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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW

1st Review Date: 7/20/98
Authority: ADC ADD
Name: W Rogers
2nd Review Date: 7/23/98
Authority: ADD
Name: R B Craner

Determination (Circle Number):
1. Classification Retained
2. Classification Changed to U
3. Contains No DOE Classified Information
4. Coordinate With:
5. Contains UCAI? NC
6. Comments: OK for Openness

APR 19 1961

TX-53 3.2
T-17282
869.00

TO: DISTRIBUTION

Re: Drop Tower Test on Convair Pod No. 3

RECEIVED
APR 19 1961
CENTRAL RECORD FILE

Summary of Test

This test was on the third Convair B-58 Pod which was dropped from the 185-foot drop tower at Sandia Corporation's Area III Environmental Test Laboratory.

The vertical component of velocity for this test was increased from 60 to 70 ft/sec, and the horizontal component of velocity remained unchanged at 51.3 ft/sec.

The test results showed that the maximum faired acceleration upon impact in the longitudinal direction was +35.9 g's with a pulse duration of 92.2 milliseconds. During the slapdown sequence, the maximum faired acceleration pulse in the transverse direction was -310 g's with a pulse duration of 23.1 milliseconds.

During the slapdown sequence, the dummy TX-53 moved aft (with respect to the Pod) about 15 inches.

RD FILE
ACCOUNTABILITY CARD
FILE No. TX-53 3-2

Object of Test

This test was a continuation of the investigation of the shock-mitigating characteristics of the Convair B-58 Pod with a dummy TX-53 mounted inside.

Authorization for Test

This test was requested in a Work Order Authorization from Mr. P. F. Jones, 7183, to Mr. E. H. Copeland, 7321. Mr. H. E. Kinney, 7183, was the consultant. The test was assigned to Division 7323 to be conducted on the 185-foot drop-test tower.

Summary of Past Tests

Previous test results can be found in Sandia Corporation Environmental Test Laboratory test reports, Nos. T-17076 and T-17228, published by Division 7321.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U
Emelda Selph 7/30/98
PERSON CHANGING MARKING & DATE
WC Rogers 7/30/98
PERSON VERIFYING MARKING & DATE

AUTHORITY: R. B. Craner
RECORD ID: 98SN3074
DATED: 7/23/98

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Setup and Procedure for Test

Figure 1 shows the Pod as it was suspended from the carriage just prior to being hoisted to the dropping position. (Due to lack of a photograph of Pod Test No. 3, a photograph from Pod Test No. 4 has been substituted.) It was necessary to cant the Pod off-vertical by tightening the stabilizing cables to insure stability of the Pod during the slide sequence. The stabilizing cables slacken considerably as the carriage is hoisted to the dropping position, because the angle of the load cable (with respect to ground) increases at greater heights.

A 14-channel CEC Data Tape Recorder, Type 5-752-A, Serial No. T-01465, was used to record the acceleration data. The tape was later played back on an Ampex FM Tape Recorder, Model 114-A, and the signals were recorded on a CEC Recording Oscillograph, Type 5-119, using 7-326 galvanometers. Ampex Output Data Filters were used to filter out frequency above 624 cps.

Statham Model A5A accelerometers were mounted in the dummy TX-53. The accelerometer specifications are listed in Table 3.

Figure 2 shows the accelerometer locations and station numbers. Also shown are the locations of the Model A-12 Recording Accelerometers made by the Pace Engineering Company. The sign convention used to designate direction of acceleration is also shown in this figure.

Results

The maximum longitudinal faired acceleration pulse at impact was recorded by accelerometer A-1 with a value of +35.9 g's, a rise time of 41.3 milliseconds, and a duration of 92.2 milliseconds. During the slapdown sequence, the maximum transverse faired acceleration was recorded by accelerometer A-8 which was mounted on the aft end of the dummy TX-53. This acceleration was -310 g's with a rise time of 3.2 milliseconds and a duration of 23.1 milliseconds. This is quite a severe slapdown.

On Pod Test No. 2, the maximum faired transverse acceleration during slapdown was +97 g's. Table II contains a tabulation of the acceleration data as read from the filtered record. All accelerations were read according to Sandia Corporations SCS-10, Paragraphs 7.4 through 7.4.5, and Figure 3 has been included to illustrate this technique. The sign convention used in Table II, indicating the direction of acceleration, is in agreement with the directions shown in Figure 4 (see also Figure 2). This sign convention is the same for all tests regardless of whether the pylon on the Pod is on the leading or trailing side at impact.

The area under the impact and slapdown curves for Pod Drop Nos. 2 and 3 were compared energywise, and it was found that Pod No. 3 dissipated less energy at impact than the previous Pod (No. 2) did. Therefore, Pod No. 3 had a larger amount of energy to be dissipated during slapdown than Pod No. 2.

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The problem was further compounded by the fact that Pod No. 3 had about 18 percent more kinetic energy available at impact than Pod No. 2, due to the increase in the vertical component of velocity from 60 to 70 ft/sec.

Table III shows the accelerations recorded by the Pace Recording Accelerometers.

Figures 4 and 5 show, respectively, the filtered and unfiltered playback records from the tape recorder. In Figure 4, on accelerometers A-1, A-4, and A-7, a constant acceleration can be seen which starts after initial impact and continues until slapdown. This is the centrifugal acceleration that each longitudinal accelerometer sees as the Pod revolves about its CG during its free flight between impact and slapdown. The other accelerometers, of course, do not see this centrifugal acceleration since their sensitive axes are perpendicular to the acceleration.

Some explanation of the behavior of accelerometers A-1 and A-7, which were mounted respectively forward and aft in the longitudinal direction, may be appropriate at this point. From Figure 4 it is seen that they both indicate positive accelerations at impact; but, at slapdown, A-1 records a negative acceleration which represents a deceleration as the Pod skids along the target surface on the parachute can during the few milliseconds of slapdown. The signature from A-7 during slapdown indicates a positive acceleration which is a local phenomenon prevailing in the aft end of the Pod during slapdown. From the photographic film, the Pod was found to be oriented with its longitudinal axis about 30 degrees from the horizontal at the instant of slapdown, with the nose pointed skyward. By knowing this and also the geometric location of accelerometer A-7 with respect to the CG of the Pod, the absolute velocity of A-7 was found to be in such a direction that it would record the pulse at slapdown as shown in Figure 4.

Figure 6 shows the shattered nose fairing. Figures 7, 8, and 9 show other views of the Pod after the test. In Figure 9 can be seen the approximate 15-inch displacement of the dummy TX-53 warhead. Figures 10 and 11 are two views of the honeycomb nose which was ripped from the Pod during the impact. Figure 11 contains a 6-inch reference line that could be used to make measurements from the photo, but which would be accurate only for the surface of the honeycomb nearest the camera lens. From this figure can be seen how the honeycomb crushed more on one side than the other. This was caused from the angular rotation of the pod, beginning at initial impact as it descended downward on the honeycomb. The combination of such forces causes a crush pattern as shown in Figure 11. At the instant before impact, the Pod was almost vertical, with no angular velocity.

Conclusions

It was agreed among Sandia personnel, Convair personnel, and the author that this Pod was perhaps subjected to an overtest brought about by the increase in the vertical velocity component. This Pod certainly experienced

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a more severe slapdown than did the previous ones. The vertical velocity component will probably be reduced to 65 ft/sec for Pod Test No. 4.

for C. G. COALSON - 7323-3

7321 PROJECT ENGINEER: BILL JOHNSON - 7321-5

APPROVED BY: R. S. HOOPER - 7321-5

CGC:7323-3:5/cbe

Enc. Figs. 1-12
Tables I-III

Copy to:
Commander, AFSWC, Attn: Chief, Mail and Message Center, for Capt. H. H. Mechly
Convair, AF Plant Rep., Attn: R. E. Cole (9)
F. F. Jones, 7183, Attn: H. E. Kinney
J. M. Wiesen, 1442
E. I. Bruce, 7117
D. M. Bruce, 7182, Attn: John Riese
E. H. Copeland, 7321
D. S. Dreesen, 7522
R. K. Smeltzer, Central Record File, 3421-3

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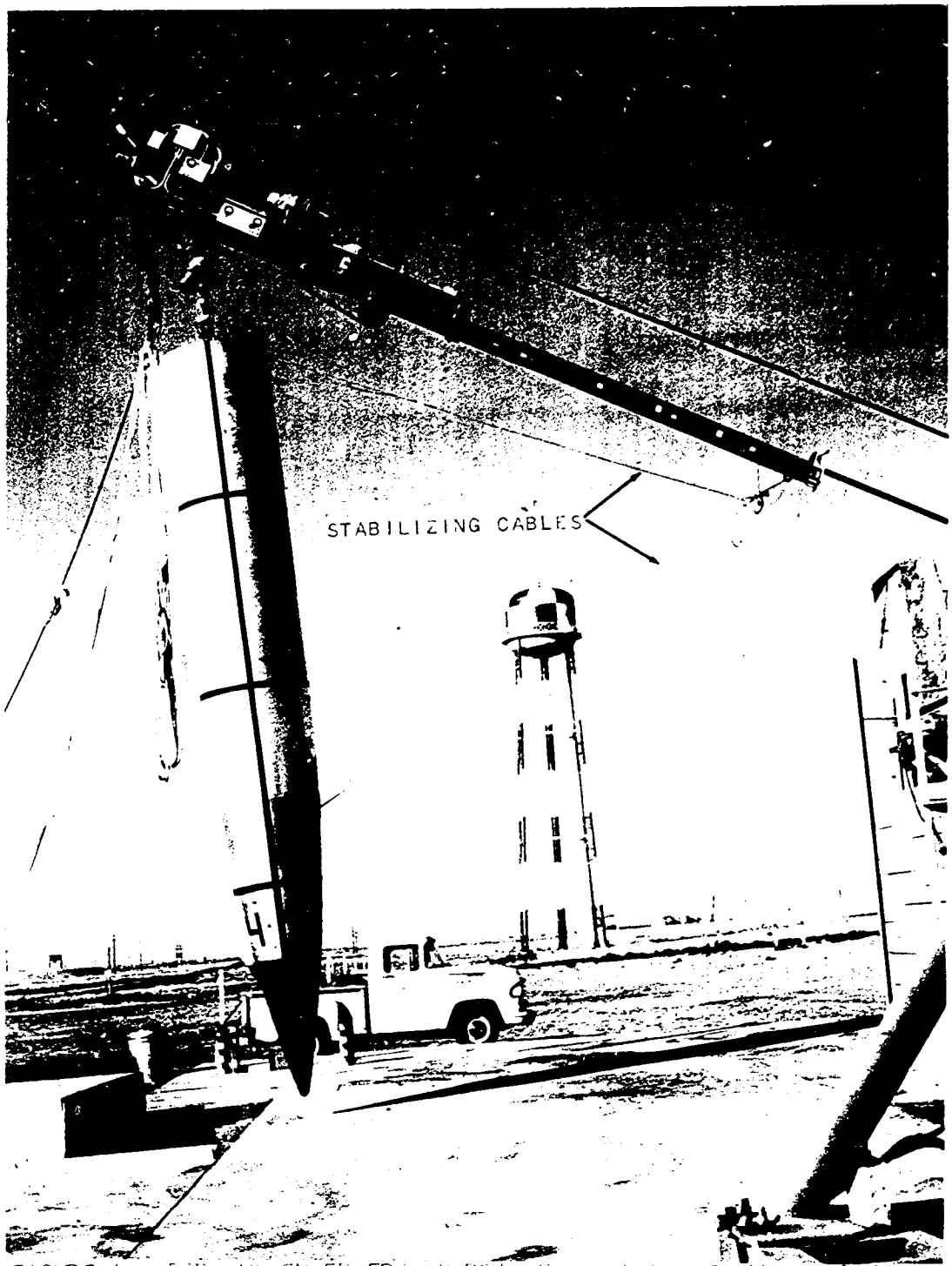

FIGURE 1 - POD SUSPENDED FROM CARRIAGE, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS == DROP TOWER TEST OF CONVAIR B-58 POD

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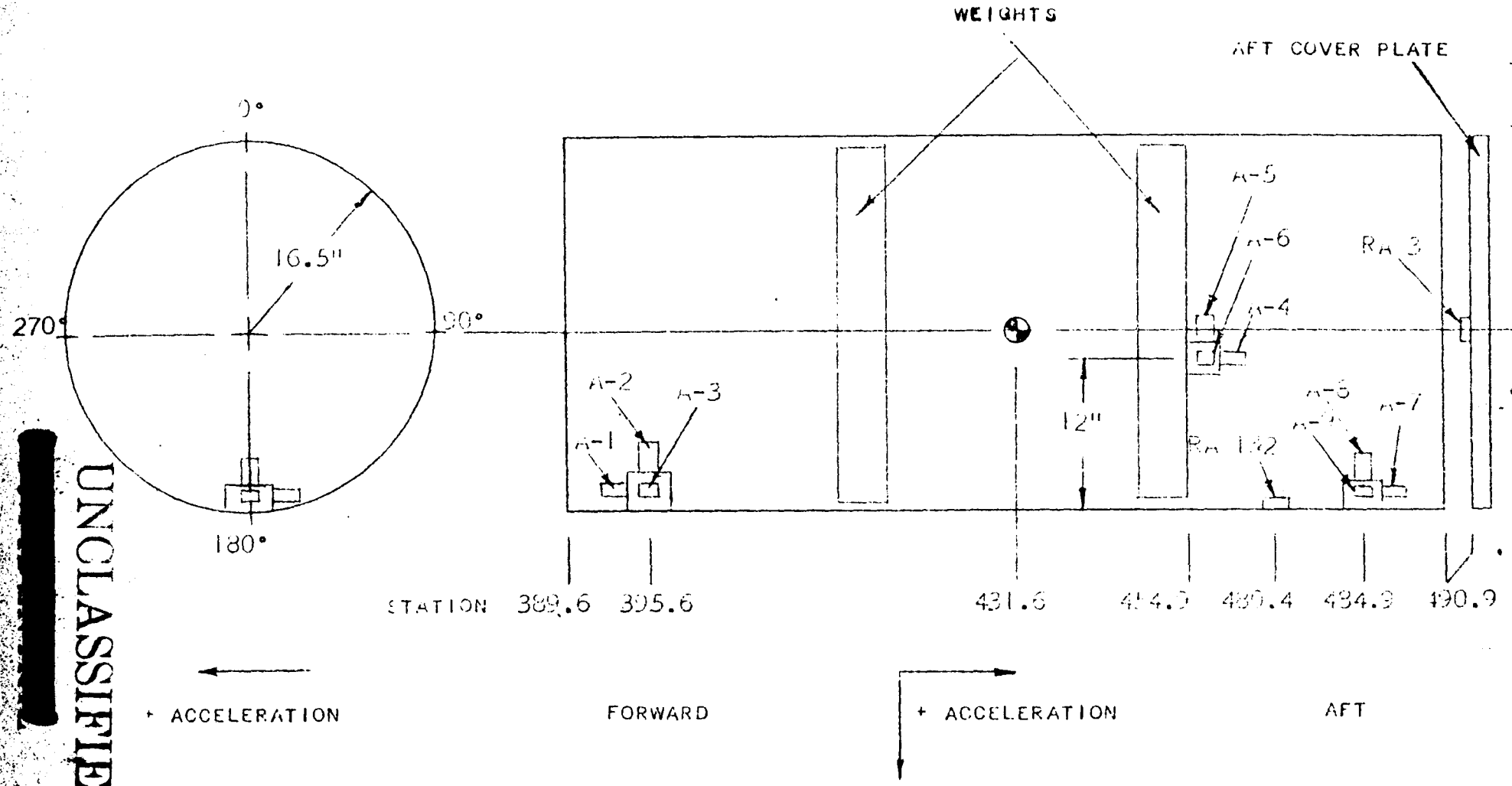

FIGURE 2 - DIAGRAM SHOWING ACCELEROMETER LOCATIONS AND STATION NUMBERS, POD DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17283

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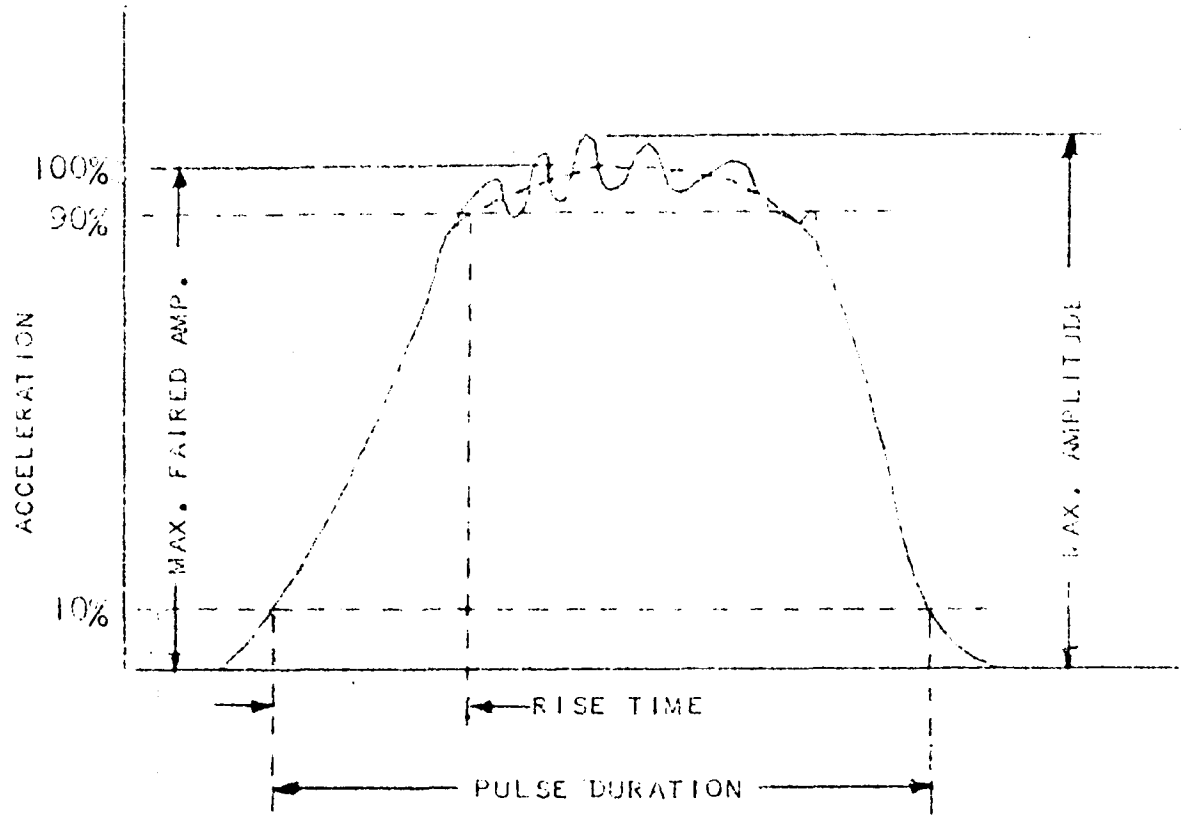

FIGURE 3 - DIAGRAM ILLUSTRATING METHOD OF READING AN ACCELERATION SIGNATURE PER SANDIA CORPORATION'S S.C.S. 10, PARAGRAPH 7.4 TO 7.4.5, POD DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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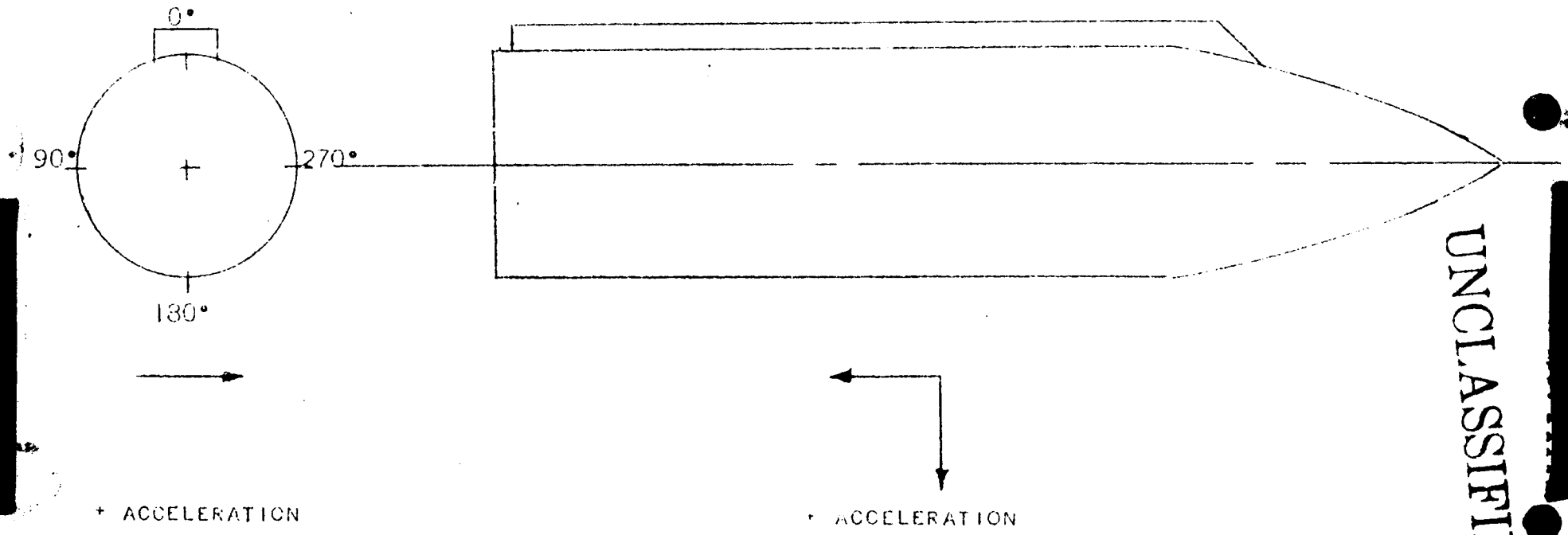

FIGURE 4 - SIGN CONVENTION USED TO DESIGNATE DIRECTION OF ACCELERATION, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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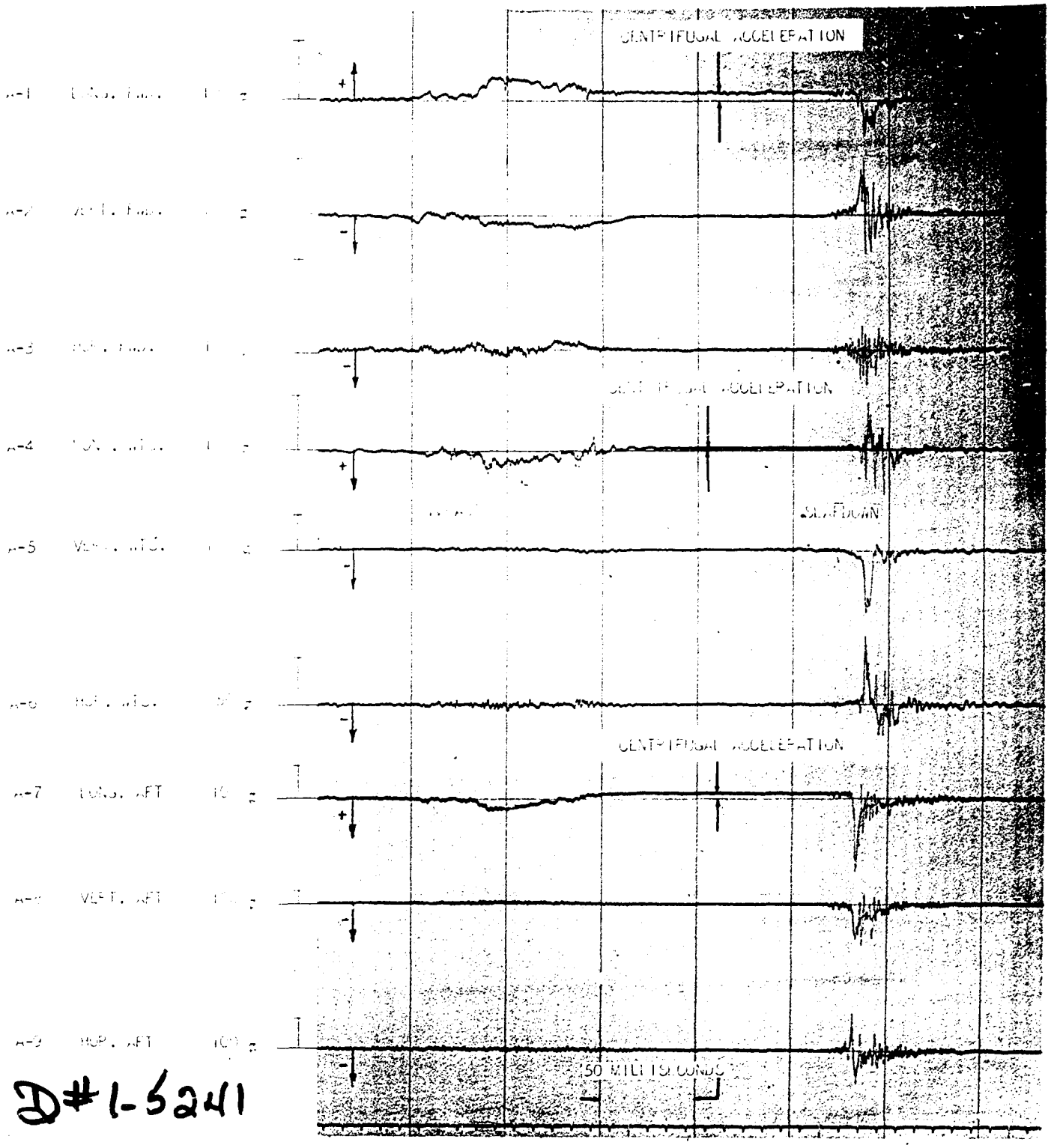

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FIGURE 5 - FILTERED RECORD OF ACCELERATION SIGNATURES FROM POD DROP No. 3, V_V = [illegible] FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT No. T-17263

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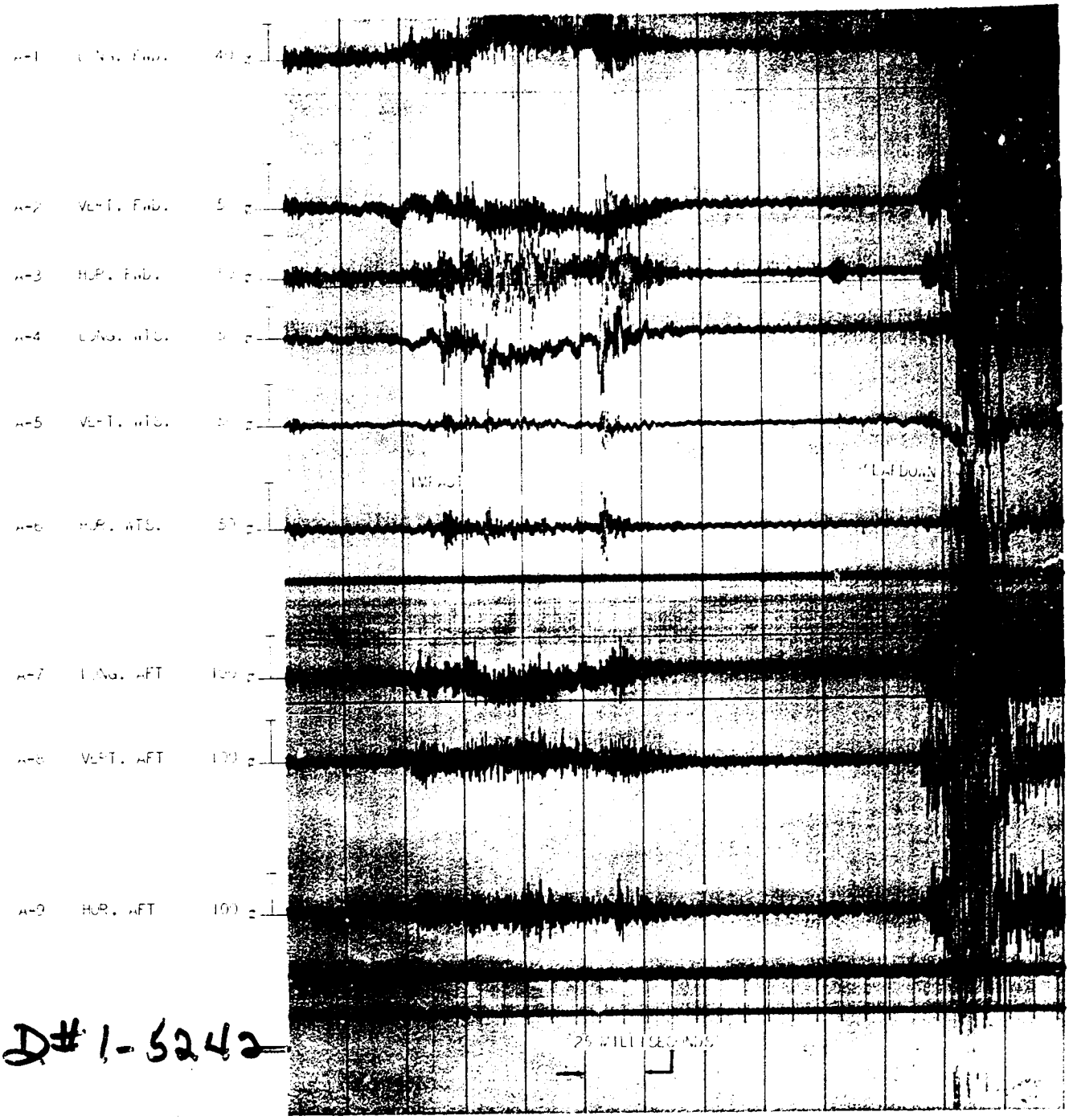

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FIGURE 6 - UNFILTERED RECORD OF ACCELERATION SIGNATURES FROM TEST DROP NO. 3, V_V = [illegible] FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. [illegible]

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FIGURE 7 - CRUMPLED NOSE FAIRING, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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FIGURE 8 - FORWARD END OF WARHEAD, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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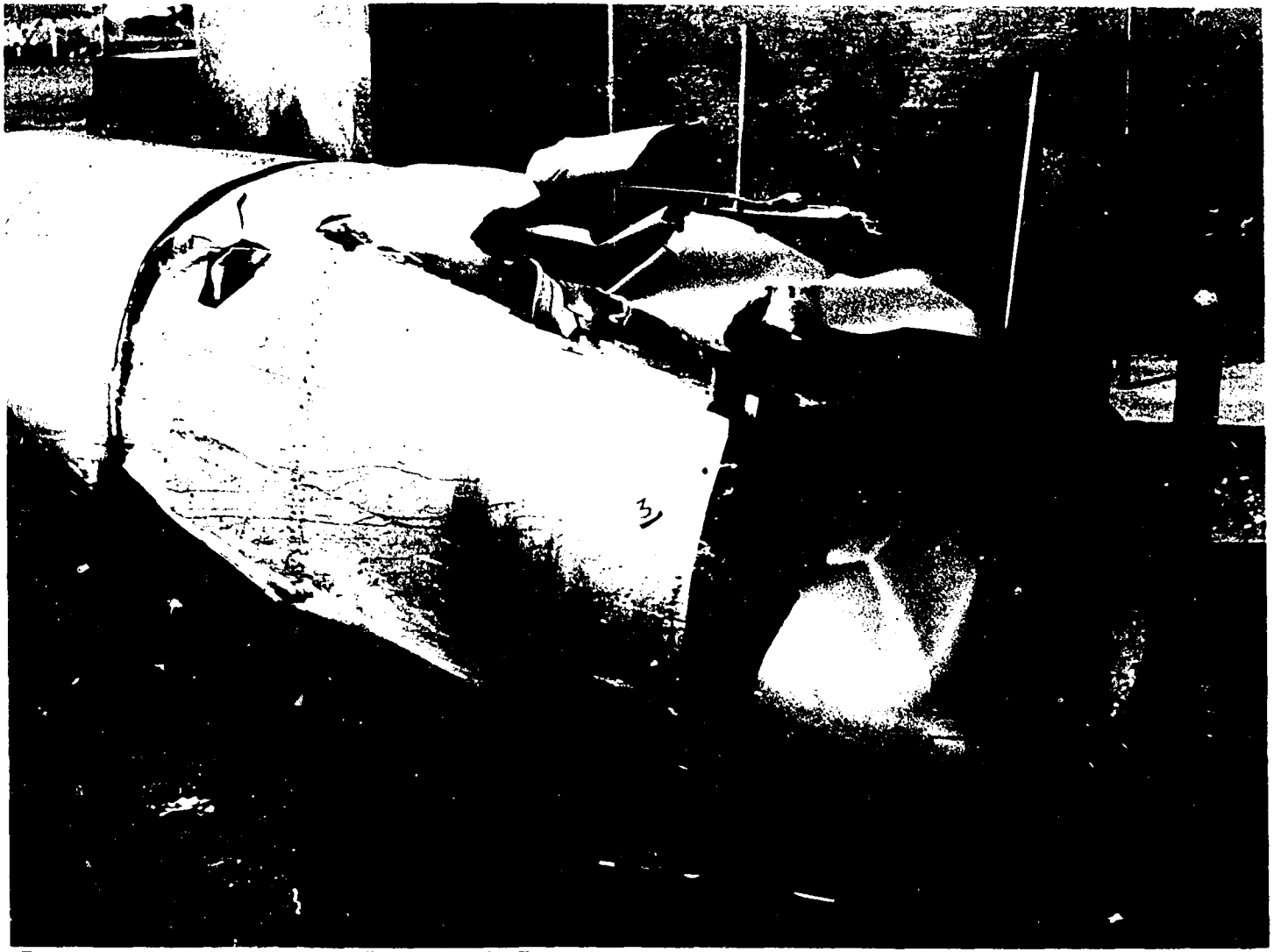

FIGURE 9 - DAMAGE DONE TO PARACHUTE CAN DURING SLAPDOWN, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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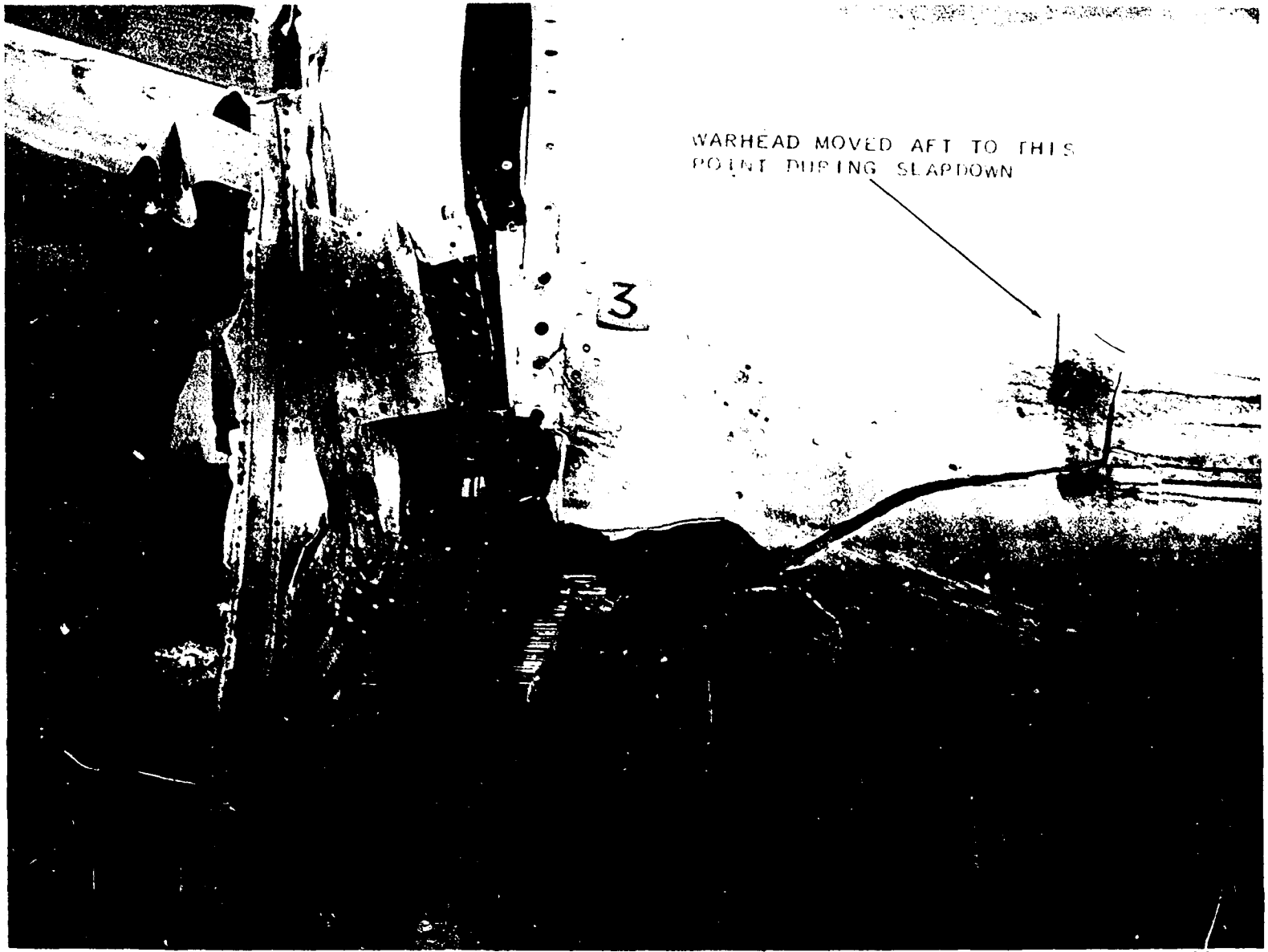

FIGURE 10 - FORWARD BULKHEAD ON SIDE OPPOSITE PYLON, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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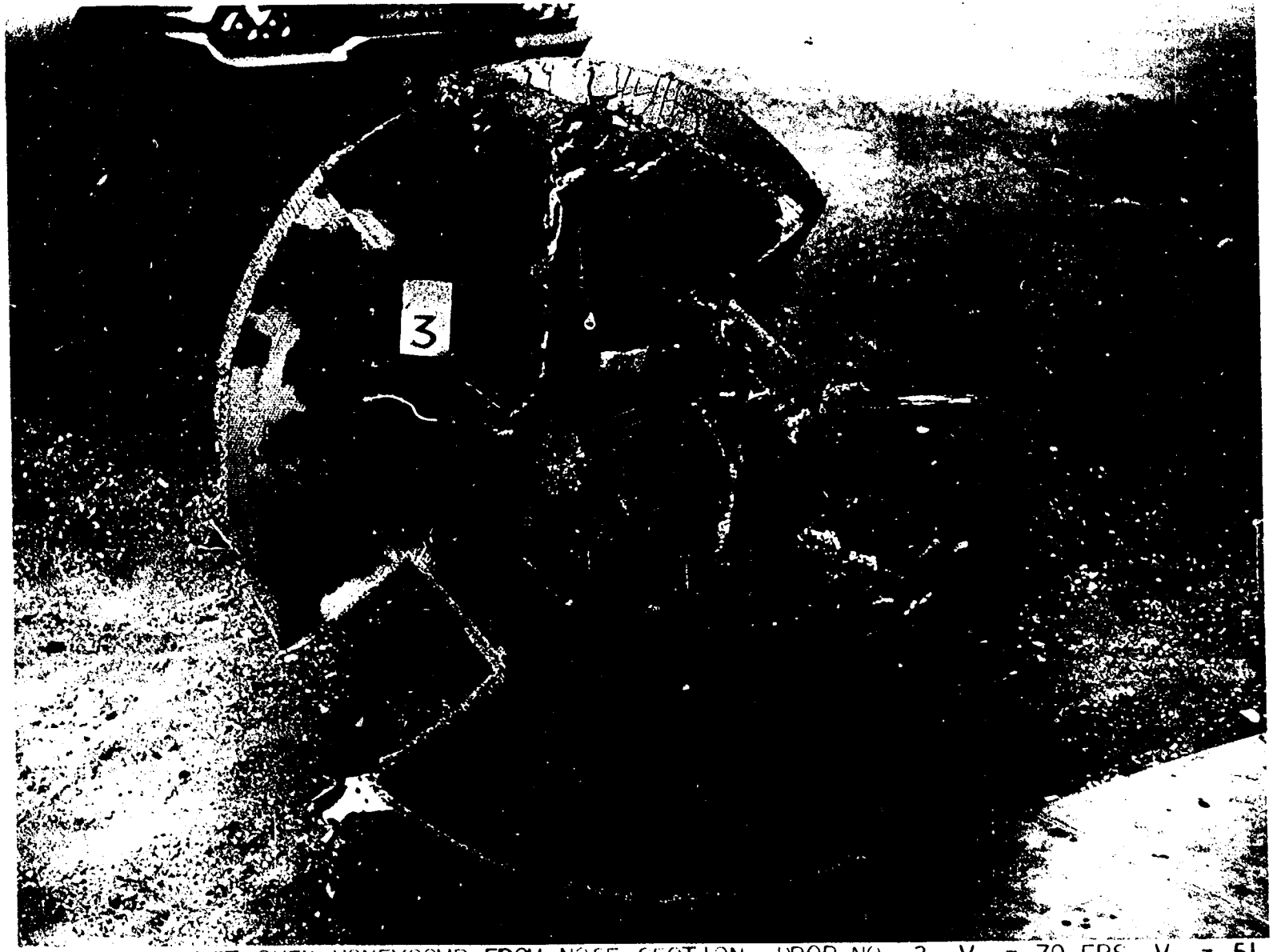

FIGURE 11 - DETACHED HONEYCOMB FROM NOSE SECTION, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17283

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FIGURE 12 - HONEYCOMB WAS SEVERED FROM WARHEAD SECTION BEFORE ABSORBING THE MAXIMUM ENERGY, DROP NO. 3, V_V = 70 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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TABLE I

Accelerometers Used on Pod Drop No. 3
Drop Tower Test of Convair B-58 Pod

Position	Station No.	Statham S/N	Statham Model	Range (g's)	Natural Frequency (cps)
A-1	395.6	7161	ASA-1000-350	1000	2200
A-2	395.6	5380	ASA-1000-350	1000	2200
A-3	395.6	7173	ASA-1000-350	1000	2200
A-4	434.9	7180	ASA-1000-350	1000	2200
A-5	434.9	7177	ASA-1000-350	1000	2200
A-6	434.9	7407	ASA-1000-350	1000	2200
A-7	434.9	7163	ASA-1000-350	1000	2200
A-8	434.9	7162	ASA-1000-350	1000	2200
A-9	434.9	7164	ASA-1000-350	1000	2200

RA-1	480.4	Race Engineering Company Recording Accelerometer, Model A-12, 10-100-g range
RA-2	480.4	Race Engineering Company Recording Accelerometer, Model A-12, 10-100-g range
RA-3	480.9	Race Engineering Company Recording Accelerometer, Model A-12, 10-100-g range

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TABLE II

Acceleration, Rise Time, and Pulse Duration from
Accelerometers A-1 through A-9 for Pod Drop No. 3
Drop Tower Test of Convair B-58 Pod

Position	Location	Recording Direction	Station No.	Valued Pulse (g's)	Max Pos Peak (g's)	Max Neg Peak (g's)	Rise Time (ms)	Duration (ms)
A-1	Long., Fwd	Long.	395.6	+39.9	39.1	-	42.3	92.2
A-2	Vert., Fwd	0-180°	395.6	-22.1	6.5	27.6	51.0	86.4
A-3	Hor., Fwd	90-270°	395.6	+8.9	10.5	8.3	8.6	30.9
A-4	Long., on Weights	Long.	454.9	+34.6	44.0	24.2	20.3	72.8
A-5	Vert., on Weights	0-180°	454.9	-	8.4	11.5	-	-
A-6	Hor., on Weights	90-270°	454.9	-2.2	4.1	6.3	9.7	12.9
A-7	Long., Aft	Long.	484.9	+31.6	37.2	15.9	15.9	52.5
A-8	Vert., Aft	0-180°	484.9	-	40.7	24.6	-	-
A-9	Hor., Aft	90-270°	484.9	-	9.6	8.3	-	-
			Slapdown					
A-1	Long., Fwd	Long.	395.6	-59.4	16.8	59.0	0.66	8.7
A-2	Vert., Fwd	0-180°	395.6	+64.9	94.9	70.4	0.9	20.8
A-3	Hor., Fwd	90-270°	395.6	-8.0	35.9	25.7	6.2	15.7
A-4	Long., on Weights	Long.	454.9	-46.3	84.4	85.9	1.[illegible]	5.2
A-5	Vert., on Weights	0-180°	454.9	-180.8	18.6	179.4	[illegible]	8.9
A-6	Hor., on Weights	90-270	454.9	+54.6	70.6	32.9	[illegible]	4.4
A-7	Long., Aft	Long.	484.9	+182.5	219.7	66.5	[illegible]	32.3
A-8	Vert., Aft	0-180°	484.9	-310.6	102.4	436.9	3.[illegible]	25.[illegible]
A-9	Hor., Aft	90-270°	484.9	-86.0	125.9	167.4	1.6	23.6

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TABLE XII

Accelerations Recorded from Recording Accelerometers
Prop Power Test of Convair B-58 Pod No. 3

Position	Location	Recording Direction	Station No.	Acceleration (g's)
RA-1	Long., Aft	Long.	480.4	+50-55
RA-2	Long., Aft	Long.	480.4	+50-55
RA-3	Vert., Aft Plate	0-180°	480.9	> -100

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