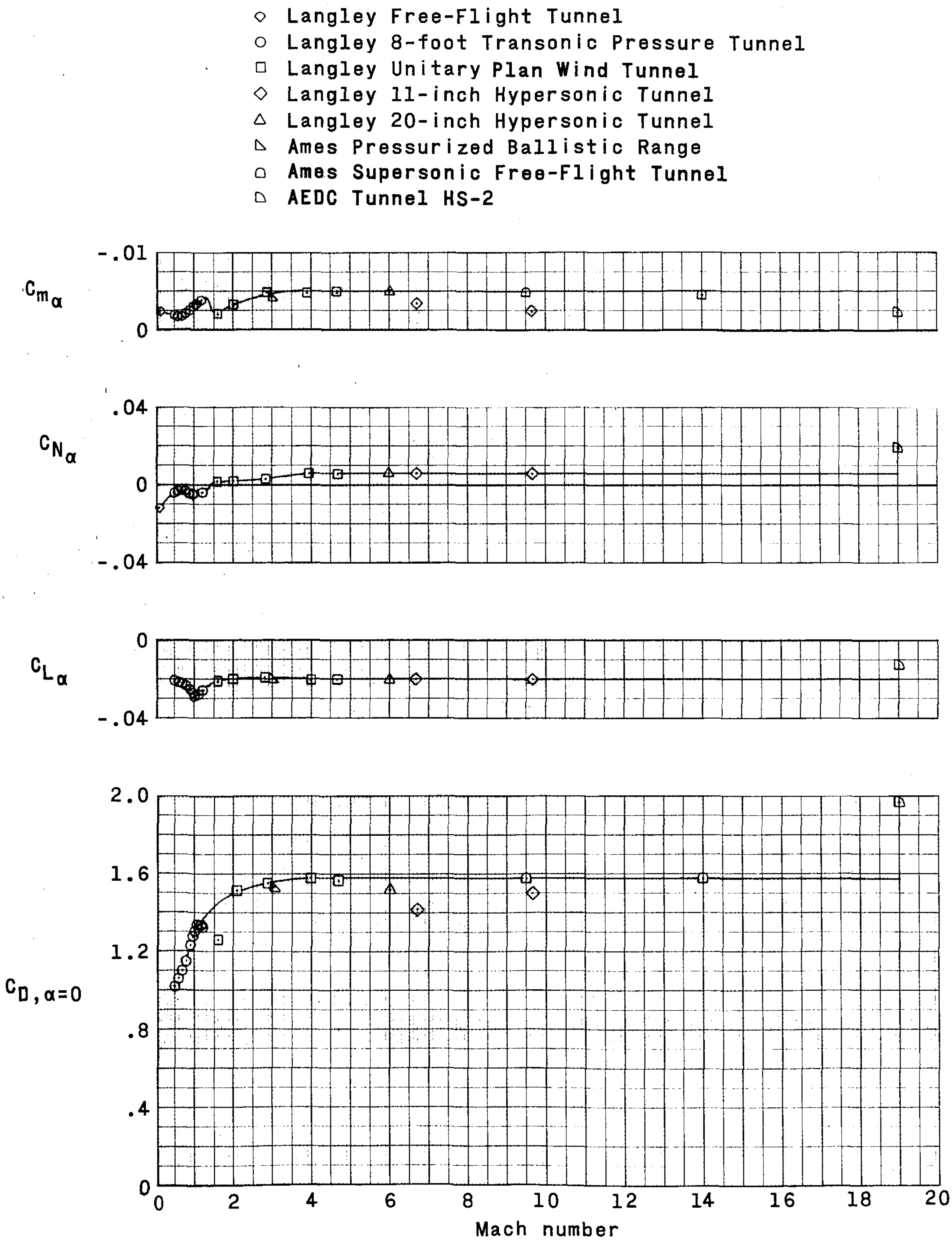
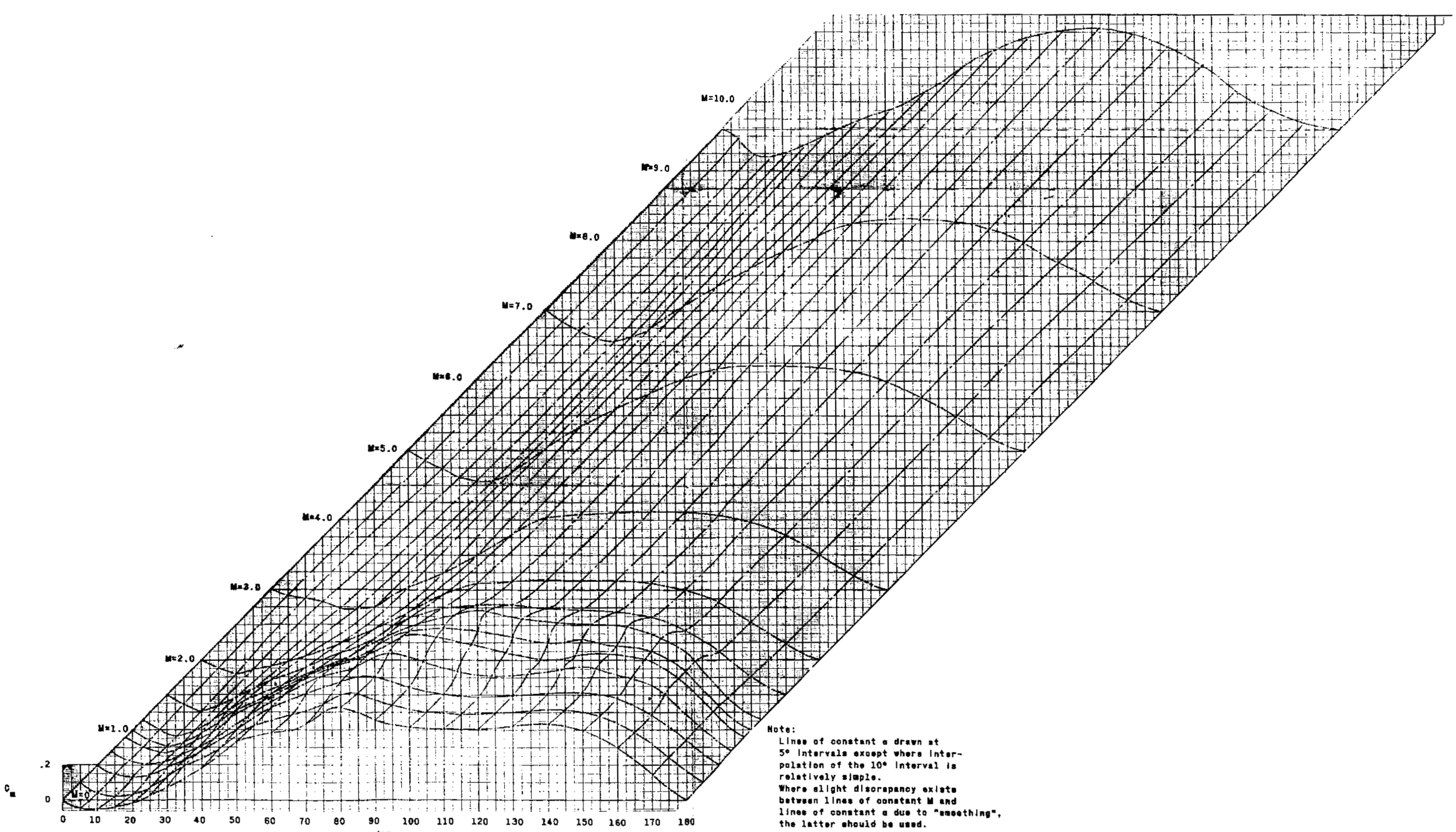


Figure 22.- Summary of longitudinal aerodynamic characteristics. Reentry configuration.

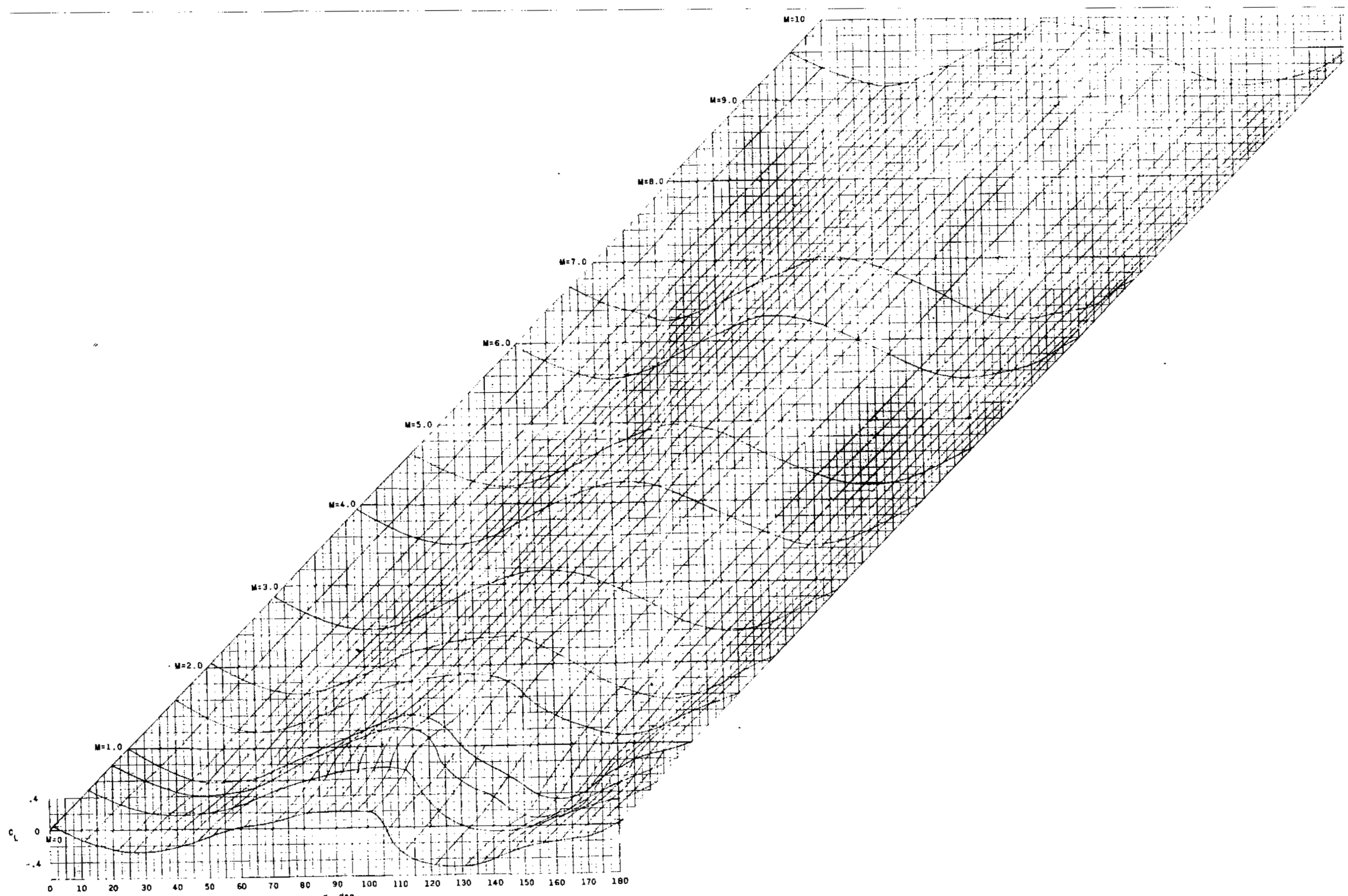
[redacted]



(a) Pitching-moment coefficient.

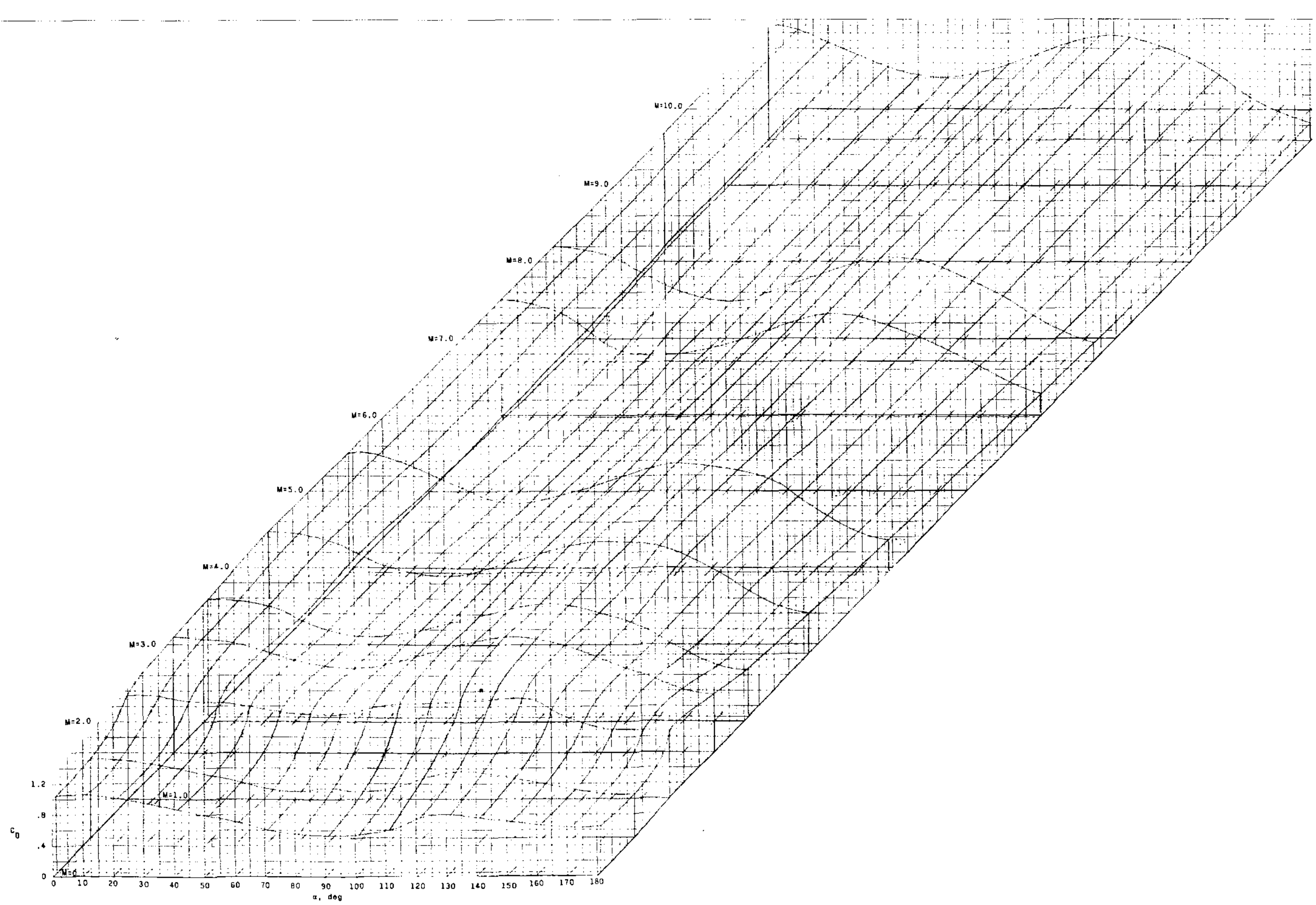
Figure 23.- Variation of aerodynamic characteristics with angle of attack and Mach number. Escape configuration.

[redacted]



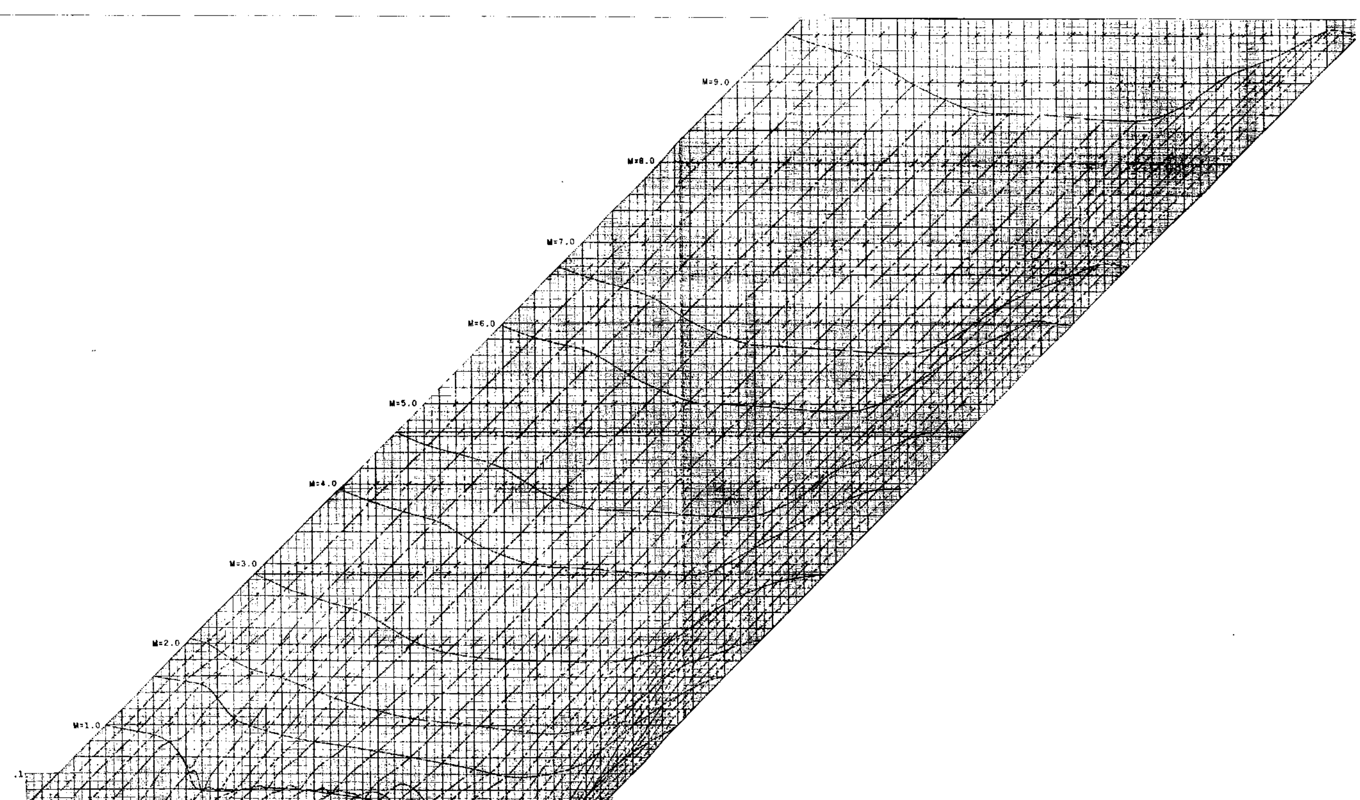
(b) Lift coefficient.

Figure 25.- Continued.



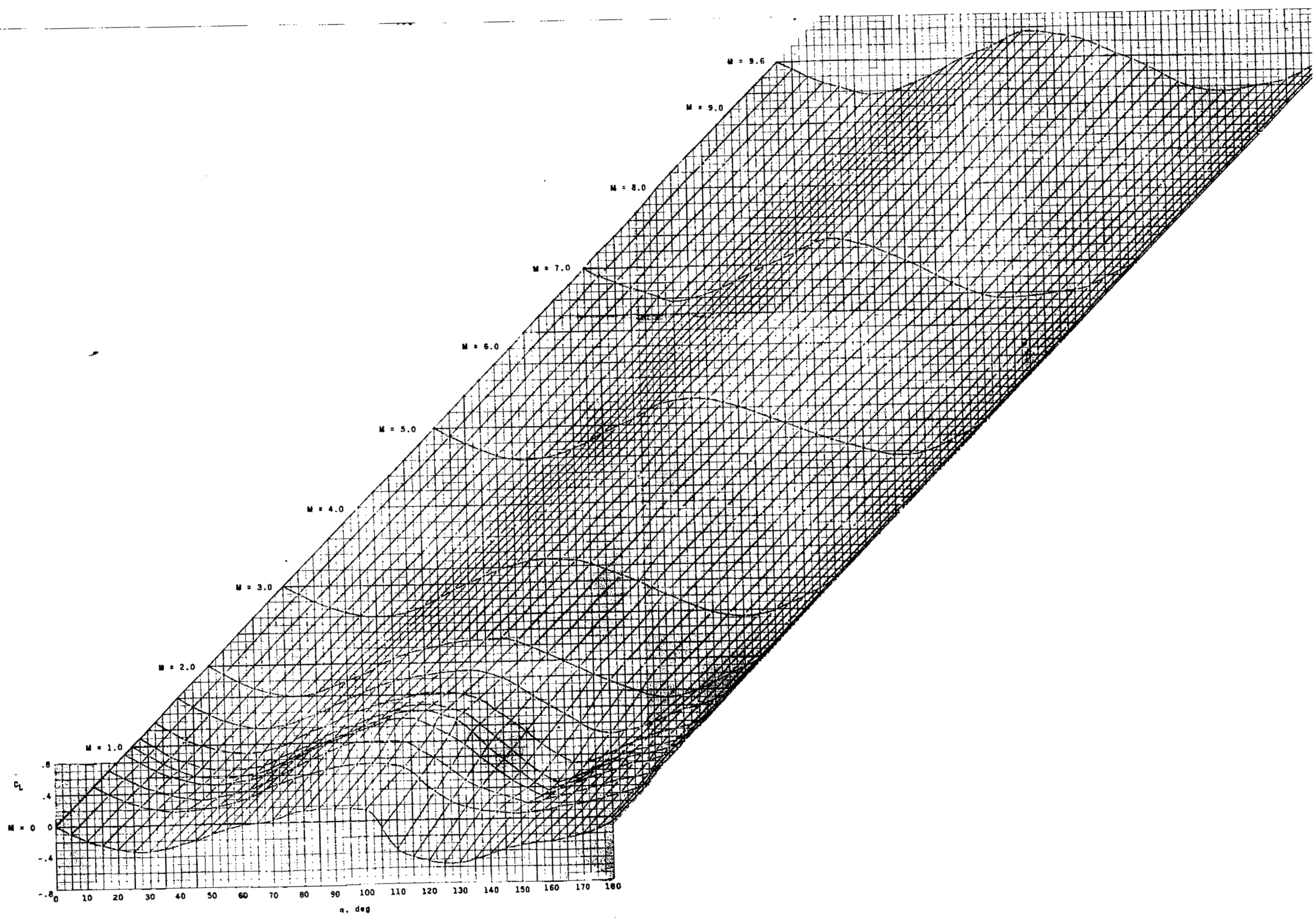
(c) Drag coefficient.

Figure 23.- Concluded.



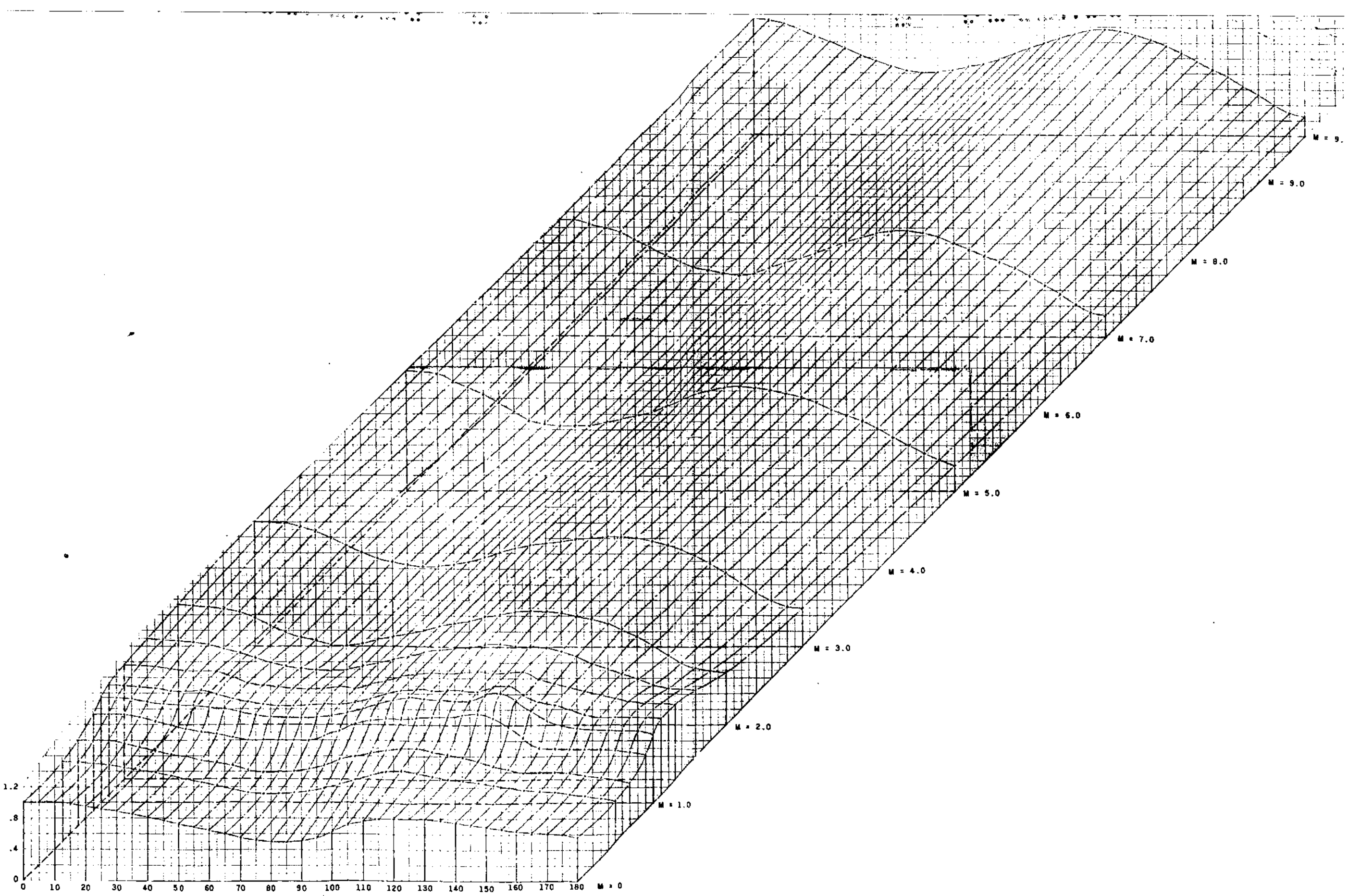
(a) Pitching-moment coefficient.

Figure 25.- Variation of aerodynamic characteristics with angle of attack and Mach number. Reentry configuration without destabilizer flap.



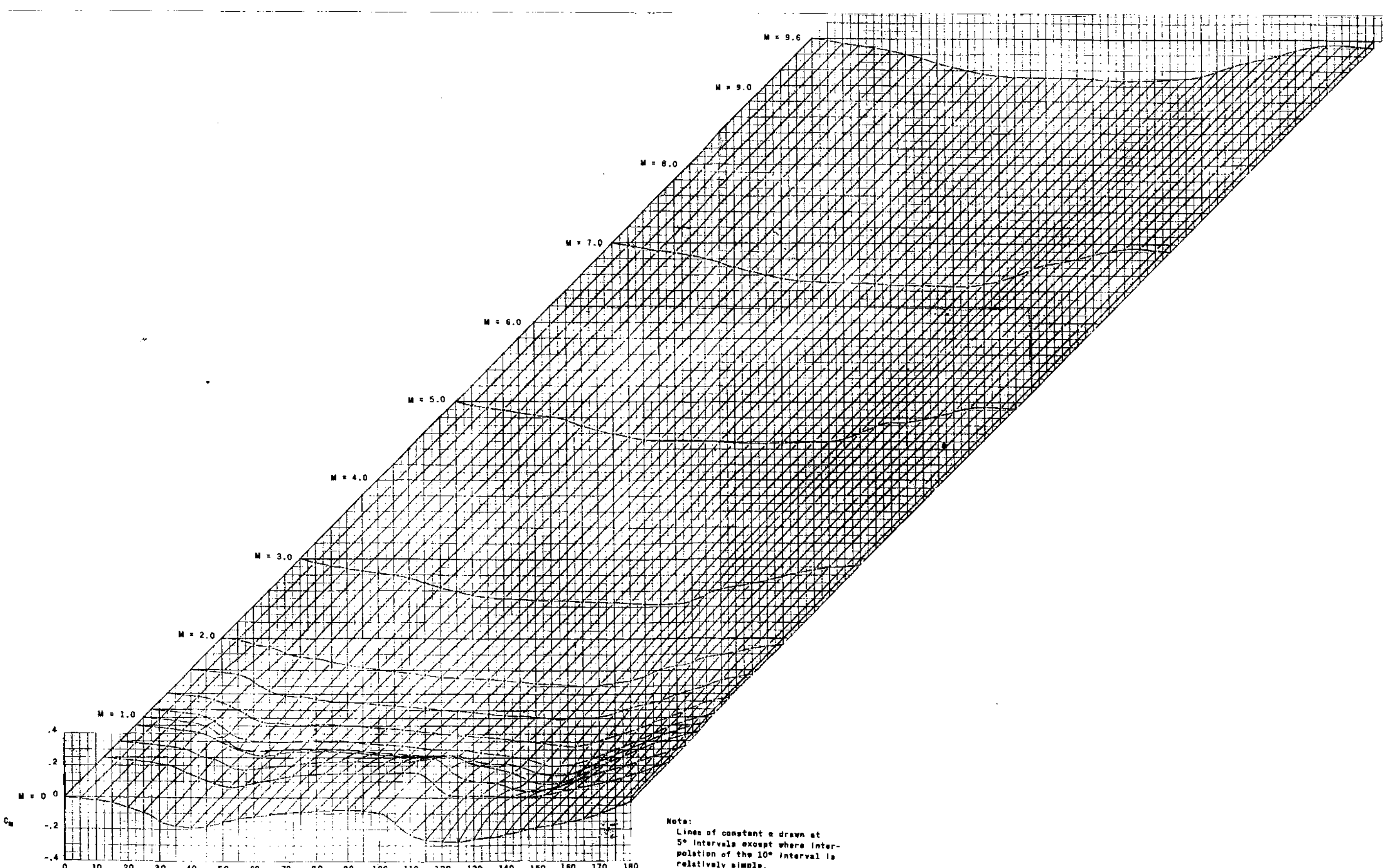
(b) Lift coefficient.

Figure 24.- Continued.



(c) Drag coefficient.

Figure 24.- Concluded.

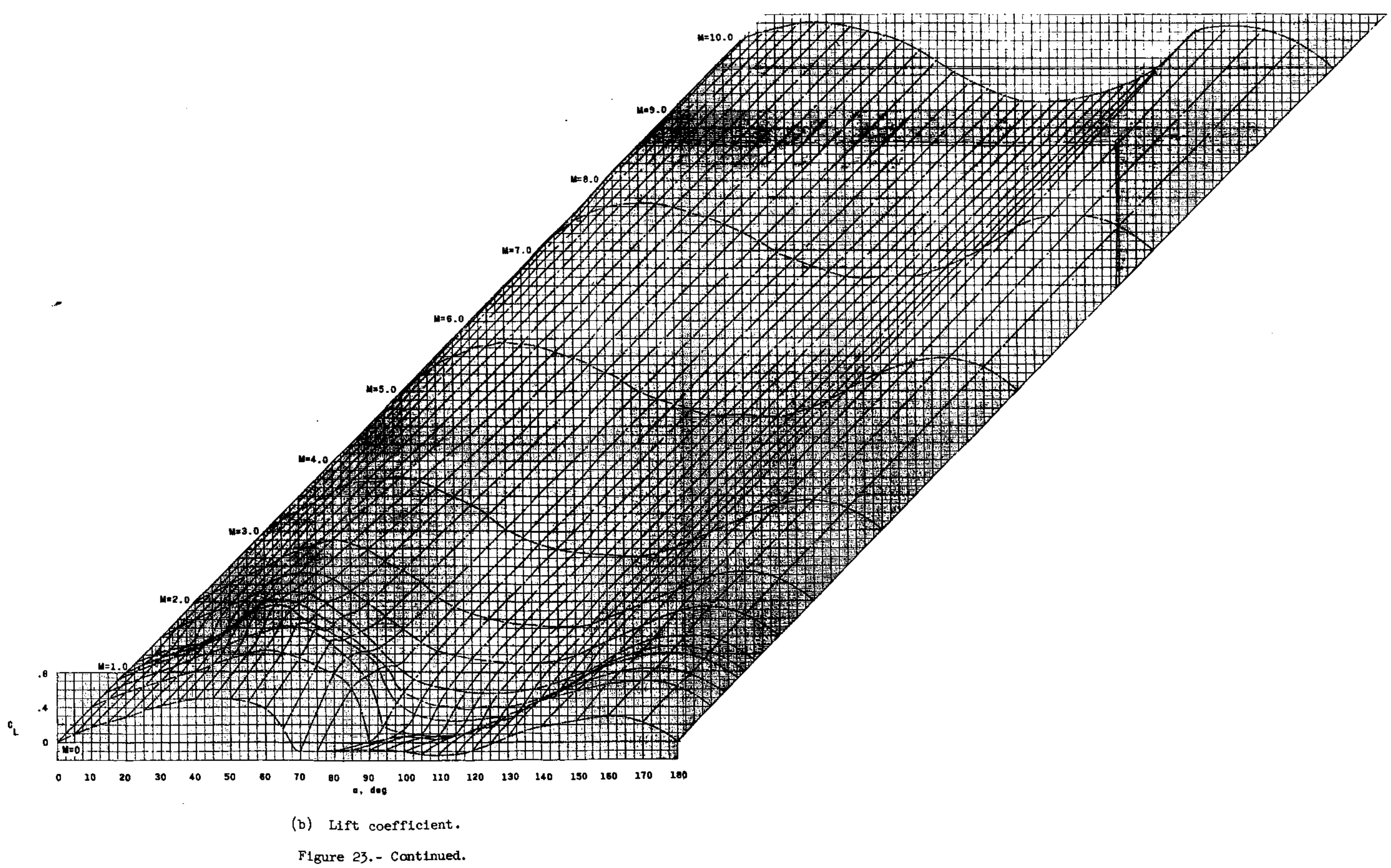


Note:
Lines of constant α drawn at 5° intervals except where interpolation of the 10° interval is relatively simple.
Where slight discrepancy exists between lines of constant M and lines of constant α due to "smoothing", the latter should be used.

(a) Pitching-moment coefficient.

Figure 24.- Variation of aerodynamic characteristics with angle of attack and Mach number. Reentry configuration with destabilizer flap.

[redacted]



(b) Lift coefficient.

Figure 23.- Continued.

[redacted]

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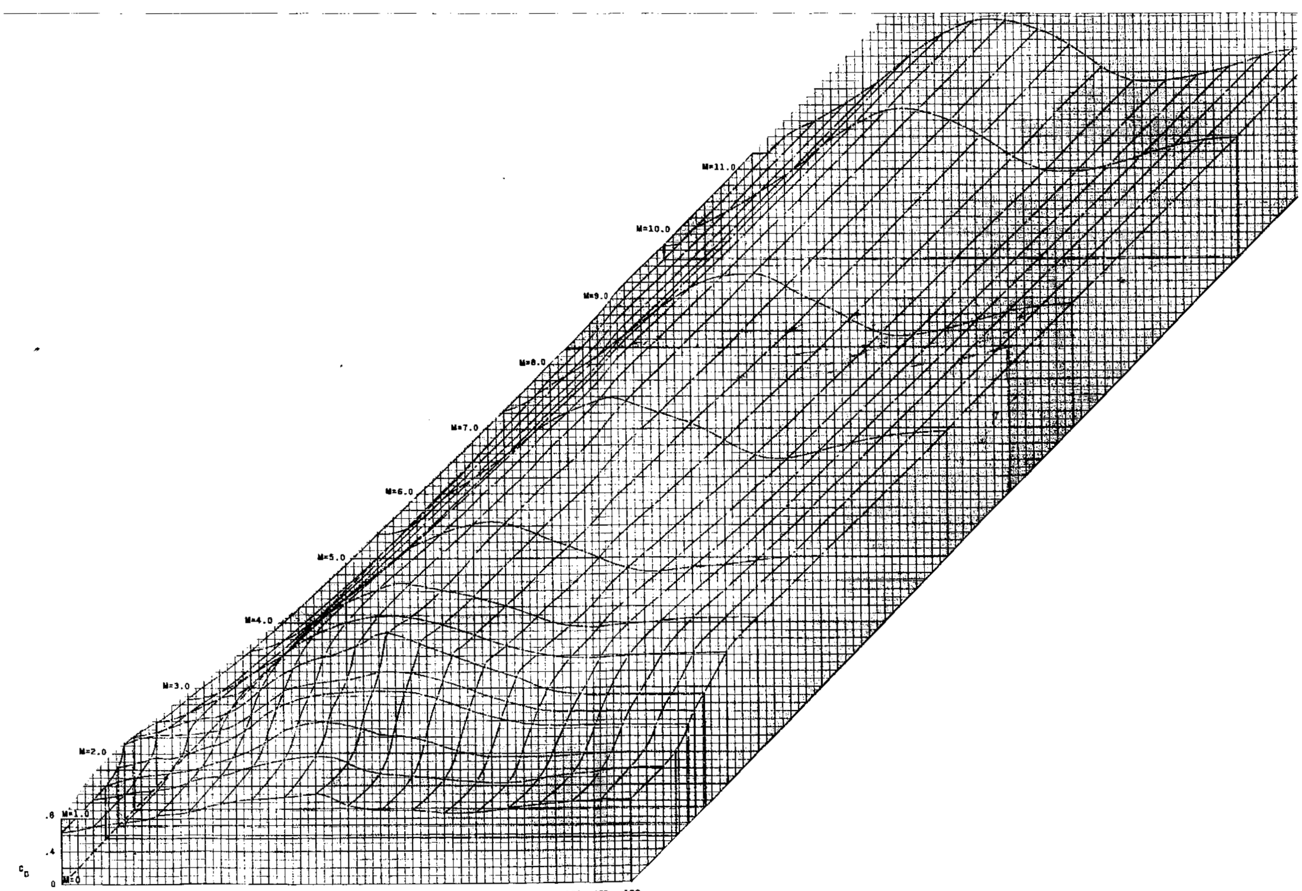

(c) Drag coefficient.

Figure 23.- Concluded.

[redacted]