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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW

1st Review Date: 7/14/98	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: ADD	4. Coordinate With:
Name: R B Craner	5. Contains UCAI? NO
	6. Comments: OK for Openmet

JUL 1 3 1961

File No. TX-53, 3-2
T-17374
Project No. 13.858.00

TO: DISTRIBUTION

Re: Drop Tower Test on Full Scale Barrel Test No. 1 (U)

Summary of Test

This test was conducted to evaluate the shock mitigating capabilities of the Barrel Nose Configuration for the TX-53.

The Dummy TX-53 unit was instrumented with 6 Statham accelerometers to record in the three mutually perpendicular planes. Three were located on the aft cylinder wall, and three were located on the aft weights. The unit was impacted on a horizontal concrete surface at a vertical velocity of 62'/sec and a horizontal velocity of 51.3'/sec with the longitudinal axis of the unit oriented 90° from horizontal.

The full scale Barrel Nose was made of a forward nose section 0.5" thick of 6061 AL. This section was aluminum welded to an aft section of 0.6" 3003 AL. The maximum faired longitudinal acceleration measured in the unit was 139.5 g in the longitudinal direction on the aft weight with a pulse duration of 17.7 milliseconds.

The Barrel Nose bottomed out on the case of the test unit during impact causing the maximum acceleration to go much higher than was desired.

Object of Test

This test was conducted to evaluate the shock mitigating capabilities of the Barrel Nose for the TX-53 during simulated laydown delivery.

Authorization for Test

This test was requested in a Work Order Authorization, from E. I. Bruce, 7117, to E. H. Copeland, 7321, dated 11-9-60. The test was assigned to P. H. Adams, 7323, to be conducted on the 185' drop tower. The consultant was Don Baker, 7117.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U	AUTHORITY: R. B. Craner
Emelda Selph 7/30/98	RECORD ID: 98SN2990
PERSON CHANGING MARKING & DATE	
WC Layne 7/30/98	DATED: 7/23/98
PERSON VERIFYING MARKING & DATE	

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

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Summary of Past Tests

No past tests have been made on the Full Scale Barrel Nose configuration at the drop tower.

Setup for Test

Figure 1 shows the unit hung on the 185' drop tower. Figure 2 shows the location, and direction of the positive accelerations, of each accelerometer in the unit.

The drawing of the Barrel Type Nose is N-10603; outer panels, 158661; afterbody, 158674; wedges, 158662; fins, 160800.

The inner ballistic steel cyclinder has no drawing number.

The test equipment used was six Kintel amplifiers Model 111BF mounted in tower instrumentation panel and one 14 Channel C.E.C. Datatape Recorder Type 5-752-A, Serial No. T-01465.

Table I shows the instrumentation used on the test vehicle.

Procedure

The unit was instrumented with Statham accelerometers as shown in Figure 2. The unit was then hung on the 185' drop tower carriage as shown in Figure 1. The 0° side of the unit was facing the barricade at impact. The instrument cables were attached to the accelerometer leads and then the instrument cables were attached to the carriage boom. Three loops were made in the instrument cables to allow slack when the unit was released from the carriage. The unit was raised on the tower by means of a dynamic carriage attached to the haul block. The haul block was attached to the dynamic carriage by a 3/8" aircraft cable loop containing two guillotine cutters. A signal from the tower control building fired the guillotine cutters on the carriage (haul block cutter loop) allowing the carriage to slide down the tower work cable. The unit was released from the dynamic carriage by guillotine cutters cutting the unit free at points shown on Figure 1.

Results

The Barrel Nose bottomed out on the case of the test vehicle and a 139.5 g longitudinal faired acceleration was measured on the aft weights. The unit slid into the barricade standing up and damaged the afterbody and fins, Figure 3. Figure 4 shows a closeup of the damage to the afterbody and fins.

The maximum faired longitudinal accelerations were 139.5 g on the weights and 112.6 g on the steel case. These values and the other accelerations

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are listed in Table II. The waveforms and pulse durations of the impact shocks may be seen on the oscillograph record, Figure 5. The accelerometer signals were recorded on a G.E.C. (FM) Tape Recorder. The tape was played back in Area I on an Ampex FM Tape Recorder Model 114-A through Ampex 625 cps low pass output data filters and recorded on a G.E.C. 5-119 Oscillograph to obtain a permanent record.

The movie coverage, which was used on this drop, showed the pitch and velocities at impact. The movie data reduction showed the unit was -8.4 degrees off vertical, nose leading at impact. The velocities read from from the movie film at impact are given on Figure 6. The requested drop conditions were vertical velocity 62'/sec and horizontal velocity 51.3'/sec. The horizontal velocity as read from the movie films was 49.2'/sec which is within the ±10% accuracy claimed by the movie data reduction people. The requested vertical velocity of 62'/sec for the test checked out closely with the results of the movie data reduction (V_A = 60.6'/sec, V_B = 61.7'/sec) shown in Figure 6.

J. H. Strever

J. H. STREVER - 7323-3

Dale Buchanan

7321 Project Engineer: D. BUCHANAN - 7321-5

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

JHS:7323-3:de

Encs: Figs. 1-6, Tables I-II

Distribution:
E. I. Bruce, 7117
J. M. Wiesen, 1442
D. S. Bliss, 2344
E.H. Copeland, 7321
J. R. Harrison, 7523
R. K. Smeltzer, 3421-3

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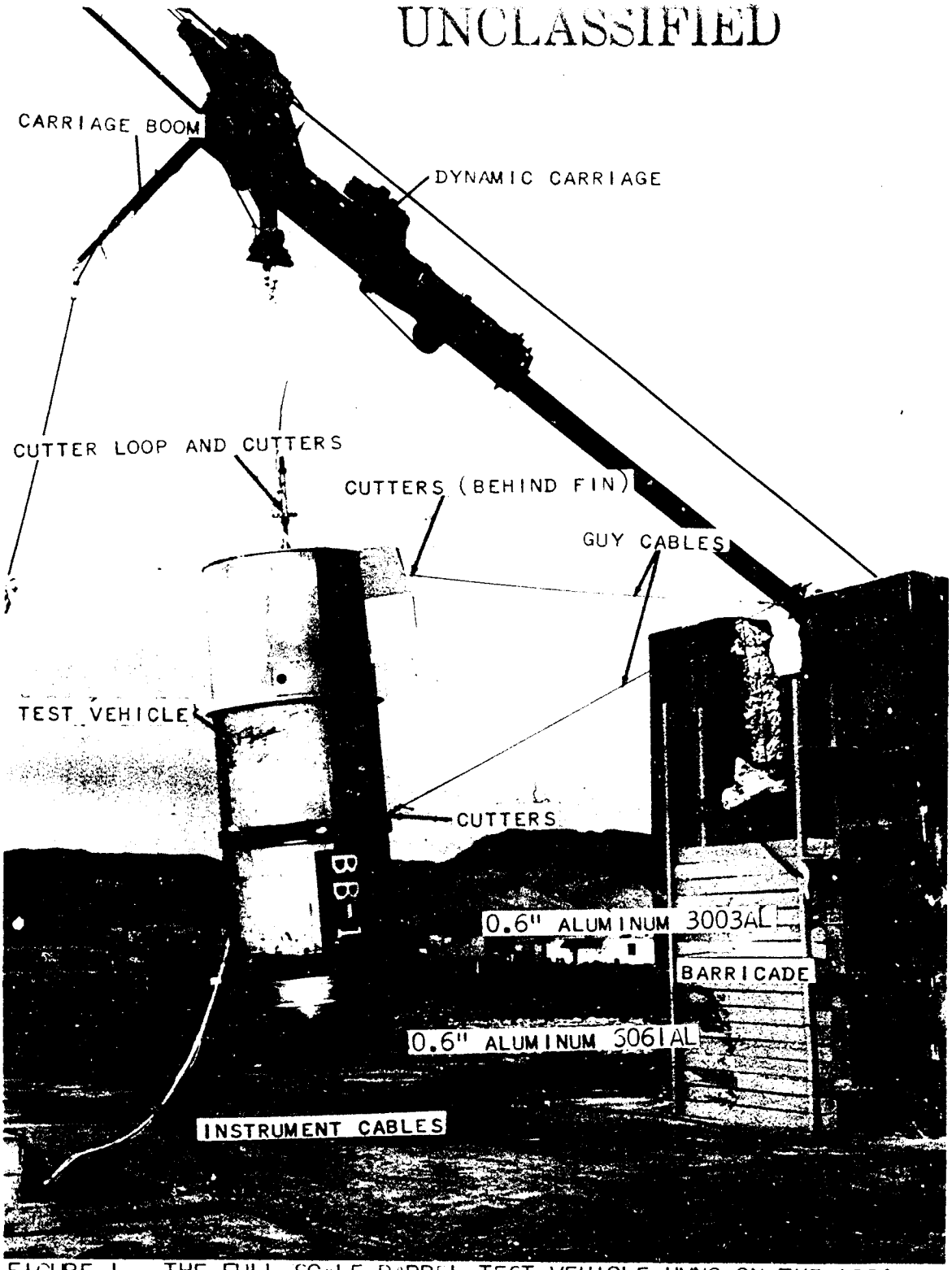

FIGURE 1 - THE FULL SCALE BARREL TEST VEHICLE HUNG ON THE 185' TOWER CARRIAGE (V_V = 62'/SEC, V_H = 51.3'/SEC) -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

D#61-8709

PROJECT NO. T-17374

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NOTE: ARROWS INDICATE POSITIVE ACCELERATIONS

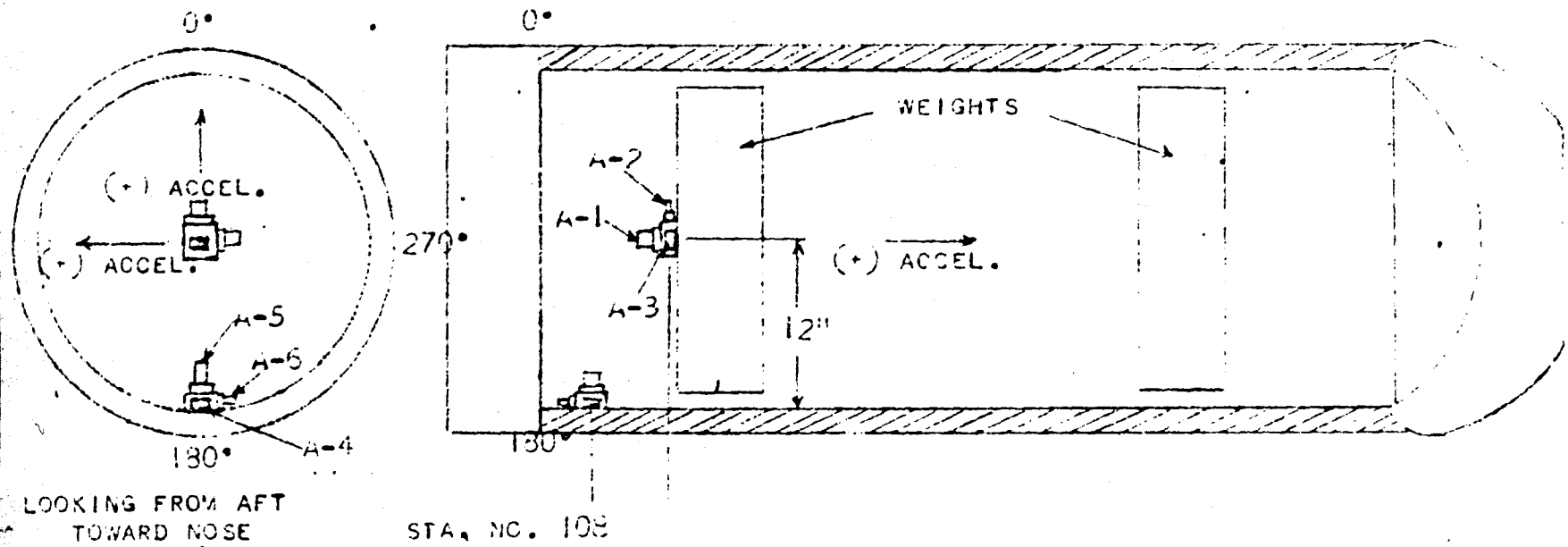

FIGURE 2 - SKETCH SHOWING THE INSTRUMENT LOCATIONS, AND THE DIRECTION OF POSITIVE ACCELERATION ON FULL SCALE BARREL NOSE -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

PROJECT NO. T-17374

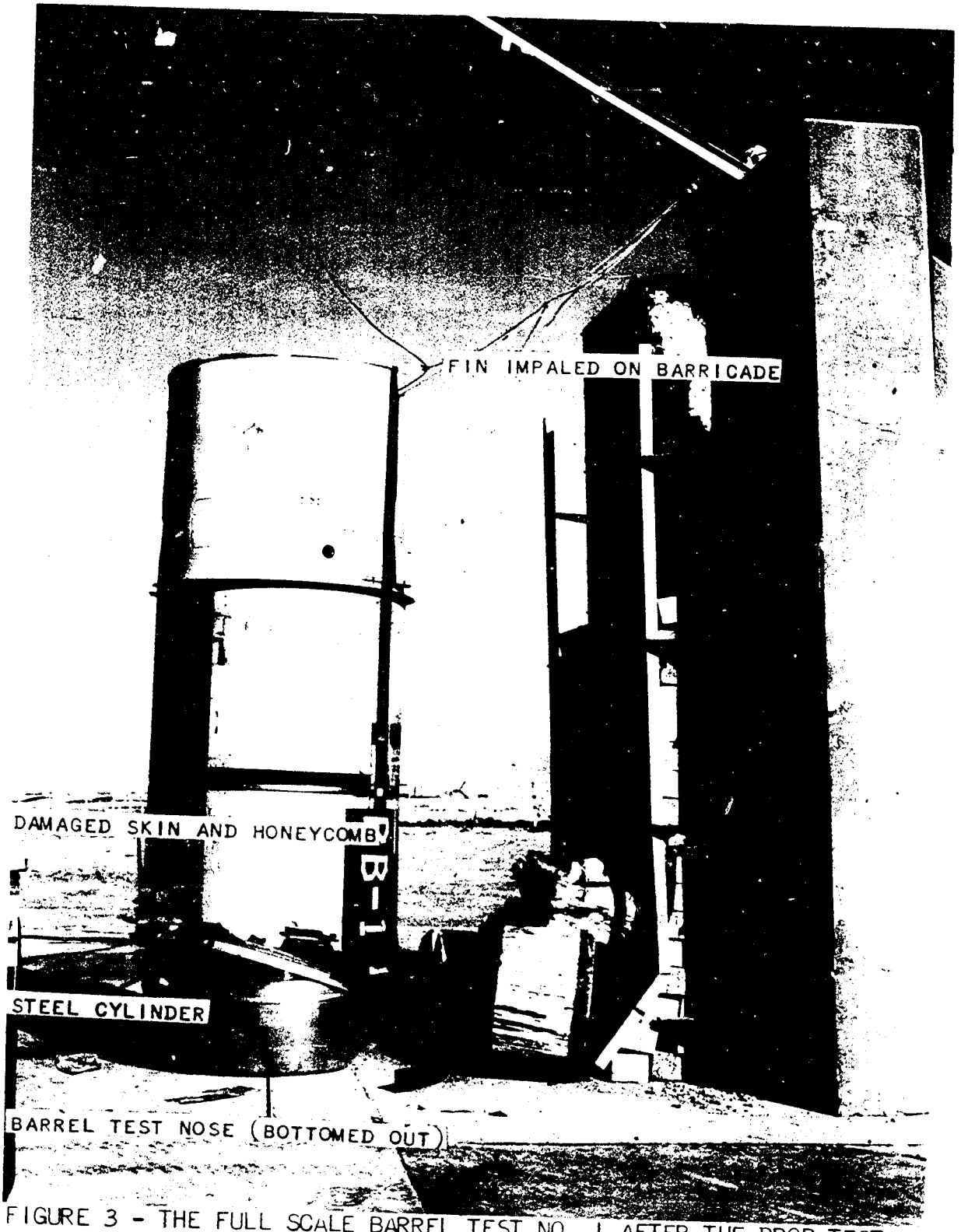

FIGURE 3 - THE FULL SCALE BARREL TEST NO. 1 AFTER THE DROP TEST -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

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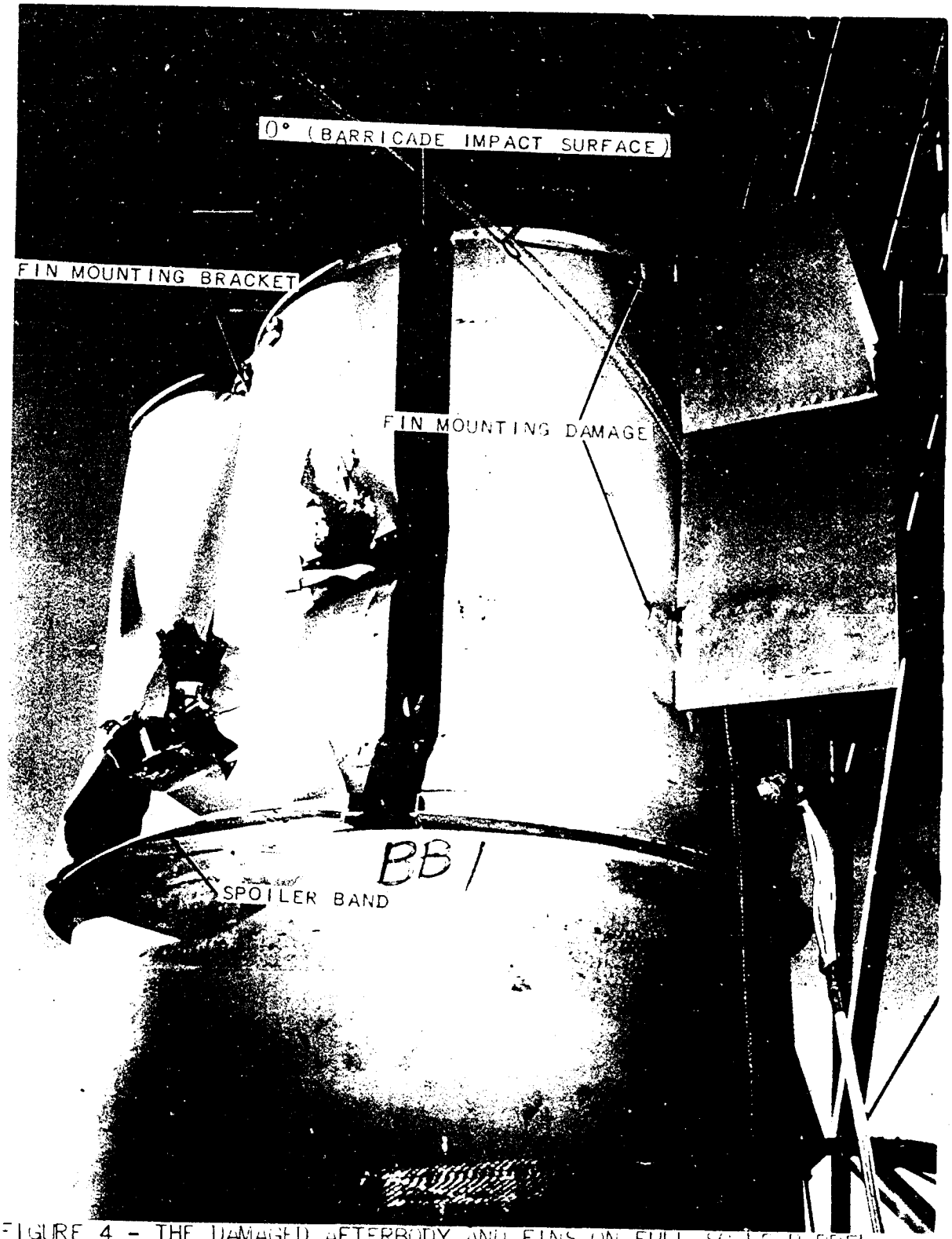

FIGURE 4 - THE DAMAGED AFTERBODY AND FINS ON FULL SCALE BARREL NOSE TEST NO. 1 -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

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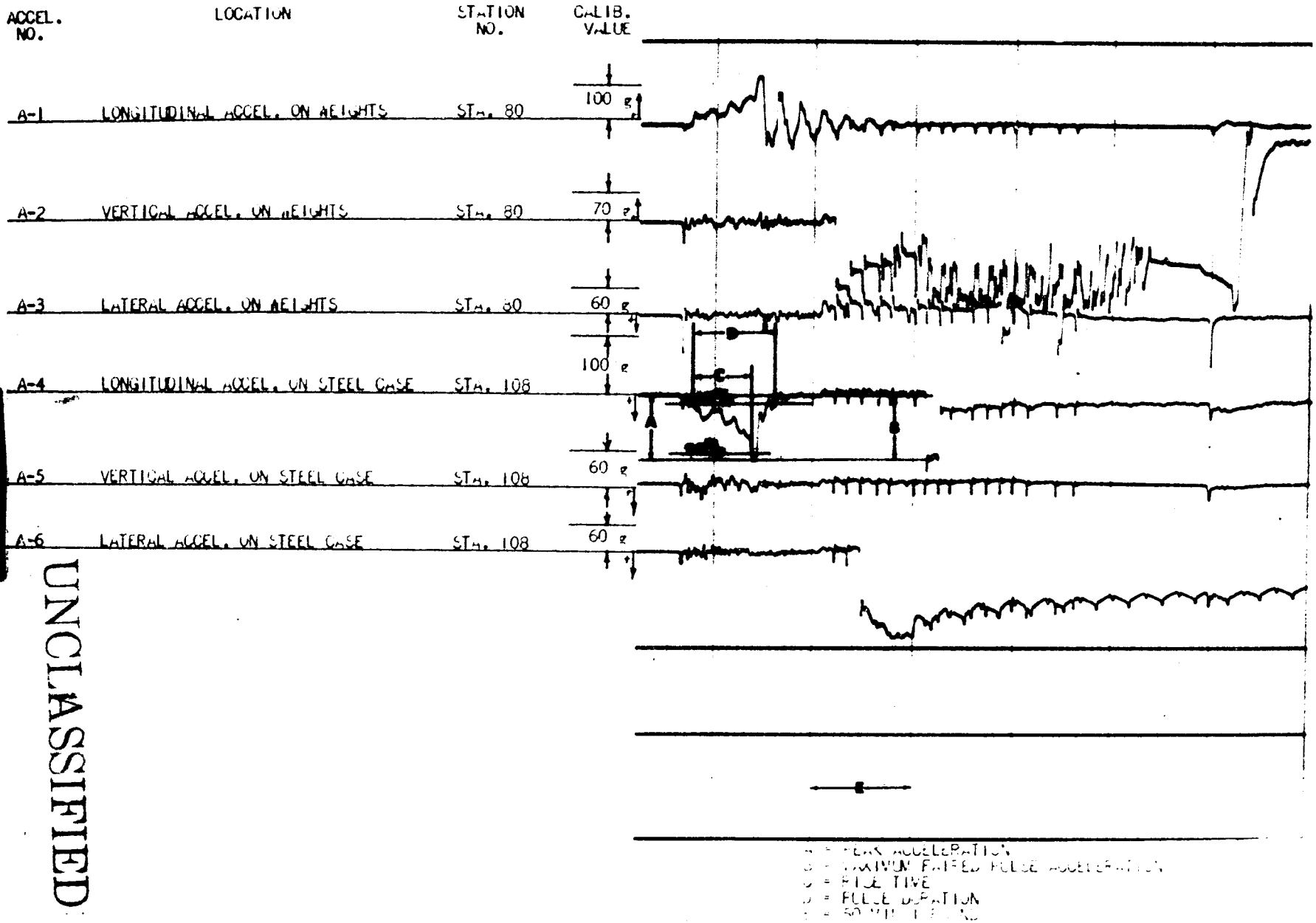

FIGURE 5 - TYPICAL OSCILLOGRAPH RECORD OF FULL SCALE BARREL TEST (V_V = 62 ft/sec, V_H = 51.3 ft/sec) -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

PROJECT NO. T-17374

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BB-1 TOWER DROP
(Revised)

Side View 35MM Approximately 96 Frames Per Second

At Impact: Pitch = -3.42 Degrees
X_A Velocity = 49.16 Ft/Sec
X_B Velocity = 49.16 Ft/Sec
Y_A Velocity = 60.64 Ft/Sec
Y_B Velocity = 61.73 Ft/Sec

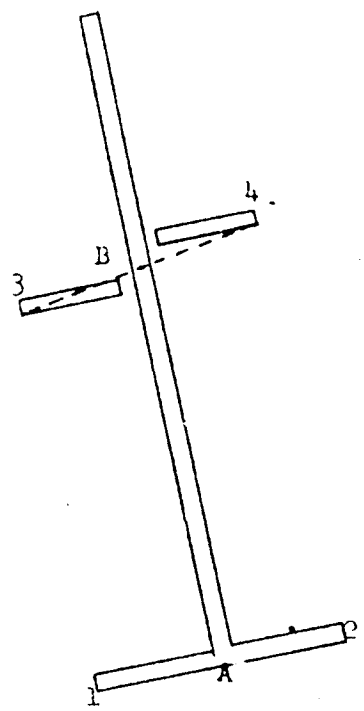

FIGURE 6 - DIAGRAM SHOWING PITCH OF THE UNIT AND VELOCITIES AT IMPACT TAKEN FROM MOVIE COVERAGE -- DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

PROJECT NO. 1-17374

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TABLE I

TABLE OF ACCELEROMETERS USED ON THE
DROP TEST ON FULL SCALE BARREL TEST NO. 1
DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

Accel. No.	Accel. Serial No.	Direction Sensitive Axis	Statham Accel. Type	Range ± g	Natural Frequency C.P.S.
A-1	1686	Long.	A5A - 100 - 335	100	670
A-2	3997	Vert.	A5A - 500 - 350	500	>1500
A-3	7168	Lat.	A5A - 1000 - 350	1000	>1500
A-4	615	Long.	A5A - 100 - 300	100	750
A-5	634	Vert.	A5A - 100 - 300	100	810
A-6	1665	Lat.	A5A - 200 - 335	200	1120

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TABLE II

TABLE OF ACCELERATIONS ON FULL SCALE BARREL TEST
DROP TOWER TEST ON FULL SCALE BARREL TEST NO. 1

Inst. No.	Location	Direction	Drop Test of Barrel Nose on Flat Concrete Target. VV = 62'/sec. VH = 51.3'/sec. Acceleration (g or Rad/sec²) Max +	Max −	Paired	Time (ms) Rise	Pulse
A-1	On Weights Sta. 80	Longitudinal	139.5	73.1	+139.5	16.0	37.7
A-2	On Weights Sta. 80	Vertical	19.2	29.0	------	----	----
A-3	On Weights Sta. 80	Lateral	39.6	16.7	------	----	----
A-4	Aft Steel Case Sta. 108	Longitudinal	112.8	6.0	+112.6	17.9	23.7
A-5	Aft Steel Case Sta. 108	Vertical	28.8	16.3	+ 14.7	2.0	5.5
A-6	Aft Steel Case Sta. 108	Lateral	18.8	17.5	------	----	----

All accelerations were measured with a seismic type accelerometer with 0.6 damping.
All accelerations were read according to SCS-10, Para. 7.4 to 7.4.5.

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