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E.O. 10501, 5 Nov 1953; USNSWC ltr dtd 25 Feb 1975

NPG REPORT NO. 879

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

[redacted]

Twenty-eighth Partial Report

on

Mine and Mine Component Testing under

Task Assignment NPG-Dahlgren-Re6b-311-1-51

Final Report

on

Aircraft Drops of Mine Parachute, XH-20G,

Attached to Mine, Mk. 36

Project No.: NPG-Dahlgren-Re6b-311-1-51
No. of Pages: 7

Date:

NOV 7 1951

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Aircraft Drops of Mine Parachute, XH-20G, Attached to Mine, Mk. 36

PART A

SYNOPSIS

1. This is a final report on Aircraft Drops of Mine Parachute, XH-20G, attached to Mine, Mk. 36, conducted under Task Assignment No. NPG-Dahlgren-Re6b-311-1-51.

2. This test was conducted to determine the flight characteristics, ballistic coefficients and terminal velocities of six of the subject mine-parachute combinations.

3. It was concluded that:

a. The six Mines, Mk. 36, equipped with Parachutes, XH-20G, had excellent flight characteristics and the operation of the parachute packs and parachutes was satisfactory.

b. The ballistic coefficients and terminal velocities, respectively, for the six drops are as follows: Drop No. one, 0.0475 - 176 ft./sec.; Drop No. two, 0.0527 - 186 ft./sec.; Drop No. three, 0.0537 - 188 ft./sec.; Drop No. four, 0.0421 - 165 ft./sec.; Drop No. five, 0.0420 - 165 ft./sec.; Drop No. six, 0.0423 - 166 ft./sec.

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Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

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Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

PART B

INTRODUCTION

1. AUTHORITY:

This test was requested by references (a) and (b) and conducted under Task Assignment No. NPG-Dahlgren-Re6b-311-1-51, authorized by reference (c).

2. REFERENCES:

a. NOL restr speedltr of 5 February 1951
b. NOL speedltr NP/NOL/X17(161) Ser 1159 of 26 March 1951
c. BUORD conf ltr NP9(Re6b) of 24 July 1950

3. BACKGROUND:

a. This test is a part of a long range program to design a parachute suitable for installation on aircraft mines which will withstand high speed launching.

4. OBJECT OF TEST:

This test was conducted to determine:

a. Flight characteristics of the mine-parachute combination.
b. Ballistic coefficient of the mine-parachute combination.
c. Terminal velocity of mine-parachute combination.

5. PERIOD OF TEST:

a.	Date Project Letter	5 February 1951
b.	Date Necessary Material Received	19 February 1951
c.	Date Commenced Test	26 February 1951
d.	Test Completed	26 February 1951

6. REPRESENTATIVE PRESENT:

R. R. Grim Naval Ordnance Laboratory

Aircraft Drops of Mine Parachute, XH-20G,
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PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. The Parachute, XH-20G, is a single chute, 72 inches in diameter, elliptical in shape, and constructed of nylon. There are 16 nylon braided shroud lines, each having a breaking strength of 2500 pounds. The chute is opened by a fifteen foot lanyard, the other end of which is attached to the aircraft. General arrangement and details of the parachute are shown on Bureau of Ordnance Drawing No. SK 186770. Drop Nos. four, five, and six were modified by cutting the pocket bands. This arrangement is shown in detail "G" of the above Bureau of Ordnance drawing.

b. The Parachutes, XH-20G, were housed in Parachute Pack, Mk. 13 Mod. 1, for drops one, two, and three. The Parachute is shown in Figure 1. The chutes were housed in modified Parachute Packs, Mk. 9, for drops four, five, and six. The parachute and pack is shown in Figure 2.

c. The parachute packs were assembled on Mines, Mk. 36, by means of an attachment band for all drops.

8. DESCRIPTION OF TEST EQUIPMENT:

a. Mines were launched separately from a TBM-3E type aircraft.

b. Release and flight of the mines were photographed by cine-theodolites and related equipment.

c. Standard horizontal bombing technique was used for all drops.

d. Mitchell high speed cameras were used to photograph release, flight and impact of each mine.

Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

9. PROCEDURE:

a. Six Mines, Mk. 36, assembled with Parachutes, XH-20G, were launched separately from a TBM-3E type aircraft in horizontal flight at the time of release. Indicated airspeed for the six drops was 150 knots. Indicated altitude for all drops was 5,000 feet.

b. Film from the cine-theodolites and stationary Mitchell Cameras was used to compute the terminal velocity. Film from the tracking Mitchell camera was used to determine flight characteristics.

10. RESULTS AND DISCUSSIONS:

a. The six Mines, Mk. 36, equipped with Parachute, XH-20G, had excellent flight characteristics, and the operation of the parachute packs and parachutes was satisfactory.

b. For each drop, the vertical component of striking velocity was obtained from Askania theodolite measurements of the mine-parachute combination during descent and a ballistic coefficient based on this vertical striking velocity was determined. The ballistic coefficients and the corresponding terminal velocities were corrected for variation of atmospheric density from standard and for variation of mine weight from the average weight of 972 pounds. The ballistic coefficients and terminal velocities, respectively, are as follows: Drop No. one, 0.0475 - 176 ft./sec.; Drop No. two, 0.0527 - 186 ft./sec.; Drop No. three, 0.0537 - 188 ft./sec.; Drop No. four, 0.0421 - 165 ft./sec.; Drop No. five, 0.0420 - 165 ft./sec. Drop No. six, 0.0423 - 166 ft./sec. The estimated probable error in the ballistic coefficients is 0.001 and in terminal velocity, 2 ft./sec. Ballistic coefficients and terminal velocities for drops four, five, and six based on the time of fall of each unit to a point near impact were also determined and is included in Table II of Appendix (B).

c. Tables I and II of Appendix (B) give detailed data for all drops.

PART D

CONCLUSIONS

11. It was concluded that:

a. The six mines, Mk. 36, equipped with Parachutes, XH-20G, had excellent flight characteristics and the operation of the parachute packs and parachutes was satisfactory.

b. The ballistic coefficients and terminal velocities, respectively, for the six drops are as follows: Drop No. one, 0.0475 - 176 ft./sec.; Drop No. two, 0.0527 - 186 ft./sec.; Drop No. three, 0.0537 - 188 ft./sec.; Drop No. four, 0.0421 - 165 ft./sec.; Drop No. five, 0.0420 - 165 ft./sec.; Drop No. six, 0.0423 - 166 ft./sec.

PART E

DISPOSITION OF MATERIAL

12. The parachutes and packs were recovered and returned to the Naval Ordnance Laboratory.

Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

The tests upon which this report is based were conducted by:
E. B. HALL, Aircraft Ordnance Stores Division,
Aviation Ordnance Department

The ballistic measurements and analysis involved in this report were conducted by the Ballistics Division of the Computation and Ballistics Department

This report was prepared by:
E. B. HALL, Aircraft Ordnance Stores Division,
Aviation Ordnance Department

This report was reviewed by:
J. B. KING, Aircraft Ordnance Stores Division,
Aviation Ordnance Department
F. W. DRESCH, Director of Computation and Ballistics,
Computation and Ballistics Department
H. T. CARMODY, Lieutenant Commander, USN,
Aircraft Ordnance Stores Officer,
Aviation Ordnance Department
W. F. MILLER, Director of Research,
Aviation Ordnance Department
S. VAN MATER, Captain, USN, Aviation Ordnance Officer,
Aviation Ordnance Department
C. C. BRAMBLE, Director of Research, Ordnance Group

APPROVED: IRVING T. DUKE
Rear Admiral, USN
Commander, Naval Proving Ground

C. T. MAURO
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By direction

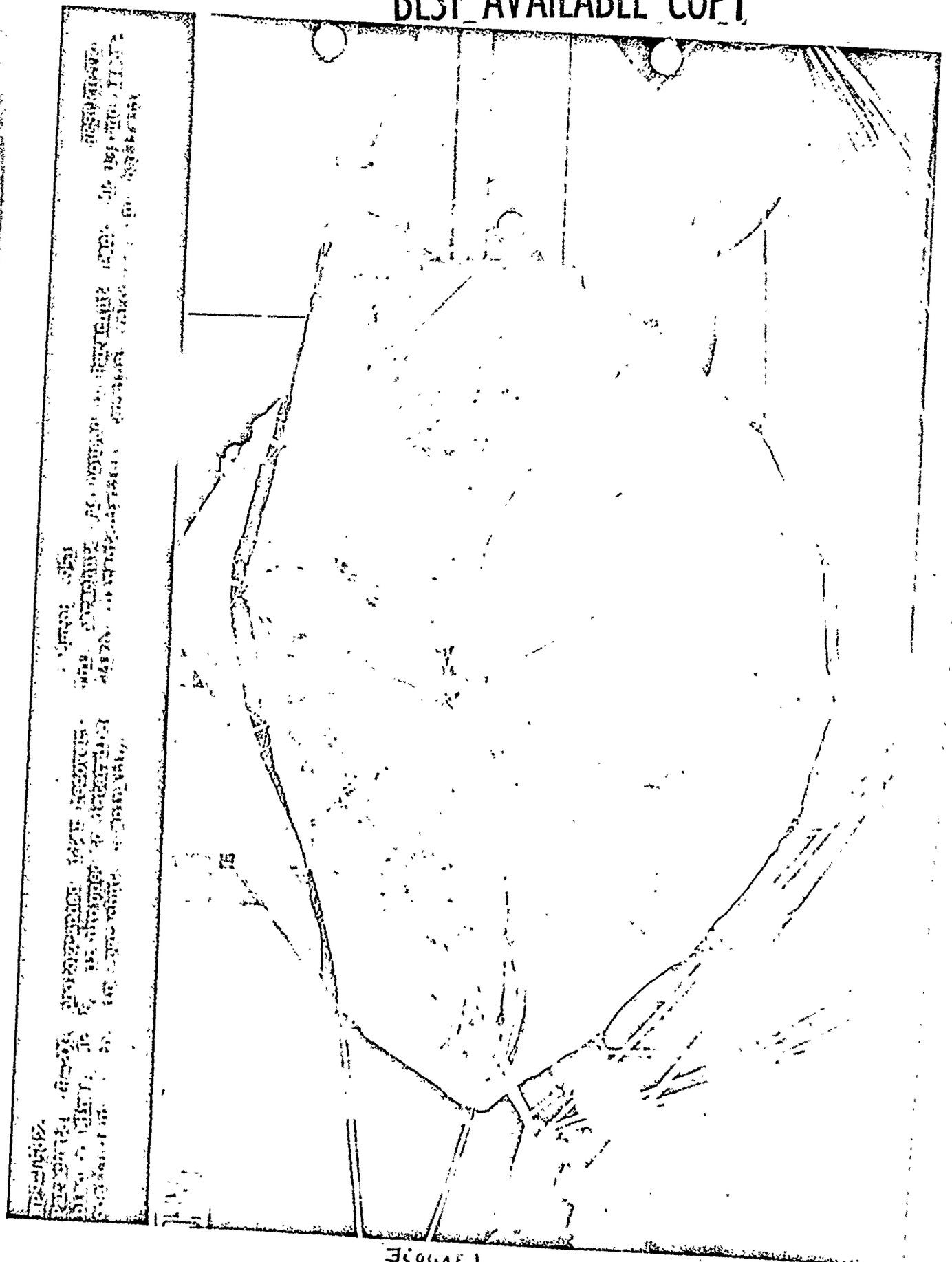

Figure 1

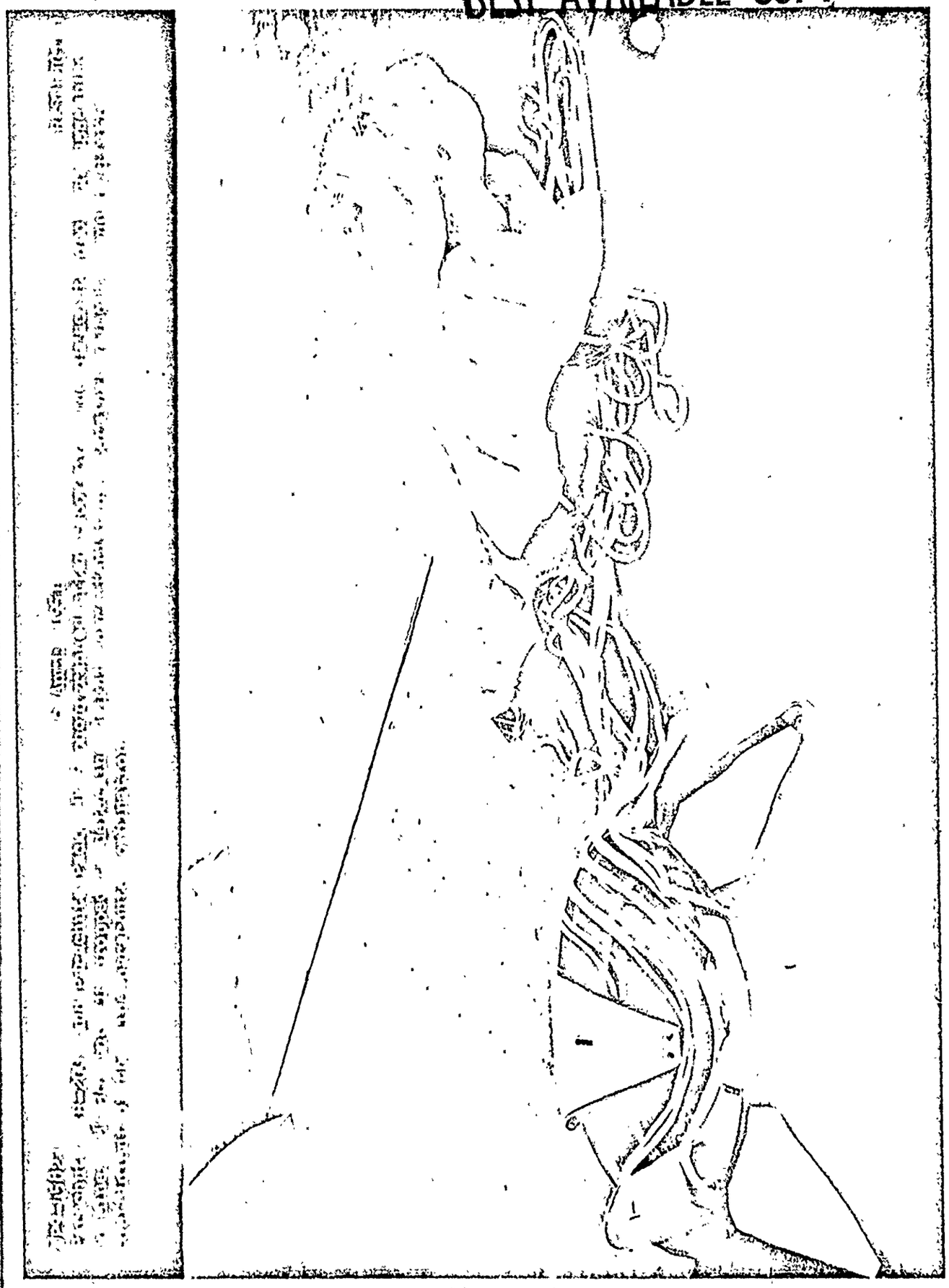

Figure 2

Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

TABLE I

Tabulated Test Data

Launching Plane was a TBM-3E Type Aircraft

Date	Drop No.	Indicated Release Altitude (feet)	Indicated Airspeed (Knots)	Time of Fall (Seconds)***	Remarks
2/26/51	1*	5,000	150	32.92	Satisfactory drop. Excellent flight characteristics.
"	2*	5,000	150	32.08	"
"	3*	5,000	150	32.5	"
3/31/51	4**	5,000	150	32.60	"
"	5**	5,000	150	33.50	"
"	6**	5,000	150	33.5	"

* Parachute housed in Parachute Pack, Mk. 13
** Parachute housed in Modified Parachute Pack, Mk. 9
*** Stop watch times, except that for Drop 3, which is estimated from cine-theodolite records.

TABLE II

Table of Ballistic Data for Mines, Mk. 36, Equipped with Parachute, XH-20G Tested 2-26-51

Drop No.	Wt. of Mine (lbs.)	True Altitude of Release (feet)	Vertical Component of Striking Velocity (ft./sec.)	Ballistic Coefficient		Terminal Velocity (ft./sec.)	
				VSV	TF	VSV	TF
1	966	5080	176	.0475		176	
2	968	5100	185	.0527		186	
3	980	5230	188	.0537		188	
4	963	4860	164	.0421	.0457	165	173
5	983	4970	166	.0420	.0416	165	164
6	974	4930	166	.0423	.0410	166	163

The estimated probable error in the ballistic coefficient is 0.001 and in terminal velocity, 2 ft./sec.

Ballistic Coefficients and terminal velocities corrected to a mean weight of 972 lb.

Aircraft Drops of Mine Parachute, XH-20G,
Attached to Mine, Mk. 36

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Attached to Mine, Mk. 36

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