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SERVICE REPORT

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MEMORANDUM

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for the

U. S. Air Force

EFFECT OF SIX MISSILE-BAY BAFFLE CONFIGURATIONS AND A
ROCKET END PLATE ON EJECTION RELEASES OF AN
MB-1 ROCKET FROM A 0.05-SCALE MODEL
OF THE CONVAIR F-106A AIRPLANE

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[redacted]ORD. NO. AF-AM-57

[redacted]By William [redacted] Hinson and John B. Lee

Langley Research Center
Langley Field, Va.

[redacted]

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
WASHINGTON
APR 20 1959

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MEMORANDUM 4-29-59L

for the

U. S. Air Force

EFFECT OF SIX MISSILE-BAY BAFFLE CONFIGURATIONS AND A ROCKET END PLATE ON EJECTION RELEASES OF AN MB-1 ROCKET FROM A 0.05-SCALE MODEL OF THE CONVAIR F-106A AIRPLANE*

COORD. NO. AF-AM-57

By William F. Hinson and John B. Lee

SUMMARY

As a continuation of an investigation of the release characteristics of an MB-1 rocket carried internally by the Convair F-106A airplane, six missile-bay baffle configurations and a rocket end plate have been investigated in the 27- by 27-inch preflight jet of the NASA Wallops Station. The MB-1 rocket used had retractable fins (ref. 1) and was ejected from a missile bay modified by the addition of six different baffle configurations. For some tests a rocket end plate was added to the model. Dynamically scaled models (0.04956 scale) were tested at a simulated altitude of 22,450 feet and Mach numbers of 0.86, 1.59, and 1.98, and at a simulated altitude of 29,450 feet and a Mach number of 1.98.

The results of this investigation indicate that the missile-bay baffle configurations and the rocket end plate may be used to reduce the positive pitch amplitude of the MB-1 rocket after release. The initial negative pitching velocity applied to the MB-1 rocket might then be reduced in order to maintain a near-level-flight attitude after release. As the fuselage angle of attack is increased, the negative pitch amplitude of the rocket is decreased.

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INTRODUCTION

The MB-1 is an air-to-air unguided missile having a solid-propellant rocket motor. The armament consists of a conventional or atomic warhead. To carry the rocket in the missile bay of the F-106A, the fin tips are retracted inside the fins. The fin tips are extended upon rocket-motor ignition, at which time the rocket must be in near level flight.

In previous investigations (refs. 1 and 2), large negative pitching velocities were necessary at the instant of release for successful ejection of the MB-1 rocket, with fins retracted, from the missile bay of the Convair F-106A airplane at high values of dynamic pressure. These large pitching velocities were beyond the capability of the airplane ejection mechanism. Therefore, the original MB-1 rocket and the missile bay of the F-106A were modified in an attempt to reduce the pitching velocity required at release. (See ref. 2.) The modification to the missile bay was a transverse baffle closing off the front one-third portion. Since this transverse baffle resulted in some reduction of the initial pitching velocity required, the present investigation was undertaken to study the effects of six different missile-bay baffle configurations and a rocket end plate on the ejection characteristics of a retractable-fin MB-1 rocket.

The ejection characteristics of the MB-1 rocket were studied at Mach numbers of 0.86, 1.59, and 1.98 and simulated altitudes of 22,450 and 29,450 feet. The Reynolds number per foot ranged from 5×10^6 to 14×10^6. This investigation was made with 0.04956-scale models in the 27- by 27-inch preflight jet of the NASA Wallops Station. The models were dynamically scaled according to the light-model method outlined in reference 3.

SYMBOLS

D	diameter, in.
d	maximum diameter of rocket model, 0.859 in.
h_p	simulated altitude, ft
I_Y	moment of inertia in pitch plane, lb-in.^{2}
K	radius of gyration, in.

M_∞ free-stream Mach number

q_∞ free-stream dynamic pressure, lb/sq ft

r radius, in.

t time, sec

Δt time interval of stroboscopic photographs, sec

V_∞ free-stream velocity, ft/sec

W rocket weight, lb

x horizontal displacement of center of gravity with origin at point of release, positive downstream, in.

z vertical displacement of center of gravity with origin at point of release, positive down, in.

$\dot{z}_o$ ejection velocity at release, ft/sec

α_f angle of attack of airplane fuselage, deg

ρ mass density of air, slugs/cu ft

θ pitch angle in reference to free-stream direction, deg

$\dot{\theta}_o$ pitch rate at instant of release, radians/sec

$\ddot{\theta}_o$ pitch acceleration at instant of release, radians/sec^2

N_f number of Falcon missiles in missile bay

Subscripts:

P prototype

M model

MODELS AND APPARATUS

A sketch of the basic MB-1 rocket with retracted (folded) fin tips and rocket end plate is shown in figure 1. The rocket-model ordinates are shown in table I. The baffle configurations tested (configurations 1a, 1b, 1c, 2, 3, and 4) are shown in figure 2. A bottom view of the basic missile bay of the F-106A with the MB-1 rocket, four Falcon missiles, and transverse baffle in place is shown in figure 3. The transverse baffle was used in all tests. All models were supplied by Convair, Division of General Dynamics Corporation.

A sketch of the 0.04956-scale model of the Convair F-106A airplane and the ejection mechanism with which a pitching velocity could be applied to the rocket is shown in figure 4. A break link that passed through the rocket-model center of gravity and connected to the top of the missile bay was used to hold the model securely in place until the ejection force was applied, breaking the link flush with the top of the model.

This investigation was conducted in the 27- by 27-inch preflight jet of the NASA Wallops Station. A description of this jet is given in reference 3.

Stroboscopic photographs were obtained by using a spinning disk with slits in front of the camera lens. (See ref. 1.) The time interval between exposures was approximately 0.002 second.

TESTS

Tests were made at free-stream Mach numbers of 0.86, 1.59, and 1.98 at a simulated altitude of 22,450 feet. One test was made at a free-stream Mach number of 1.98 and a simulated altitude of 29,450 feet. The MB-1 rocket had an angle of incidence of -2° relative to the fuselage reference line. The fuselage reference line was set at angles of attack of 1°, 3°, and -1.5°, relative to the free stream. The angle of attack was determined by the expected flight condition of the full-scale F-106A airplane at the desired Mach number and at the particular dynamic-pressure conditions simulated. A full-scale weight of 800 pounds, moment of inertia of approximately 650,000 lb-in.^{2}, and radius of gyration of 28.45 inches were simulated. The rocket model was ejected with a nose-down pitching velocity at release, and with a vertical velocity of 32 feet per second. The pitch rate requested by the contractor (-5.2 to -8.7 radians per second, model scale) was obtained during the early runs of the investigation; however, as the investigation progressed, the pitch rate deteriorated because of mechanical difficulties. Pitch rates for the remaining tests will be discussed later.

The basic missile bay includes four Falcon missiles and the transverse baffle, which are standard in all tests unless otherwise stated. Table II lists the test runs and pertinent conditions of each test.

RESULTS AND DISCUSSION

After the MB-1 rocket is ejected into the airstream the rocket motor is ignited. The fins are extended by a mechanism which operates on rocket-motor chamber pressure. The rocket is ejected after the airplane is pointed at the target; therefore, it is necessary that the rocket be in the proper attitude at the instant of rocket-motor ignition. This attitude is essentially parallel to the airplane reference line and in the plane of symmetry of the airplane. It is desirable for safety reasons that this attitude be obtained at some distance below the airplane. This requirement is rendered more difficult to fulfill by the fact that the retracted fin tips of the MB-1 rocket cause the missile to be slightly unstable during the initial part of the drop. In reference 2 it was found that the rocket motor could be ignited and the fins opened approximately 5 rocket diameters below the release point. For the purpose of the present investigation, the drops considered favorable will be those in which level or negative pitch attitudes exist in the region from 5 to 8 rocket diameters below the release point. The negative pitch attitudes are deemed favorable because they could be corrected to level attitudes at rocket-motor ignition by reducing the negative pitching velocity applied during the ejection stroke.

The first phase of this investigation was an attempt to obtain a favorable condition or conditions by ejecting the MB-1 rocket while using six baffle configurations separately (fig. 2) in the missile bay of the F-106A. Initial conditions included an applied pitch rate of -5.2 to -8.7 radians per second or less (model scale), a vertical velocity of 32 feet per second, and a free-stream Mach number of 1.59.

In the second phase of the investigation the baffle configuration that gave the best results in the first phase was tested with variations in N_f, α_f, h_p, rocket end plate, and Mach number.

Figures 5 to 7 represent the results of the first phase, and figures 8 to 12 represent the results of the second phase of the investigation. The results are presented in the form of stroboscopic photographs and plots of the rocket-model pitch oscillations and trajectories. The release pitch rate is probably equal to or less than the specified amount of approximately $\dot{\theta}_{o,M} = -5.2$ to -8.7 radians per second. Tests 1 and 12, which were made during the early part of the investigation, compare favorably with similar tests reported in reference 2, where a pitch rate of $\dot{\theta}_{o,M} = -5.5$ radians per second was used.

Distances divided by the maximum rocket diameter of $d = 0.859$ inch are used in the motion plots to nondimensionalize the results. The numbers appearing on the stroboscopic photographs were arbitrary and were used for identification of the film and tests.

Comparison of Baffle Configurations

As shown in figure 5 (test 1), a large positive pitch attitude was obtained with the basic missile bay. With the addition of baffle configuration 1a (test 2), negative pitch angles of -3.5° to -14° were obtained in 10 rocket diameters below release.

Results obtained with baffle configurations 1b (test 3) and 1c (test 4) are shown in figure 6. In both tests the rocket remained in a near-level-flight position for over 10 rocket diameters below release. Baffle configuration 1a was ultimately selected to be used in the second phase of the investigation. The curve for this configuration has been repeated in figure 6 for comparison and was found to have a more negative pitch attitude.

A comparison of MB-1 rocket ejections with baffle configurations 2, 3, and 4 (tests 5, 6, and 7) is shown in figure 7. With baffle configuration 2 (test 5), the pitch angle of the rocket model remained below 10° for 8.5 rocket diameters below release, and the rocket then pitched to a high angle of attack. In ejections with baffle configurations 3 and 4 (tests 6 and 7) the rocket model remained in a near-level-flight position for over 12 rocket diameters below release. Here again baffle configuration 1a was found to have a more negative pitch attitude than the other configurations.

The more negative pitch attitude obtained with baffle configuration 1a is a favorable condition because it offers the possibility of reducing the initial pitching rate of approximately -6.98 radians per second for $h_p = 22{,}450$ feet, which is greater than desired. The more favorable ejection characteristics, simplicity of design and construction, and relatively low weight of baffle configuration 1a led to its selection for further tests under other conditions (tests 9, 10, 11, 13, 14, 15, 17, and 18).

Rocket Lateral Displacement and Angle of Yaw

In some tests the lateral displacement and angle of yaw were found to be large (test 3, baffle 1b, fig. 6(a); test 6, baffle 3, fig. 7(a); test 7, baffle 4, fig. 7(a); test 11, baffle 1a, fig. 9(a); test 13, baffle 1a, fig. 10(a); and test 17, baffle 1a, fig. 11(a)). In most cases for baffle 1a, however, large values of lateral displacement and angle of yaw were not obtained until the lower portion of the trajectory. However, perforating baffle 1a to produce baffle 1c appeared to reduce the tendency to yaw. (See test 4, fig. 6(a).)

Effect of Rocket End Plate

Figure 8 shows a comparison between drop characteristics when the rocket end plate is used alone and in conjunction with baffle configuration 1a. A negative pitch attitude was obtained by using the rocket end plate and baffle configuration 1a separately (tests 8 and 2). However, the combination of the rocket end plate and baffle configuration 1a increased the negative pitch attitude (tests 9 and 10). Therefore, with this combination it is apparent that the initial pitch rate of approximately -6.98 radians per second was greater than necessary, and apparently a lower pitch rate could be used successfully. Test 10 is a repeat of test 9 and shows the repeatability of the tests.

Effect of Zero and Four Falcon Missiles in the Missile Bay

Figure 9 shows rocket ejections with and without Falcon missiles in the missile bay. With baffle configuration 1a (test 2, $N_f = 4$; test 11, $N_f = 0$), results of both tests were acceptable. The trajectory for $N_f = 0$ showed a near-level-flight attitude for over 10 rocket diameters below release. This indicates that the MB-1 rocket can be ejected with a smaller pitch rate than was specified for this investigation. A static check prior to test 11 showed that the pitch rate for this satisfactory release was near zero.

With the Falcons installed (test 2) a large negative pitch angle was obtained, indicating that the initial pitch rate of approximately -6.98 radians per second was greater than necessary and could be reduced in order to obtain a level flight attitude. With the basic missile bay (test 1, $N_f = 4$; test 12, $N_f = 0$), the effect of the Falcons is insignificant because in both tests a large positive pitch attitude was obtained during the entire trajectory.

Effect of Changes in Fuselage Angle of Attack

The effect of changes in airplane fuselage angle of attack at $M_\infty = 1.59$, with $\dot{\theta}_{o,M}$ near 0 radian per second, is shown in figure 10. As the fuselage angle of attack was increased, the negative pitch attitude of the rocket was decreased. With $\alpha_f = 3^\circ$ the rocket pitch amplitude was near 0° for the first 12 rocket diameters below release.

Rocket Ejections at $M_\infty = 1.98$

As shown in figure 11, a large positive pitch attitude was present in test 16 (the rocket model passed close to the tail of the airplane fuselage). The addition of baffle configuration 1a (test 15) gave a negative pitch attitude of -3° to -12° during the first 8 rocket diameters below release. In comparing test 16 with previous tests (test 15 of ref. 2), it was believed a smaller pitch rate was applied in test 16. A static check at this point showed a zero pitch rate at store release. Assuming the same applied pitch rate at release for both runs, the addition of baffle configuration 1a (test 15) gives more favorable ejection characteristics. In test 17 the rocket remained in a near-level-flight attitude for over 11 rocket diameters below the release point.

Ejections at $M_{\infty} = 0.86$

Figure 12 shows a test at $M_{\infty} = 0.86$ and $\alpha_f = 3^{\circ}$ with $\dot{\theta}_{o,M}$ near zero. The rocket remained in a near-level-flight attitude for the entire trajectory.

CONCLUSIONS

The effects of six missile-bay baffle configurations and a rocket end plate on the ejection release characteristics and flight behavior of an MB-1 rocket when ejected from a 0.04956-scale model of the Convair F-106A airplane have been investigated in the 27- by 27-inch preflight jet of the NASA Wallops Station. The tests were made at free-stream Mach numbers of 0.86, 1.59, and 1.98 at a simulated altitude of 22,450 feet. One test at a Mach number of 1.98 was made at a simulated altitude of 29,450 feet. From this investigation it appears that the MB-1 rocket can be ejected satisfactorily with all the baffle configurations tested.

Results for the most favorable baffle configuration and the rocket end plate indicated that, used together or separately, they might allow a reduction in the negative pitch rate applied to the MB-1 rocket at ejection and produce a near-level-flight attitude of the rocket after release.

As the fuselage angle of attack is increased, the negative pitch trajectory of the MB-1 rocket is decreased.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Field, Va., March 30, 1959.

REFERENCES

1. Lee, John B.: Investigation of Ejection Releases of an MB-1 Rocket From a 0.04956-Scaled Model of the Convair F-106A Airplane at Mach Number 1.59 - COORD. No. AF-AM-57. NACA RM SL57E07, U. S. Air Force, 1957.

2. Lee, John B., and Basford, Rubert C.: Investigation of Ejection Releases of an MB-1 Rocket From a 0.04956-Scaled Model of the Convair F-106A Airplane at Several Mach Numbers and Simulated Altitudes - COORD. No. AF-AM-57. NACA RM SL57I11, U. S. Air Force, 1957.

3. Sandahl, Carl A., and Faget, Maxime A.: Similitude Relations for Free-Model Wind-Tunnel Studies of Store-Dropping Problems. NACA TN 3907, 1957.

TABLE I.- MB-1 ROCKET-MODEL ORDINATES

Distance from nose, in.	r, in.
0.248	0.166
.497	.248
.744	.312
.991	.362
1.239	.398
1.497	.421
1.927	.429
2.212	.429
2.618	.372
4.139	.372
4.701	.359
5.495	.279

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TABLE II.- TEST SEQUENCE

[Scale, 0.04956; d = 0.859 in.; $\dot{z}_o$ = 32 ft/sec; W_P = 800 lb; $I_{Y,P}$ = 650,000 lb-in.^{2}; K_M = 1.41 in.; K_P = 28.45 in.; $\dot{\theta}_{o,M}$ = -6.98 radians/sec or less; $\ddot{\theta}_{o,M}$ = -2,670 radians/sec^2 or less; $\dddot{\theta}_{o,P}$ = -6.67 radians/sec^2 or less]

Figure	Test	M_∞	h_p, ft	Missile-bay configuration	α_f, deg	W_M, lb	$I_{Y,M}$, lb-in.^{2}	V_∞, ft/sec	ρ, slugs/cu ft	$q_{\infty,M}$, lb/sq ft	$q_{\infty,P}$, lb/sq ft	Δt, sec
5	1	1.59	22,370	Basic	1	0.2355	0.467	1,640	0.002800	3,852	1,556	0.00199
5	2	1.59	22,450	1a	1	.2337	.485	1,646	.002820	3,806	1,560	.00202
6	3	1.59	22,450	1b	1	.2337	.467	1,677	.002780	3,889	1,560	.00202
6	4	1.59	22,450	1c	1	.2337	.455	1,684	.002632	3,719	1,560	.00201
7	5	1.59	22,450	2	1	.2337	.470	1,677	.002759	3,864	1,560	.00199
7	6	1.59	22,450	3	1	.2337	.470	1,666	.002781	3,845	1,560	.00221
7	7	1.59	22,450	4	1	.2337	.480	1,666	.002719	3,758	1,560	.00190
8	8	1.59	22,450	Basic and end plate	1	.2337	.455	1,648	.002930	3,961	1,560	.00197
8	9	1.59	22,450	1a and end plate	1	.2337	.457	1,683	.002756	3,888	1,560	.00200
8	10	1.59	22,450	1a and end plate	1	.2337	.467	1,696	.002694	3,855	1,560	.00199
9	11	1.59	22,450	1a; all Falcons out	1	.2337	.480	1,687	.002734	3,873	1,560	.00196
9	12	1.59	22,450	Basic; all Falcons out	1	.2337	.482	1,681	.002684	3,781	1,560	.00199
10	13	1.59	22,450	1a	3	.2337	.473	1,668	.002792	3,871	1,560	.00202
10	14	1.59	22,450	1a	-1.5	.2337	.455	1,666	.002743	3,792	1,560	.00200
11	15	1.98	22,450	1a	1	.2337	.467	2,067	.002722	5,789	2,419	.00202
11	16	1.98	22,450	Basic	1	.2337	.455	2,072	.002831	6,046	2,419	.00198
11	17	1.98	29,450	1a	3	.3197	.650	2,058	.002161	6,030	1,768	.00198
12	18	.86	22,450	1a	3	.2337	.455	996	.002302	1,131	456	.00200

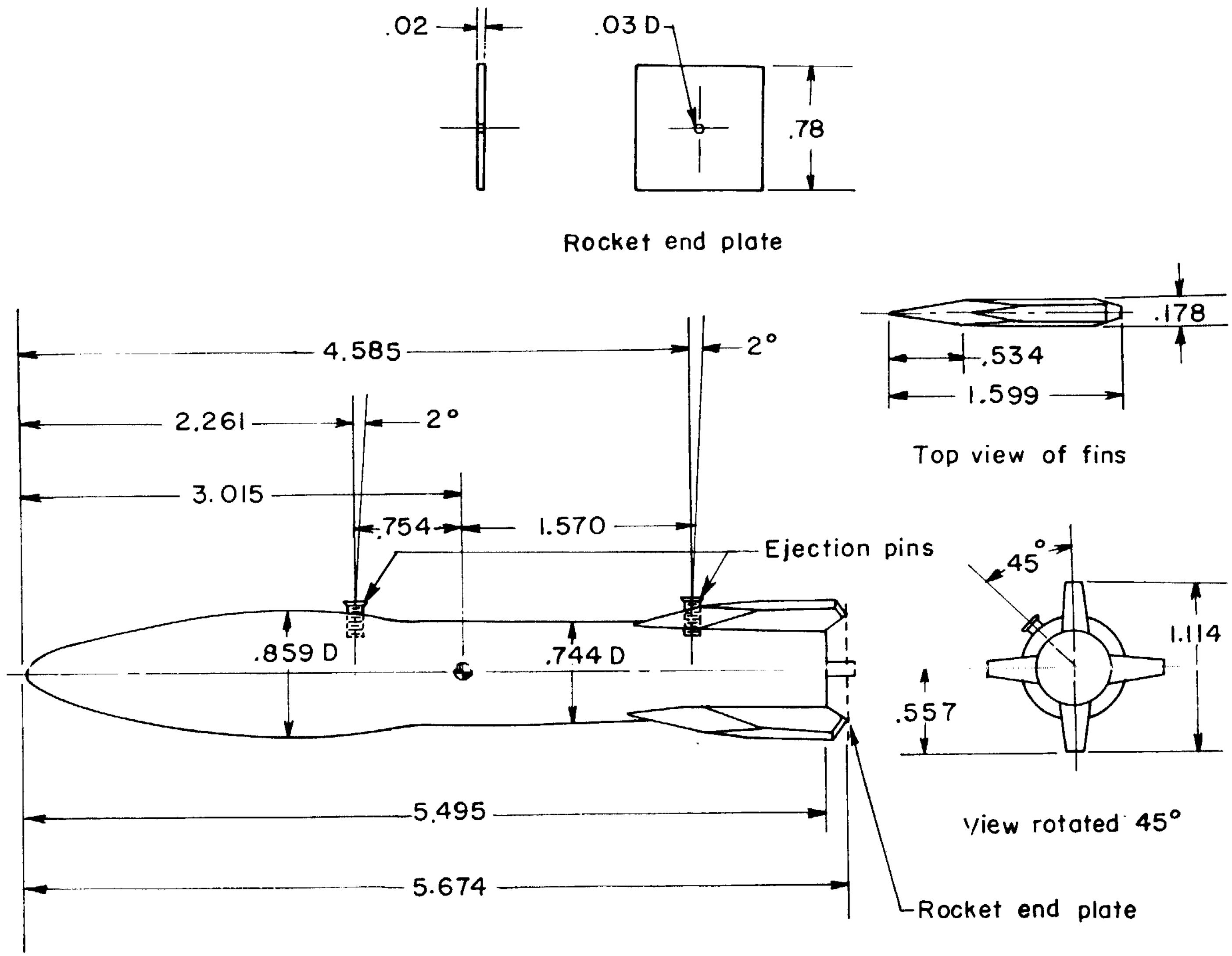
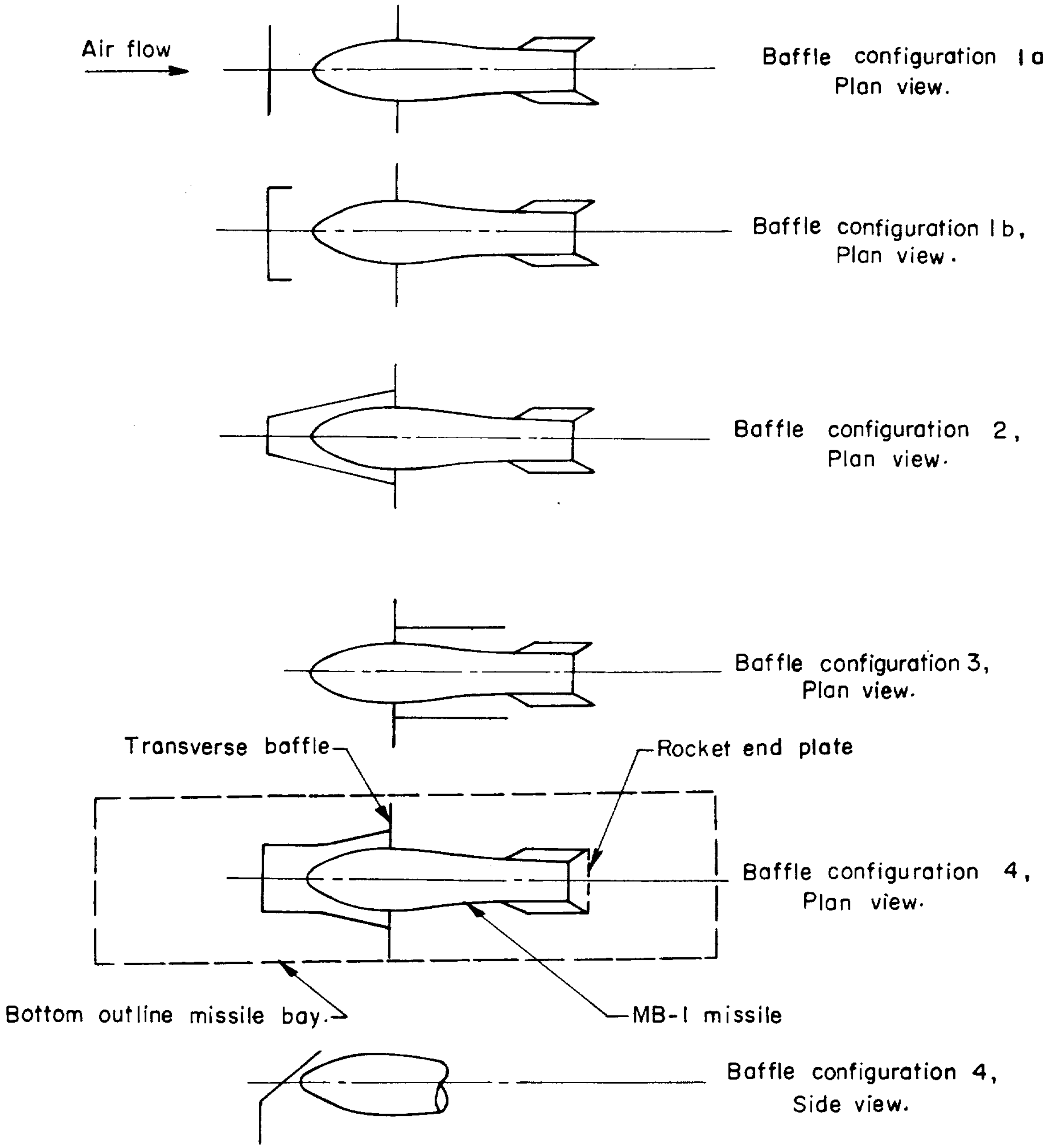


Figure 1.- Basic MB-1 rocket model with simulated retracted fins (0.04956 scale).
All dimensions are in inches.



(a) Relationship of MB-1 missile to the various baffle configurations and rocket end plate (not to scale).

Figure 2.- Baffle configurations.

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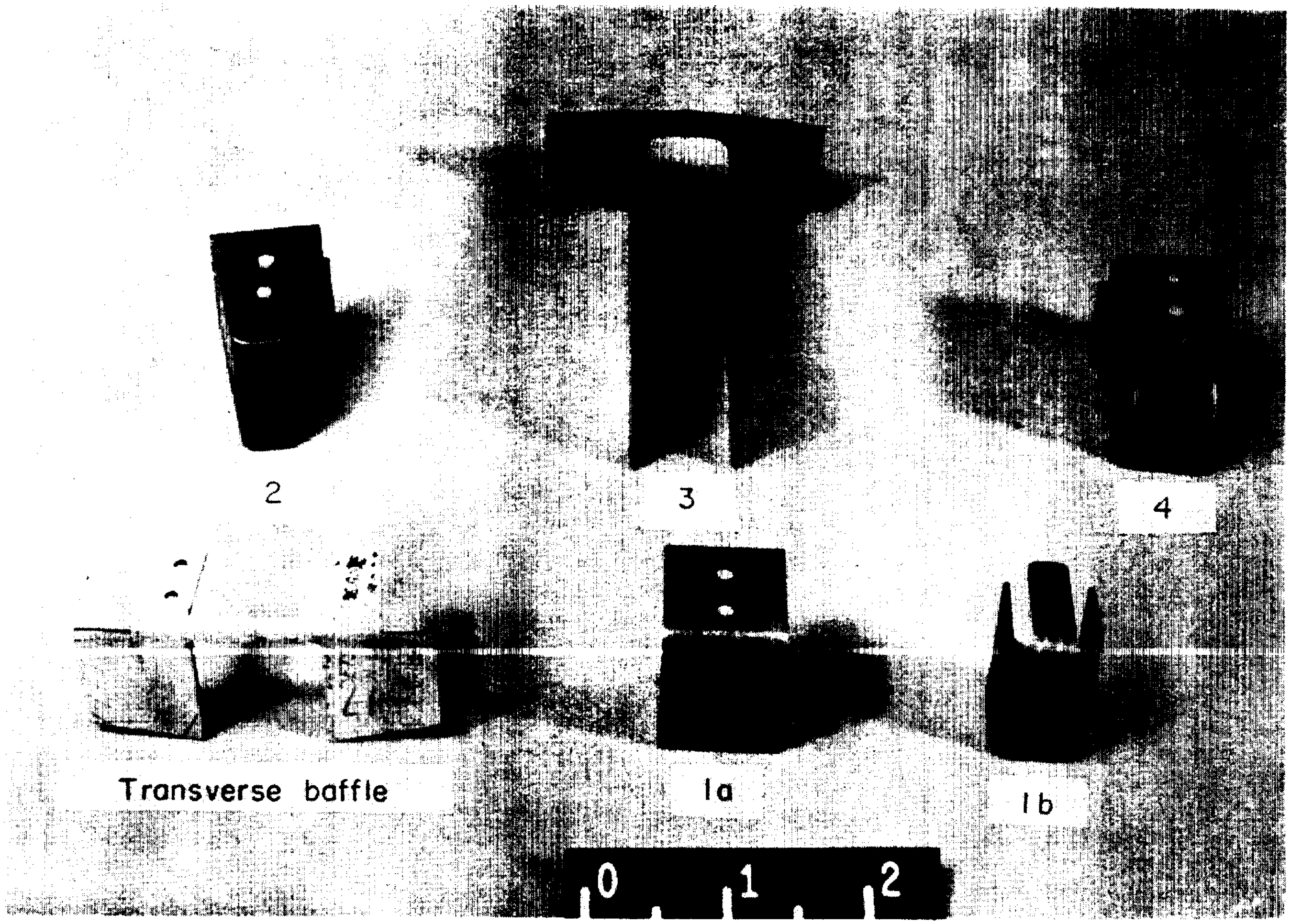

(b) Photograph of missile-bay baffle configurations. L-58-4201.1

Figure 2.- Continued.

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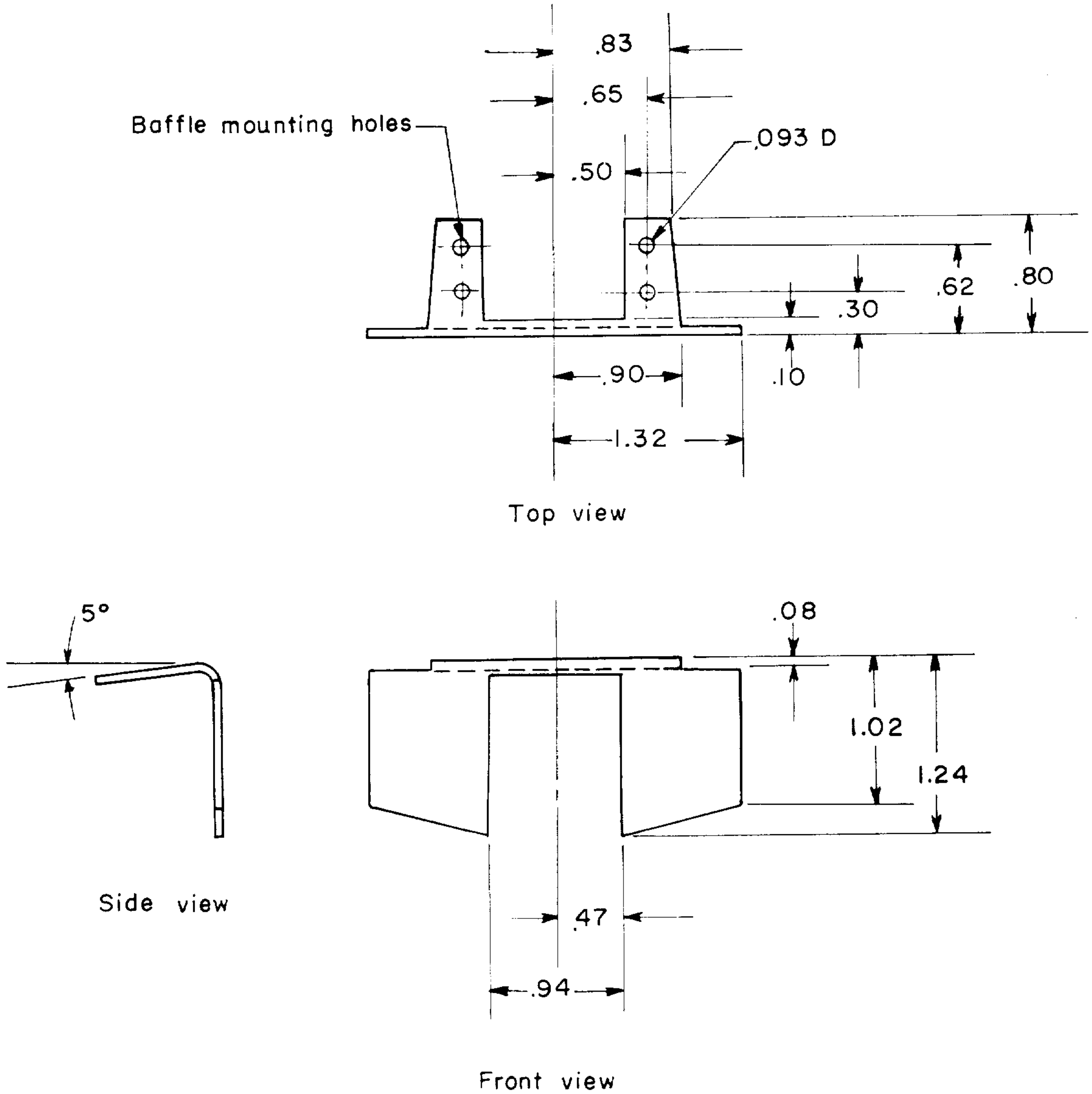
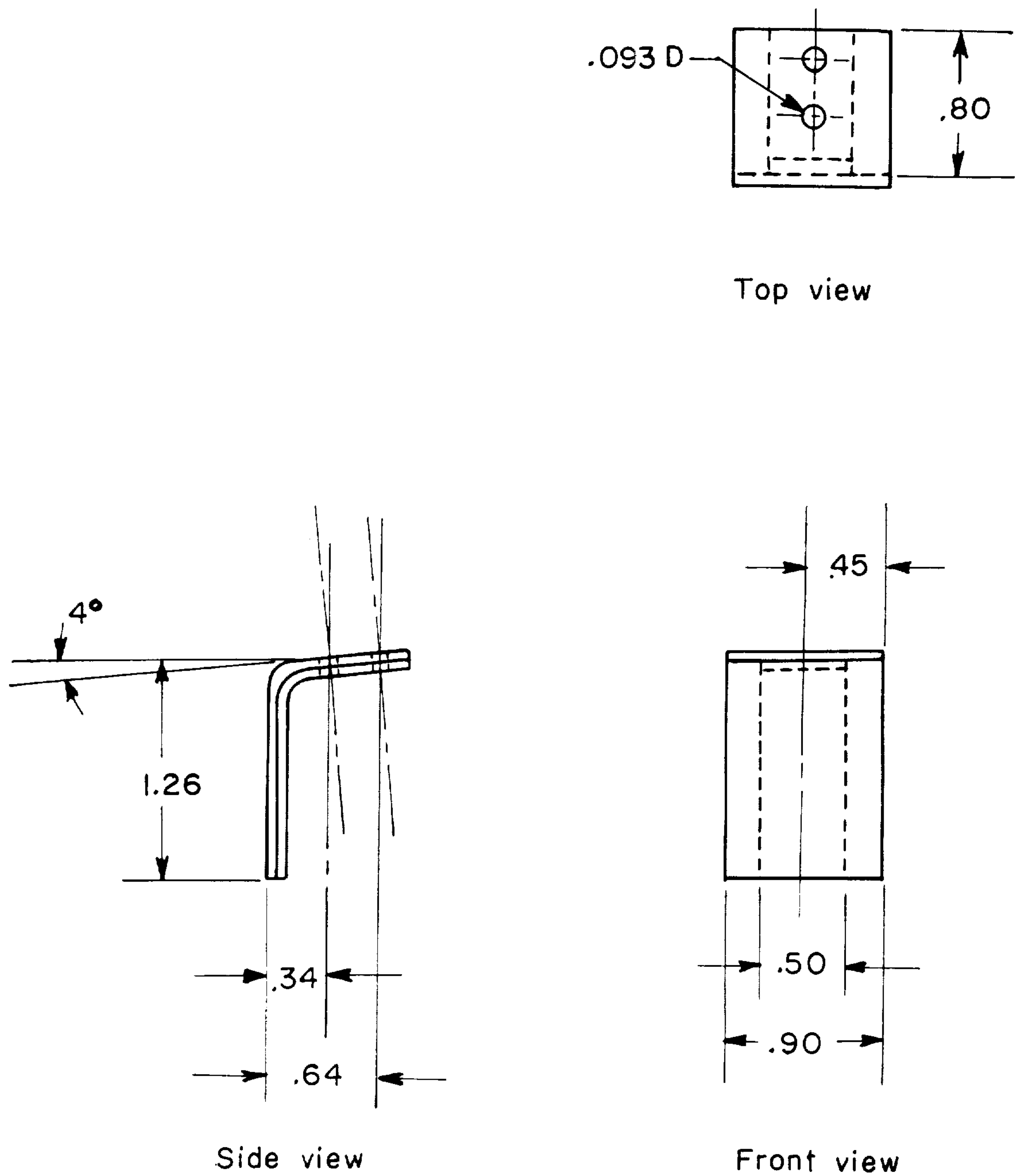


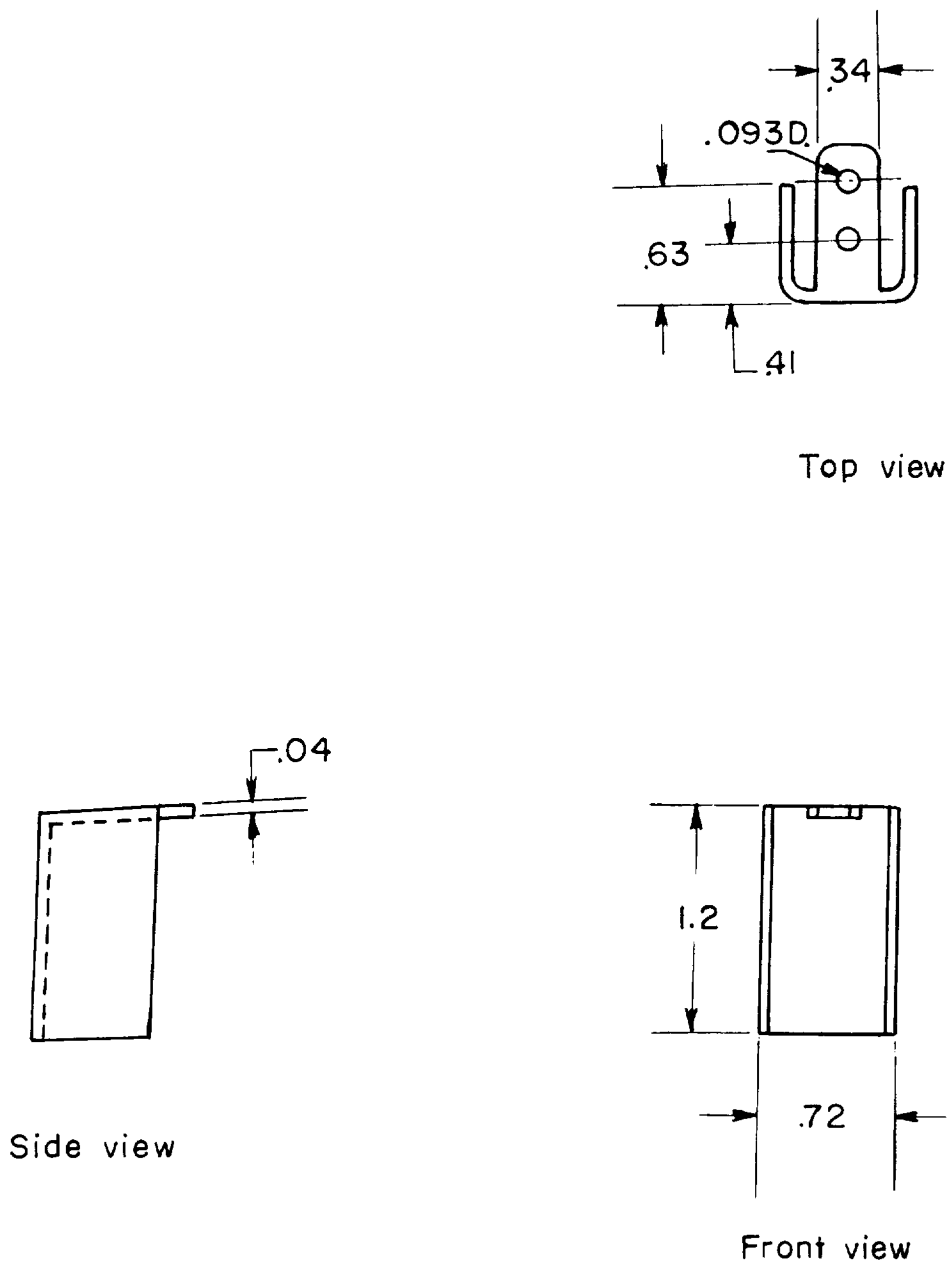
(c) Transverse baffle.

Figure 2.- Continued.



(d) Baffle configuration 1a.

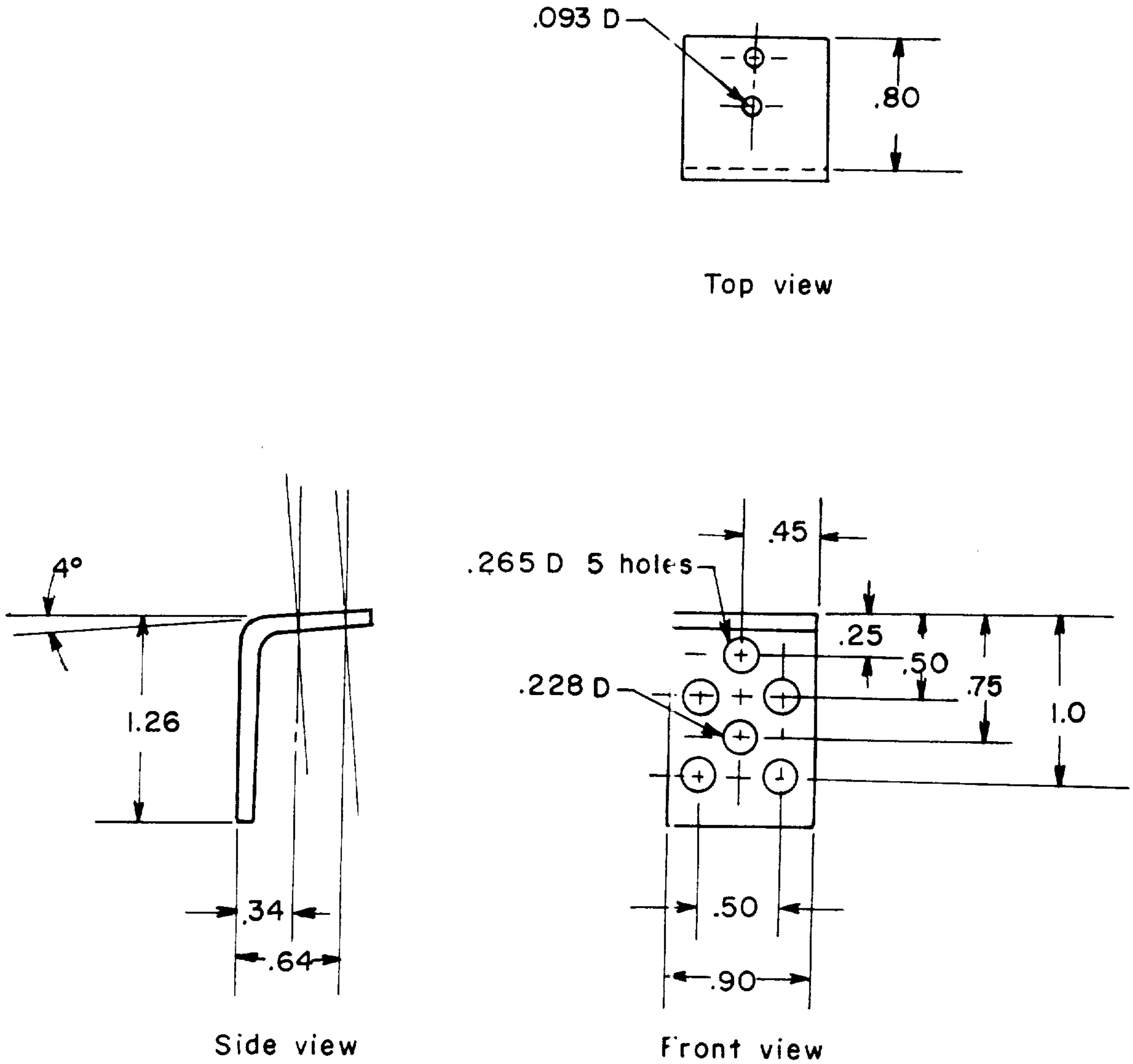
Figure 2.- Continued.



(e) Baffle configuration 1b.

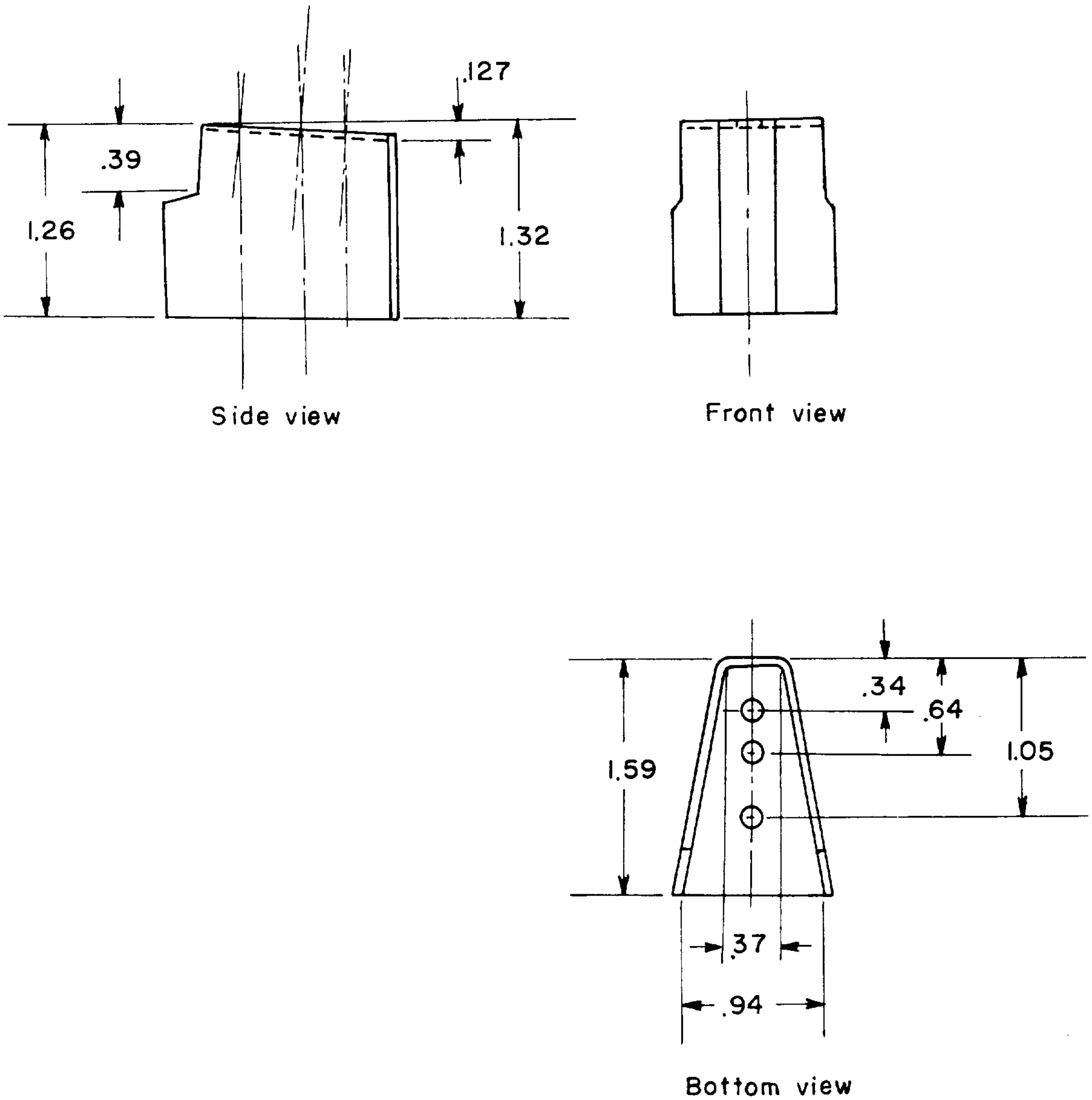
Figure 2.- Continued.

[redacted]



(f) Baffle configuration 1c.

Figure 2.- Continued.



(g) Baffle configuration 2.

Figure 2.- Continued.

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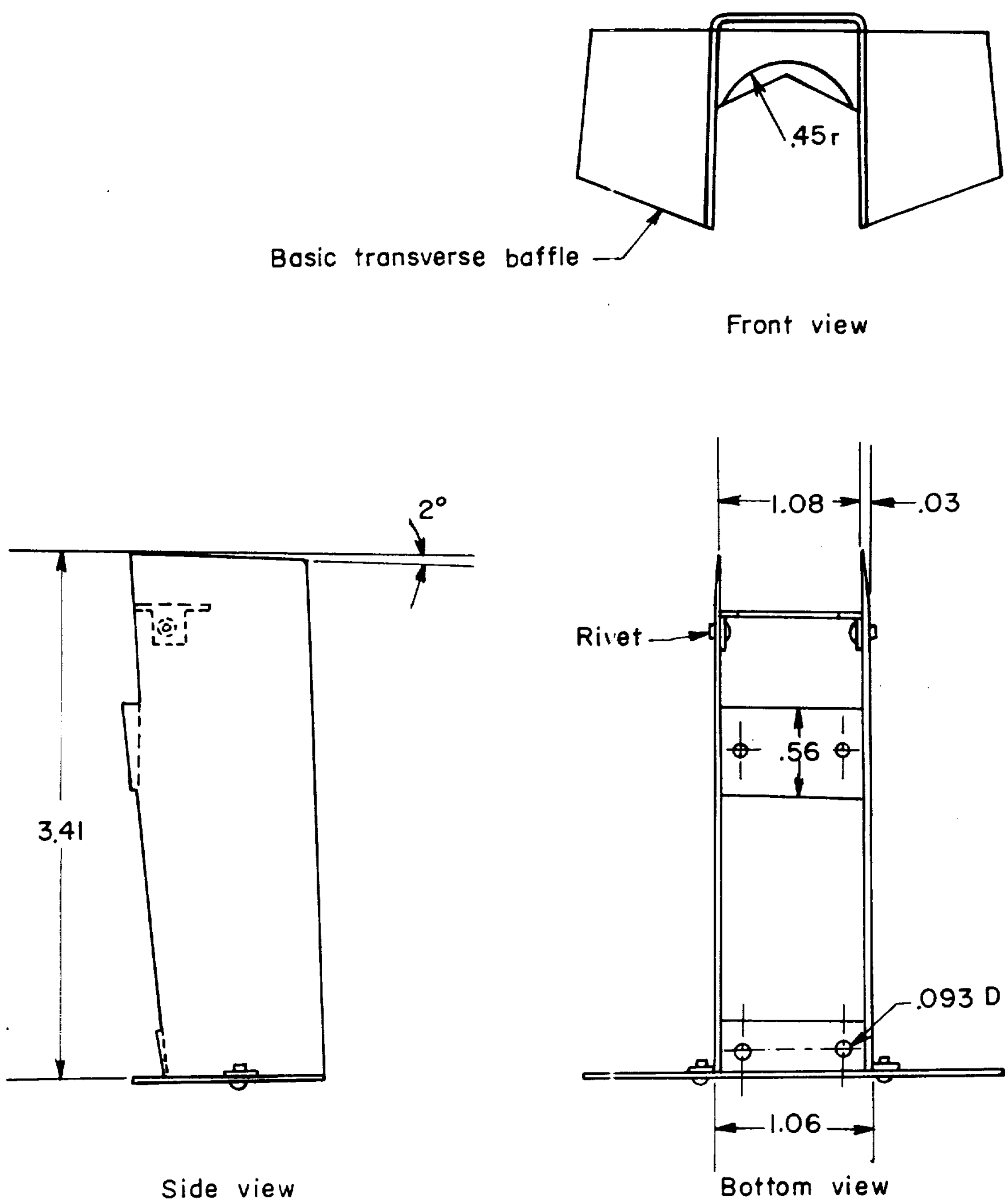

(h) Baffle configuration 3.

Figure 2.- Continued.

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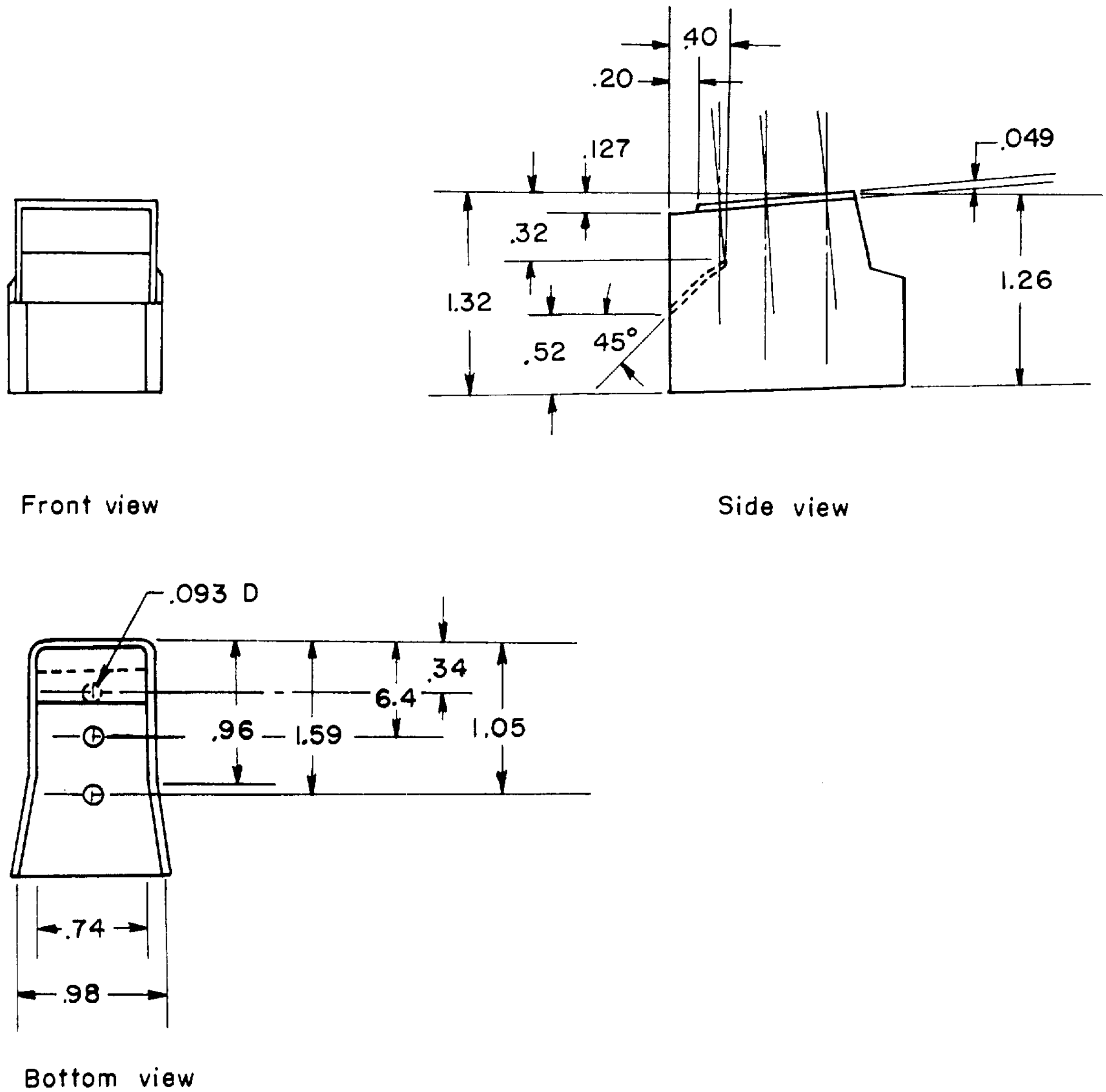

(i) Baffle configuration 4.

Figure 2.- Concluded.

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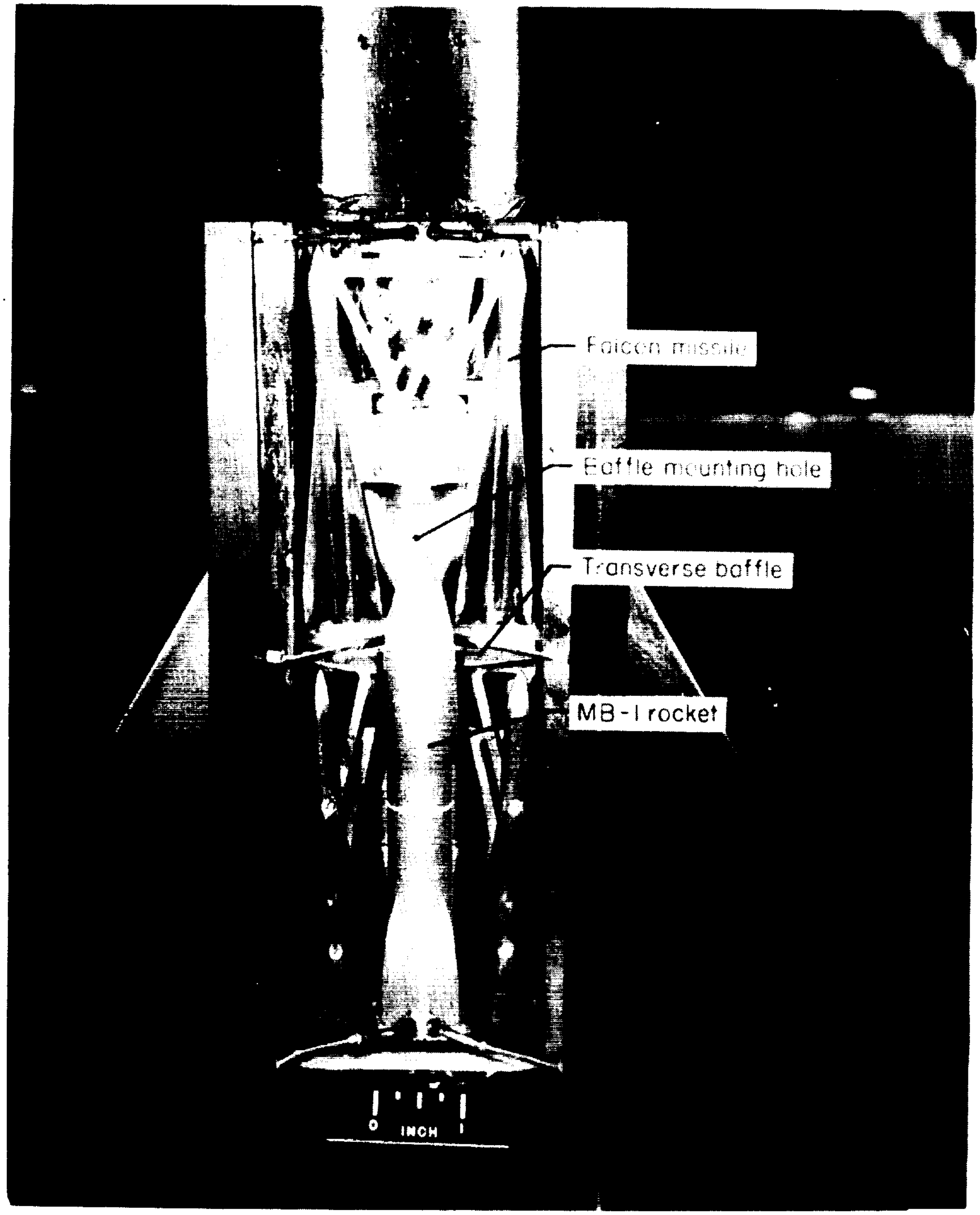

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Figure 3.- Bottom view of the Convair F-106A missile bay with MB-1 rocket, transverse baffle, and Falcon missiles in place.

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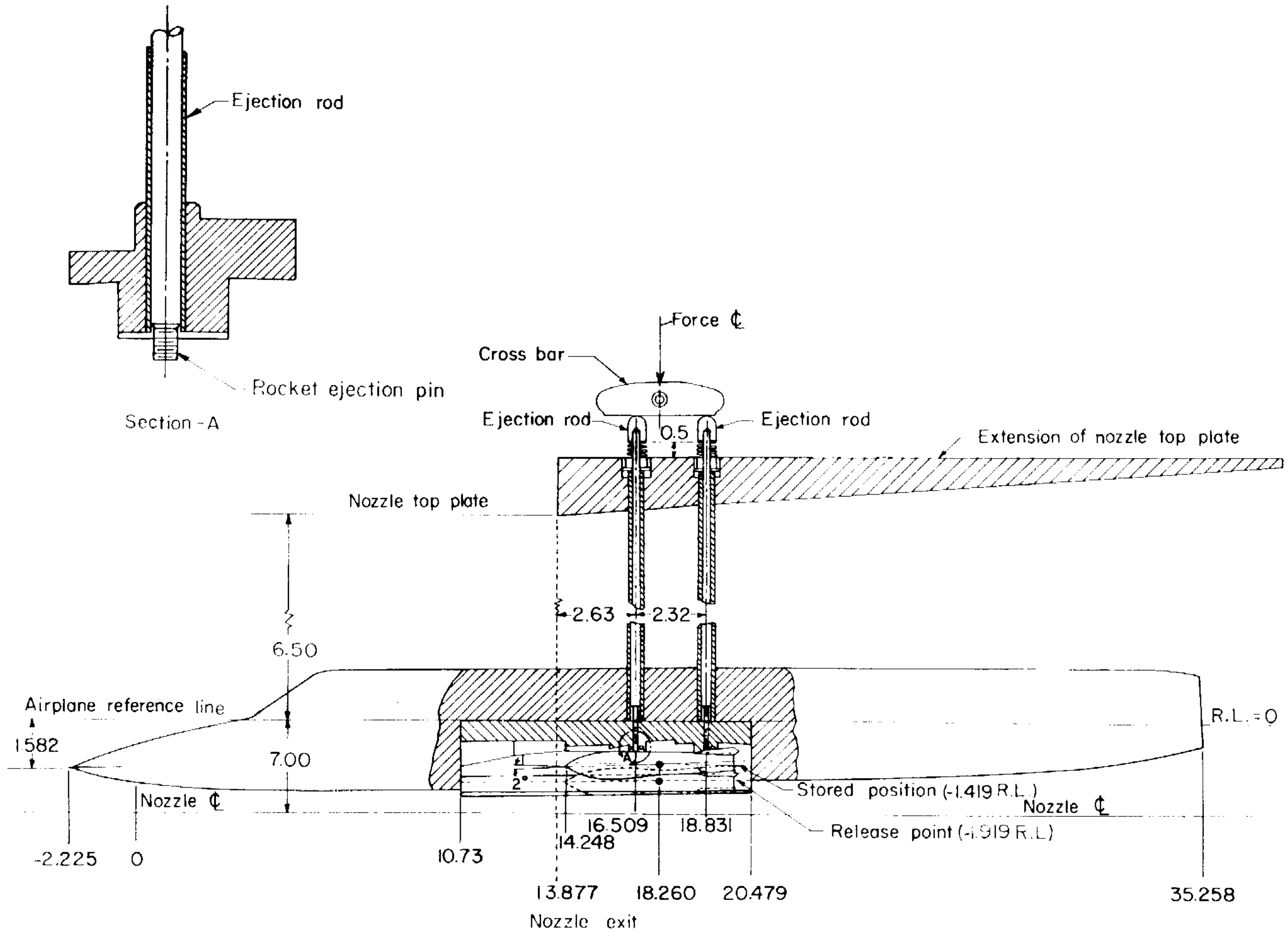
[redacted]



(a) Side view.

Figure 4.- The 0.04956-scale model of the Convair F-106A airplane in preflight jet. All dimensions are in inches.

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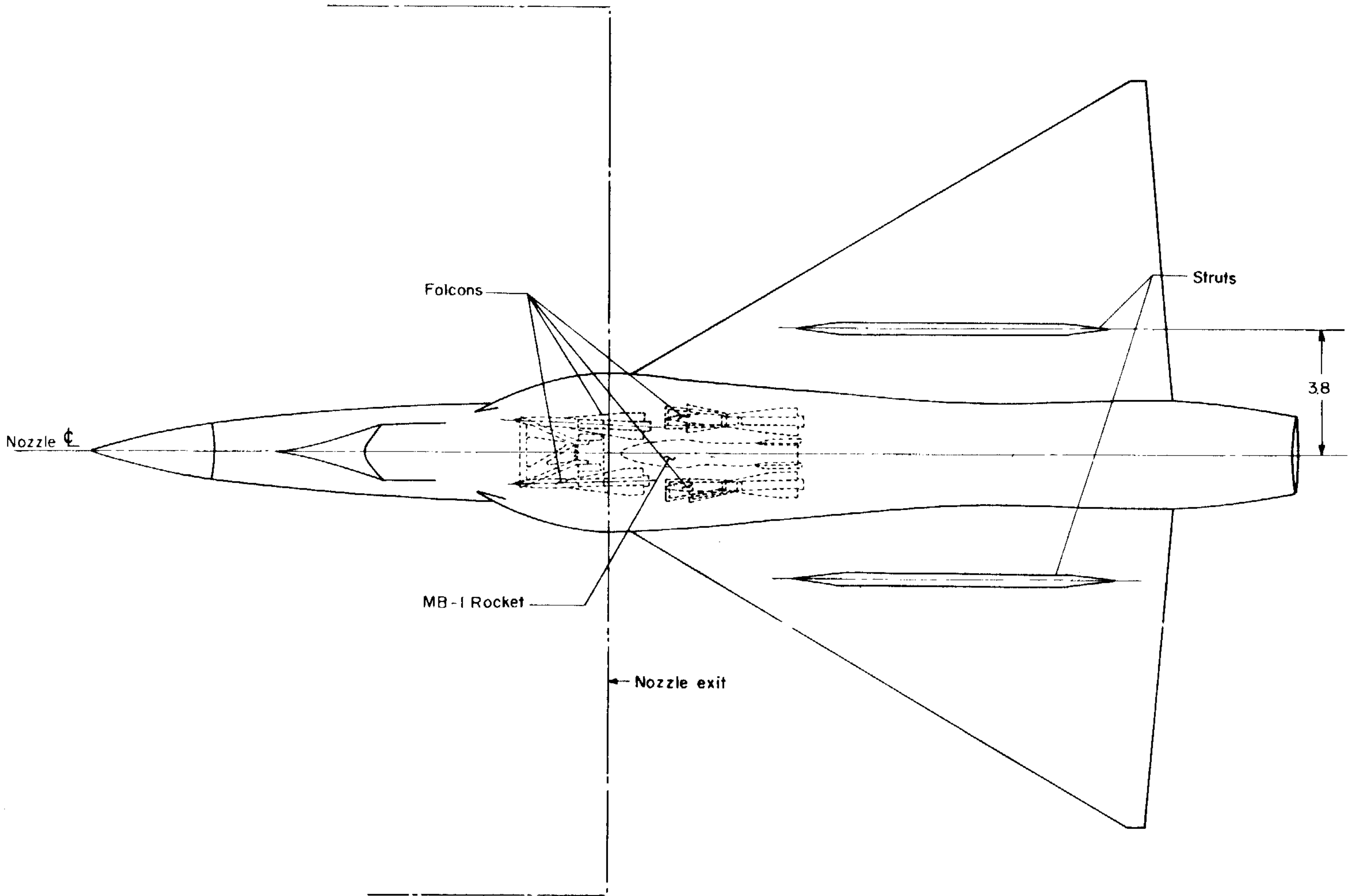


(b) Top view.

Figure 4.- Concluded.

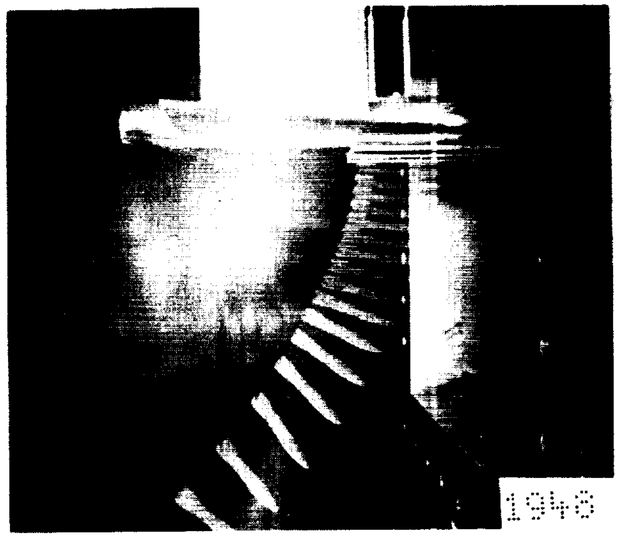
[redacted]

Test 1; basic missile bay; h_p = 22,370 feet   L-59-1913

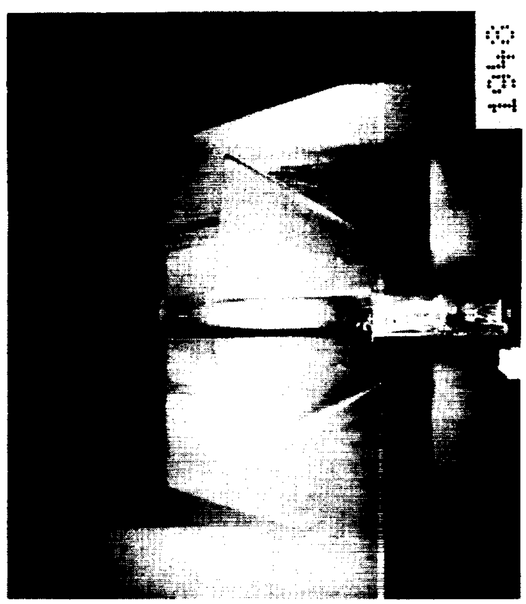
(a) Stroboscopic photographs.

Figure 5.- Effect of changes in missile-bay baffle configurations. $M_\infty = 1.59$; $N_f = 4$; $\alpha_f = 1^\circ$; $\dot{z}_o = 32$ feet per second.

[redacted]



Test 2; baffle configuration la (side view); h_p = 22,450 feet



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Test 2; baffle configuration la (bottom view); h_p = 22,450 feet

(a) Concluded.

Figure 5.- Continued.

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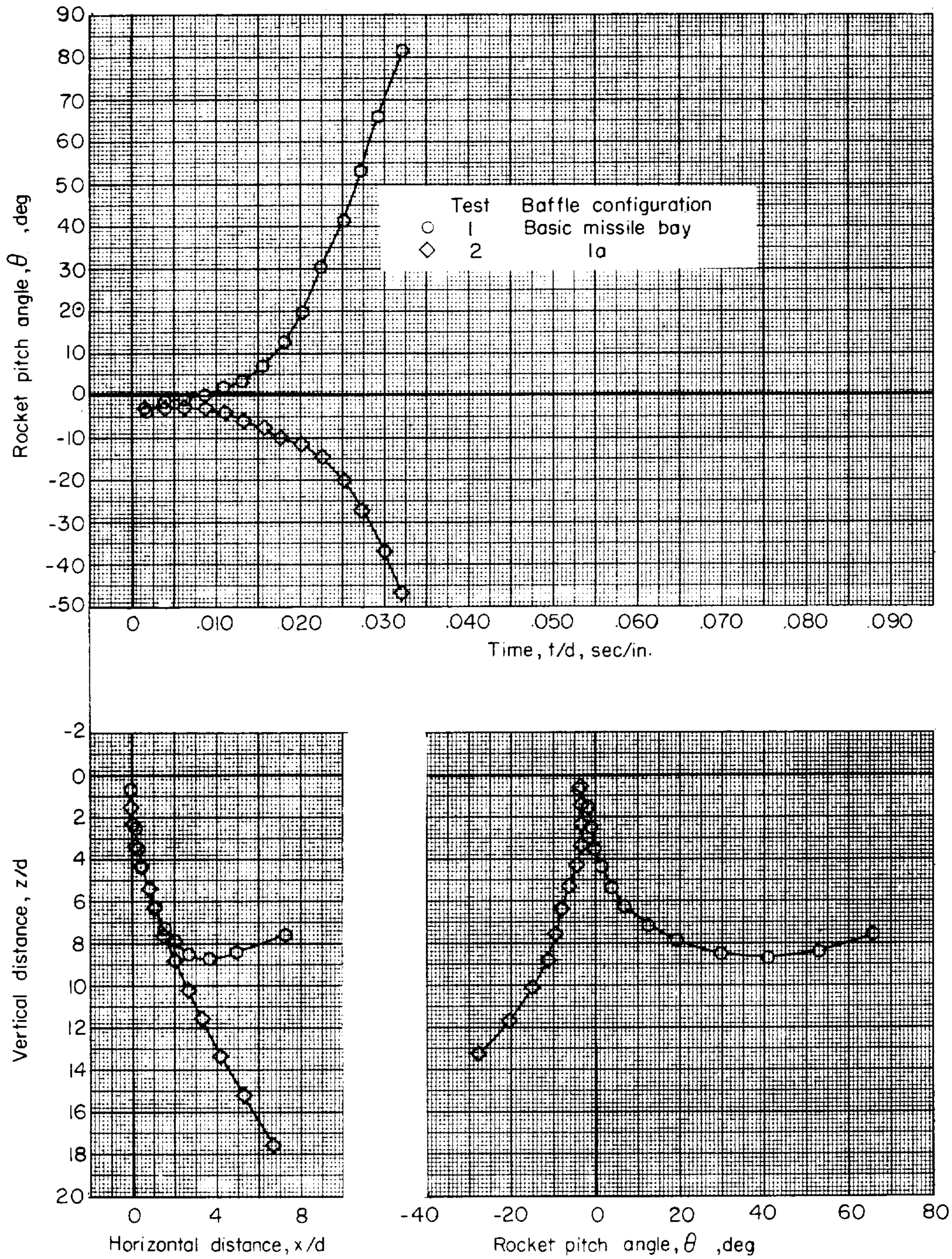

(b) Measured trajectories and oscillations.

Figure 5.- Concluded.

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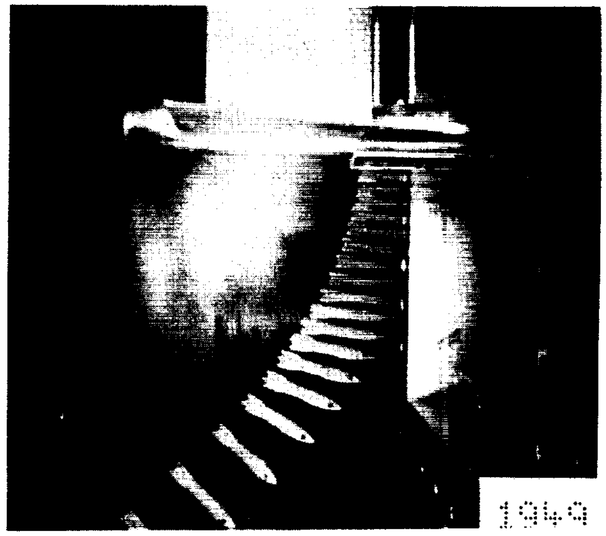
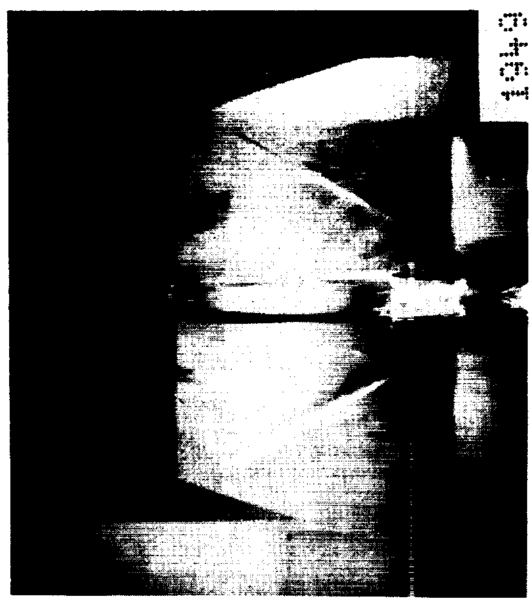


Test 3; baffle configuration 1b (side view)



Test 3; baffle configuration 1b (bottom view)   L-59-1915

(a) Stroboscopic photographs.

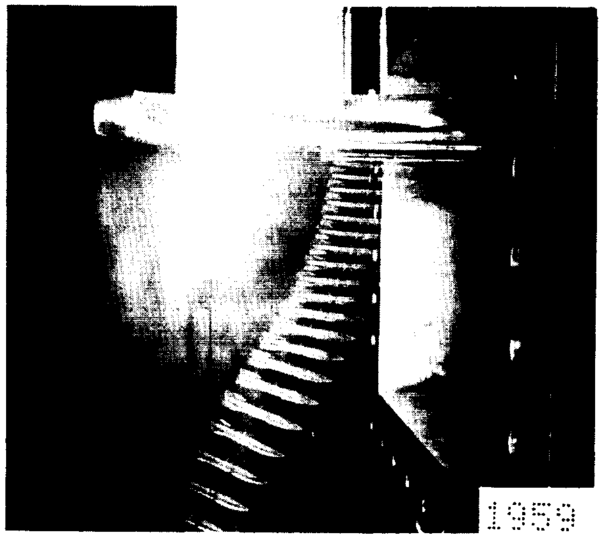
Figure 6.- Effect of changes in missile-bay baffle configurations. $M_\infty = 1.59$; $h_p = 22{,}450$ feet; $N_f = 4$; $\alpha_f = 1^\circ$; $\dot{z}_o = 32$ feet per second.

[redacted]

[redacted]

[redacted]

[redacted]



Test 4; baffle configuration lc (side view)

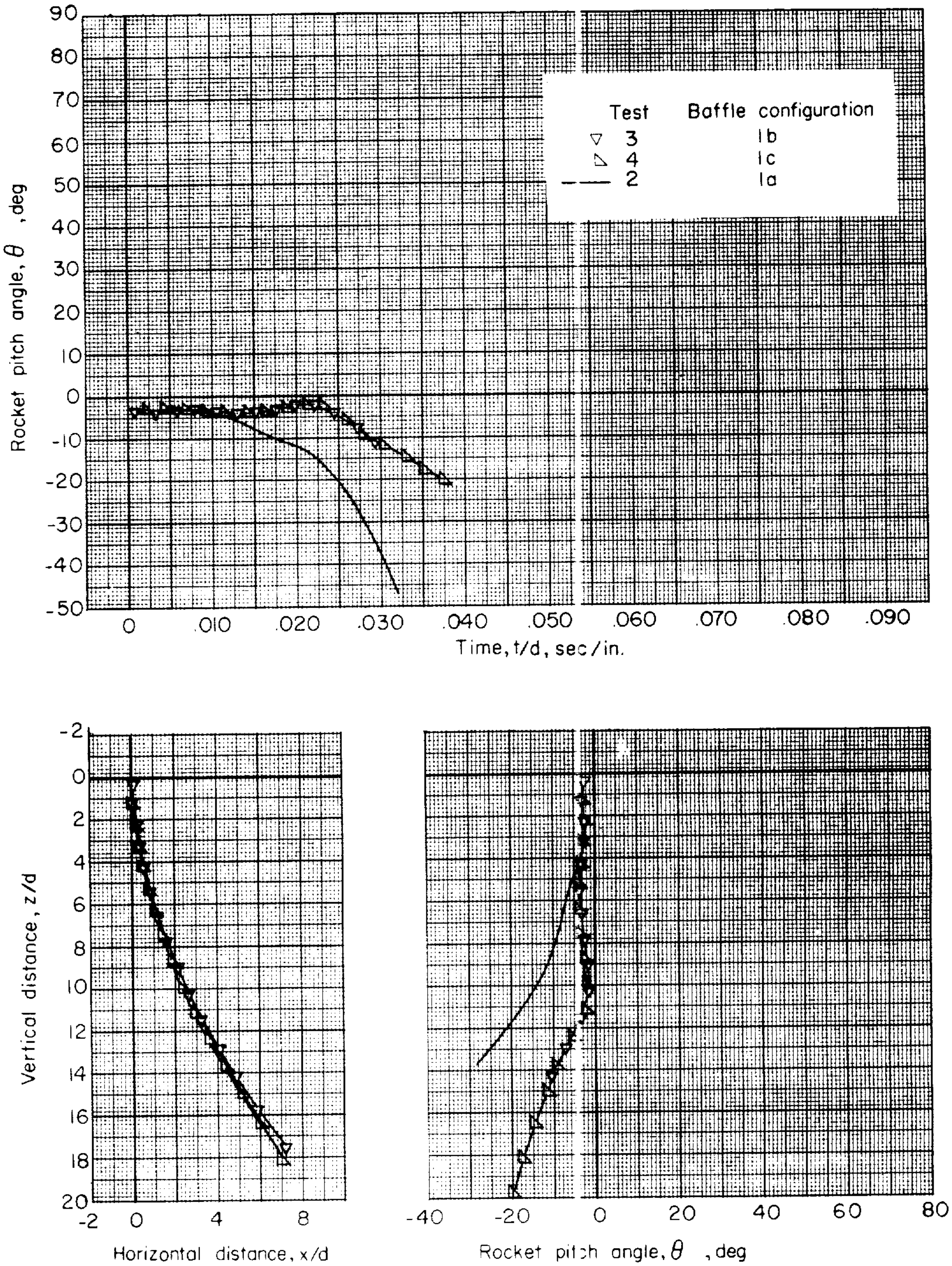
Test 4; baffle configuration lc (bottom view) L-59-1916

(a) Concluded.

Figure 6.- Continued.

[redacted]

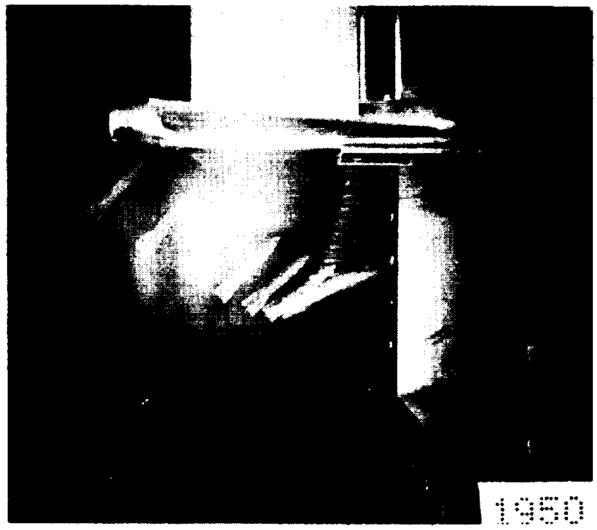
[redacted]



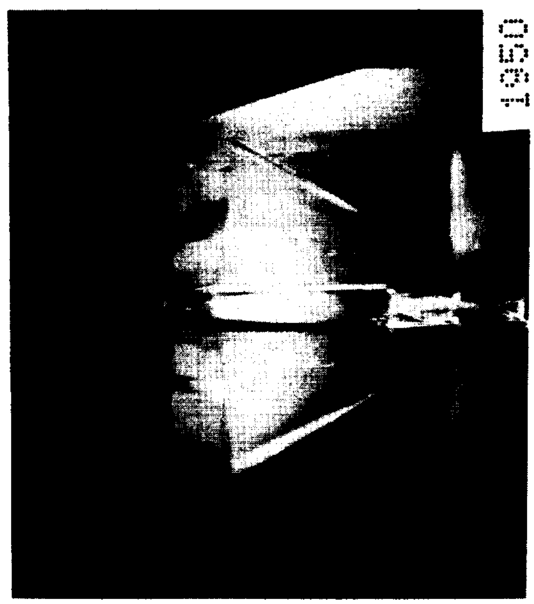
(b) Measured trajectories and oscillations.

Figure 6.- Concluded.

L-361



Test 5; baffle configuration 2 (side view)

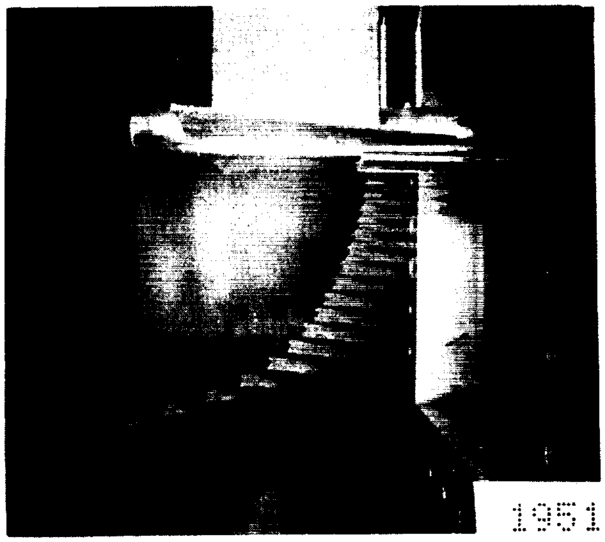


Test 5; baffle configuration 2 (bottom view)   L-59-1917

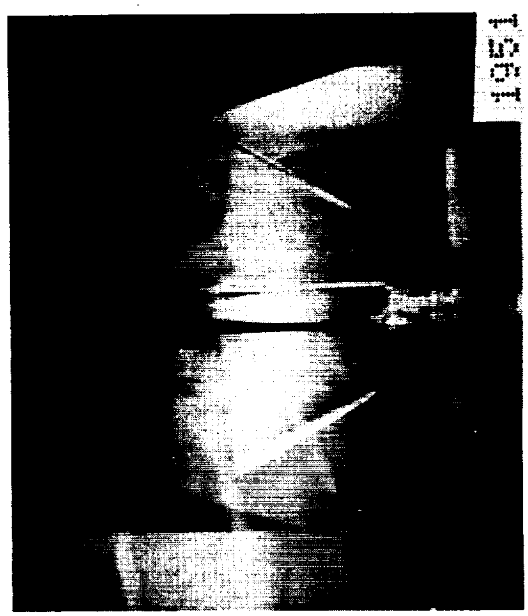
(a) Stroboscopic photographs.

Figure 7.- Effect of changes in missile-bay baffle configurations. $M_\infty = 1.59$; $h_p = 22{,}450$ feet; $N_f = 4$; $\alpha_f = 1^\circ$; $\dot{z}_o = 32$ feet per second.

[redacted]



Test 6; baffle configuration 3 (side view)



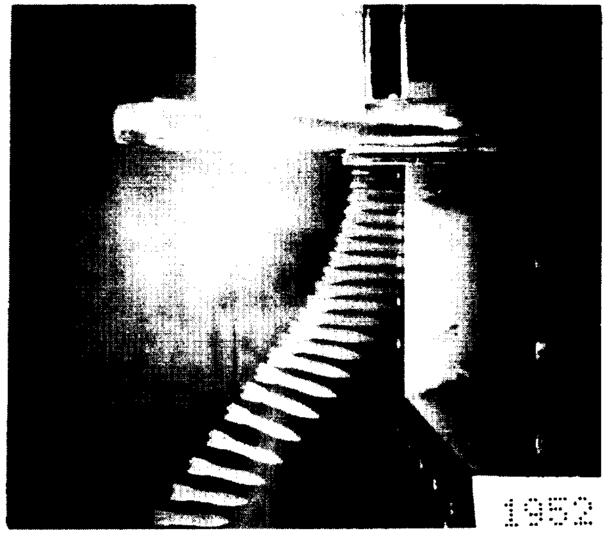
Test 6; baffle configuration 3 (bottom view) L-59-1918

(a) Continued.

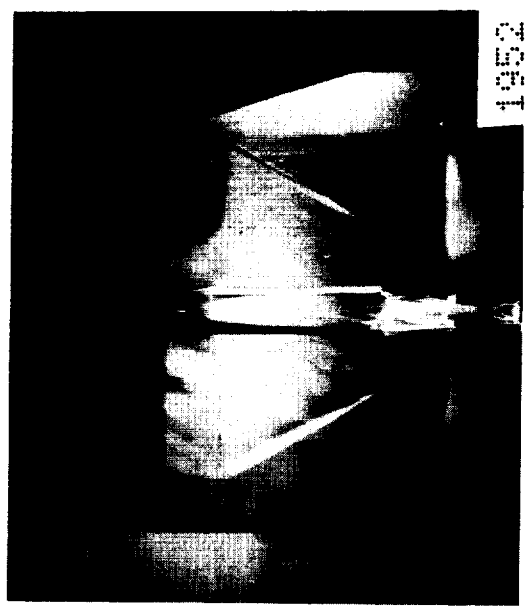
Figure 7.- Continued.

[redacted]

[redacted]



Test 7; baffle configuration 4 (side view)



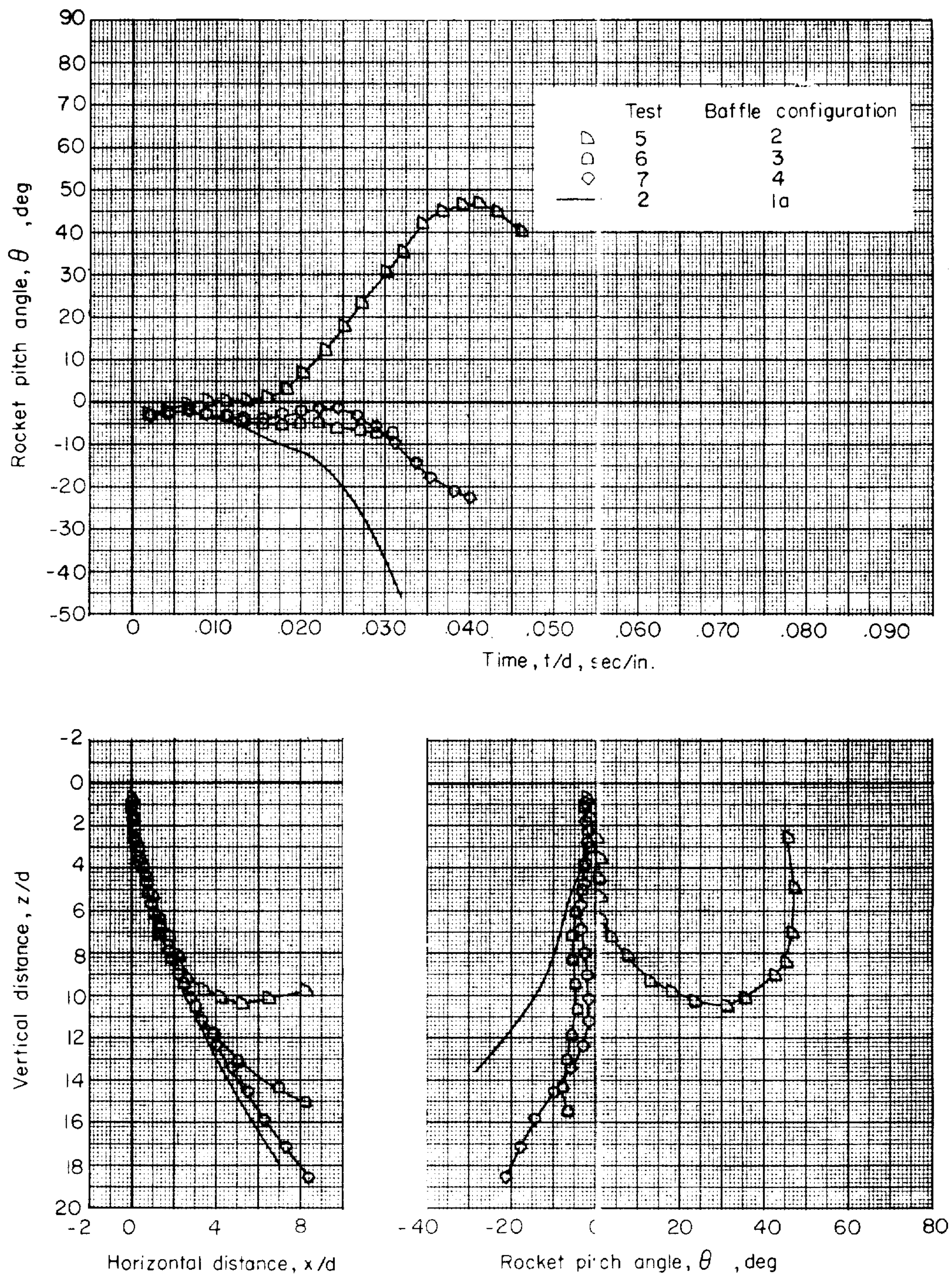
Test 7; baffle configuration 4 (bottom view) L-59-1919

(a) Concluded.

Figure 7.- Continued.

[redacted]

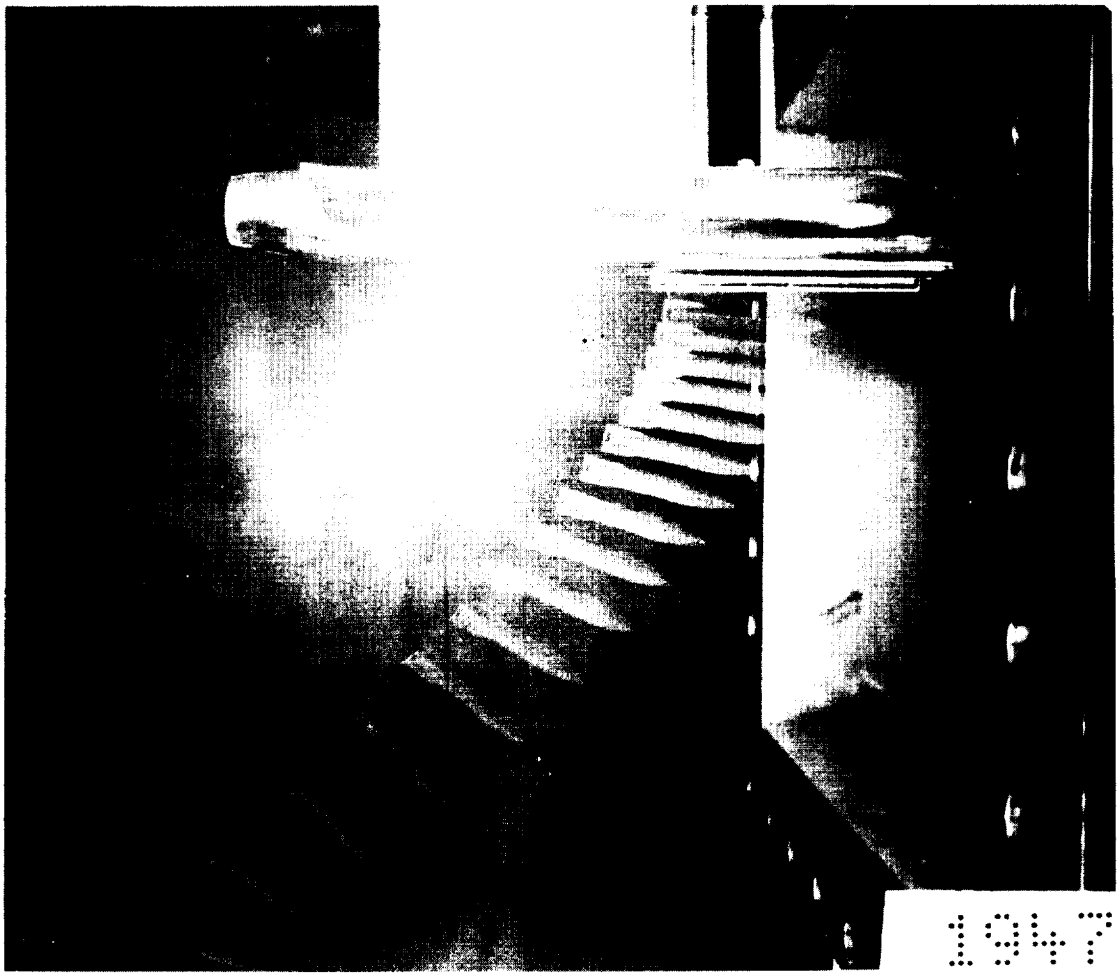
[redacted]



(b) Measured trajectories and oscillations.

Figure 7.- Concluded.

[redacted]

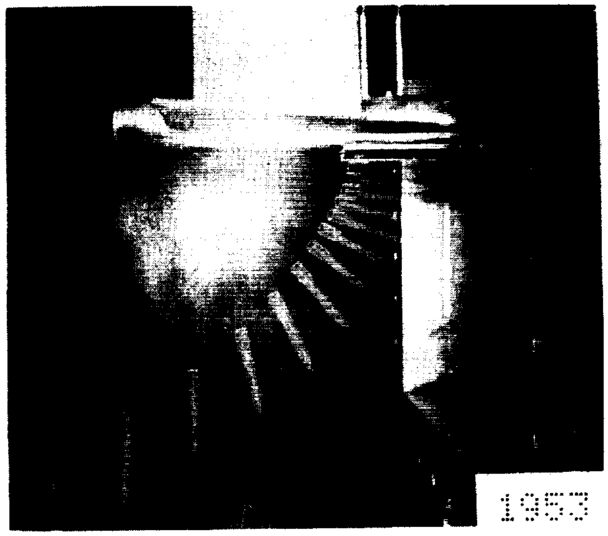


Test 8; basic missile bay with rocket end plate L-59-1920

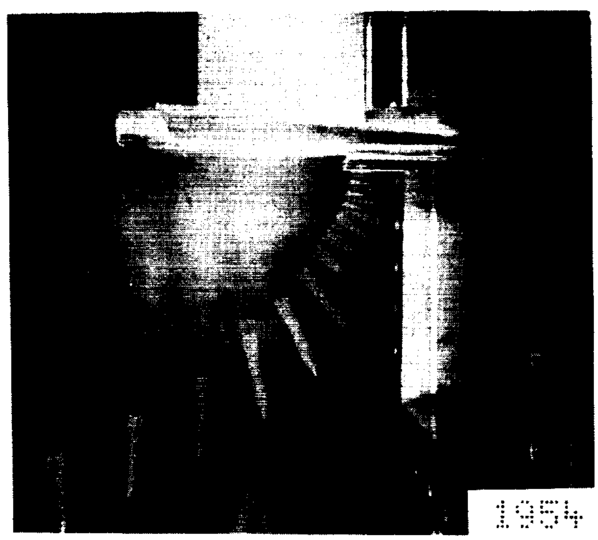
(a) Stroboscopic photographs.

Figure 8.- Effect of the rocket end plate. $M_\infty = 1.59$; $h_p = 22,450$ feet; $N_f = 4$; $\alpha_f = 1^\circ$; $\dot{z}_o = 32$ feet per second.

[redacted]



Test 9; baffle configuration 1a with rocket end plate



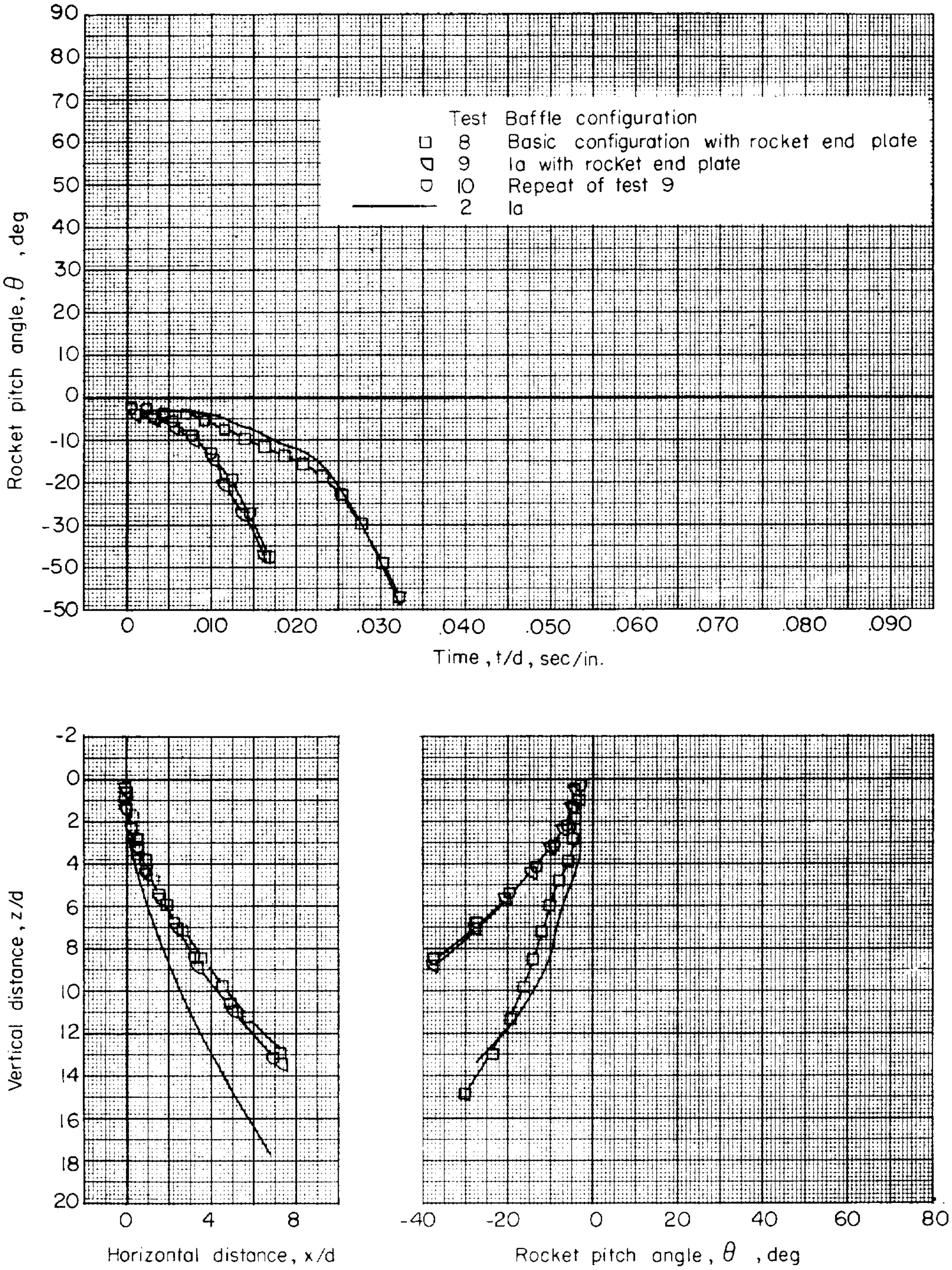
Test 10; repeat of test 9 L-59-1921

(a) Concluded.

Figure 8.- Continued.

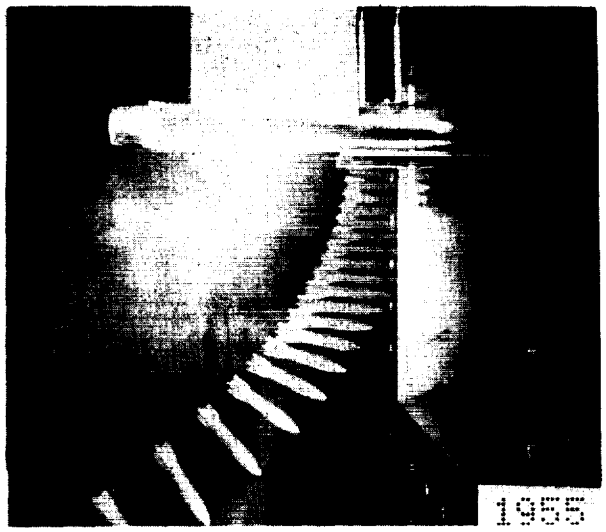
[redacted]

L-701



(b) Measured trajectories and oscillations.

Figure 8.- Concluded.



Test 11; baffle configuration 1a (side view); N_f = 0

L-59-1922

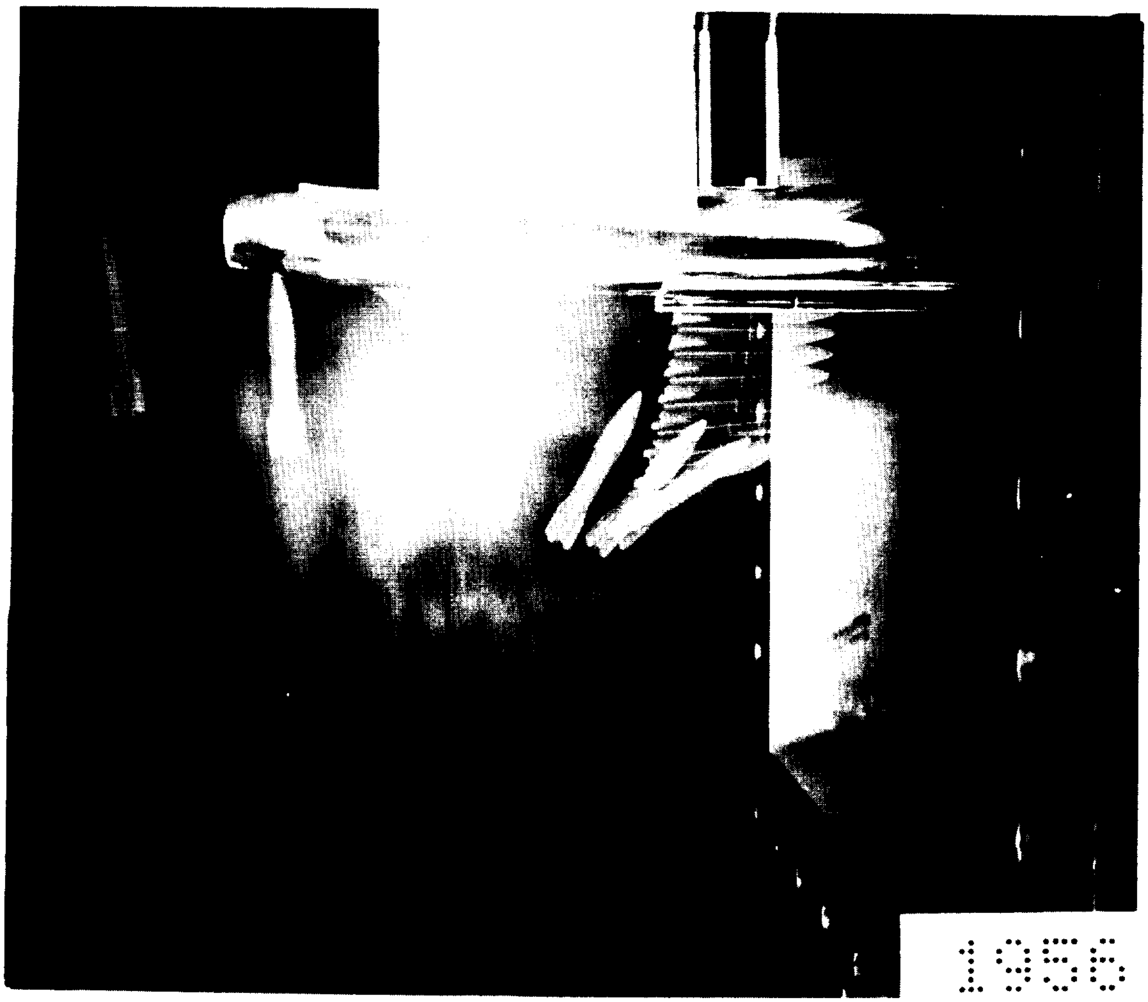
Test 11; baffle configuration 1a (bottom view); N_f = 0

(a) Stroboscopic photographs.

Figure 9.- Effect of 0 and 4 Falcons in the missile bay. $M_\infty = 1.59$; h_p = 22,450 feet; $\alpha_f = 1^\circ$; $\dot{z}_o$ = 32 feet per second.

[redacted]

L-361



1956

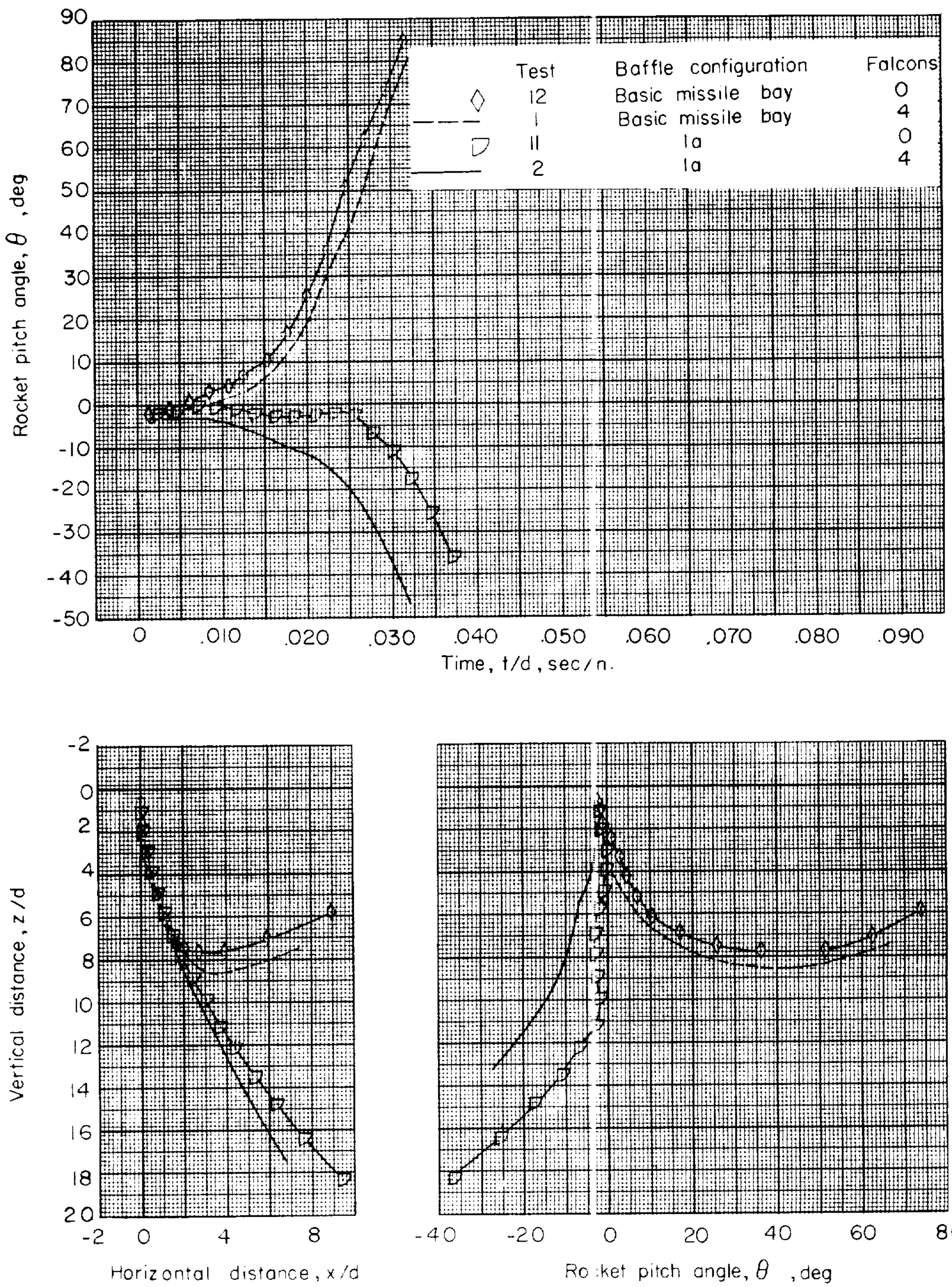
Test 12; basic missile bay; $N_f = 0$ L-59-1923

(a) Concluded.

Figure 9.- Continued.

[redacted]

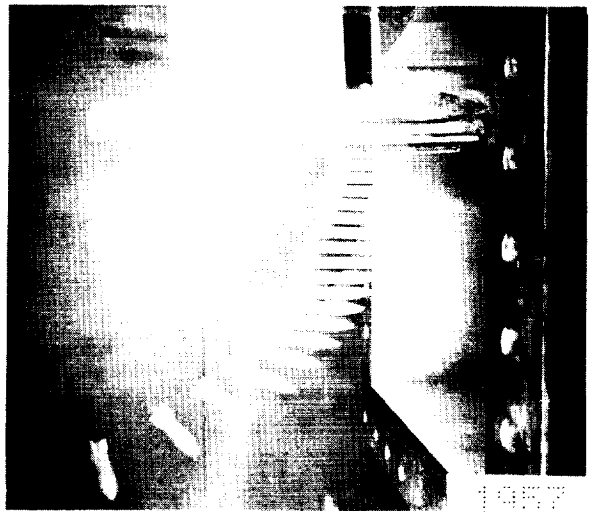
[redacted]



(b) Measured trajectories and oscillations.

Figure 9.- Concluded.

[redacted]



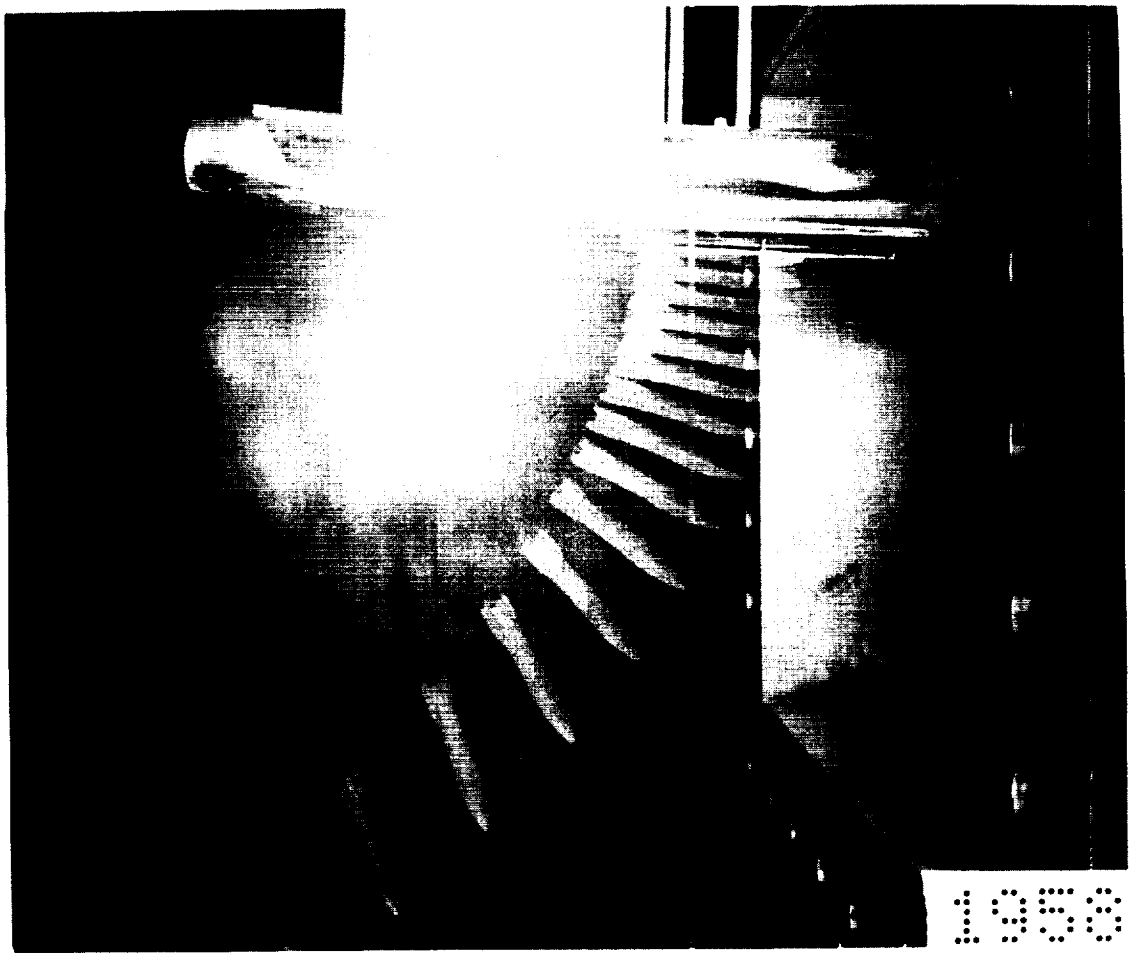
Test 13; side view; $\alpha_f = 3^{\circ}$.

Test 13; bottom view; $\alpha_f = 3^{\circ}$ L-59-1924

(a) Stroboscopic photographs.

Figure 10.- Effect of changes in fuselage angle of attack α_f. Baffle configuration 1a; $M_{\infty} = 1.59$; $h_p = 22{,}450$ feet; $N_f = 4$; $\dot{z}_o = 32$ feet per second.

[redacted]

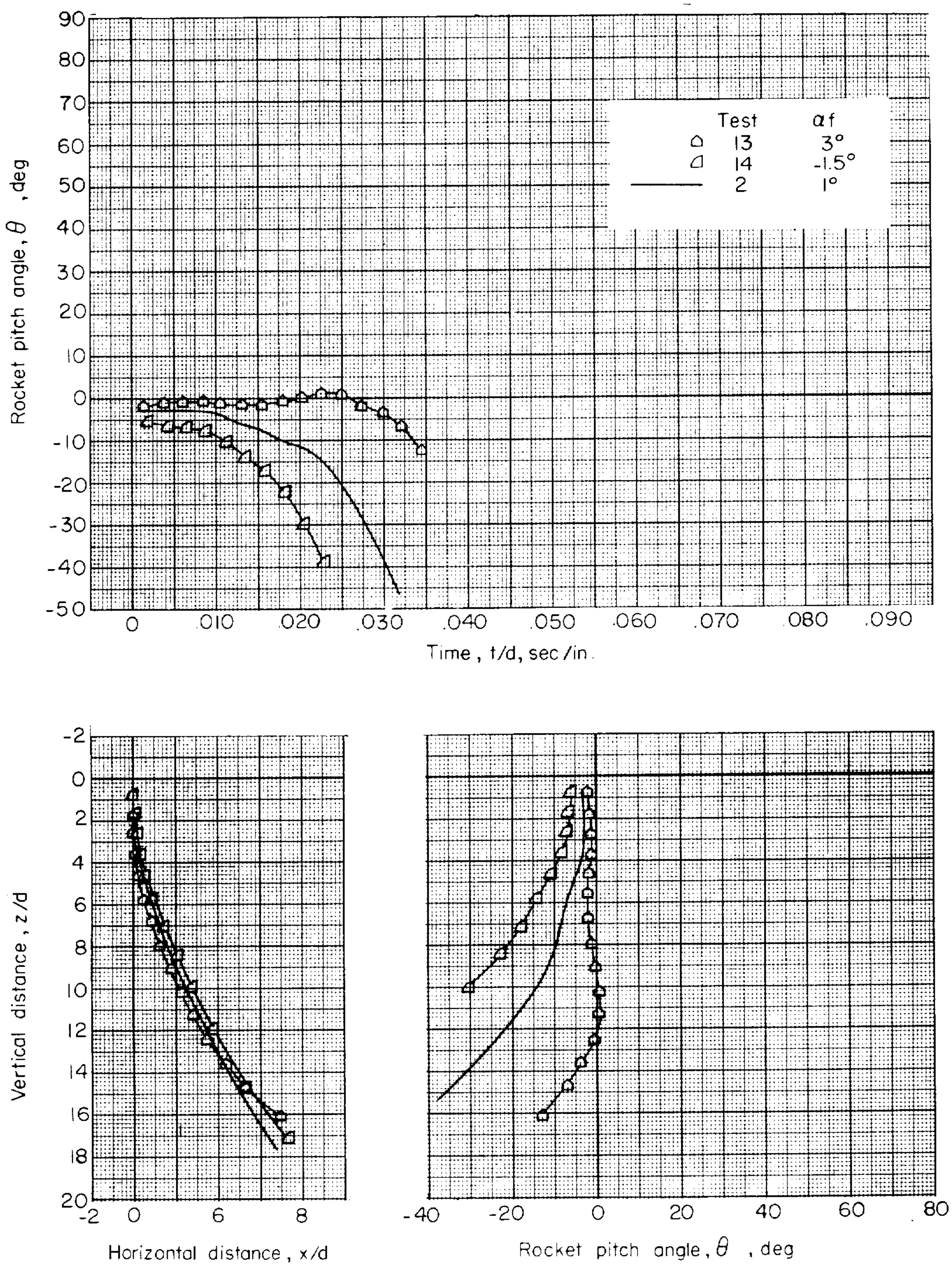


Test 14; $\alpha_f = -1.5^\circ$ L-59-1925

(a) Concluded.

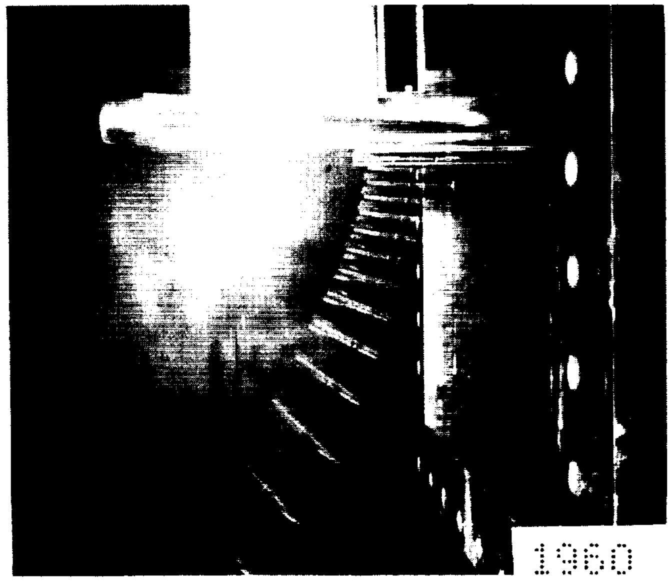
Figure 10.- Continued.

[redacted]

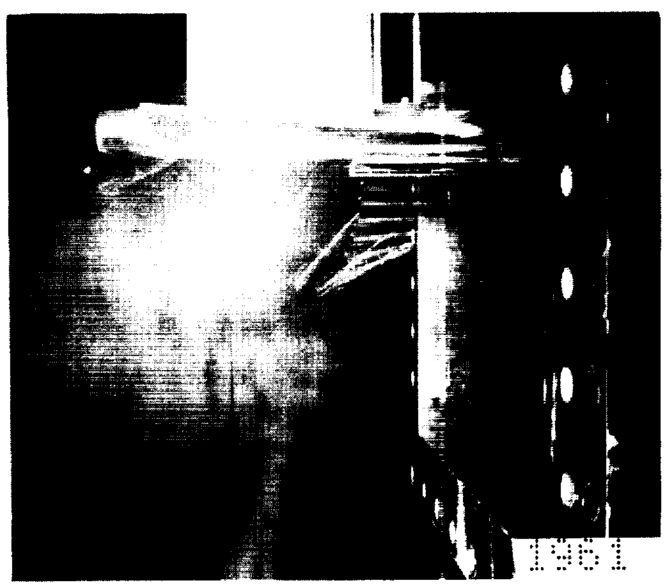


(b) Measured trajectories and oscillations.

Figure 10.- Concluded.



Test 15; baffle configuration 1a; h_p = 22,450 feet; $\alpha_f = 1^\circ$



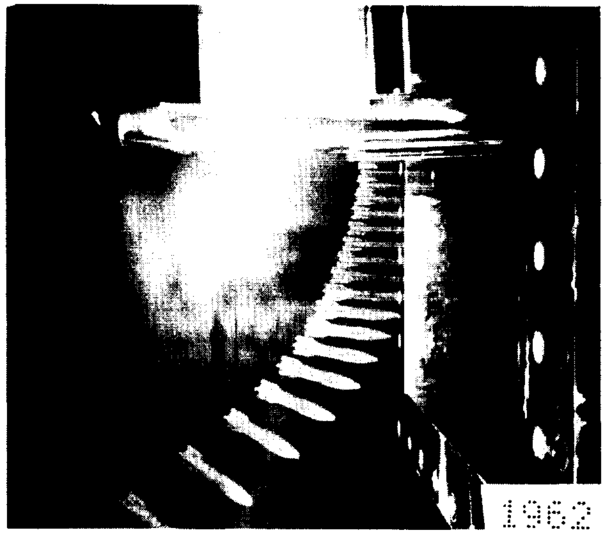
L-59-1926

Test 16; basic missile bay; h_p = 22,450 feet; $\alpha_f = 1^\circ$

(a) Stroboscopic photographs.

Figure 11.- Ejections at $M_\infty = 1.98$. $N_f = 4$; $\dot{z}_o = 32$ feet per second.

L-361



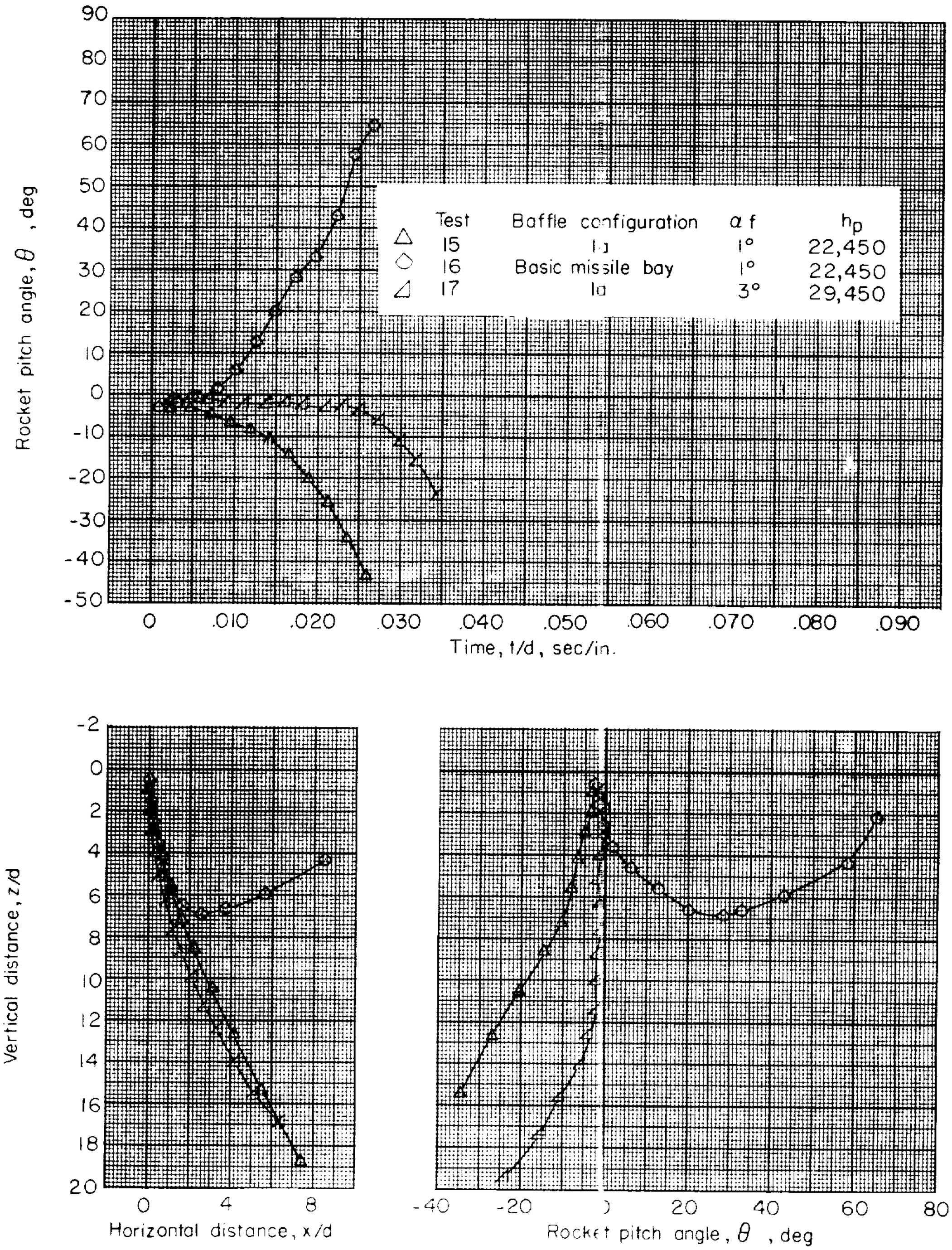
Test 17; baffle configuration 1a (side view); h_p = 29,450 feet; α_f = 3°

L-59-1927

Test 17; baffle configuration 1a (bottom view); h_p = 29,450 feet; α_f = 3°

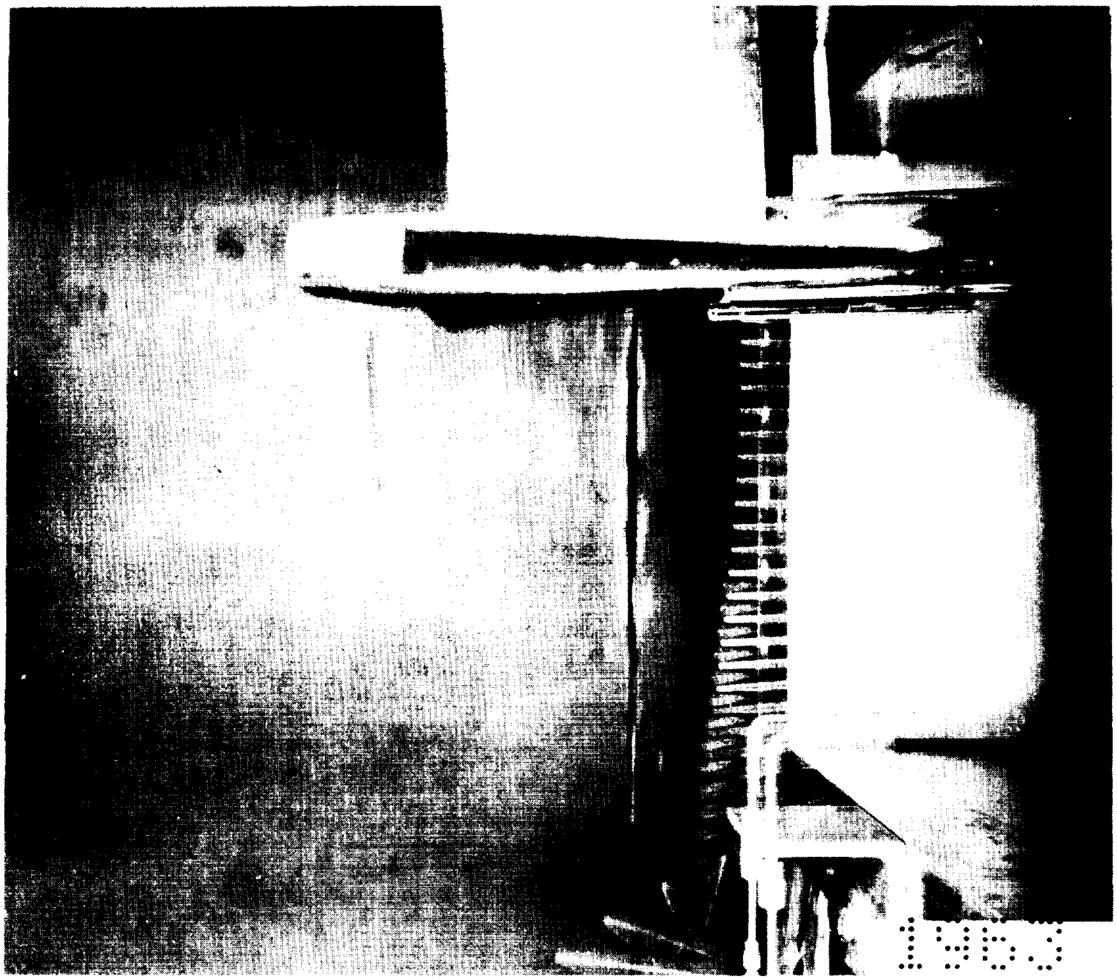
(a) Concluded.

Figure 11.- Continued.



(b) Measured trajectories and oscillations.

Figure 11.- Concluded.

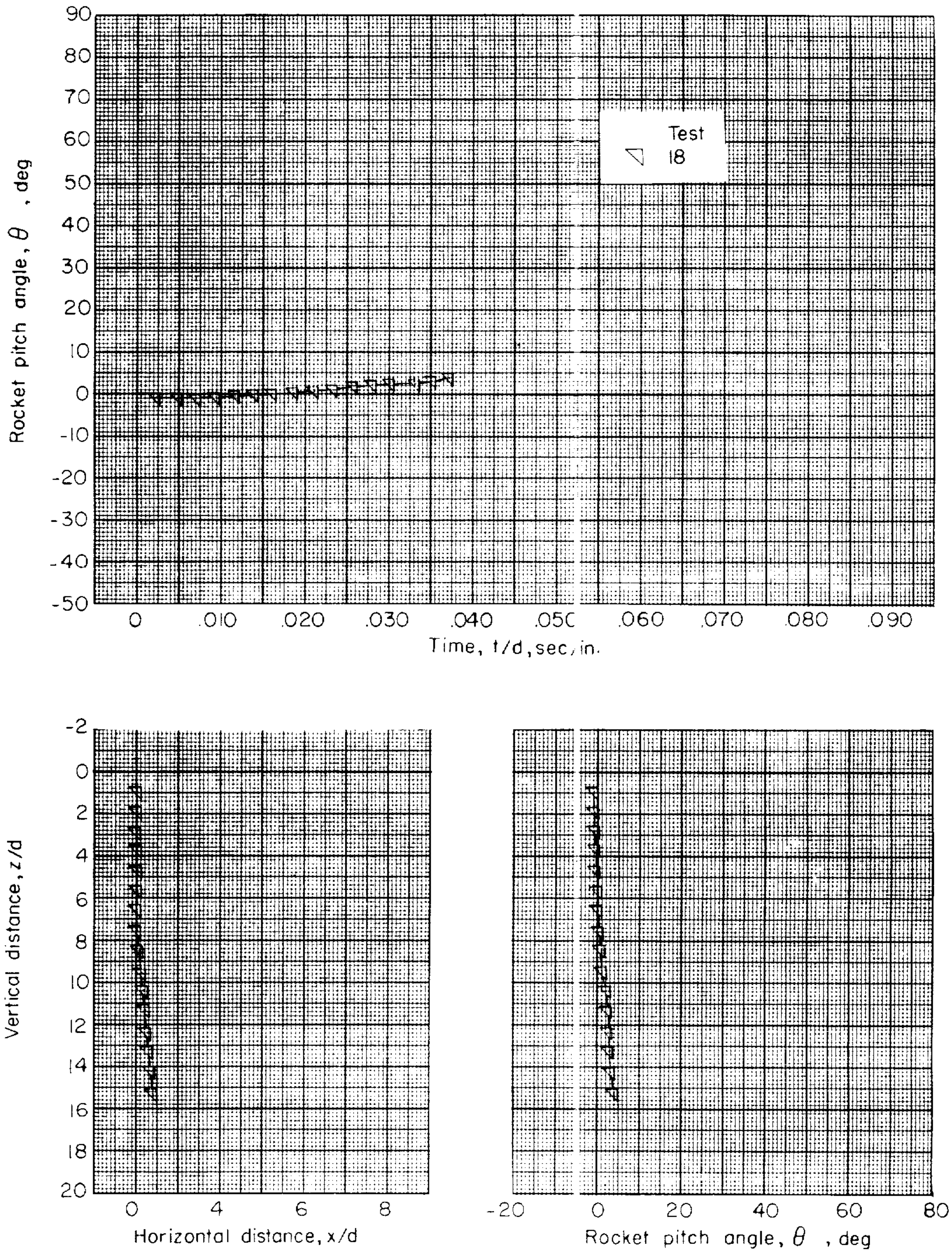


Test 18; baffle configuration 1a L-59-1928

(a) Stroboscopic photograph.

Figure 12.- Ejections at $M = 0.86$. $h_p = 22,450$ feet; $N_f = 4$; $\alpha_f = 3^{\circ}$; $\dot{z}_o = 32$ feet per second.

[redacted]



(b) Measured trajectories and oscillations.

Figure 12.- Concluded.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MEMORANDUM 4-29-59L

for the

U. S. Air Force

EFFECT OF SIX MISSILE-BAY BAFFLE CONFIGURATIONS AND A ROCKET END PLATE ON EJECTION RELEASES OF AN MB-1 ROCKET FROM A 0.05-SCALE MODEL OF THE CONVAIR F-106A AIRPLANE*

COORD. NO. AF-AM-57

By William F. Hinson and John B. Lee

ABSTRACT

An investigation has been conducted in the 27- by 27-inch preflight jet of the NASA Wallops Station to determine the effects of six missile-bay baffle configurations and a rocket end plate on the ejection release characteristics of an MB-1 rocket from the missile bay of the Convair F-106A airplane. Successful ejections were obtained with all the missile-bay baffle configurations. Tests of the most favorable configuration under various conditions indicated that the initial negative pitching velocity applied to the MB-1 rocket might be reduced in order to maintain a near-level-flight attitude after release.

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Flow, Supersonic	1.1.2.3
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