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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW

1st Review Date: 7/20/98	Determination (Circle Numbers):
Authority: ☐ADC ☒ADD	1. Classification Retained
Name: W Layne	2. Classification Changed to: U
2nd Review Date: 7/23/98	3. Contains No DOE Classified Information
Authority: ADC	4. Coordinate With:
Name: R B Craner	5. Contains UCAI? no
	6. Comments: OK for Opened

JAN 12 1962
File No. TX-53, 3-2
T-17442
Completed 6-6-61

MR. E. I. BRUCE - 7117
Attn: D. D. Baker

Re: Dynamic Drop Tests of Half-Scale Barrel Nose

Summary of Test

The object of these tests was to study the shock mitigating characteristics of the half-scale barrel nose with gussets. The nose was designed to limit the longitudinal faired acceleration to 60 g at impact when dropped parachute retarded in a 35 mph sidewind. The half-scale barrel noses were tested with appropriately scaled down impact velocities. Four noses were tested with the following combined horizontal and vertical velocities: No. 1, 32 fps and 44 fps; No. 2, 32 fps and 44 fps; No. 3, 32 fps and 39 fps; No. 4, 32 fps and 39 fps.

The test vehicle was instrumented with 4 Statham accelerometers; two accelerometers were mounted on the inside of the steel cyclinder just behind the contoured nose plate and two were mounted on the inside of the steel cylinder at the aft end of the steel cylinder. At each of these locations, one accelerometer measured along the longitudinal axis of the cylinder and one accelerometer measured in the vertical axis through the lugs. Four drop tests were made with the longitudinal axis of the steel cylinder normal to a horizontal concrete target at impact.

The results of the tests showed the noses with gussets helped to prevent the nose from bottoming out. The longitudinal faired accelerations were greater than the limit of 60 g in all drops.

Object of Test

The object of these tests was to study the shock mitigating characteristics of the half-scale barrel nose with gussets. The nose was designed to limit the longitudinal faired acceleration to 60 g at impact when dropped with parachute retarded laydown in a 35 mph sidewind on a horizontal concrete target.

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JAN 15 1962

CENTRAL RECORD FILE

CENTRAL RECORD FILE	
ACCOUNTABILITY CARD	Lt
FILE No.	TX 53 3-2

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U	AUTHORITY: R B Craner
Emilda Selph 7/30/98	
PERSON CHANGING MARKING & DATE	RECORD ID: 98SN3073
W C Layne 7/30/98	
PERSON VERIFYING MARKING & DATE	DATED: 7/23/98

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Authorization for Test

This test was requested in a Work Order Authorization from E. I. Bruce, 7117, to E. H. Copeland, 7321, dated 12-8-60. The work order was sent to F. H. Adams, 7323, Area III. Mr. Don Baker, 7117-1, was the consultant.

Summary of Past Tests

No previous tests have been made by Organization 7323 on the half-scale barrel nose with gussets.

Setup for Test

Figure 1 shows the half-scale barrel nose unit hung on the drop tower. The components making up the object tested were a half-scale steel cylinder, no drawing number, and a half-scale barrel nose, Dwg. No. N-10603 (half scale, Issue 3). The test equipment used on this series of drops was a C.E.C. Oscillograph recorder, Type 5-119R, Serial Number 9071, Property No. S-89965 and 4 ea. Kintel amplifiers, Model 111BF, Property Nos. S-99047, 99049, 99054 and 99363.

The specifications of the accelerometers used are listed in Table I and their locations and orientations are shown in Figure 2.

Procedure

The half-scale steel cylinder was instrumented with 4 Statham accelerometers, two each mounted on the steel cylinder at station 18 just aft of the contoured nose plate and two each mounted on the inside of the steel cylinder at station 65.3 at the aft end of the steel cylinder. One longitudinal and one vertical accelerometer were mounted at each station. The longitudinal accelerometer measured along the longitudinal axis of the cylinder and the vertical accelerometer measured in a horizontal plane through the lugs. Directions of positive accelerations are shown in Figure 2.

The steel cylinder with the half-scale barrel nose attached was hung on the tower (Figure 1); the guy cables were tightened sufficiently to pull the unit over about 3°. The guy cables were tight enough to prevent a pendulum type oscillation of the unit at carriage release.

Drop DS-1 was made according to "Tower Operating Procedures" with the drop height and slide distance computed to provide horizontal and vertical velocity components of 32 fps and 44 fps respectively. The half-scale unit impacted on a horizontal concrete target. Figure 1 shows the 180° point of the unit trailing, this was the orientation used for all drops. Three more drops, with a new nose attached for each drop, were made at the following computed horizontal and vertical velocity components, DS-2, 32 fps and 44 fps; DS-3, 32 fps and 39 fps; DS-4, 32 fps and 39 fps.

The accelerometer signals were recorded on an oscillograph for each drop test. Fastax and Milliken cameras were used to record the units angle and velocity at impact.

Results

The results of these four drop tests showed the half-scale barrel noses with gussets did not limit the longitudinal faired pulse to 60 g during simulated laydown conditions with a 35 mph sidewind. The maximum longitudinal faired pulse occurred on drop DS-1. An acceleration of 95 g was recorded at Station 18. The amplifier for the longitudinal accelerometer at Station 18 became defective during drop DS-1, and must not be regarded as accurate beyond the point shown in Figure 3. Table II lists the accelerations and pulse times for all the half-scale drops. The shock pulses were interpreted according to SG-4452(M), Section D, Paragraph 2.1.1, dated January 1961.

The shock signatures of drop DS-2, Figure 4, are typical of the shocks found on the other drop tests, DS-3 and DS-4. Table III gives the impact velocities computed from drop height and slide distance, and the impact velocities as determined by the data reduced from the movie film. The accuracy of the velocities reduced from the cameras may vary ±2 fps from the reported values. The impact angle may vary ±2° from the reported value.

The forward longitudinal accelerometer measured a velocity change approximately 5 ft/sec higher than the impact velocity, while the aft longitudinal accelerometer measured a velocity change approximately equal to the impact velocity in all drops.

The velocity change at the forward accelerometer station, being about 5 fps greater than the impact velocity, indicated a rebound height of about 5 inches. This rebound was verified by a study of the movie films. The rotational velocity of the test unit about the impact point produced a downward acceleration at the aft accelerometer station, which, when combined with the rebound velocity, produced a velocity change approximately equal to the impact velocity at this station. The following figures are used to show the impact damage to the noses, Figure 5, nose DS-1; Figure 6, nose DS-2; Figure 7, nose DS-3 and Figure 8, nose DS-4.

J. H. Stoever

J. H. STOEVER - 7325-2

Dal Buchanan

7321 Project Engineer: D. K. BUCHANAN - 7321-5

Dal Buchanan for 12-20-61

Approved by: R. S. HOOPER - 7321-5

JHS:7325-2:dc

Encs: Figures 1-8
Tables I-III

Copy to:
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D. S. Bliss, 2344
W. L. Stevens, 7162
D. M. Bruce, 7182
E. H. Copeland, 7321
C. L. Johnson, 7523
R. K. Smeltzer, 3421-3

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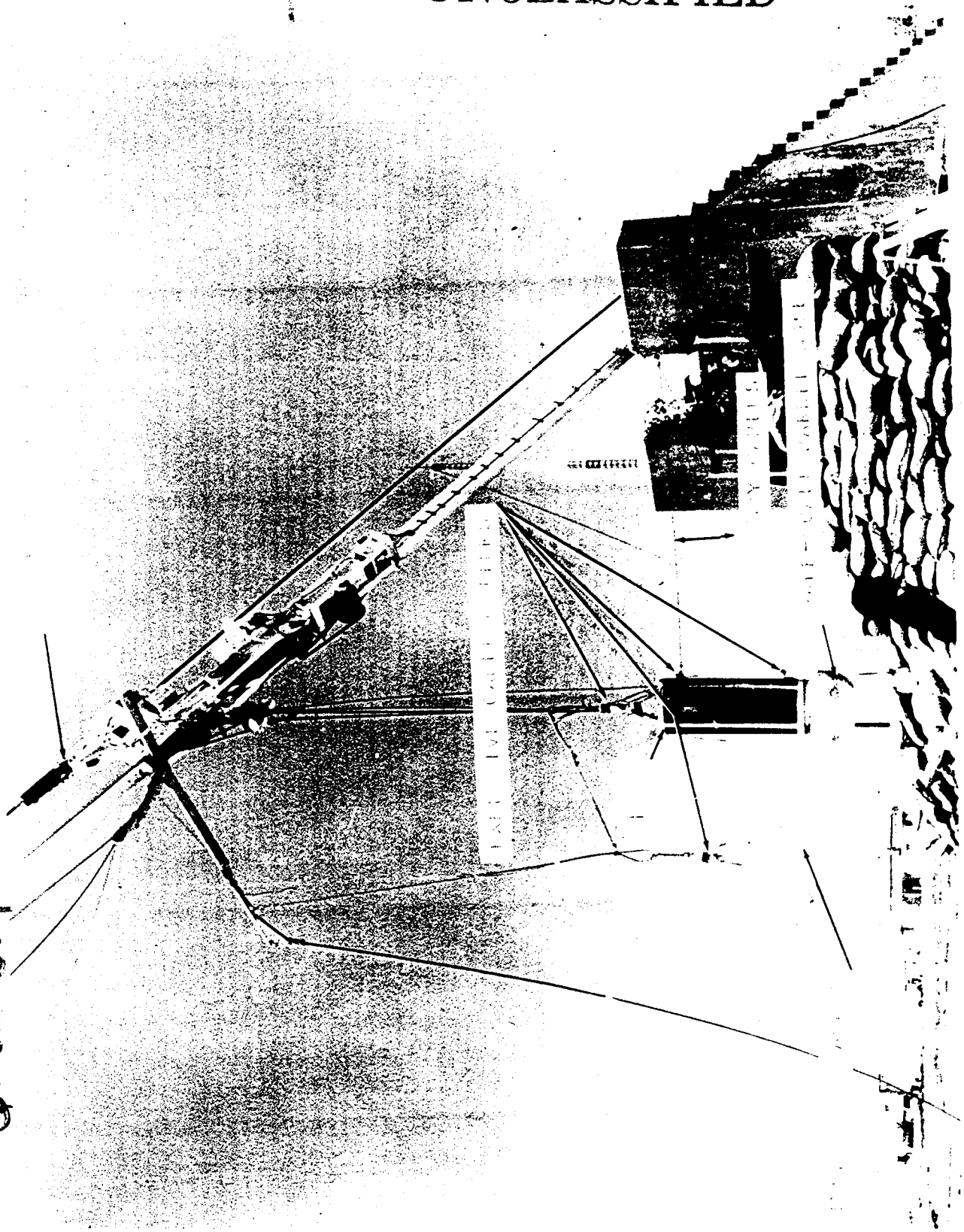

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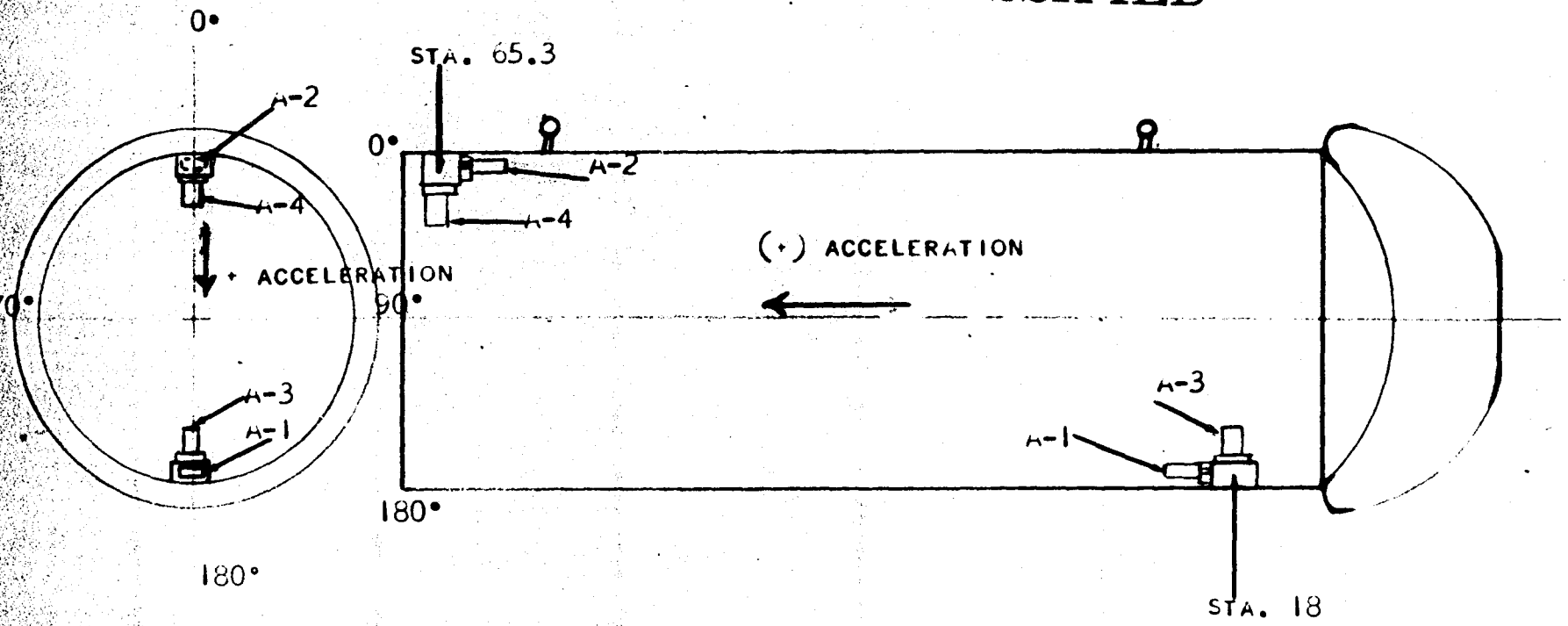

A = STRAIN-GAGE TYPE ACCELEROMETER

FIGURE 2 LOCATION AND ORIENTATION OF ACCELEROMETERS. DYNAMIC DROP TESTS OF HALF-SCALE BARREL NOSE. PROJECT NO. T-17442.

[redacted]

ACCEL. NO.	LOCATION	STA. NO.	CAL VALUE G
A-1	FORWARD LONGITUDINAL ACCEL.	18	100
A-2	AFT LONGITUDINAL ACCEL.	65.3	80
A-3	FORWARD VERTICAL ACCEL.	18	40
A-4	AFT VERTICAL ACCEL.	65.3	60

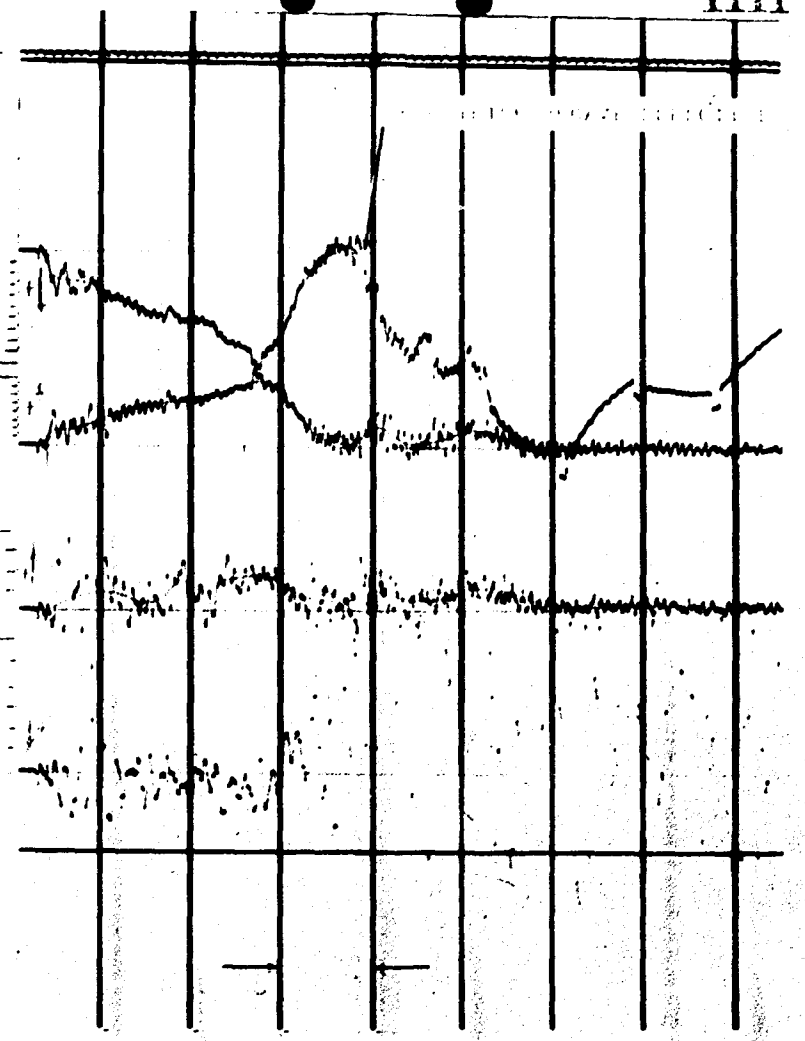

FIGURE 3 DROP RECORD OF THE DROP, DS-1, SHOCK SIGNATURES. DYNAMIC DROP TESTS OF THE HALF-SCALE BARREL NOSE. PROJECT NO. T-17442

[redacted]

ACCEL. NO.	LOCATION	STA. NO.
A-1	FORWARD LONGITUDINAL ACCEL.	18
A-2	AFT LONGITUDINAL ACCEL.	65.3
A-3	FORWARD VERTICAL ACCEL.	18
A-4	AFT VERTICAL ACCEL.	65.3

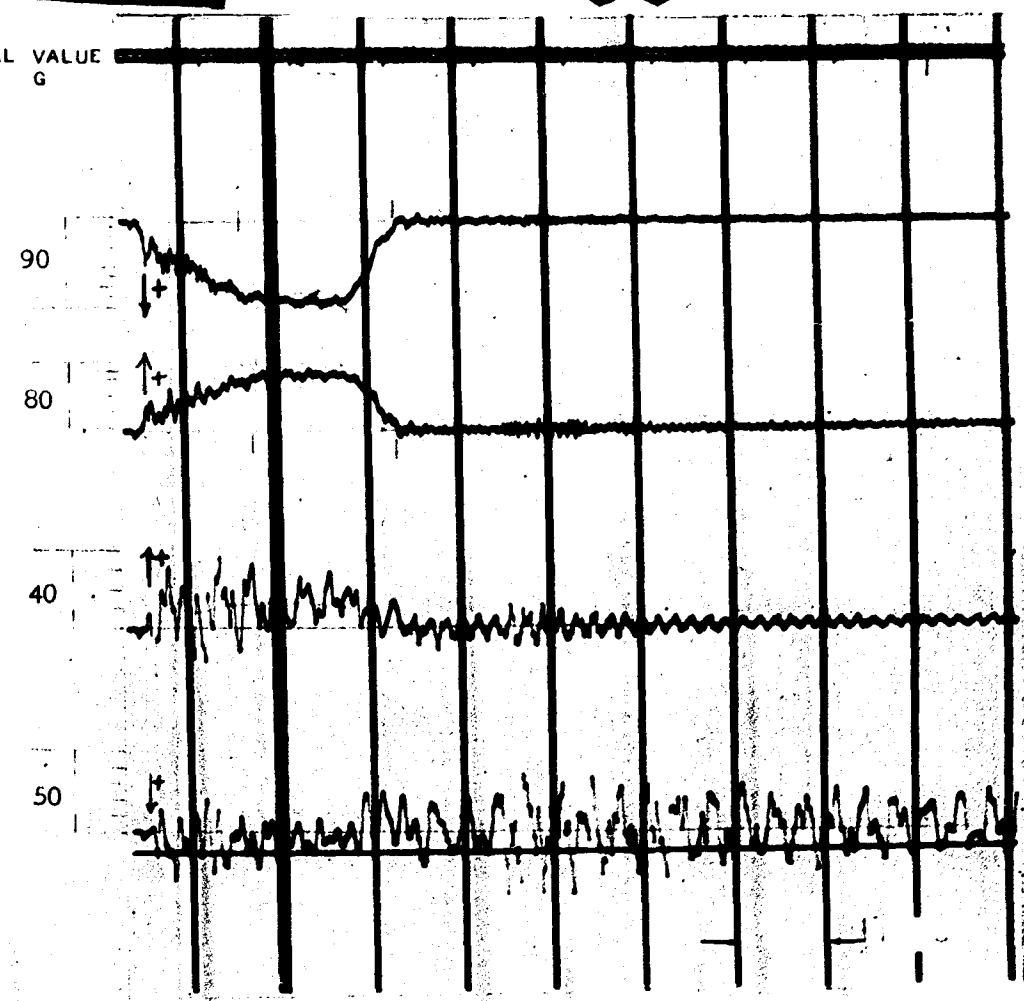

FIGURE 4 A TYPICAL RECORD OF THE DROP, DS-2, SHOCK SIGNATURES. DYNAMIC DROP TESTS OF HALF-SCALE BARREL NOSE.

PROJECT NO. T-17442

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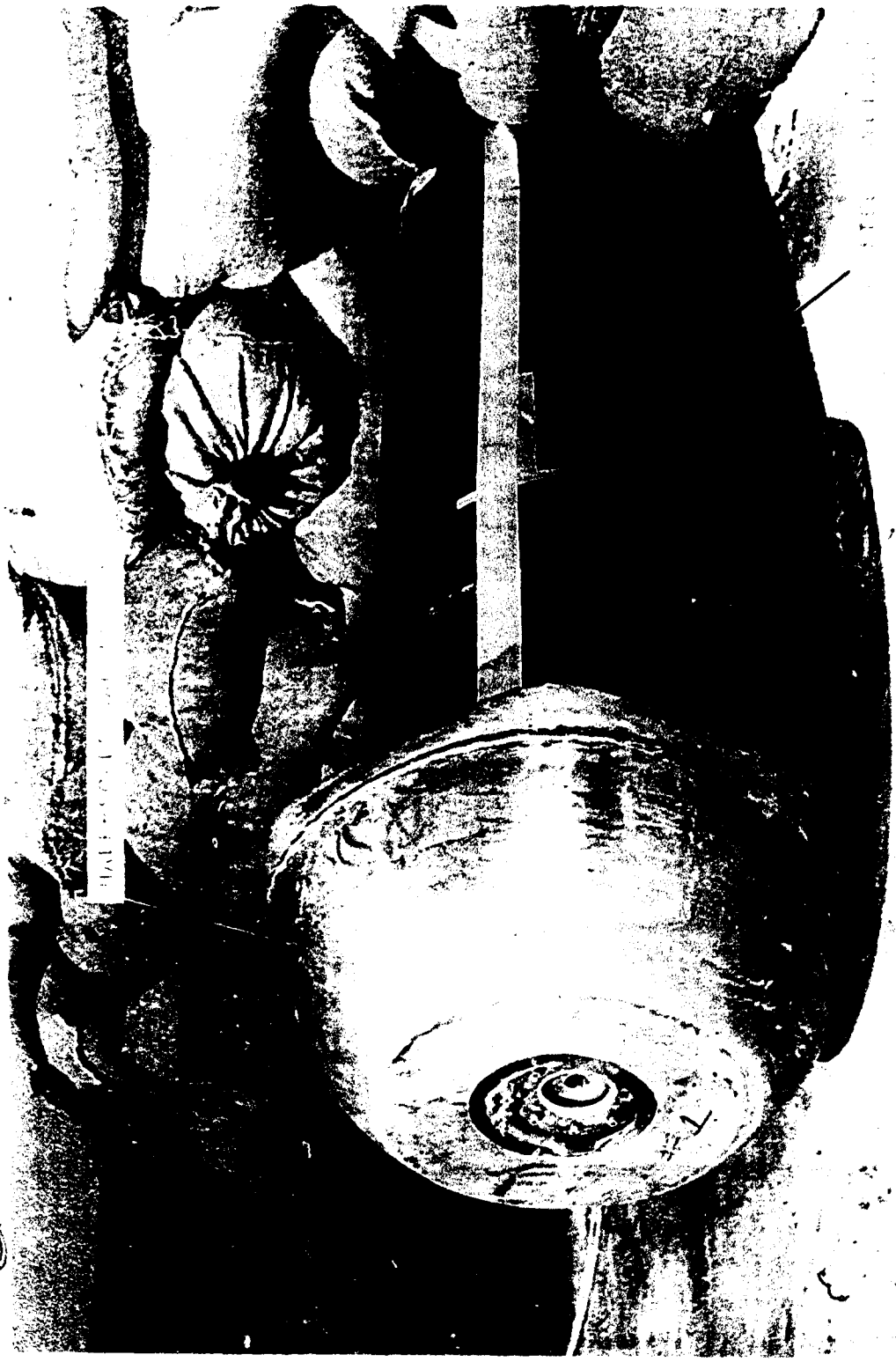

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D# 1-4295

FIGURE [illegible] DAMAGED BAFFLE NOSE SHOWN AFTER DROP, DS-2 (VELOCITY COMPONENTS V_V = 44 I/SEC. AND V_H 32 I/SEC.) - DYNA[illegible] TEST [illegible] BAFFLE NOSE. PROJECT [illegible]

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D# 61-10009

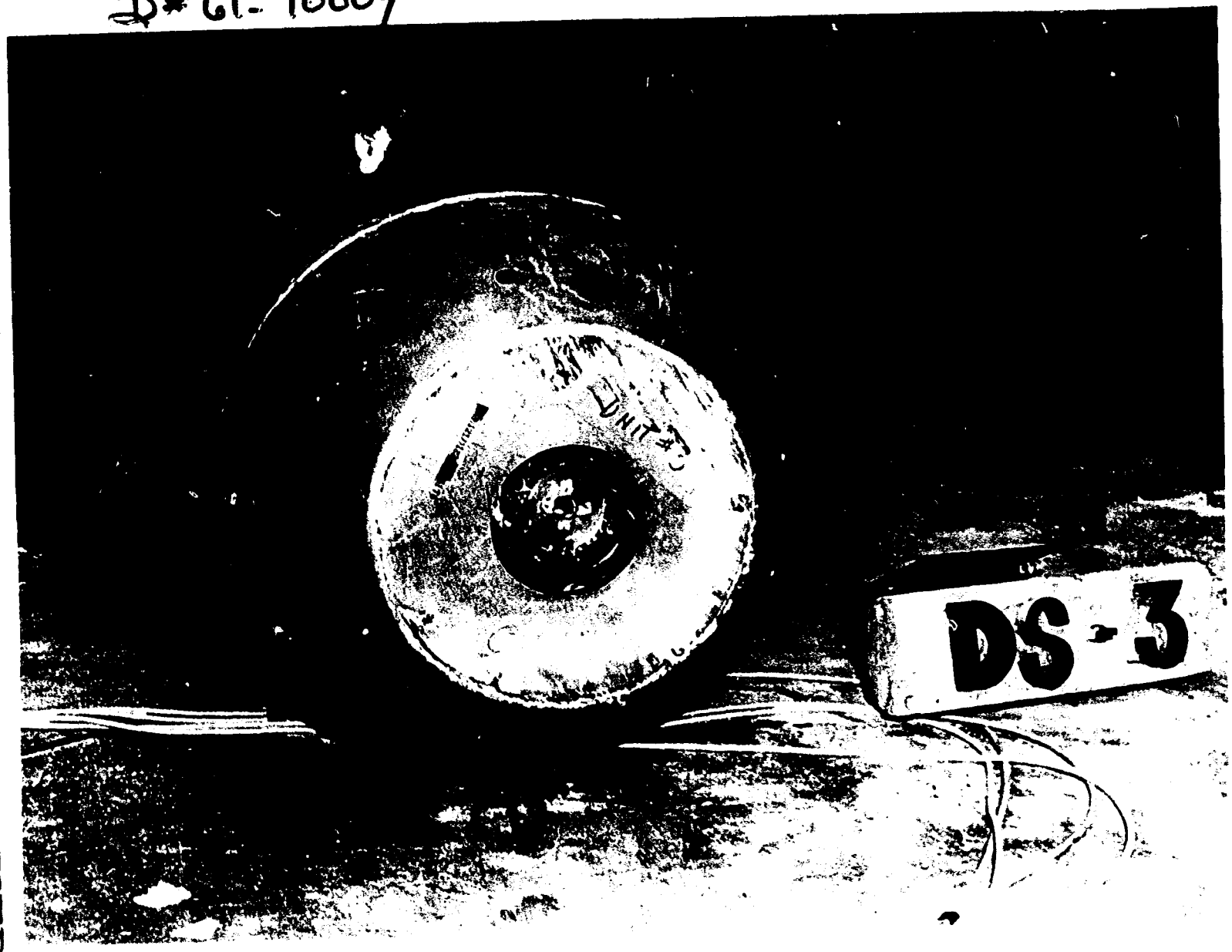

FIGURE 7 DAMAGED BARREL NOSE SHOWN AFTER DROP, DS-3 (VELOCITY COMPONENTS V_V 3[illegible] 1/SEC. AND V_H 32 1/SEC.) - DYNAMIC DROP TESTS OF HALF-SCALE [illegible] NOSE. PROJECT NO. T-17[illegible]

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D#61-10008

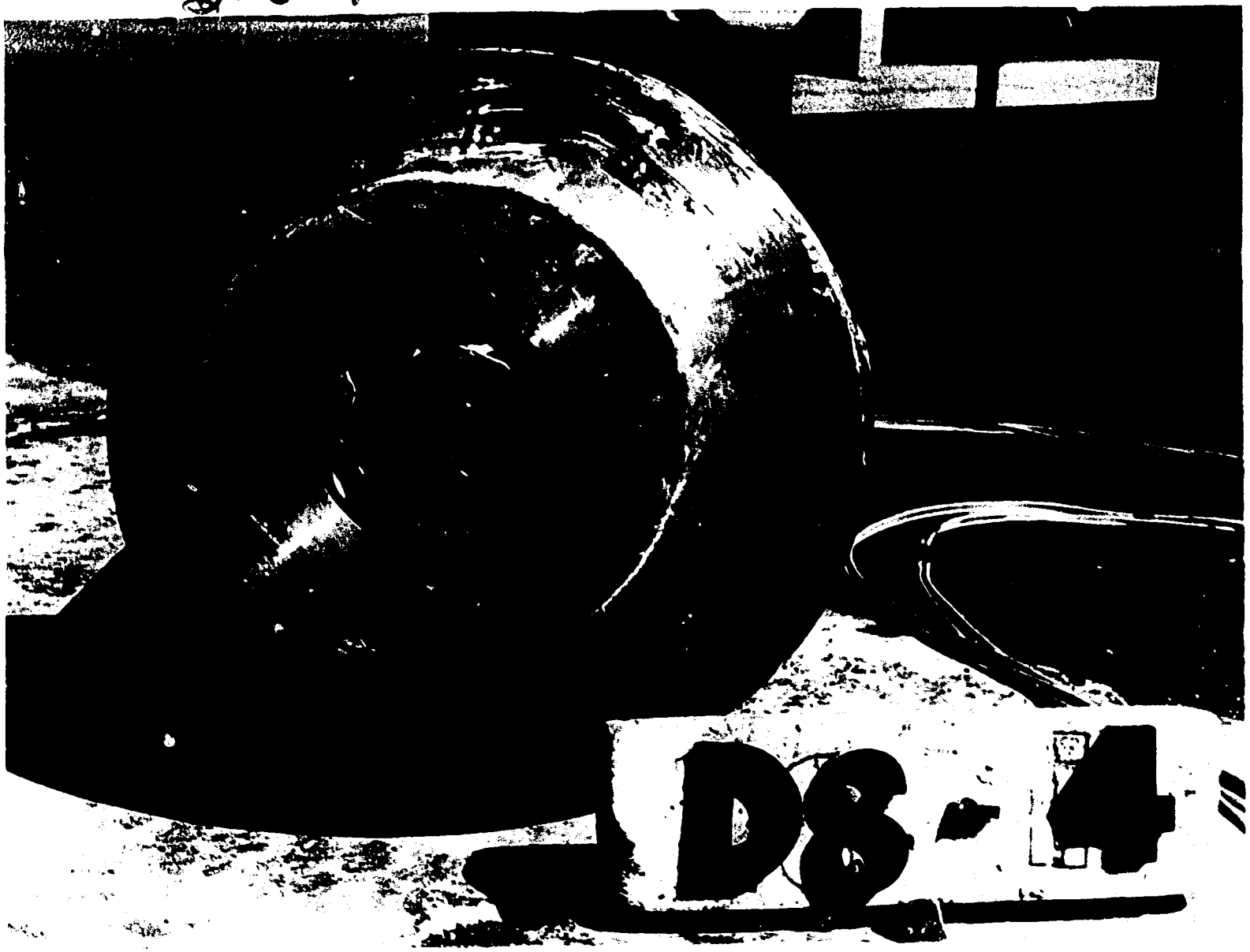

FIGURE 8 DAMAGED BARREL NOSE SHOWN AFTER DROP, DS-4 (VELOCITY COMPONENTS V_V 39 I/SEC. AND V_H 32 I/SEC.) - DYNAMIC DROP TESTS OF THE HALF-SCALE BARREL NOSE. PROJECT NO. T-17442

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TABLE I

Instrumentation

Dynamic Drop Tests of Half-Scale Barrel Nose

Gage No.	Location and Station	Statham Type or Model No.	Serial No.	Nat. Freq. (cps)	Figure Ref.
A-1	Forward longitudinal, Sta. 18	A5A-200-350	5402	910	2
A-2	Aft longitudinal Sta. 65.3	A5A-200-350	1670	920	2
A-3	Forward vertical, Sta. 18	A5A-100-335	1688	720	2
A-4	Aft vertical, Sta. 65.3	A5A-100-335	1687	760	2
A-4	Aft vertical Sta. 65.3 (Replaced Serial No. 1687 after drop DS-3)	A5A-100-350	10901	750	2

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TABLE II

Dynamic Drop Tests of Half-Scale Barrel Nose

Accel. No.	Location and Station	Direction	DS-1 V_V = 44 fps; V_H = 32 fps Nose No. 1 Acceleration (g's) Max (+)	Max (-)	Faired	Time (ms) Rise	Pulse	DS-2 V_V = 44 fps; V_H = 32 fps Nose No. 2 Acceleration (g's) Max (+)	Max (-)	Faired	Time (ms) Rise	Pulse	DS-3 V_V = 39 fps; V_H = 32 fps Nose No. 3 Acceleration (g's) Max (+)	Max (-)	Faired	Time (ms) Rise	Pulse	DS-4 V_V = 39 fps; V_H = 32 fps Nose No. 4 Acceleration (g's) Max (+)	Max (-)	Faired	Time (ms) Rise	Pulse
A-1	Forward Sta. 18	Long.	105.0	15.0	+95.0	21.8	28.9	85.8	6.7	+78.6	10.8	27.6	80.3	18.1	+74.9	11.3	28.3	71.4	5.4	+68.2	20.0	33.1
A-2	Aft Sta. 65.3	Long.	93.0	14.9	+77.7	20.5	31.7	71.6	11.5	+71.6	11.1	27.6	74.2	11.7	+64.8	12.7	28.1	68.0	14.0	+58.4	18.5	32.1
A-3	Forward Sta. 18	Vert.	38.2	30.6	+17.8	18.9	54.4	37.2	26.2	+12.9	8.5	28.7	52.2	20.8	+9.2	12.2	26.8	58.2	32.2	+8.3	5.0	20.7
A-4	Aft Sta. 65.3	Vert.	101.7	137.4	--	--	--	41.3	36.8	--	--	--	54.9	55.3	+8.9	3.1	24.5	37.2	26.1	--	--	--

Notes:
All accelerometers were of the strain-gage seismic-mass type.
All accelerometer pulses read according to SC-4452(M), Section D, Paragraph 2.1.1, dated January 1961.
The arrows on Figure 2 indicate the direction of positive accelerations.

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TABLE III

Test Results

Dynamic Drop Tests of Half-Scale Barrel Nose

Drop No.	Requested Velocity for Test		Impact Velocity Determined by Reduced Movie Film (Tolerance ±2 fps)		Aluminum Nose Thickness (inches)	Impact Angle Requested	Impact Angle Determined by Reduced Movie Film (Tolerance ±2°)*	Damage Sustained by Nose (Fig. Ref.)
	Horizontal (fps)	Vertical (fps)	Horizontal (fps)	Vertical (fps)				
DS-1	32	44	31	47	0.25	90°	90°	This nose was most severely crushed and almost bottomed out (Fig. 5).
DS-2	32	44	30	45	0.30	90°	89°	(Fig. 6)
DS-3	32	39	29	40	0.30	90°	88°	(Fig. 7)
DS-4	32	39	31	41	0.25	90°	86°	This nose was crushed more on one side than the other, due probably to 4° angle at impact (Fig. 8).

*Less than 90 degrees indicates tail trailing at impact.

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