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1163

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
1st Review Date: 7/20/98 Authority: ☐ADC ☒ADD Name: W Layne 2nd Review Date: 7/23/98 Authority: ADD Name: RB Craner	Determination (Circle Number): 1. Classification Retained 2. Classification Changed to: U 3. Contains No DOE Classified Information 4. Coordinate With: 5. Contains UCAI? No 6. Comments: OK for Opennet

APR 21 1961
TX-53-3.2
T-17488
13.868.00

TO: DISTRIBUTION

Re: Drop Tower Test of Convair Pod No. 5

Object of Test

This test was a continuation of the investigation of the shock-mitigating characteristics of the B-58 Pod. Accelerations were measured at 12 selected points within the Pod.

Authorization for Test

This test was requested in a Work Order Authorization from Mr. H. E. Kinney, 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.

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CENTRAL RECORD FILE

Summary of Results

This drop test was made from Sandia Corporation's 185-foot drop-test tower. The vertical component of impact velocity was 62 ft/sec, and the horizontal component was 51.3 ft/sec. The parachute can had been redesigned and had some reinforcing ribs and honeycomb in it. The nose fairing was made from ductile aluminum instead of the 7075 aluminum used on previous drop units.

Summary of Past Tests

Four drop tests were made previously, and the test reports are on file with Division 7321 of Sandia Corporation. For the results of Test Nos. 1 through 4, respectively, see reports numbered T-17076, T-17228, T-17283, and T-17371.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW DOWNGRADING OR DECLASSIFICATION STAMP	
CLASSIFICATION CHANGED TO: U Emelda Selph 7/30/98 PERSON CHANGING MARKING & DATE WC Layne 7/30/98 PERSON VERIFYING MARKING & DATE	AUTHORITY: R.B. Craner RECORD ID: 98SN3071 DATED: 7/23/98

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

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Setup and Procedures for Test

The Pod was transported to the tower on a special trailer and spotted under the carriage. The instrumentation cables were connected to the Pod, the support slings were attached, and the trunnion bar was installed. The Pod was raised from the trailer with a crane and a forklift, and was attached to the hoisting mechanism on the carriage. It was then hoisted and secured to the carriage. This was followed by the routine rigging and preparation of the Pod and carriage for the test. Figure 1 shows the Pod attached to the carriage prior to the test. Note that the pylon is on the trailing side. It was necessary to incline the Pod off-vertical about 3 degrees by tightening the stabilizing cables to insure stability of the Pod during the slide sequence.

The acceleration data were recorded on a CEC Data Tape Recorder, Type 5-752A, Serial No. T-01465, at a tape speed of 60 in/sec. This was later played back through an Ampex FM Recorder, Model 114-A, and a CEC Oscillograph, Model 5-119, to get a permanent record. Ampex Output Data Filters were used to filter out frequencies above 624 cps.

Table I contains a tabulation of the specifications of the Statham and Pace accelerometers used on Pod No. 5. Figure 2 shows the locations and station numbers of the accelerometers mounted in Pod No. 5. Also shown is the sign convention used to designate directions of positive acceleration.

Results

The test results revealed that the reinforced parachute can performed quite successfully during the slapdown sequence. The maximum faired transverse acceleration during this event was only -22.5 g's, with a rise time of 10 milliseconds and a duration of 74 milliseconds. This was a radical departure from the behavior taken by the previous Pod tests where the accelerations ranged from 100 to 200 g's.

The maximum faired longitudinal acceleration at impact was +50.7 g's with a rise time of 26 milliseconds and a pulse duration of 70 milliseconds. The behavior of Pod No. 5 at impact was quite similar to the previous Pod tests.

Table II is a tabulation of the acceleration, rise time, and pulse duration for each accelerometer as read from the filtered record. No readings were taken from the unfiltered record. The sign convention used to designate direction of acceleration is in accordance with the directions shown in Figure 2. Acceleration signatures were read according to Sandia Corporation's SCS-10, Paragraphs 7.4 through 7.4.5, and Figure 3 has been included to illustrate this technique graphically.

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Figures 4 and 5 show the unfiltered records. The filtered records are shown in Figures 6 and 7.

Looking at vertical accelerometers A-14 and A-17 of Figure 6, which were mounted in the forward section of the dummy TX-53, one can see that each records a pulse at impact of about 20 g's. This represents the deceleration of the Pod as it skids along the target surface during initial impact. Referring now to Figure 7 and looking at vertical accelerometers A-5 and A-11, mounted in the aft end of the dummy TX-53 and recording in the same direction as A-14 and A-17, no pulse at impact can be noticed. The reason for this is that the Pod begins to see an angular acceleration at initial impact with the center of rotation being in the area where the nose contacts the target surface. Under such conditions, accelerometers A-5 and A-11 are subjected to two accelerations, one being the deceleration at impact and the other being a tangential acceleration impressed upon them by the angular acceleration of the Pod. These two accelerations are substractive and in this case were very nearly equal in magnitude. The forward accelerometers, A-14 and A-17, are not greatly affected by the tangential acceleration since they are relatively close to the center of rotation.

One other phenomenon that exists during a drop test of this nature has to do with the behavior of the longitudinal accelerometers during the time interval between impact and slapdown. From Figures 6 and 7, it can be seen that accelerometers A-16, A-13, A-10, and A-4 record a more or less constant acceleration between impact and slapdown. This is the centrifugal acceleration that acts on each longitudinal accelerometer as the Pod revolves about its CG during its free flight between impact and slapdown. The other accelerometers are not affected by this entrifugal acceleration since their sensitive axes are at right angles to the acceleration.

The dummy TX-53 was displaced aft (with respect to the Pod) 36 inches during the slapdown sequence (refer to Figure 8). The rivets that secured the parachute can to the forward section of the Pod sheared during the slapdown; this is also shown in Figure 8. A view of the parachute can is shown in Figure 9. The crumpled nose fairing is also shown in this figure. Figure 10 shows a front view of the nose section of the Pod after the test. Note that the ductile aluminum kept the honeycomb nose section fairly well intact.

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Conclusions

This was the most successful Pod drop to date when considered in light of the relatively mild accelerations experienced at impact and slapdown. Even though the Pod was pulled apart during the slapdown, it is believed that a live warhead would have remained functional.

for C. G. COALSON - 7323-3

7321 PROJECT ENGINEER: BILL JOHNSON - 7321-5

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

CGC:7323-3:5/dke

Enc: Figs. 1-10
Tables I-II

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

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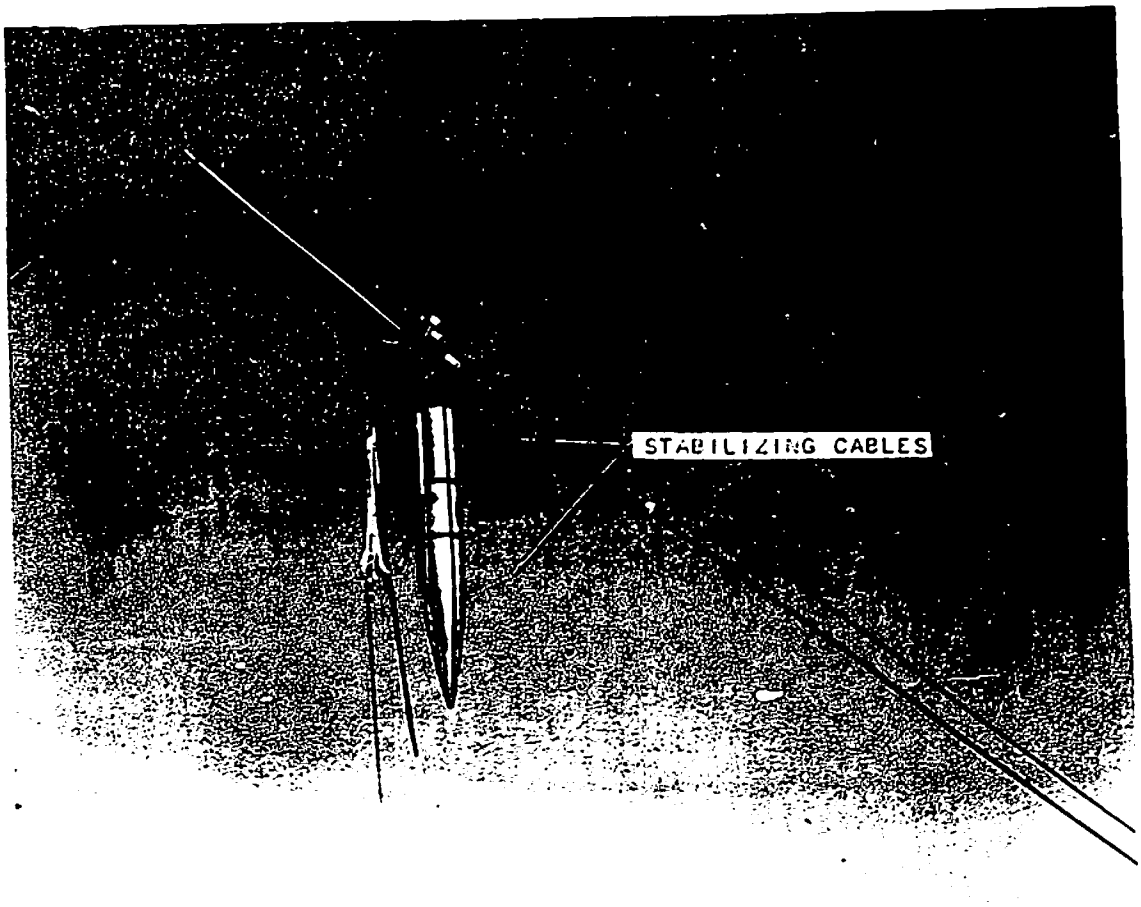

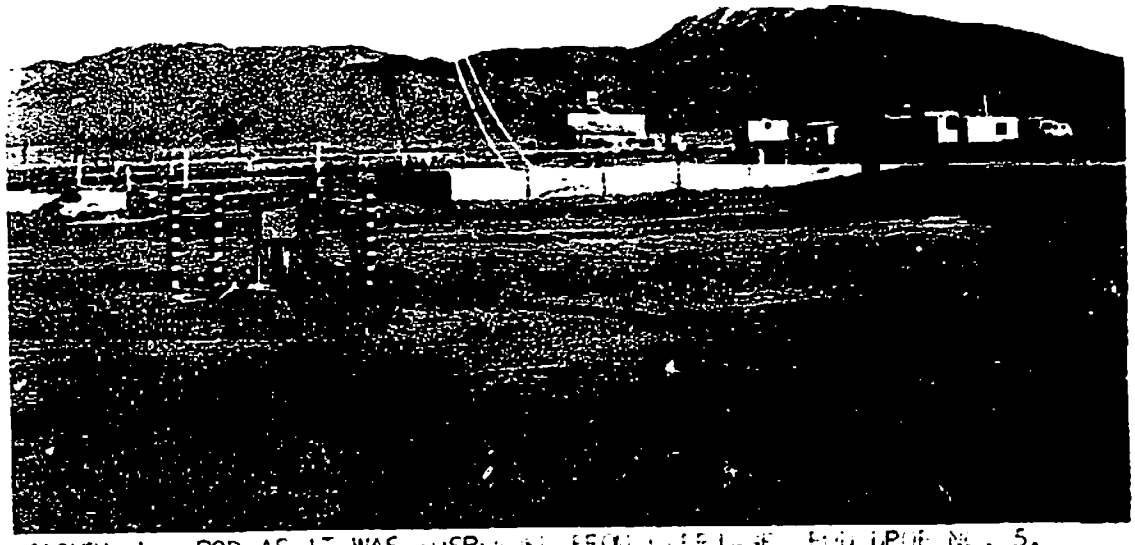

FIGURE 1 - POD AS IT WAS SUSPENDED FROM CARRIAGE, POD DROP NO. 5, V_V = 52 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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PROJECT NO. T-17428

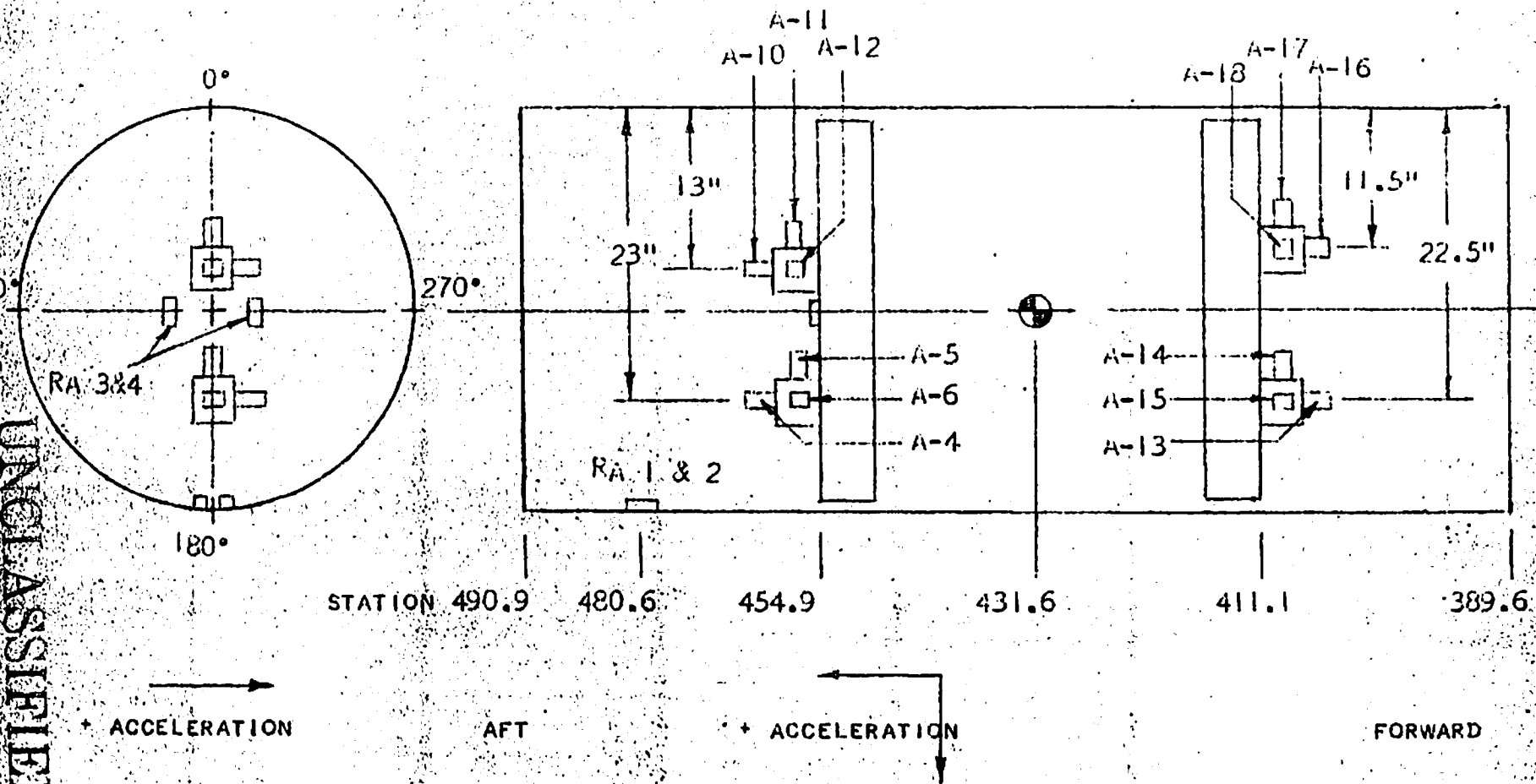

FIGURE 2 - DIAGRAM SHOWING ACCELEROMETER LOCATIONS, STATION NUMBERS, AND DIRECTION OF POSITIVE ACCELERATION, POD DROP NO. 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17488

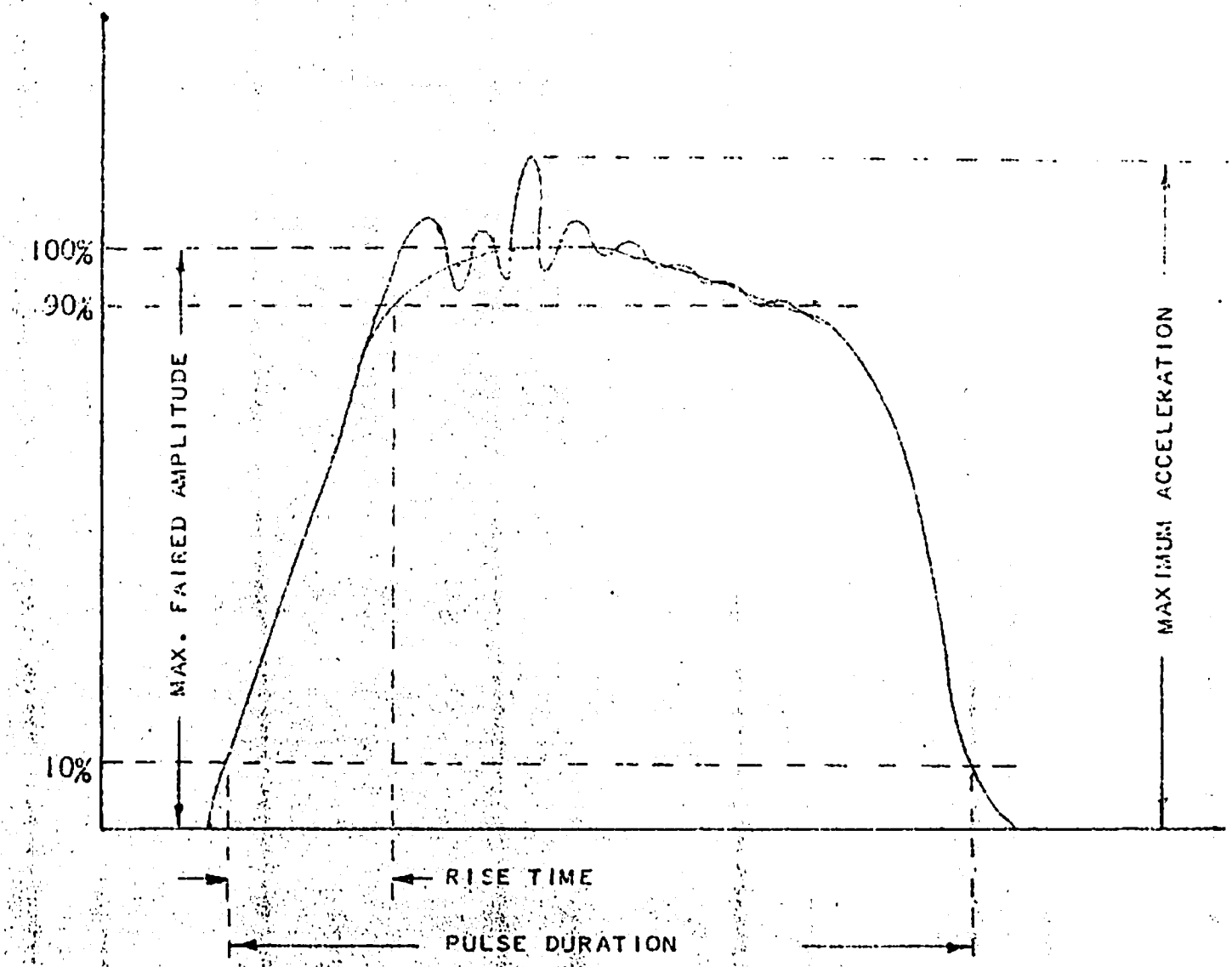

FIGURE 3 - DIAGRAM ILLUSTRATING METHOD OF READING AN ACCELERATION PULSE ACCORDING TO SANDIA CORPORATION'S SCS 10, PARAGRAPH 7.4 TO 7.4.5 -- DROP TOWER TEST OF CONVAIR B-58 POD

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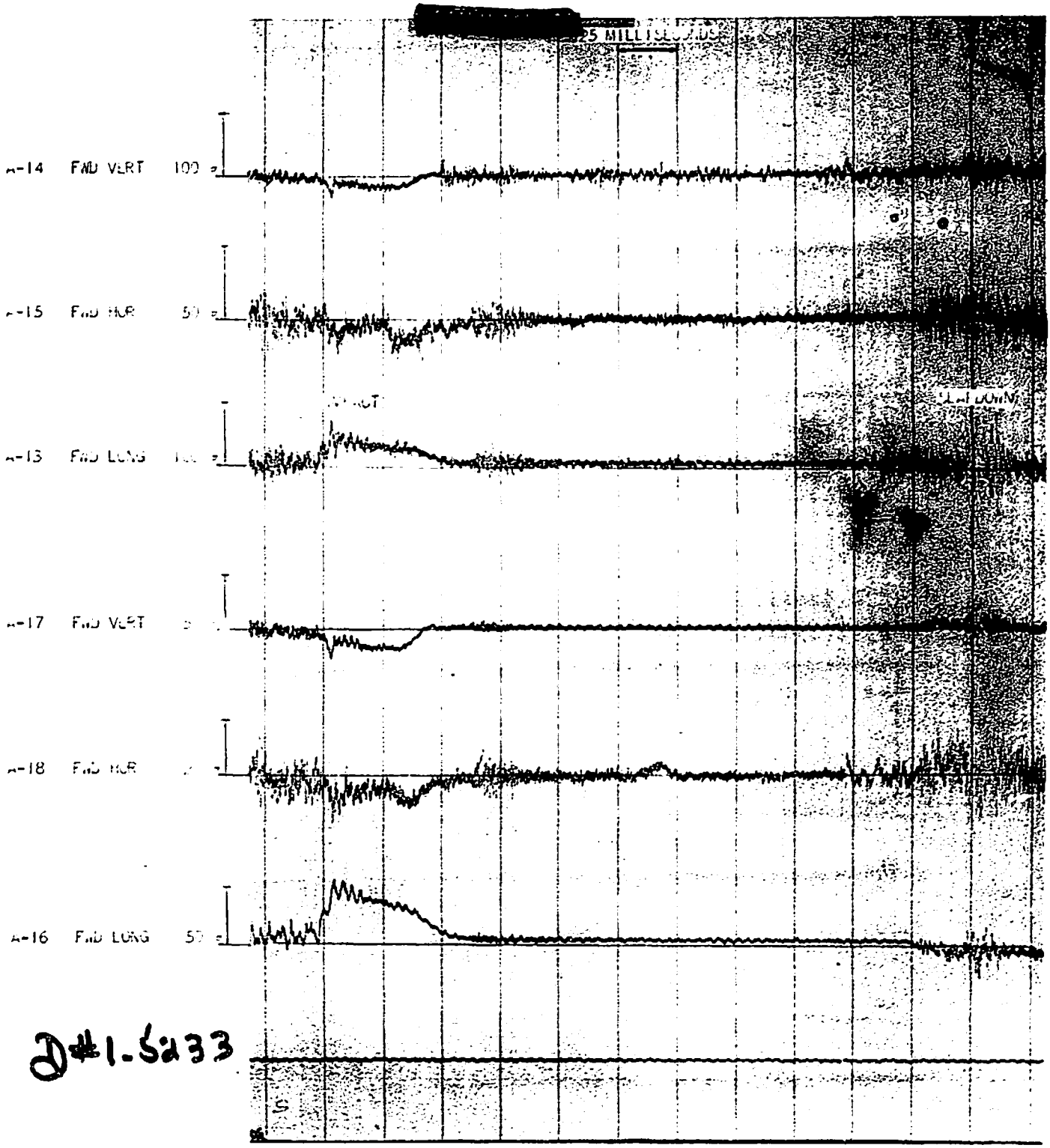

FIGURE 4 - UNFILTERED ACCELERATION SIGNATURES FROM ACCELEROMETERS A-13 THROUGH A-18, POD DROP NO. 5, V_V = [illegible] FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-1742

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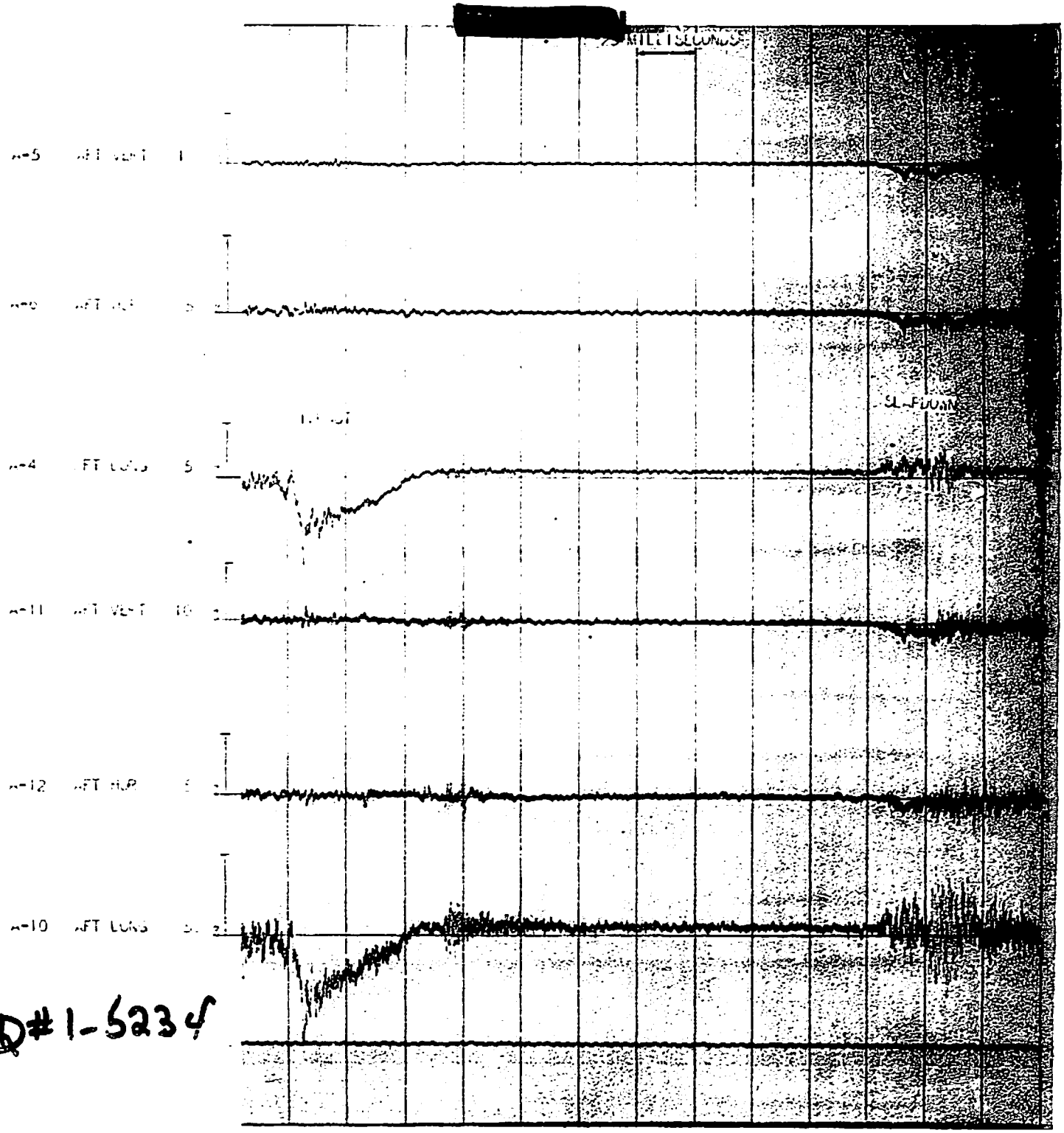

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FIGURE 5 - UNFILTERED ACCELERATION SIGNATURES FROM ACCELEROMETERS A-4 THROUGH A-6 AND A-10 THROUGH A-12, POD DROP NO. 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17488

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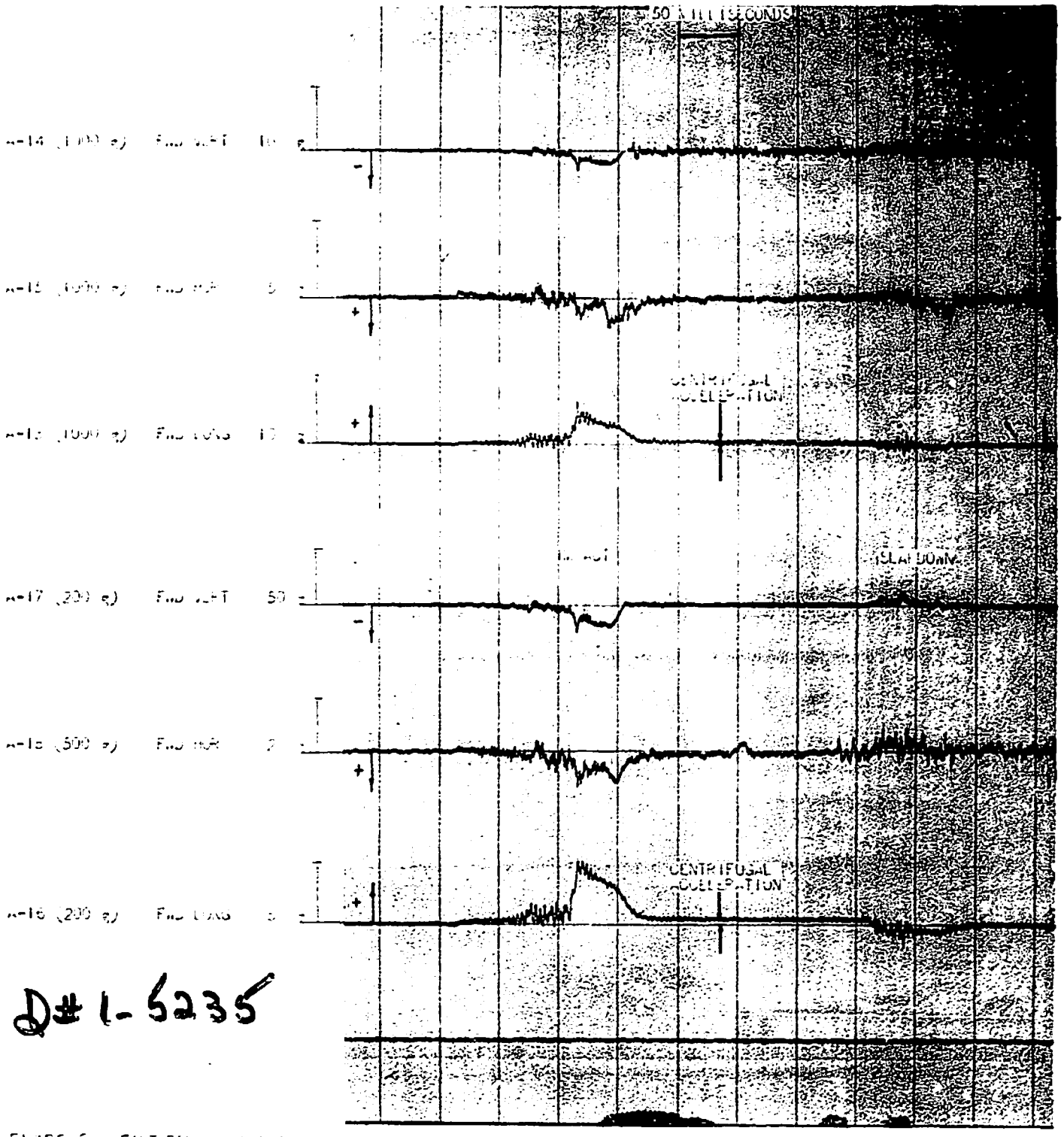

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FIGURE 6 - FILTERED ACCELERATION SIGNATURES FROM ACCELEROMETERS A-13 THROUGH A-18 INCLUSIVE, POD DROP NO. 5, V_i = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17488

#1173

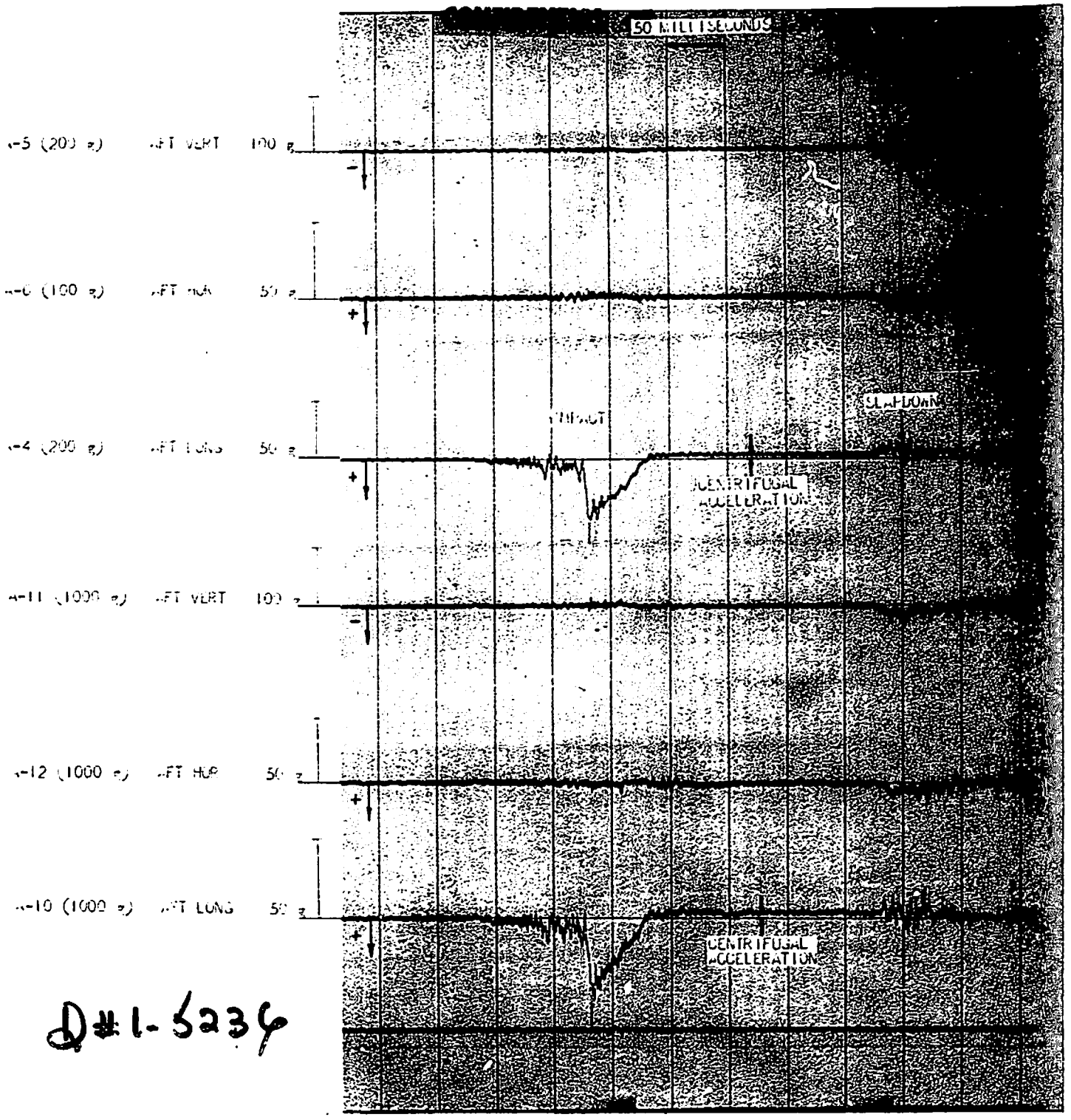

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FIGURE 7 - FILTERED ACCELERATION SIGNATURES FROM ACCELEROMETERS A-4 THROUGH A-6 AND A-10 THROUGH A-12, POD DROP NO 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-1742

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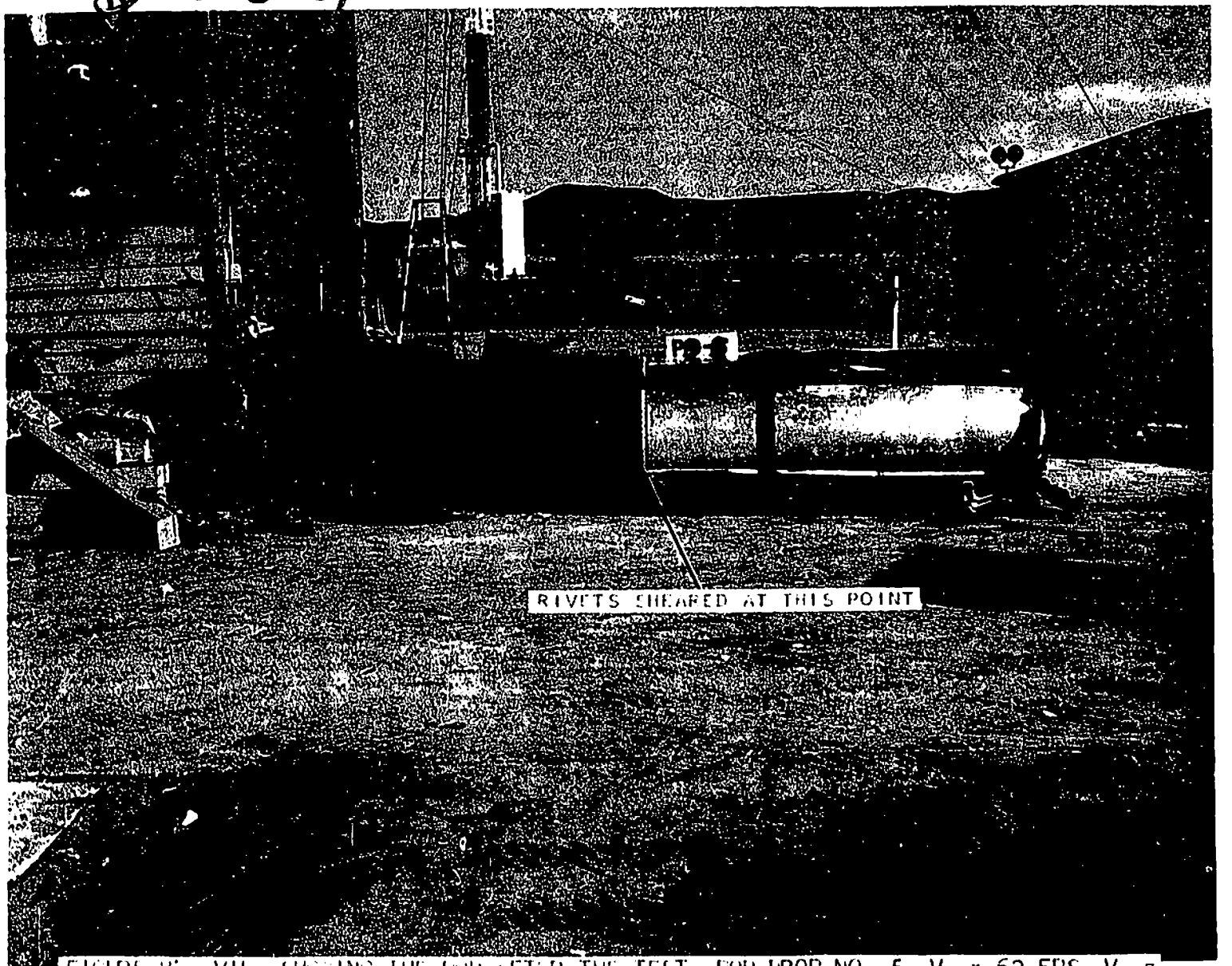

FIGURE 8 - VIEW SHOWING THE POD AFTER THE TEST, POD DROP NO. 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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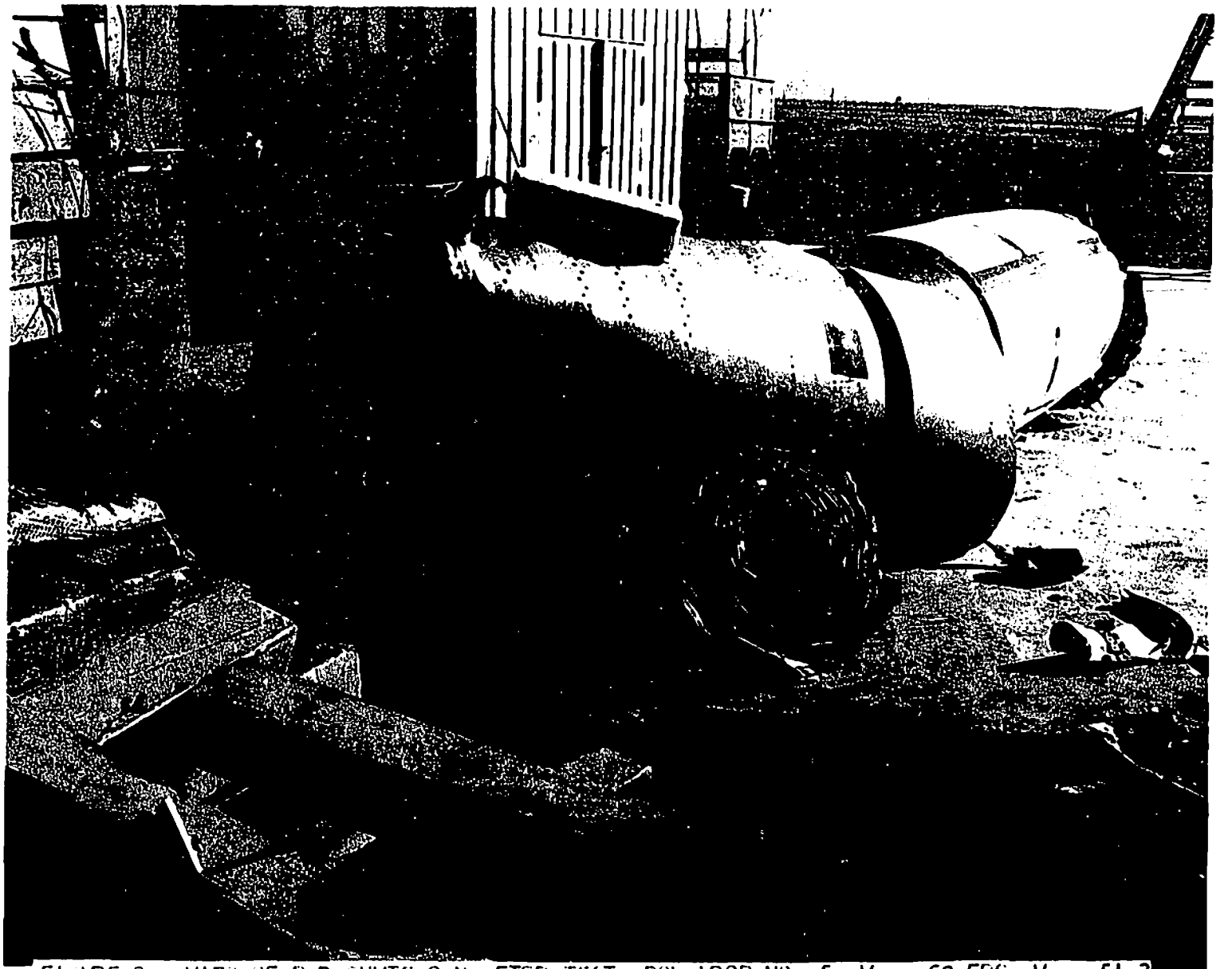

FIGURE 9 - VIEW OF PARACHUTE CAN AFTER TEST, POD DROP NO. 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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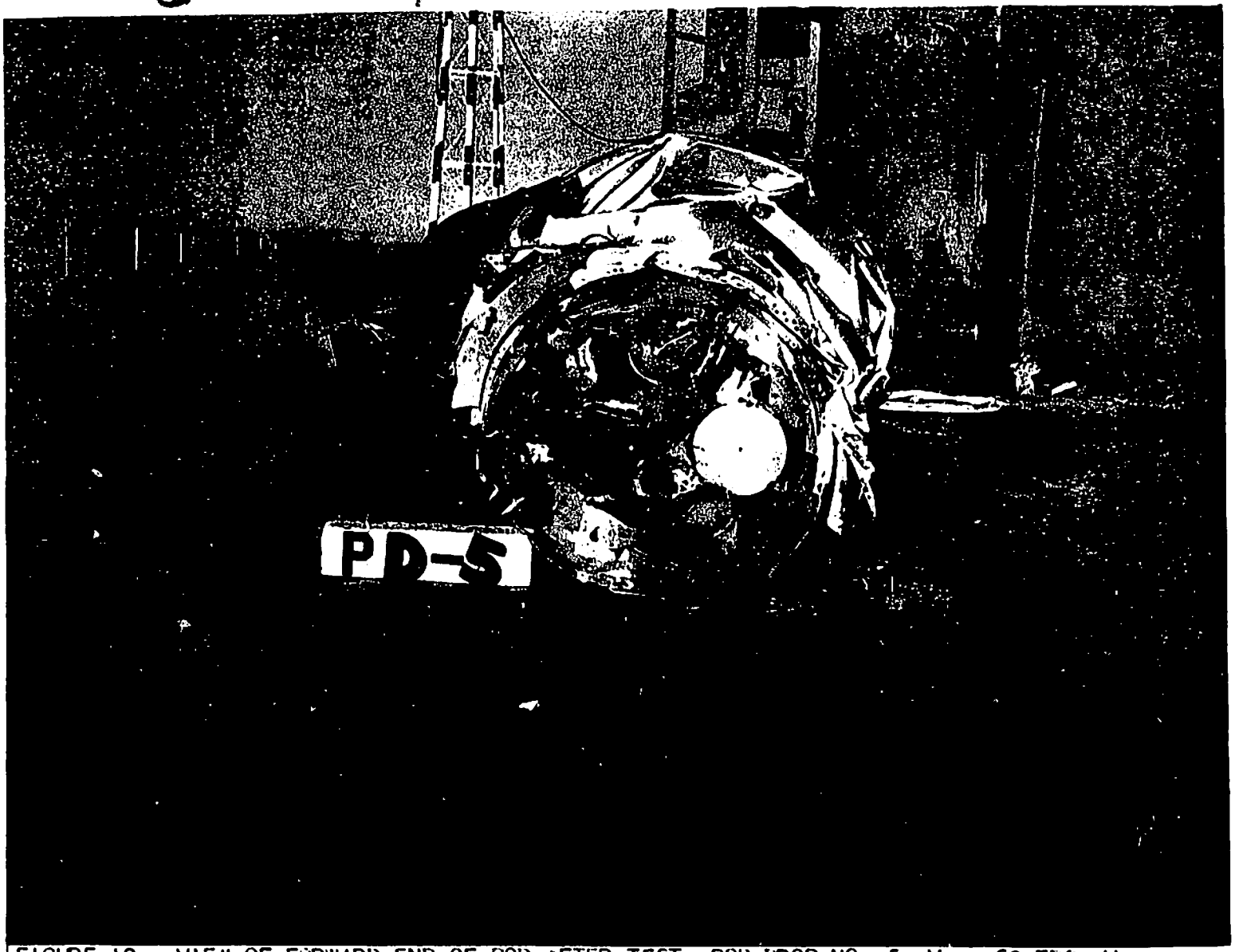

FIGURE 10 - VIEW OF FORWARD END OF POD AFTER TEST, POD DROP NO. 5, V_V = 62 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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TABLE I

Specifications of Accelerometers Used on Pod Test No. 5
V_v = 62 ft/sec; V_h = 51.3 ft/sec
Drop Tower Test of Convair B-58 Pod

Instrument Position No.	Statham Serial No.	Statham Model No.	Range (±g's)	Natural Frequency (cps)
A-4	1665	A5A-200-350	200	1120
A-5	5534	A5A-200-350	200	1120
A-6	630	A5A-100-350	100	820
A-10	7407	A5A-1000-350	1000	2200
A-11	7164	A5A-1000-350	1000	2200
A-12	5380	A5A-1000-350	1000	2200
A-13	7180	A5A-1000-350	1000	2200
A-14	7177	A5A-1000-350	1000	2200
A-15	7162	A5A-1000-350	1000	2200
A-16	6914	A5A-200-350	200	950
A-17	6019	A5A-200-350	200	910
A-18	3997	A5A-500-350	500	1500
RA-1	Pace Recording Accelerometer Model A-12		50	-
RA-2	Pace Recording Accelerometer Model A-12		50	-
RA-3	Pace Recording Accelerometer Model A-12		100	-
RA-4	Pace Recording Accelerometer Model A-12		100	-

TABLE II

Acceleration, Rise Time, and Pulse Duration Time Read from Filtered Record
Pod Drop Test No. 5, V_v = 62 ft/sec; V_h = 51.3 ft/sec

Drop Tower Test of Convair B-58 Pod

Instrument No.	Location	Recording Direction	Impact Acceleration (g's or rad/sec²) max (+)	Impact Acceleration max (-)	Impact Acceleration Faired	Impact Time (ms) Rise	Impact Time (ms) Pulse	Slapdown Acceleration (g's or rad/sec²) max (+)	Slapdown Acceleration max (-)	Slapdown Acceleration Faired	Slapdown Time (ms) Rise	Slapdown Time (ms) Pulse
A-14	Vert., Sta. 411.1	0-180°	13.7	29.7	-20.6	35	58	18.4	17.7	+12	38	47
A-15	Hor., Sta. 411.1	90-270°	19.6	8.7	+14.8	28	72	15.9	8.5	+10	30	36
[redacted]-13	Long., Sta. 411.1	Long.	63.1	6.3	+41.4	12	66	16	13	-	-	-
[redacted]-17	Vert., Sta. 411.1	0-180°	4.3	24.6	-19.0	20	61	12.8	3.0	+10.3	30	48
[redacted]-18	Hor., Sta. 411.1	90-270°	3.7	12.9	+11.0	28	90	6.6	8.2	-3.5	12	50
[redacted]-16	Long., Sta. 411.1	Long.	53.7	2.3	+48.6	43	113	4.3	18.2	-6.4	12	77
[redacted]-5	Vert., Sta. 454.9	0-180°	2.3	4.7	-	-	-	2.1	27.6	-22.5	10	74
[redacted]-6	Hor., Sta. 454.9	90-270°	3.4	3.6	-	-	-	11.6	1.6	+8.4	10	56
[redacted]-4	Long., Sta. 454.9	Long.	74.4	4.5	+50.7	26	70	18.8	7.5	+12.6	10	70
A-11	Vert., Sta. 454.9	0-180°	13.8	8.2	-	-	-	9.6	27.3	-17.8	10	61
A-12	Hor., Sta. 454.9	90-270°	4.6	7.1	-	-	-	14.0	8.2	+8.3	5	59
A-10	Long., Sta. 454.9	Long.	68.9	6.5	+42.5	16	60	8.2	19.7	-8.1	12	62
RA-1	Long., Sta. 480.6	Long.			50-55					-		
RA-2	Long., Sta. 480.6	Long.			50-55					-		
RA-3	Vert., Sta. 454.9	0-180°			-					45-55		
RA-4	Vert., Sta. 454.9	0-180°			-					45-55		

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