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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 7/20/98
Authority: DADC
Name: W Lopez
2nd Review Date: 7/23/98
Authority: ADD
Name: R B Crane
Classification (Circle Number)
Classification Changed to: U
Contains No DOE Classified Information
Classification Within
Contains UCNI: N
Comments: Office Operator

MAR 10 1961

File: TX-53, 3-2
T-17076
Project No. 13.868.00

TO: DISTRIBUTION

Re: Drop Tower Tests on TX-53 in Convair Pod #1

Summary

Drop tower tests were performed on the upper component of the B-58 TCP. This pod contained a dummy 53 test weight simulating the weight and C.G. of the basic weapon used in the TX-53 bomb.

This drop on Pod #1 called for an impact on concrete at 60 fps vertically simulating impact velocity resulting from parachute retardation and 51.3 fps laterally simulating a 35 mph side wind. Attitude at impact was to be vertical with the nose down and the pylon leading.

The test results showed that the maximum longitudinal acceleration pulse was 48 g (with the "mean" acceleration being about 20 g.) The duration of this acceleration was about 120 milliseconds.

During the slapdown sequence the maximum transverse acceleration pulse was 70 g with a 16 millisecond duration.

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Object of Test

This test was to determine the shock mitigating characteristics of the Convair B-58 Two Component Pod when subjected to an impact velocity with a vertical component of 60 fps and a horizontal component of 51.3 fps. The Pod contained a dummy test weight which simulated the weight and C.G. of the TX-53 warhead.

Authorization for Test

This test was requested in a Work Order Authorization from Mr. Parker Jones, 7183, to Mr. D. Williams, Jr., 1613, dated May 31, 1960. ~~Mr. Harry Kinney~~ 7183, was the consultant.

CENTRAL FILE
TX-53
3-2

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
CLASSIFICATION CHANGED TO: U
AUTHORITY: R.B. Crane
Emelda Selph 7/30/98
PERSON CHANGING MARKING & DATE
RECORD ID: 98SN3056
LSC Lopez 7/30/98
PERSON VERIFYING MARKING & DATE
DATED: 7/23/98

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Setup for Test

Fig. 1 shows the method of suspending the Pod from the tower carriage. Explosive cable cutters were used to release the Pod from the carriage. Concrete targets one foot thick were used as an impact surface.

A drawing showing the Pod and dummy weight, station locations, and other details is Convair Dwg. HR-3843.

The accelerations were recorded on a CEC oscillograph Type 5-119, S.N. 9071, using Kintel 6 volt amplifiers, Model 111 BF. CEC Type 5-362 galvanometers were used in the oscillograph. The flat frequency response of this system was limited to 1200 cps by the Statham accelerometers.

Table I lists the accelerometer specifications and locations for this drop test. Figure 2 is a diagram showing the location of the dummy TX-53 inside the Pod. Figure 3 shows the locations of the accelerometers.

Procedure

The Pod was transported to the Drop Tower on a special trailer and spotted under the carriage. After the instrumentation cables were attached to the Pod, it was raised from the trailer into a vertical position using a crane and a fork lift. With the Pod in the vertical position, the hoist block from the carriage was attached to it, and the Pod hoisted and secured to the carriage. Stabilizing cables were attached at the fore and aft portions of the Pod and secured to a stiff arm on the carriage. In attaching the stabilizing cables, it was necessary to pull the Pod toward the stiff arm until the Pod was about 2°-3° off vertical before securing the stabilizing cables. This was found to be necessary to assure that the stabilizing cables would remain tight as the carriage was hauled up to dropping position. Due to the sag of the load cable on the tower, the stabilizing cables tend to become slack as the carriage is raised.

A transit was used to position the Pod at the correct dropping position over the ground.

Results

No damage was sustained by the dummy TX-53 on this drop.

During the carriage slide sequence, bolts in the stiff arm on the carriage sheared which permitted the Pod to swing free under the carriage. However, at impact the Pod was only about 12° off vertical with the nose leading the tail. The impact velocities were altered somewhat under these conditions. From the photographic data, the vertical velocity was found to be 52 fps and the horizontal velocity was 47 fps. During the impact sequence the concrete target was broken

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as shown in Figure 4. Figures 5 through 8 show the Pod after the drop test.

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In Table II are tabulated the acceleration, rise time and pulse duration for each accelerometer. In the column headed "Recording Direction" is listed the orientation of the recording axis of each accelerometer with respect to the Pod. It was intended to have the recording directions to be longitudinal, 0° - 180° and 90° - 270° but during the assembly and securing of the dummy TX-53 in the Pod, an angular displacement of 18° was introduced. Refer to Fig. 3.

The sign convention used in Table II to indicate the direction of acceleration is in accordance with the directions shown in Figure 9. Accelerations were read per Sandia's SCR-40, paragraph 7.4 to 7.4.5 and Figure 10 has been included to illustrate this technique.

In Table III are tabulated the accelerations as recorded by the Face Model A-12 recording type accelerometers.

The oscillograph records of the accelerations are shown in Fig. 11 and 12. After the initial impact, the Pod began to experience an angular acceleration about a horizontal axis approximately through the c.g. About one-half second after the impact, the longitudinal axis of the Pod had rotated to a position which was inclined about 70° from horizontal at which time the lip of the parachute can struck the target. This produced the accelerations shown on the oscillograph and labeled "Contact of Parachute Can on Target". The accelerations labeled "Slapdown" occurred after the aft end of the Pod had bounced back up and when the Pod fell almost broadside onto the target coming to rest.

During the Slapdown sequence the accelerometers that were mounted to the fore and aft wall sections of the dummy TX-53 were subjected to a high frequency vibration which caused the galvanometer light spots to overlap. These traces could not be read. The accelerometers that were mounted to the weights were isolated quite effectively from this vibration and recorded reasonably readable traces.

Conclusions

One item that is worthy of some consideration is the sequence of events during the impact. As the honeycomb in the nose first begins to crush, the applied force acts along the longitudinal axis of the cells. Under these conditions the honeycomb has considerable strength.

Now, as the Pod descends further on the target, the honeycomb begins to "see" the effects of the horizontal component of impact velocity in that it is subjected to a shearing action. This action causes the applied force not to be along the longitudinal axis of the honeycomb which results in a great loss of strength and a corresponding lower acceleration. As this shearing action continues, the honeycomb tends

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to bottom out as the Pod descends further. Refer to Figures 4 and 5. On this test a portion of the honeycomb was wiped off due to the shearing action; see Figure 6.

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Referring now to Figure 11 and looking at the longitudinal accelerometers A-1, A-4 and A-7, it can be seen how the acceleration rises to a certain value during the initial crushing of the honeycomb, then falls to about half this value as the honeycomb is sheared and then increases to slightly more than the initial acceleration when the honeycomb "bottomed out".

C. G. Coalson

C. G. COALSON - 7323-3

Bill Johnson

7321 PROJECT ENG: BILL JOHNSON - 7321-5

Enc: Figs. 1-12
Tables I-III

APPROVED: R. S. HOOPER - 7321-5

CGC:7323-3:br

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. Wissen, 1442
E. I. Bruce, 7117
D. M. Bruce, 7182, Attn: John Risse
E. H. Copeland, 7321
D. S. Dreesen, 7522
R. K. Smeltzer, 3421-3

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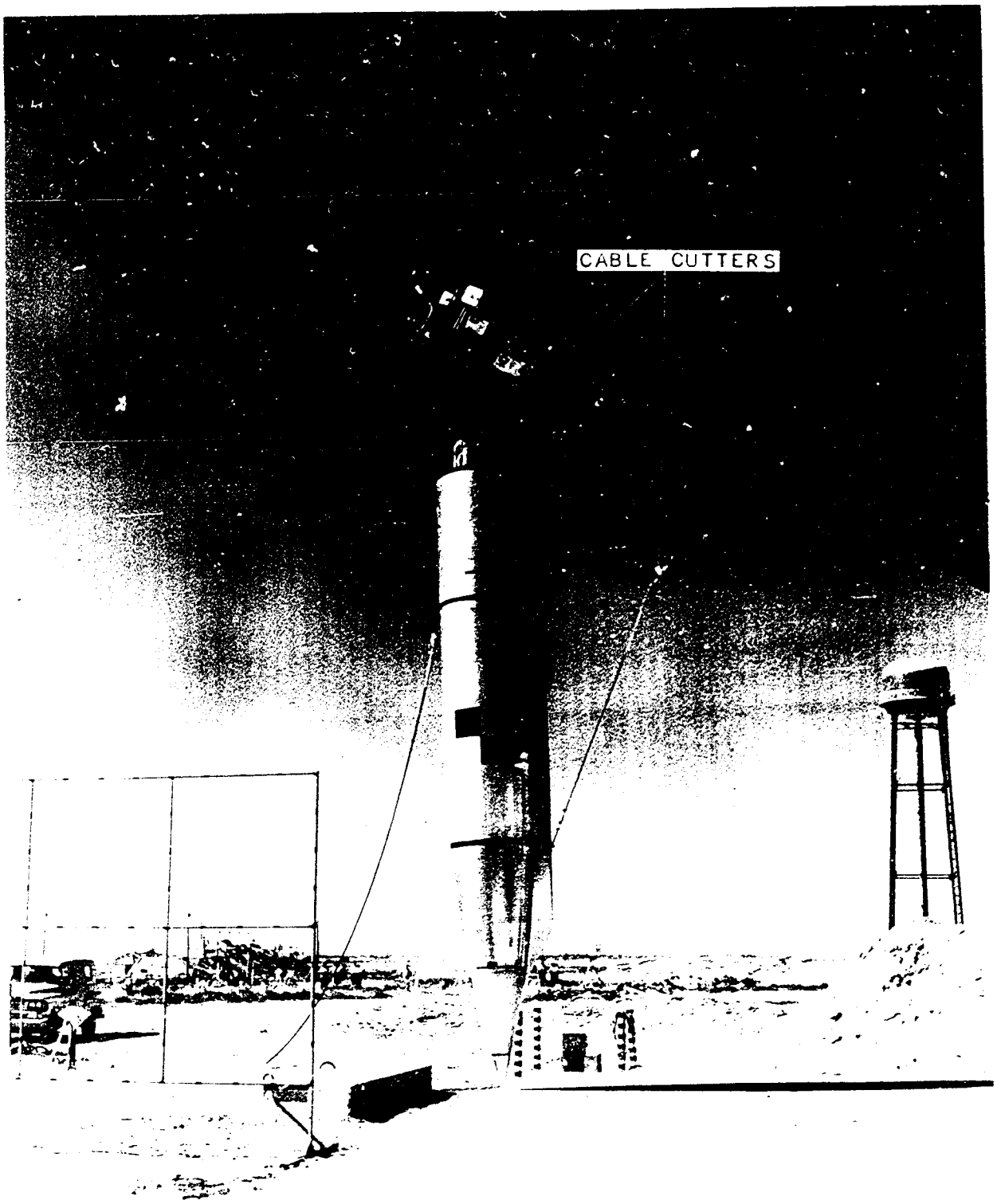

FIGURE 1 - POD SUSPENDED FROM CARRIAGE, DROP NO. 1, V_V = 60 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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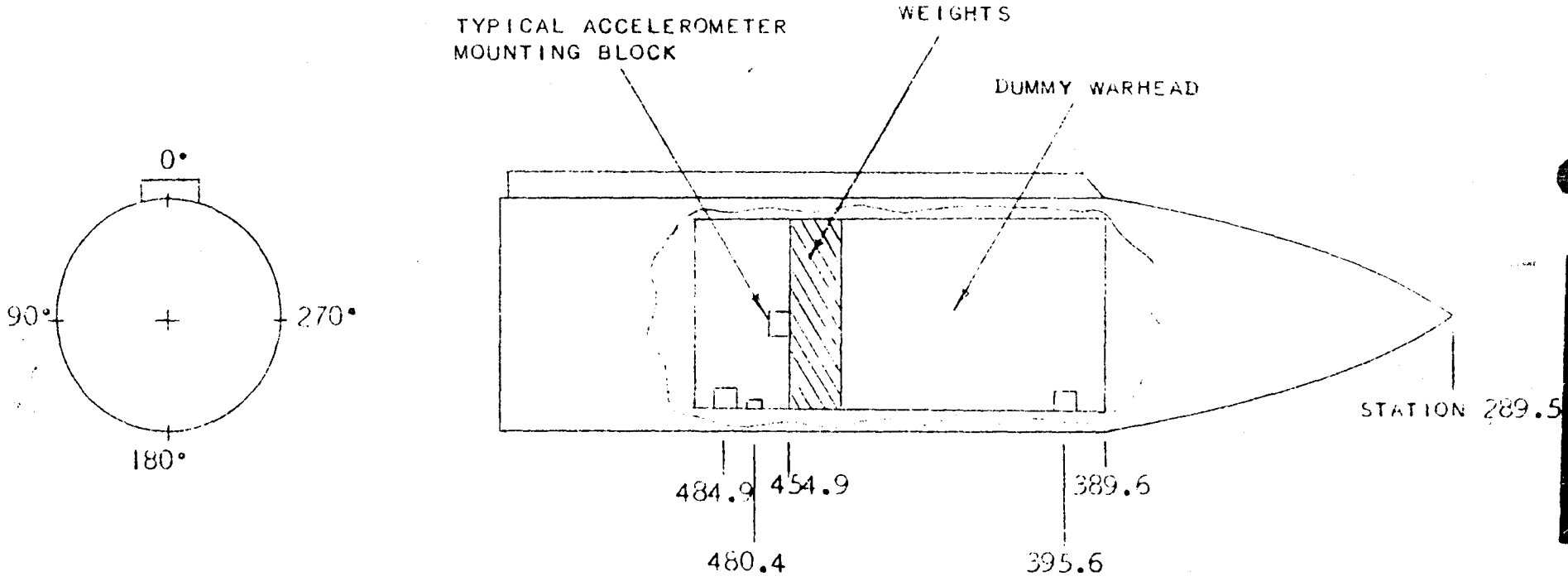

FIGURE 2 - DIAGRAM SHOWING LOCATION OF DUMMY TX-53 INSIDE POD -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17076

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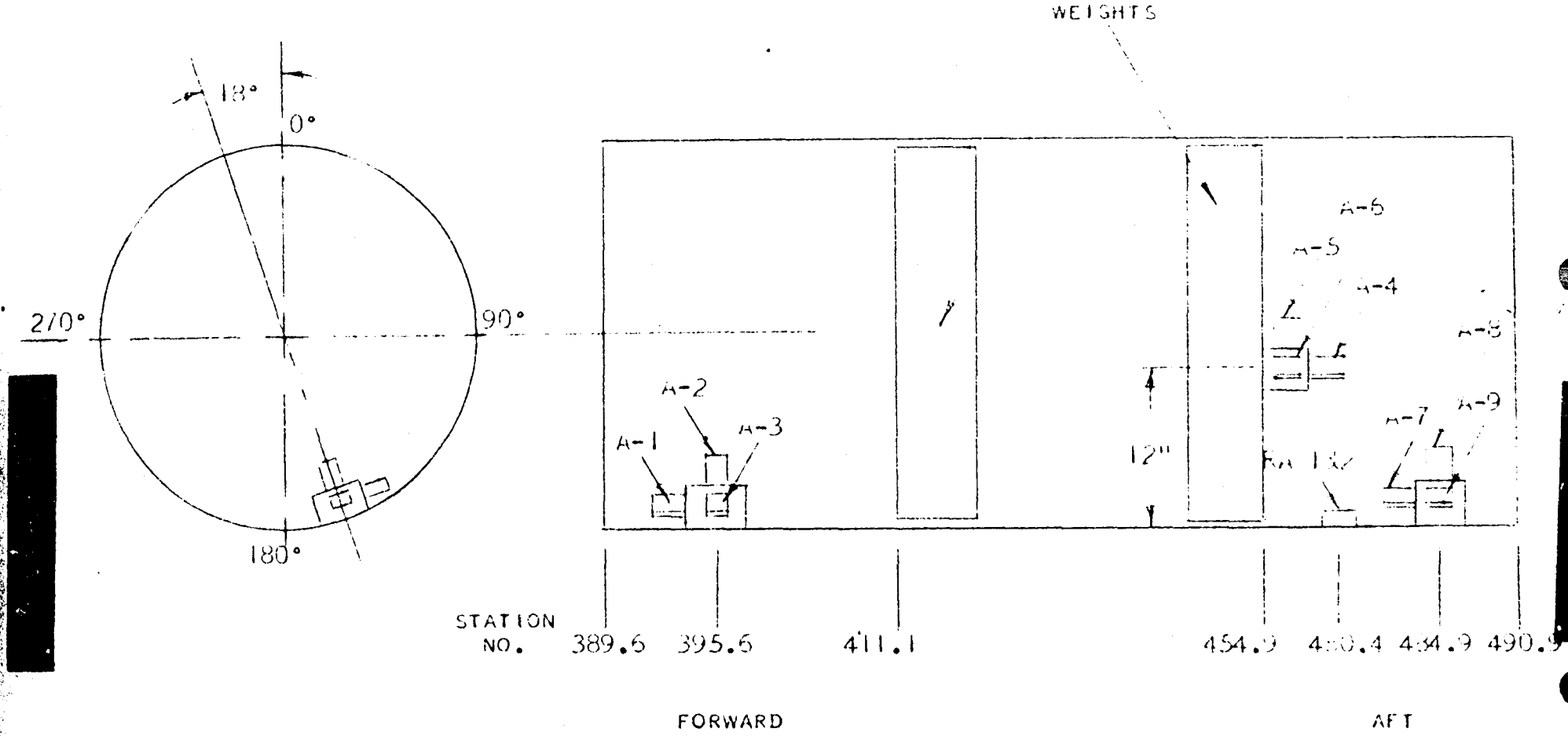

FIGURE 3 - DIAGRAM SHOWING ANGULAR DISPLACEMENT OF DUMMY TX-53 WITH RESPECT TO POD AND ACCELEROMETER POSITION NUMBERS AND LOCATIONS -- DROP TOWER TEST OF CONVAIR B-58 POD

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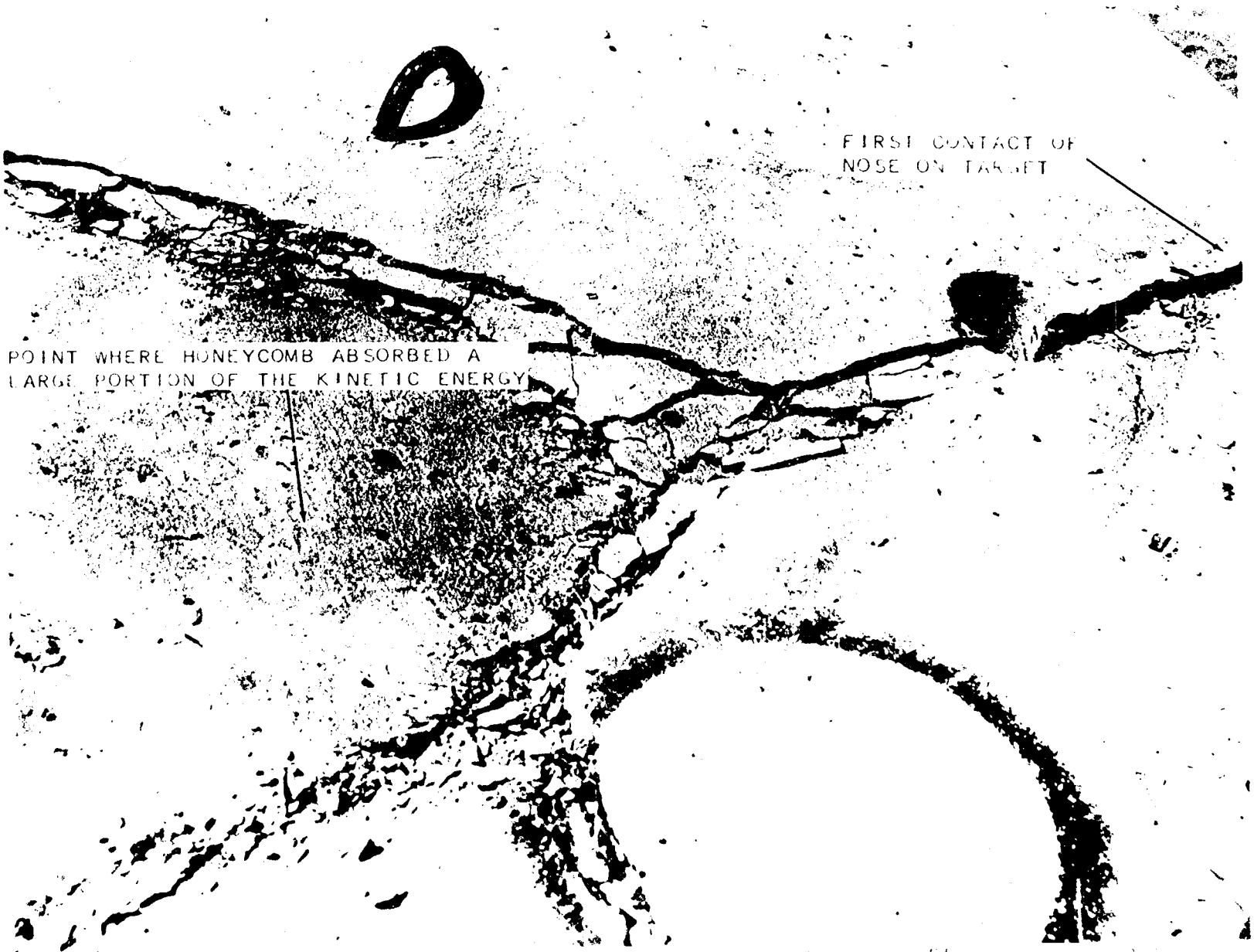

FIGURE 4 - IMPACT AREA OF NOSE SECTION, DROP NO. 1, Vv [illegible] FPS, [illegible]
DROP TOWER TEST OF CONVAIR B-58 [illegible]

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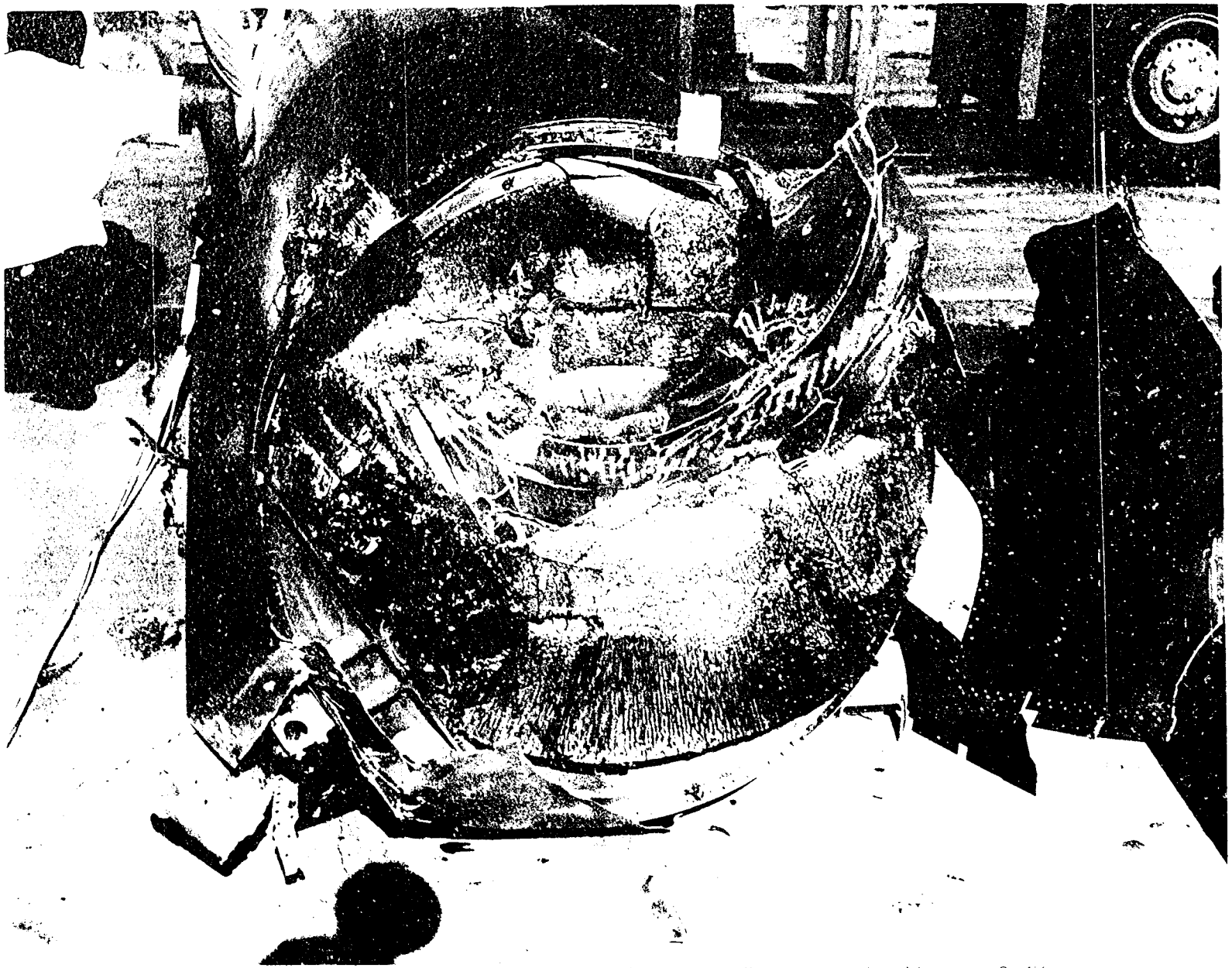

FIGURE 5 - HONEYCOMB ON FORWARD END OF WARHEAD, DROP NO. 1, Vv = 60 FPS, Vh [illegible] FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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FIGURE 6 - HONEYCOMB ON FORWARD END OF WARHEAD, DROP NO. 1, V_V = 60 FPS, V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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FIGURE 7 - SECTION OF DETACHED HONEYCOMB FROM NOSE SECTION, DROP NO. 1, V_V = 60 FPS
V_H = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 POD

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[redacted]

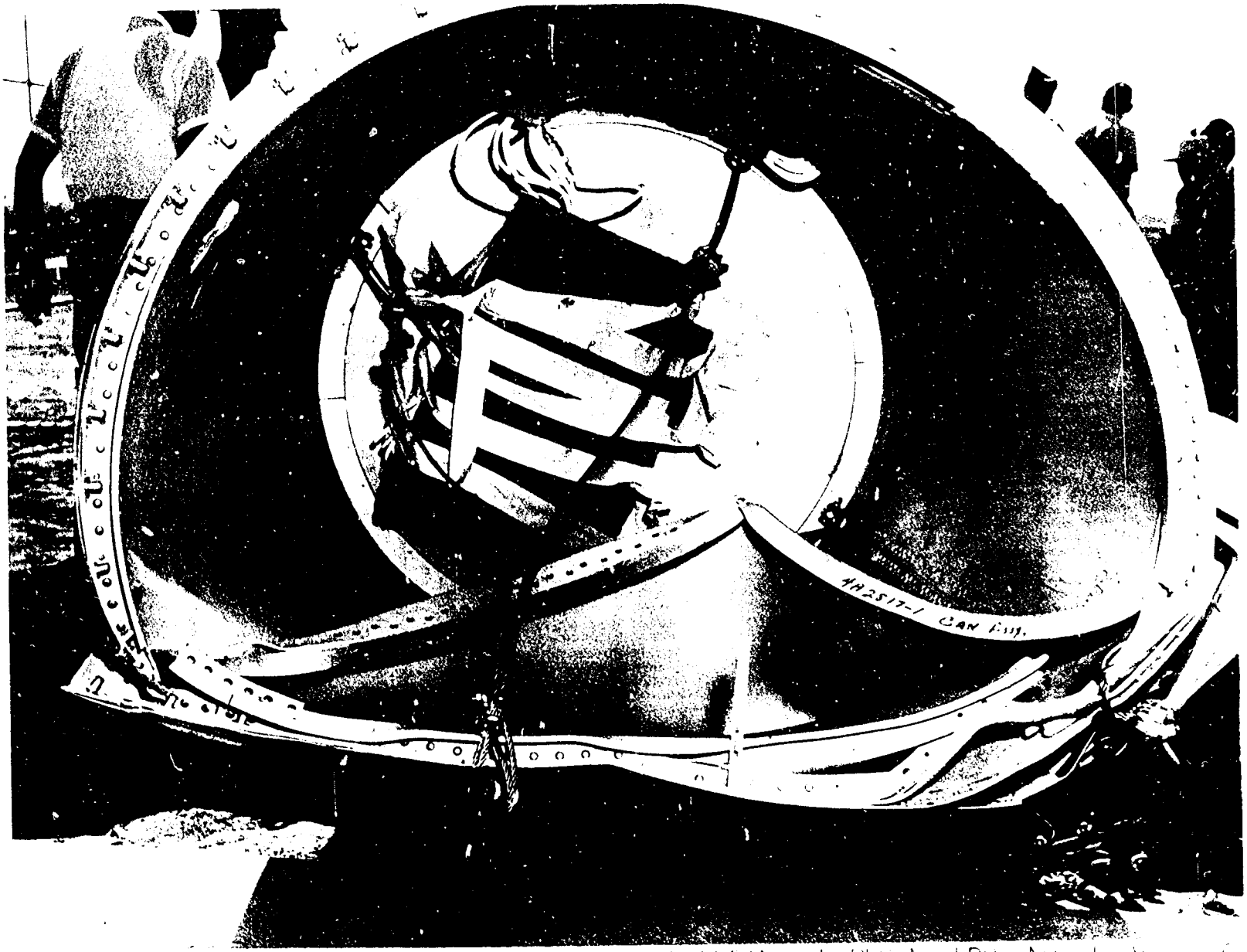

FIGURE 8 - DAMAGE SUSTAINED BY PARACHUTE CAN DURING SLAPDOWN, DROP NO. 1, VV [illegible] FPS, VH = 51.3 FPS -- DROP TOWER TEST OF CONVAIR B-58 [illegible]

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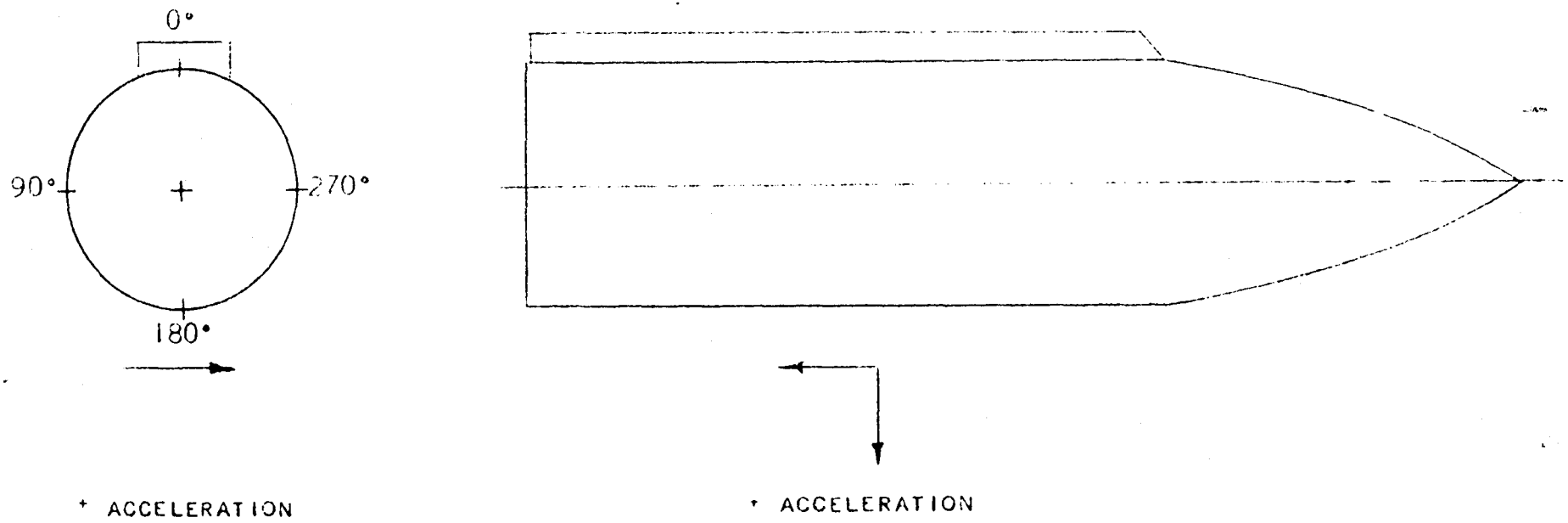

FIGURE 9 - DIAGRAM SHOWING DIRECTION OF POSITIVE ACCELERATION -- DROP TOWER TEST OF CONVAIR B-58 POD

PROJECT NO. T-17076

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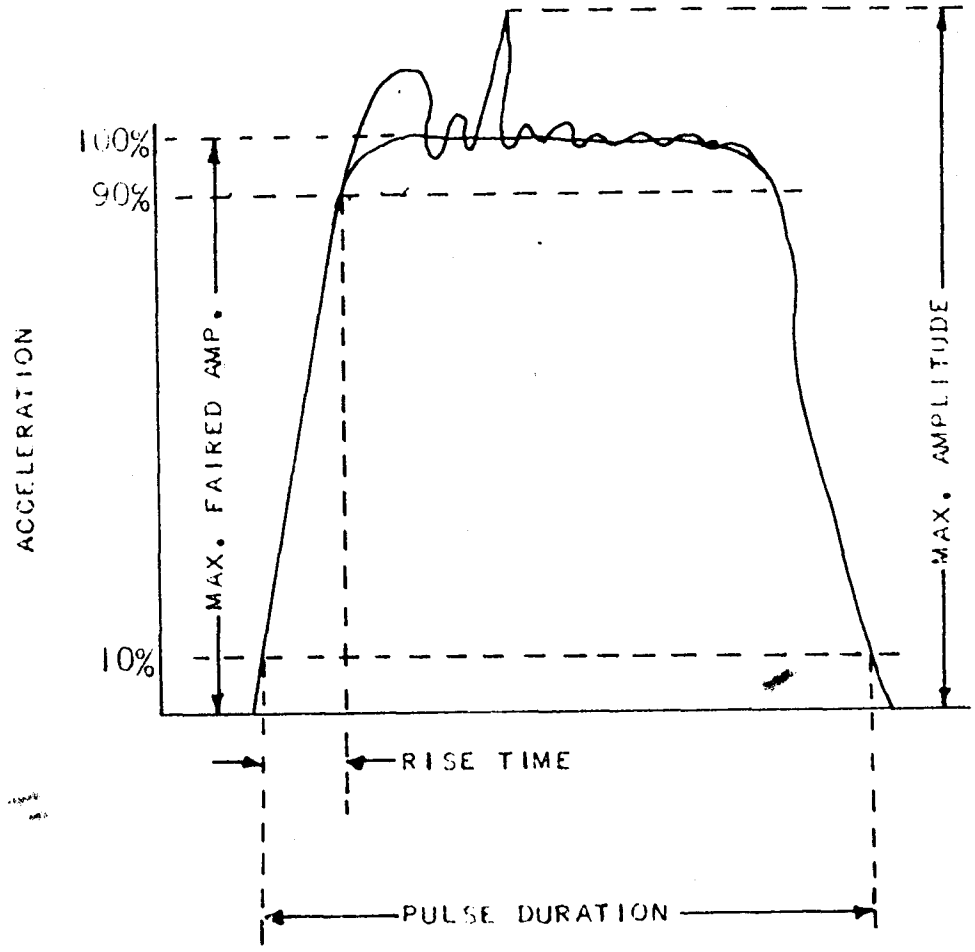

FIGURE 10 - METHOD OF READING AN ACCELERATION PULSE ACCORDING TO S.C.S. 10 PARAGRAPH 7.4 TO 7.4.5 -- DROP TOWER TEST OF CONVAIR B-58 POD

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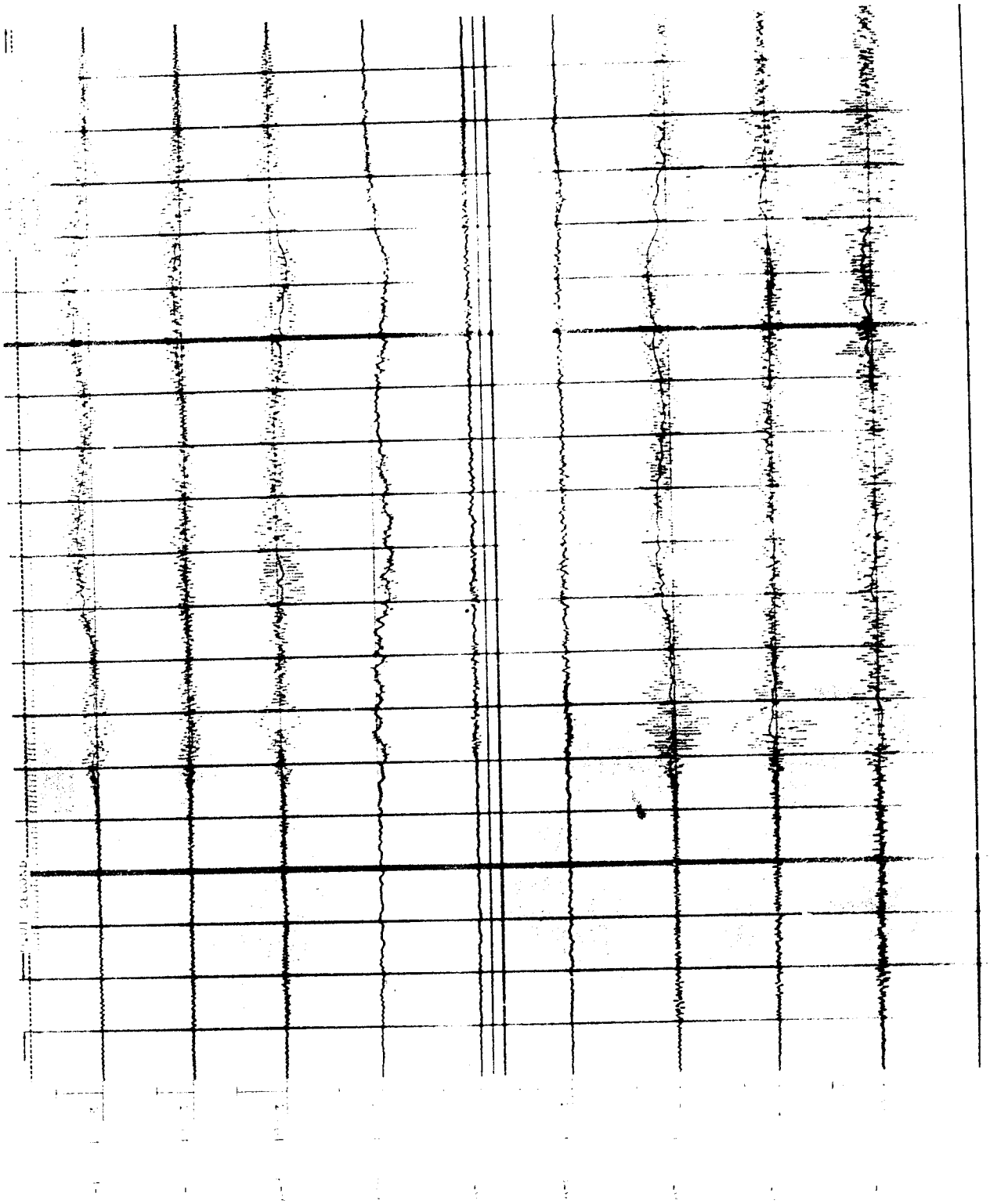

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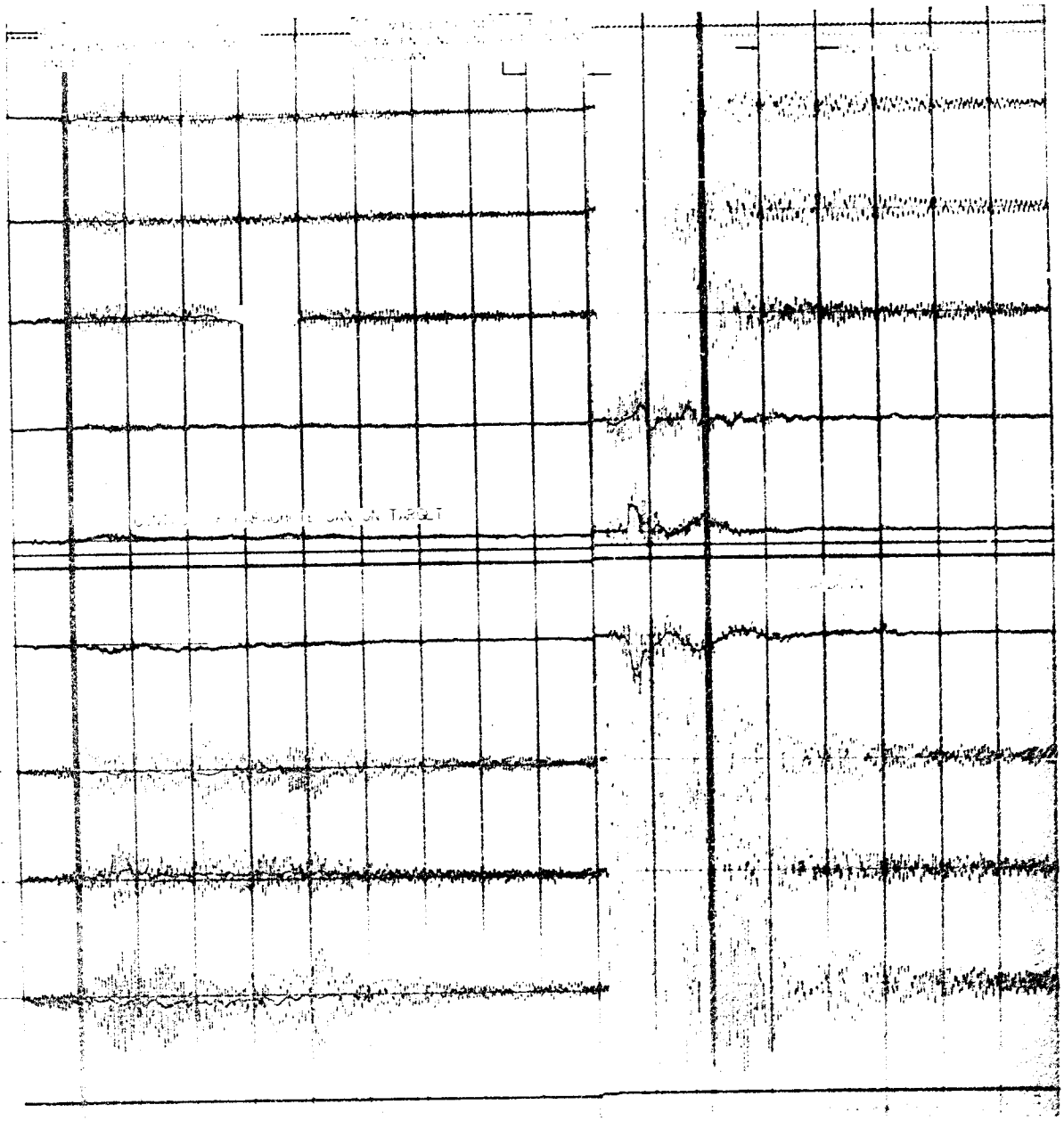

PROJECT No. T-17076

D# 1-1060

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[illegible]

[illegible] USED ON [illegible] PROP NO. 1

[illegible] CONV [illegible] P[illegible]

[illegible]	[illegible]	[illegible] NO.	[illegible] NO.	[illegible]	[illegible] FREQ. C.S.
A-1	355.6	7161	A5a-1000-350	1000	2200
A-2	355.6	7180	A5a-1000-350	1000	2200
A-3	355.6	7173	A5a-1000-350	1000	2200
A-4	454.9	7180	A5a-1000-350	1000	2200
A-5	454.9	7177	A5a-1000-350	1000	2200
A-6	454.9	7167	A5A-1000-350	1000	2200
A-7	484.9	7163	A5a-1000-350	1000	2200
A-8	484.9	7162	A5a-1000-350	1000	2200
A-9	484.9	7164	A5A-1000-350	1000	2200

B.A.1 480.4 Pace Engr. Co. Recording Accelerometer Model A-12, 10-50 g range

B.A.2 480.4 Pace Engr. Co. Recording Accelerometer Model A-12, 10-50 g range

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TABLE II

ACCELERATIONS, RISE TIMES & POINT VALUES
DROP TEST OF CONVAIR FLAP TOD

Number	Location	Accelerometer Orientation	Sec. No.	Peak Value (g)	Rise Time (sec)	Peak Time (sec)	Rise Time (Milliseconds)	Point Time (Milliseconds)
	BEFORE							
A-1	Long. Fwd.	Longitudinal	395.6	+48.3	9.6	58.9	90	119
A-2	Vert. Fwd.	18° - 198°	395.6	+21.4	8.5	31.3	22	32
A-3	Hor. Fwd.	108° - 288°	395.6	-20.7	49.1	69.9	24	38
A-4	Long. on Weights	Longitudinal	454.9	+43.2	13.2	52.8	32	104
A-5	Vert. on Weights	18° - 198°	454.9	-	10.8	21.1	-	-
A-6	Hor. on Weights	108° - 288°	454.9	-18.1	16.6	24.7	3.1	12
A-7	Long. Aft	Longitudinal	484.9	+41.1	208.9	124.4	93	117
A-8	Vert. Aft	18° - 198°	484.9	+24.0	176.3	117.3	10.3	78
A-9	Hor. Aft	108° - 288°	484.9	+35.3	120.5	132.3	22	30
	CONTACT OF PARACHUTE CAN ON TARGET							
A-1	Long. Fwd.	Longitudinal	395.6	- 8.2	32.6	49.4	11	53
A-2	Vert. Fwd.	18° - 198°	395.6	- 7.7	36.1	56.8	1.7	4.5
A-3	Hor. Fwd.	108° - 288°	395.6	+10.7	30.7	23.9	17	50
A-4	Long. on Weights	Longitudinal	454.9	- 8.0	16.9	6.1	6.5	41
A-5	Vert. on Weights	18° - 198°	454.9	+14.9	21.1	6.7	5.8	50
A-6	Hor. on Weights	108° - 288°	454.9	-12.5	5.9	16.2	3.7	40
A-7	Long. Aft	Longitudinal	484.9	- 9.5	63.8	78.3	21	41
A-8	Vert. Aft	18° - 198°	484.9	+32.2	104.6	70.1	17	63
A-9	Hor. Aft	108° - 288°	484.9	-18.9	75.4	88.1	23	53
	SLAPDOWN							
A-1	Long. Fwd.	Longitudinal	395.6					
A-2	Vert. Fwd.	18° - 198°	395.6					
A-3	Hor. Fwd.	108° - 288°	395.6					
A-4	Long. on Weights	Longitudinal	454.9	-29.1	126.6	86.5	2.6	4.1
A-5	Vert. on Weights	18° - 198°	454.9	+64.7	116.0	41.2	.25	17
A-6	Hor. on Weights	108° - 288°	454.9	-70.1	39.2	97.8	1.5	16
A-7	Long. Aft.	Longitudinal	484.9					
A-8	Vert. Aft.	18° - 198°	484.9					
A-9	Hor. Aft.	108° - 288°	484.9					

TABLE III

ACCELERATIONS READ FROM PACE MODEL A-12 ACCELEROMETERS
FOR POD DROP NO. 1

DROP TOWER TEST OF CONVAIR B-58 POD

POSITION	LOCATION	RECORDING DIRECTION	STATION NO.	ACCELERATION (g)
R.A. 1	AFT LONG	LONGITUDINAL	480.4	50
R.A. 2	AFT LONG	LONGITUDINAL	480.4	53