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JUN 13 1956

Case No. 433.00
Ref. Sym: 1612 (336)
Project No. TM-402
File: H-508, 3-2

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date 11/5/98
Authority ADD
Name P B Craner
2nd Review Date 11/10/98
Authority ADD
Name W Layne
Determination (Circle Numbers)
Classification Retained
Classification Changed to U
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Coordinate With
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SEP 14 '65
3428-3

MR. P. E. JOCKLE - 1281

Attn: Mr. S. Starzynski - 1281-1

Re: Ramp and Drop Test of the H-508, H-509, and TX-39

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Summary of Results

A TX-39 in an H-508 container was subjected to a drop test, performed in accordance with SCS-5, and a ramp test with impact velocities ranging from 5.34 to 7.23 mph. For the ramp test the H-508 container was attached to the ramp dolly through the H-509 adapter.

After the last ramp test run at 7.23 mph, it was found that three of the six bolts, that hold the H-509 end frame to the H-509 main frame, had failed in shear.

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The maximum measured faired vertical acceleration at the CG of the TX-39 during the drop tests was 6.6 g, measured during a twelve-inch drop.

The maximum faired longitudinal and vertical accelerations measured during the 7.23 mph ramp test are as follows: 7.4 g longitudinal and 1.9 g vertical at the TX-39 CG station, 7.9 g longitudinal and 5.7 g vertical on the nose of the TX-39, 8.5 g longitudinal and 11.7 g vertical on the TX-39 afterbody, 8.5 g longitudinal and 4.2 g vertical on the H-508 cradle, and 17.0 g longitudinal on the ramp dolly.

The maximum angular accelerations measured in a longitudinal-vertical plane at the CG station of the TX-39 was 11.6 rad/sec^2 measured during a twelve-inch drop test and 54.2 rad./sec^2 measured during a 5.41 mph ramp test.

The maximum measured displacements of the TX-39 with respect to the base of the H-508 container were: 3.69 inches forward, 0.81 inches aft, and 2.95 inches up, all measured during the 7.23 mph ramp test; 3.41 inches down measured during a twelve-inch drop test.

CDL No.
ACCOUNTABILITY CARD
FILE No. H-508 3-2

Object of Test

The object of this test was to subject a TX-39 in an H-508 container to simulated handling conditions. It was also desired to determine the accelerations, on the TX-39 and H-508, resulting from the simulated handling loads.

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Reason for Test

This test was requested in a Work Order Authorization from P. E. Jockle, 1281 to Department 1610, dated March 20, 1956.

Summary of Past Tests

No previous ramp and drop tests of the H-508, H-509, and TX-39 have been conducted by Department 1610.

Setup for Test

The setup for the drop test is as shown in Fig. 1 and the setup for the ramp test is as shown in Fig. 2. The components tested are as follows:

TX-39, Serial No. D-3, Drawing No. 128091.
H-509, Prototype No. 1, Drawing No. 321154.
H-508, Prototype No. 1, Drawing No. 321153.

The following equipment was used to perform the test:

Quick release mechanism
Engineering Test Ramp
Ramp Dolly
Miller amplifiers, Type C-3, Model CA12, Serial Nos. 3 and 7.
Miller oscillograph, Model J, Serial No. 99.
Hathaway Amplifier Unit, Type MRC-21, Serial No. 5492-1.
Consolidated 3KC carrier amplifiers, Type 1-113B.
Miller Oscillograph, Model H, Serial No. 159.
Consolidated Oscillograph, Type 5-114-P3, Serial No. 508AM13.

The H-508 and TX-39 were instrumented with linear accelerometers oriented to measure longitudinal, vertical, and lateral accelerations (with respect to the weapon in its normal flight orientation) at the following locations: at the CG station of the TX-39 as shown in Fig. 3; on the nose of the TX-39 and on the H-508 cradle as shown in Fig. 4; on the TX-39 afterbody as shown in Fig. 5; and for the ramp test only on the H-508 frame as shown in Fig. 6. Also during the ramp test longitudinal and vertical accelerations were measured on the ramp dolly as shown in Fig. 2. An angular accelerometer was mounted in a longitudinal vertical plane at the CG station of the TX-39 as shown in Fig. 2.

The Statham accelerometers used during the test are as tabulated in Table I.

To measure the displacement of the TX-39 with respect to the base of the H-508, scratch gages were mounted on the forward and aft ends of the H-508 cradle as shown in Fig. 2.

Procedure

The casters were removed from the H-508 and the H-508 and TX-39 were suspended from a chain hoist through a quick release as shown in Fig. 1. The container was raised to the desired height and allowed to drop to the concrete floor. The drop test was conducted in accordance with SCS-5, paragraph 3.4.1.

At the conclusion of the drop test, the H-508 was attached to the H-509 which was secured to the ramp dolly as shown in Fig. 2. Five ramp test runs were made at impact velocities ranging from 5.34 mph to 7.23 mph.

The impact velocity was measured by placing a micro-switch on the ramp dolly. A voltage was applied to the micro-switch which was connected to a galvanometer in the oscillograph. Two micro-switch pip points with a known distance between them were set up on the ground near the fixed bumper. As the micro-switch on the ramp dolly traversed the pip points, voltage deflections for each point were made on the oscillograph record and therefore the time to traverse the known distance between the pip points was obtained.

The ramp test was conducted using two 4 x 4-inch wood blocks as bumpers.

Results

After the last ramp test run (Run 5) it was found that three of the six bolts that hold the H-509 end frame to the main frame of the H-509 failed in shear. The H-509 end frame attaches the forward end of the H-508 to the H-509.

The maximum linear accelerations measured during the test are as given in Table II. The maximum angular accelerations measured during the test are as given in Table III. The maximum displacements as measured from the scratch gage plates are as given in Table IV.

Figures 7 and 8 are typical records of the accelerations measured during the drop tests and ramp tests, respectively.

During the ramp test it was noticed that the H-509 shifted (forward and aft) on the ramp dolly with each impact, indicating that the two one-inch bolts that attached the H-509 to the ramp dolly did not hold the H-509 securely to the ramp dolly.

Conclusion

In service the H-509 adapter attaches to an H-504 shipping platform. During this test the H-509 adapter was attached directly to the ramp dolly; therefore, in service the H-509 would have the benefit of the displacement of the H-504 shear pads which may be sufficient to prevent the shearing of the

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bolts that hold the H-509 end frame to the main frame of the H-509. The H-508 and the H-509 mounted on H-504 shear pads should be tested together to determine if the bolts, that hold the H-509 end frame to the main frame of the H-509, are adequate.

William H. Cross
WILLIAM H. CROSS - 1612-1

Frank C Low
FRANK C. LOW - 1612-1

William C. Clark
WILLIAM C. CLARK - 1612-1

Original Signed By
P. H. ADAMS

Approved by: _____
PAUL H. ADAMS - 1612

WHC:1612-1:as

DISTRIBUTION:
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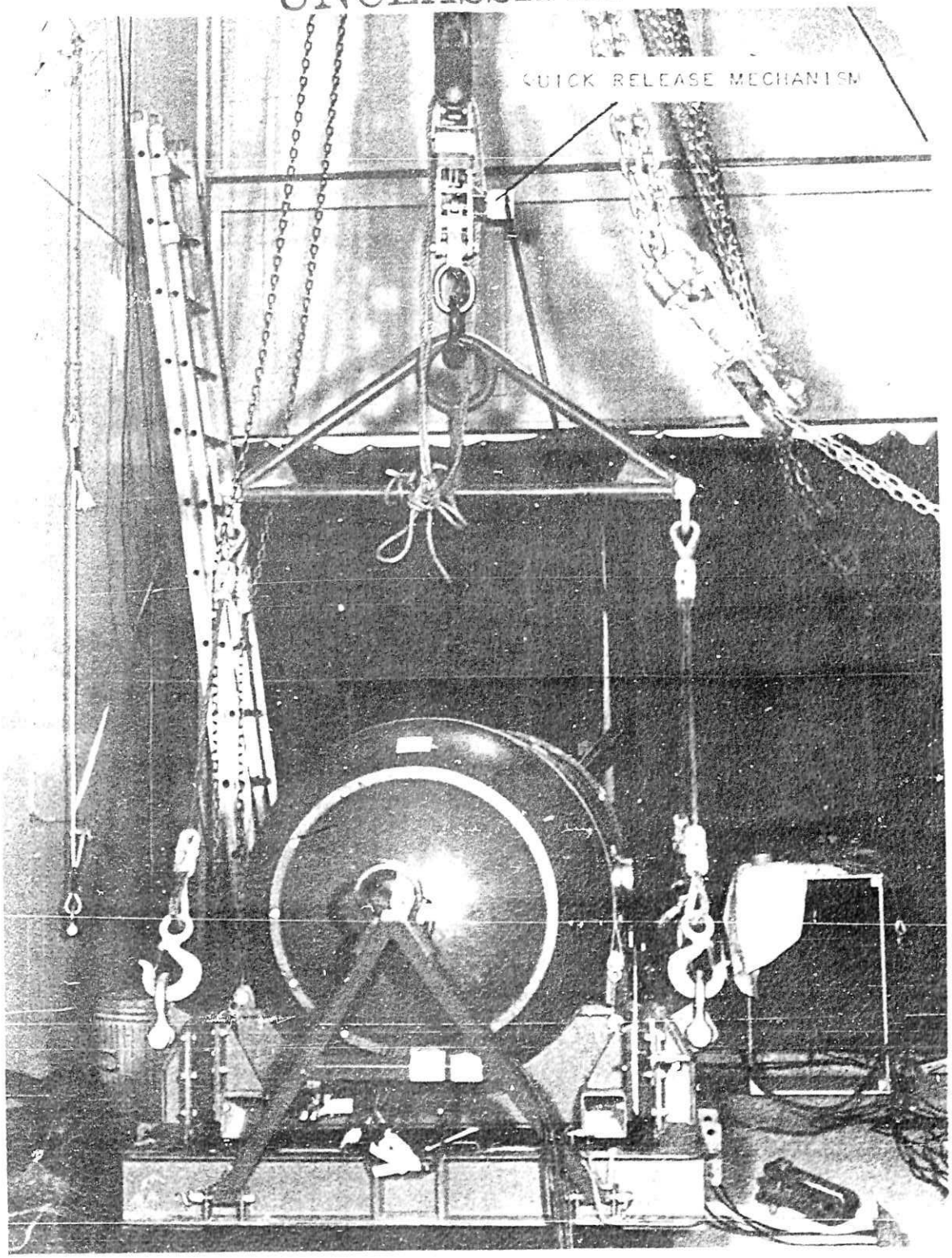

FIG. 1 SETUP FOR DROP TEST - RAMP AND DROP TEST OF THE H-50[illegible], H-509 AND TX-39.

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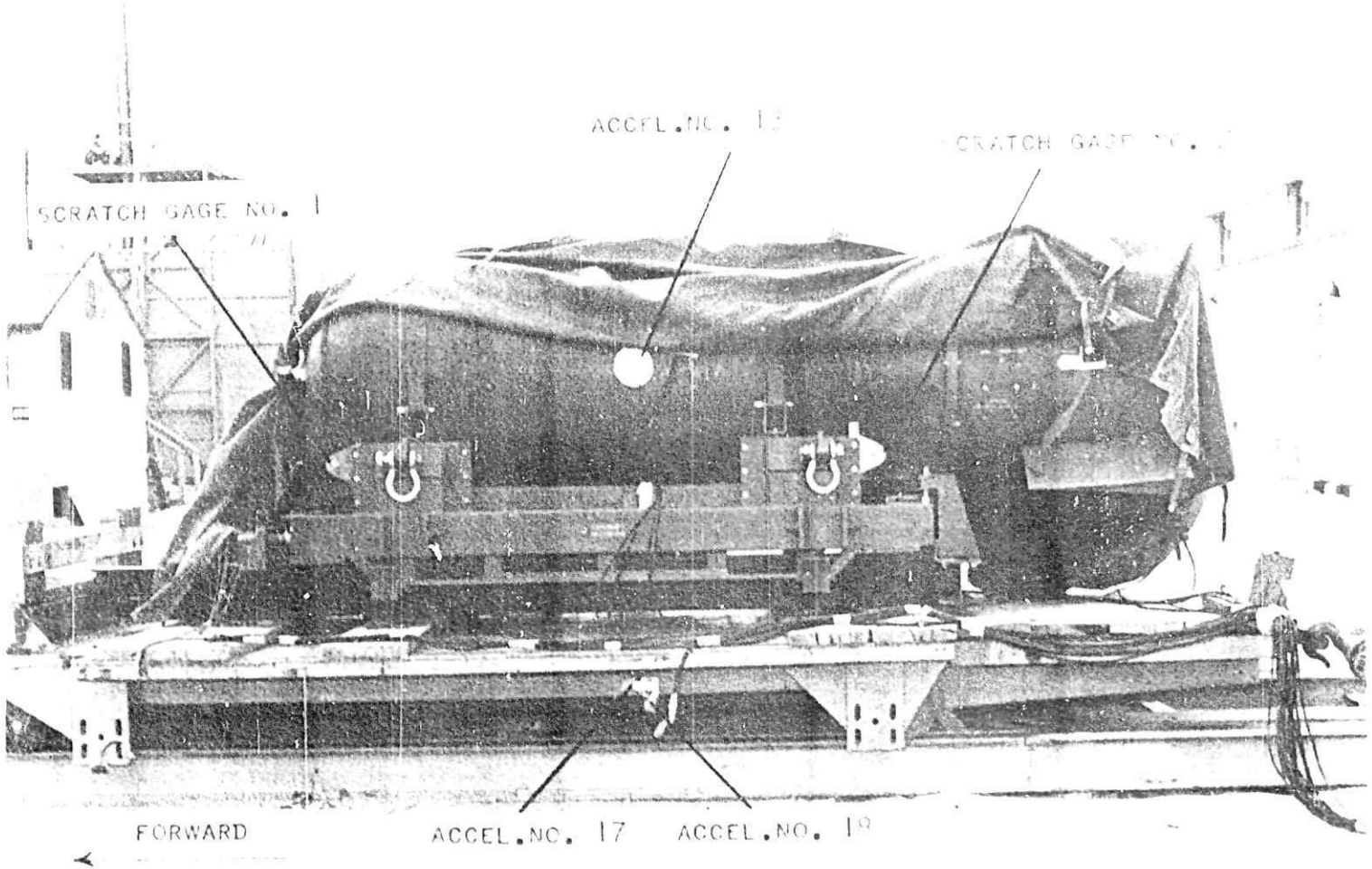

FIG. [illegible] SETUP FOR RAMP TEST AND INSTRUMENTATION OF THE TX-[illegible], [illegible] AND RAMP DOLLY [illegible] RAMP AND DROP TEST OF THE [illegible], [illegible] AND TX-[illegible].

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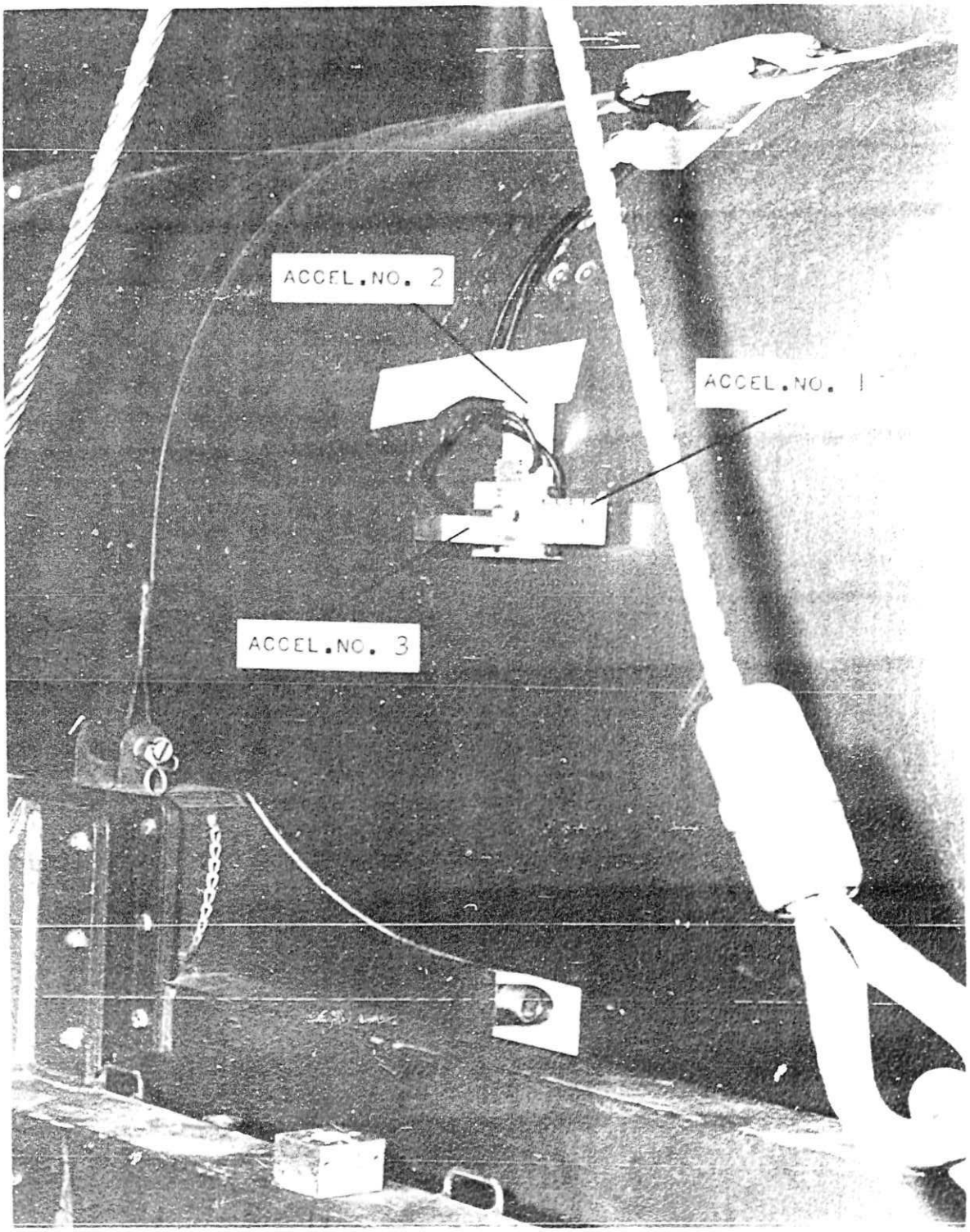

Fig. 3 ACCELEROMETERS LOCATED AT THE TX-39 CG STATION - RAMP AND DROP TEST OF THE H-[illegible], H-[illegible] AND TX-39.

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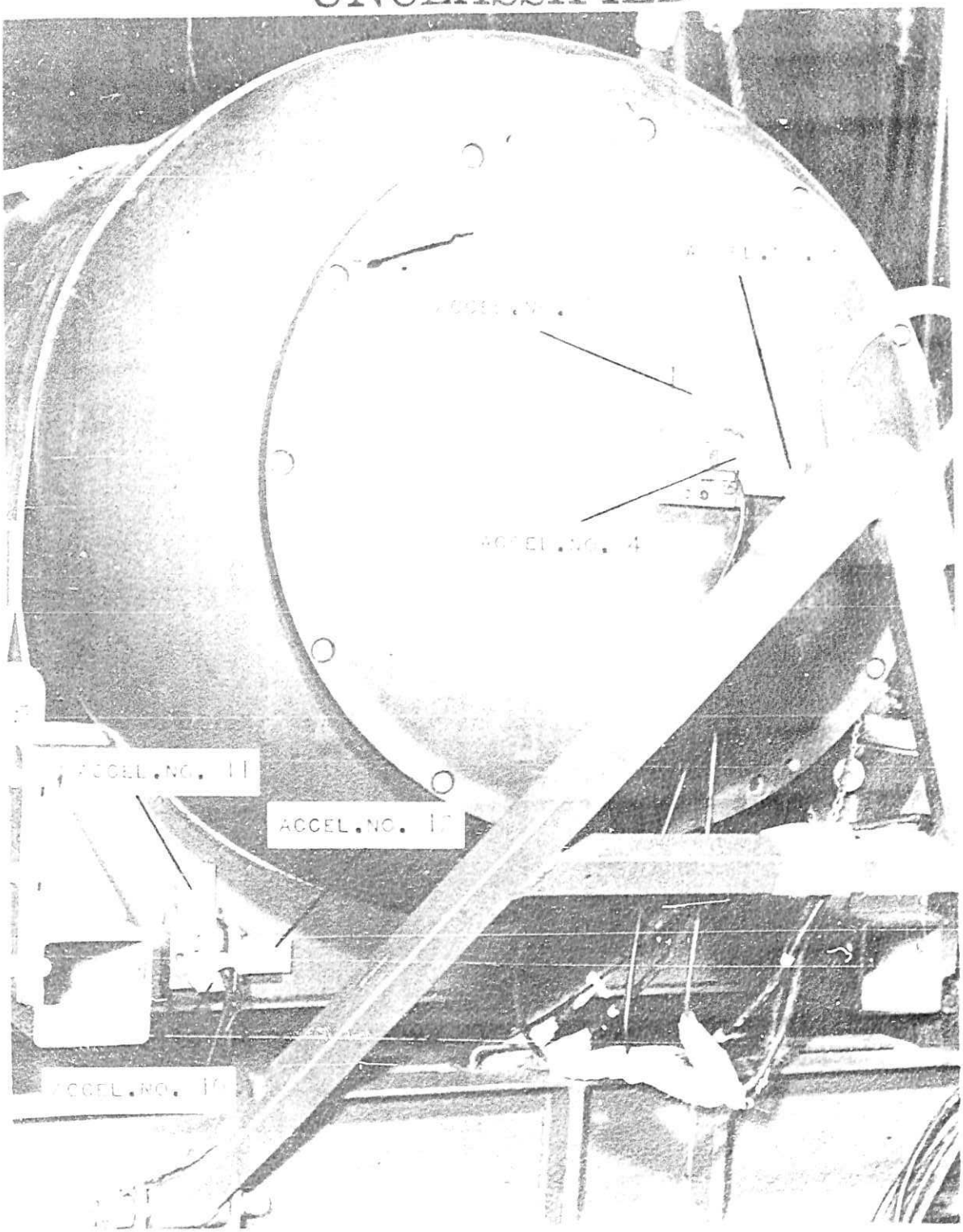

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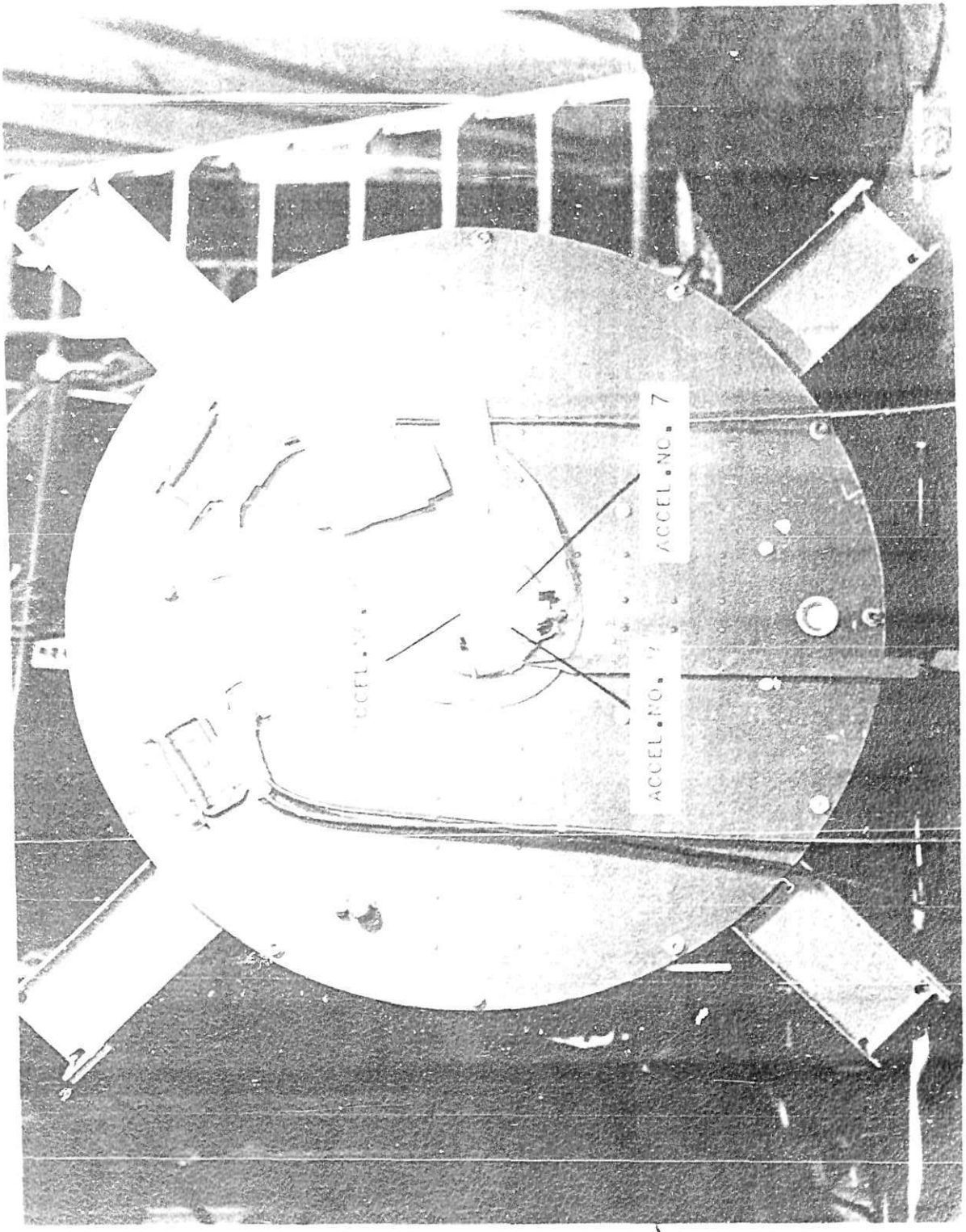

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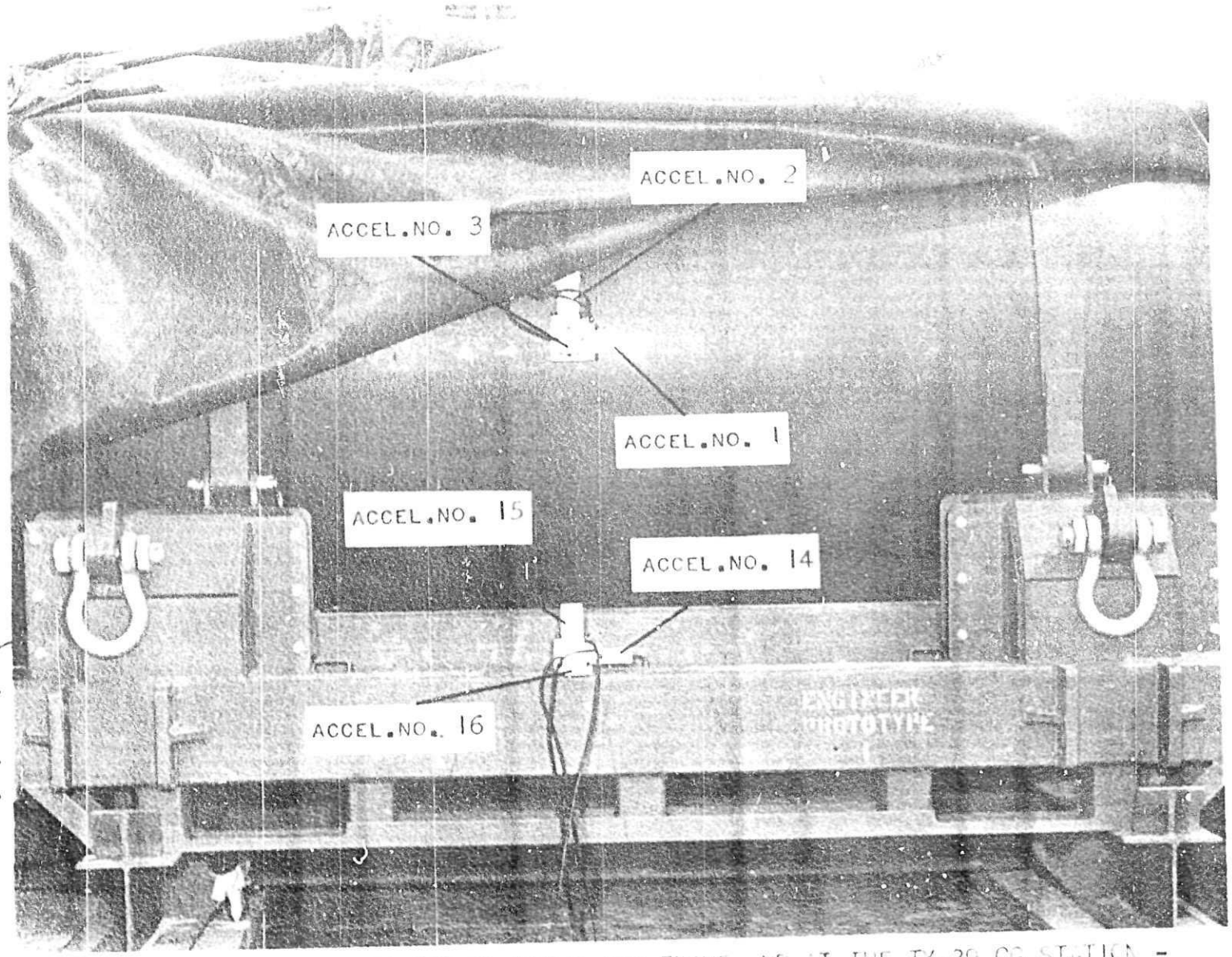

FIG. 6 ACCELEROMETERS LOCATED ON THE H-50[illegible] FRAME AND AT THE TX-39 CG STATION - RAIL AND DROP TEST OF THE H-50[illegible], H-5[illegible] AND TX-39.

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TX-[illegible]

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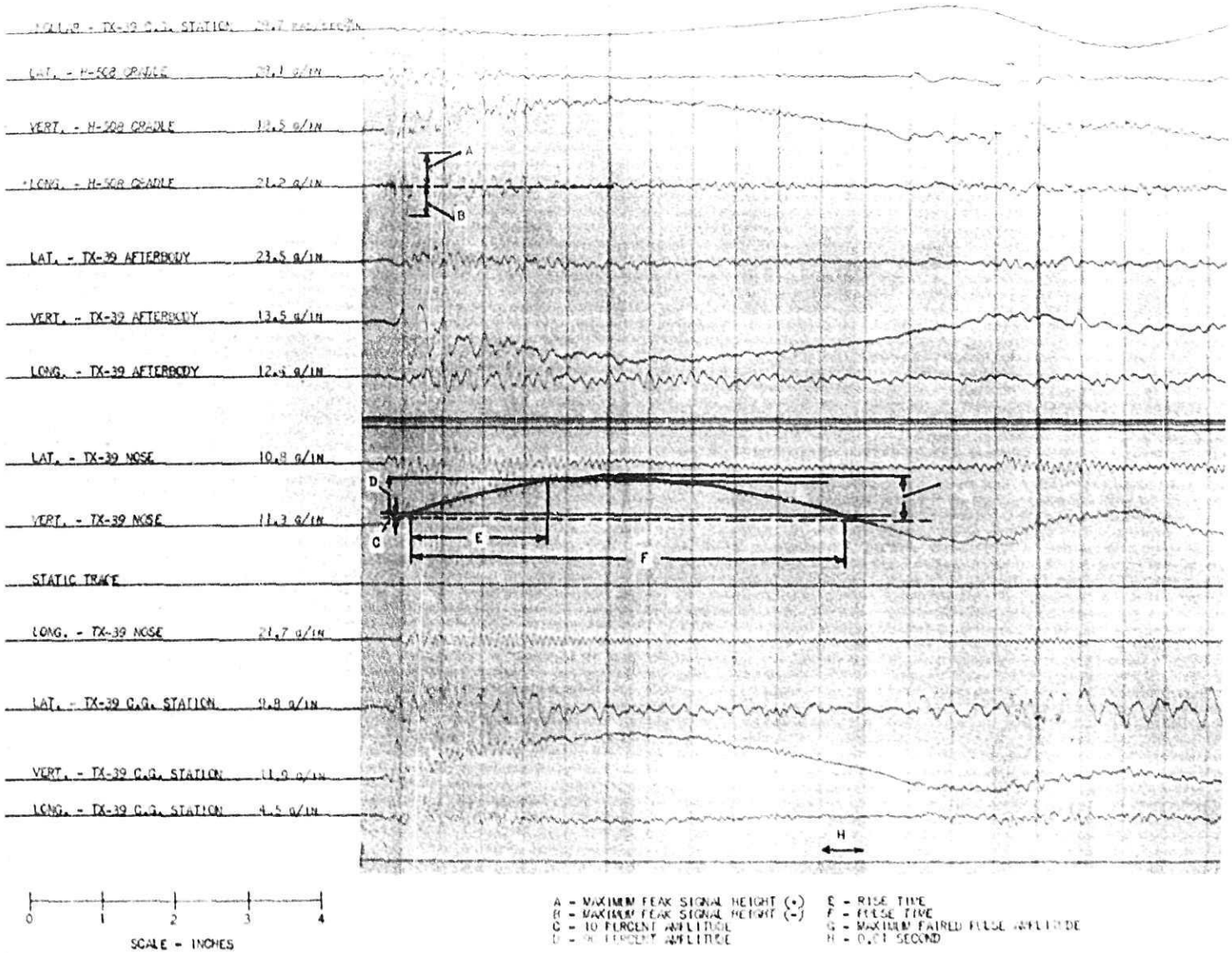

FIG. 7 TYPICAL RECORD OF THE SHOCK SIGNALS MEASURED DURING THE DROP TEST(DROP 15) - RAMP AND DROP TEST OF THE H-508, H-509 AND TX-39.

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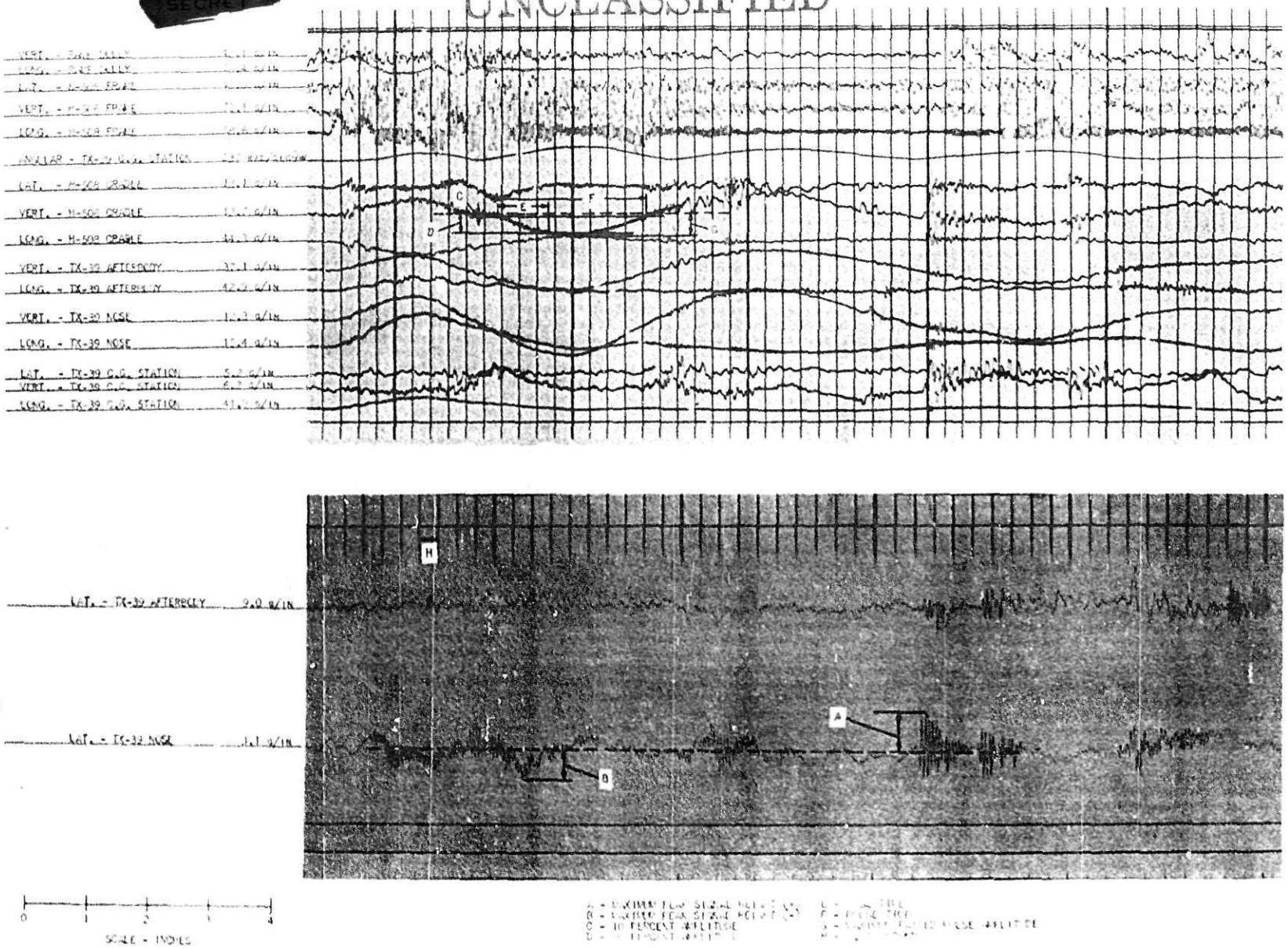

FIG. 1 TYPICAL RECORD OF THE SHOCK SIGNALS PRESENTED DURING THE TAMP TEST (RUN 5) - RAMP AND DROP TEST OF THE H-508, H-508 AND TX-39.

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TABLE I

STATHAM ACCELEROMETERS USED IN RAMP AND DROP TEST OF THE H-508, H-509 AND TX-39

Linear Accelerometers

Accel. No.	Accelerometer Location	Serial No.	Range (g)	Statham Model No.	Natural Frequency (cps)
1	Long. - CG - TX-39	282	±50	A5A-50-240	700
2	Vert. - CG - TX-39	285	±50	A5A-50-240	580
3	Lat. - CG - TX-39	637	±50	A5A-50-300	450
4	Long. - Nose - TX-39	284	±50	A5A-50-240	580
5	Vert. - Nose - TX-39	523	±50	A5A-50-240	680
6	Lat. - Nose - TX-39	276	±50	A5A-50-240	680
7	Long. - TX-39 Afterbody	2080	±100	FA-100-300	510
8	Vert. - TX-39 Afterbody	1296	±50	F-50-300	565
9	Lat. - TX-39 Afterbody	1300	±100	F-100-300	630
10	Long. - H-508 Cradle	524	±50	A5A-50-240	540
11	Vert. - H-508 Cradle	278	±50	A5A-50-240	590
12	Lat. - H-508 Cradle	521	±50	A5A-50-240	700
14	Long. - H-508 Frame	520	±50	A5A-50-240	640
15	Vert. - H-508 Frame	519	±50	A5A-50-240	640
16	Lat. - H-508 Frame	639	±50	A5A-50-300	500
17	Long. - Ramp Dolly	632	±100	A5A-100-300	750
18	Vert. - Ramp Dolly	636	±50	A5A-50-300	500

Angular Accelerometer

Accel. No.	Accelerometer Location	Serial No.	Range Rad./sec.^{2}	Statham Model No.	Natural Frequency (cps)
13	Angular at CG Station	24	±50	AA-6-50-320	24

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TABLE II

MAXIMUM LINEAR ACCELERATIONS* MEASURED DURING RAMP AND DROP TEST OF THE H-508, H-509, AND TX-39

Drop Test

Accelerometer No. and Location	Drop 2 - 4-Inch Drop					Drop 3 - 4-Inch Drop					Drop 14 - 12-Inch Drop					Drop 15 - 12-Inch Drop				
	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)
1. Long. - CG - TX-39	1.5	1.3	-0.5	0.020	0.039	3.2	1.8	--	--	--	2.8	2.2	-0.5	0.029	0.057	1.9	1.5	--	--	--
2. Vert. - CG - TX-39	5.0	5.1	+3.9	0.023	0.099	4.8	5.1	+3.8	0.022	0.098	7.0	3.0	+6.1	0.042	0.107	6.7	2.5	+6.6	0.033	0.108
3. Lat. - CG - TX-39	3.4	3.7	--	--	--	6.2	7.4	--	--	--	4.0	4.7	--	--	--	6.0	5.2	--	--	--
4. Long. - Nose - TX-39	4.1	4.0	--	--	--	6.0	6.2	--	--	--	4.2	4.5	--	--	--	4.2	4.1	--	--	--
5. Vert. - Nose - TX-39	4.4	2.8	+3.9	0.026	0.094	4.7	2.4	+3.9	0.032	0.096	7.6	3.8	+7.0	0.037	0.107	7.0	0.5	+6.8	0.031	0.104
6. Lat. - Nose - TX-39	3.3	3.4	-2.1	0.005	0.012	3.5	3.0	--	--	--	3.5	4.0	--	--	--	3.8	5.7	--	--	--
7. Long. - Afterbody - TX-39	2.6	1.8	--	--	--	2.6	2.0	--	--	--	3.1	3.4	--	--	--	3.0	3.2	--	--	--
8. Vert. - Afterbody - TX-39	4.5	3.9	+3.2	0.033	0.106	4.2	3.6	+3.3	0.032	0.103	6.4	4.8	+6.1	0.044	0.115	6.4	4.4	+6.1	0.038	0.113
9. Lat. - Afterbody - TX-39	4.7	5.9	--	--	--	5.8	3.6	--	--	--	6.1	6.0	--	--	--	6.9	7.4	--	--	--
10. Long. - H-508 Cradle	9.7	13.0	--	--	--	12.5	11.4	--	--	--	8.9	12.1	--	--	--	8.8	11.9	--	--	--
11. Vert. - H-508 Cradle	7.8	9.3	+4.0	0.021	0.093	8.2	10.8	+3.9	0.034	0.097	12.0	11.4	+6.7	0.040	0.104	9.7	8.1	+5.8	0.038	0.096
12. Lat. - H-508 Cradle	9.1	6.3	+2.9	0.010	0.034	4.4	7.2	--	--	--	5.6	7.2	--	--	--	10.9	5.2	--	--	--

Ramp Test

Accelerometer No. and Location	Run 1 - Impact Vel. 5.41 mph					Run 2 - Impact Vel. 5.91 mph					Run 3 - Impact Vel. 5.62 mph					Run 4 - Impact Vel. 5.34 mph				
	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)	Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)
1. Long. - CG - TX-39	2.9	5.8	-5.7	0.027	0.097	3.0	6.8	-6.5	0.033	0.106	3.0	6.1	-6.0	0.027	0.098	2.5	5.4	-5.4	0.031	0.095
2. Vert. - CG - TX-39	3.4	2.9	-1.9	0.011	0.025	3.9	2.8	+1.7	0.017	0.033	3.5	2.6	+1.8	0.021	0.053	2.2	2.0	+1.7	0.024	0.066
3. Lat. - CG - TX-39	1.7	1.8	--	--	--	2.4	2.4	--	--	--	1.5	1.8	--	--	--	1.7	1.8	--	--	--
4. Long. - Nose - TX-39	1.6	6.2	-6.2	0.029	0.097	3.2	6.8	-6.3	0.026	0.106	2.9	6.6	-6.3	0.031	0.106	2.5	6.6	-6.1	0.032	0.105
5. Vert. - Nose - TX-39	6.3	5.9	+6.1	0.033	0.088	7.1	6.4	+6.6	0.034	0.093	7.2	6.1	+6.9	0.036	0.095	6.7	5.7	+6.4	0.036	0.095
6. Lat. - Nose - TX-39	- - - - - - -		No Record-	- - - - - - -		2.1	1.6	--	--	--	- - - - - - -		No Record-	- - - - - - -		1.3	1.1	--	--	--
7. Long. - Afterbody - TX-39	4.0	11.1	-7.2	0.034	0.099	4.8	8.5	-8.0	0.035	0.099	4.7	8.9	-7.8	0.034	0.102	3.1	8.4	-7.6	0.028	0.102
8. Vert. - Afterbody - TX-39	11.3	11.7	-7.9	0.034	0.095	11.8	12.3	-12.2	0.036	0.090	10.9	12.4	-11.9	0.032	0.096	17.7	11.5	-10.9	0.034	0.095
9. Lat. - Afterbody - TX-39	- - - - - - -		No Record-	- - - - - - -		3.9	3.9	--	--	--	- - - - - - -		No Record-	- - - - - - -		3.1	3.4	--	--	--
10. Long. - H-508 Cradle	5.9	7.6	-6.6	0.025	0.084	6.8	8.6	-7.5	0.030	0.089	7.8	7.8	-7.1	0.030	0.092	8.9	8.5	-6.9	0.025	0.092
11. Vert. - H-508 Cradle	6.6	12.3	+4.2	0.035	0.094	16.7	12.8	+4.8	0.042	0.093	6.3	5.4	+4.4	0.040	0.087	4.4	5.6	+3.7	0.034	0.086
12. Lat. - H-508 Cradle	3.9	3.5	-1.4	0.017	0.043	4.8	5.4	+2.0	0.014	0.034	4.2	3.0	-1.3	0.018	0.042	3.4	3.8	--	--	--
14. Long. - H-508 Frame	- - - - - - -		No Record-	- - - - - - -		35.4	52.6	--	--	--	40.2	39.4	-36.6	0.003	0.009	16.6	22.4	--	--	--
15. Vert. - H-508 Frame	- - - - - - -		No Record-	- - - - - - -		34.5	69.3	-33.4	0.007	0.031	32.5	36.0	--	--	--	25.3	33.3	--	--	--
16. Lat. - H-508 Frame	- - - - - - -		No Record-	- - - - - - -		46.8	23.2	+24.1	0.006	0.031	21.3	24.3	--	--	--	15.8	24.1	--	--	--
17. Long. - Ramp Dolly	4.1	14.9	-12.0	0.017	0.034	4.6	16.9	-12.9	0.002	0.031	5.1	18.2	-13.8	0.003	0.026	5.3	15.8	-15.7	0.006	0.032
18. Vert. - Ramp Dolly	6.1	7.1	--	--	--	11.0	13.8	--	--	--	9.4	15.0	--	--	--	8.4	7.4	--	--	--

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mph		Accelerometer No. and Location	Run 5 - Impact Vel. 7.23 mph Max. Accel. (+) g	Max. Accel. (-) g	Max. Faired Pulse (g)	Rise Time (sec)	Pulse Time (sec)
Pulse	1.	Long. - CG - TX-39	0.7	7.4	-7.4	0.036	0.104
Time	2.	Vert. - CG - TX-39	2.4	2.5	-1.9	0.012	0.047
(sec)	3.	Lat. - CG - TX-39	1.8	1.4	--	--	--
	4.	Long. - Nose - TX-39	2.4	8.1	-7.9	0.032	0.096
0.095	5.	Vert. - Nose - TX-39	5.4	5.9	-5.7	0.037	0.123
0.066	6.	Lat. - Nose - TX-39	1.4	1.8	-0.7	0.026	0.062
--	7.	Long. - Afterbody - TX-39	6.0	9.4	-8.5	0.032	0.106
0.105	8.	Vert. - Afterbody - TX-39	10.2	12.4	-11.7	0.035	0.102
0.095	9.	Lat. - Afterbody - TX-39	3.1	5.2	--	--	--
--	10.	Long. - H-508 Cradle	5.0	9.4	-8.5	0.030	0.088
0.102	11.	Vert. - H-508 Cradle	5.5	12.2	+4.2	0.030	0.085
0.095	12.	Lat. - H-508 Cradle	5.0	3.9	-2.0	0.007	0.025
--	14.	Long. - H-508 Frame	27.5	38.9	--	--	--
0.092	15.	Vert. - H-508 Frame	52.1	31.3	--	--	--
0.086	16.	Lat. - H-508 Frame	27.7	27.1	--	--	--
--	17.	Long. - Ramp Dolly	12.6	18.9	-17.0	0.016	0.035
--	18.	Vert. - Ramp Dolly	14.0	9.3	--	--	--
--							
--							
0.032							
--							

* Records read as per SCS-10.

Directions of accelerations with respect to the axis of the weapon are: (+) up (-) down (+) toward nose (-) toward tail (+) to right (-) to left

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TABLE III

ANGULAR ACCELERATIONS MEASURED IN A LONGITUDINAL-VERTICAL PLANE AT THE CG OF THE TX-39 - RAMP AND DROP TEST OF THE H-508, H-509, AND TX-39

Drop Test

Drop No.	Drop Height (in)	Max. Angular* Accel. Rad./Sec.^{2}
2	4	+8.8
3	4	+8.5
14	12	+11.6
15	12	+11.0

Ramp Test

Run No.	Impact Velocity (mph)	Max. Angular* Accel. Rad./Sec.^{2}
1	5.41	-54.2
2	5.91	-53.0
3	5.62	-53.8
4	5.34	-53.3
5	7.23	-48.3

* (+) - Counterclockwise rotation of weapon when viewed from left side.

(-) - Clockwise rotation of weapon when viewed from left side.

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TABLE IV

MAXIMUM MEASURED DISPLACEMENT OF THE TX-39 WITH RESPECT TO THE BASE OF THE H-508 RAMP AND DROP TEST OF THE H-508, H-509, AND TX-39

Drop Test

Drop No.	Drop Height (in)	Scratch Gage No.	Scratch Gage Location	Displacement (Inches) Forward	Aft	Up	Down
3	4	1	Forward	--	--	0.87	1.73
3	4	2	Aft	--	--	0.73	1.83
15	12	1	Forward	--	--	1.31	3.23
15	12	2	Aft	--	--	1.16	3.41

Ramp Test

Run No.	Impact Velocity (mph)	Scratch Gage No.	Scratch Gage Location	Displacement (Inches) Forward	Aft	Up	Down
1	5.41	2	Aft	2.78	0.62	2.50	2.83
1	5.41	1	Forward	2.78	0.59	2.42	2.61
2	5.91	2	Aft	2.97	0.76	2.59	3.00
2	5.91	1	Forward	2.98	0.70	2.53	2.81
3	5.62	2	Aft	2.89	0.73	2.59	2.95
3	5.62	1	Forward	2.91	0.58	2.39	2.73
4	5.34	2	Aft	2.75	0.69	2.50	2.75
4	5.34	1	Forward		No Record		
5	7.23	2	Aft	3.69	0.81	2.95	3.19
5	7.23	1	Forward	3.64	0.70	2.81	3.16