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TEST REPORT
FOR SLED TEST 53-2E

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
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ABSTRACT

This report includes a description of the second sled test of the TX-53 and the resultant test data.

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TEST REPORT FOR SLED TEST 53-2E

Introduction

The TX-53 is a class "C" weapon incorporating three different delivery profiles; i.e., high-altitude free-fall, high-altitude retarded, and low-altitude laydown. Sled tests are being conducted to prove out and evaluate the contact fuzing system and to obtain data from high-speed dynamic tests on the laydown shock mitigating material.

This report contains a description of the second sled test and the resultant test data, but in no way does this report attempt to evaluate the weapon system. A final evaluation report will be submitted after the test program is completed.

Objectives of Test 53-2E

The primary objectives of the sled test are to prove out and evaluate the contact fuzing system at different impact angles and different impact velocities. This test also was intended to obtain data from a high-speed dynamic test on the laydown shock mitigating material.

The expected impact velocity was 350 fps with a vertical impact angle.

Test Description

Test Conditions

53-2E was tested at Area III on October 8, 1959. The impact velocity was 300 fps with an angle of about 40 degrees from the vertical.

Description of Test Assembly

General -- The "turn-around" target-on-the-sled arrangement was used on the test for two reasons: (1) to prevent deformation of the nose assembly due to excessive vibration, and (2) to improve the reliability of the instrumentation.

Sled -- The flat, steel plate on the sled was oriented for vertical contact. The sled weighed 1260 pounds, and had 4 rockets, type HVAR, each weighing 83.3 pounds. Adjustable lead weights and the rockets were placed above the longitudinal center of gravity line of the sled. This was done to raise the longitudinal center of gravity line to be coincident with the center of air pressure. Therefore, the rocket thrust line was above the longitudinal center of gravity line of the complete assembly. The sled is defined by SK 9(1615)3785. Figure 1 shows the sled, and Figure 2 shows the sled and rocket assembly.

Nose Assembly -- The nose assembly consisted of: (1) the nose honeycomb, (2) 2 dual-channel crush switches, (3) a modified TX-46 aluminum nose, (4) a mounting plate. A nose fairing was not used on this test so that the crushing of the honeycomb could be recorded on film.

The aluminum honeycomb was a single, circular section 26.25 inches long and 36 inches in diameter. Within the aluminum honeycomb were two dual-channel, circular, crush switches. One switch was placed 6 inches from the nose, and one switch 4 inches from the rear of the honeycomb assembly. The honeycomb is defined by SK 9(1217)9482, Issue A, and the crush switch is defined by SK 9(1217)9490, Issue A.

A TX-46 aluminum nose was modified and used on the test to represent the inner nose of the TX-53. The inner nose was used to give information related to the case deformation. The modified nose is defined by SK 9(1217)12400, Issue A.

The nose assembly was mounted to a 0.250-inch plate which is described by SK 9(1217)15828, Issue A. The complete assembly (see Figure 3) was mounted to a 5-foot cube of concrete. Figure 4 shows the nose assembly after impact.

Electrical System -- A simulated X-unit was used on each of the four crush-switch channels. The X-units employed the same pulse transformer and spark gap that will be used in the TX-53 firing set. Each X-unit was discharged through a flash lamp and a divider network for Mod 6 input. Figure 5 is a diagram of one of the two dual channel X-units that were used in the system.

Telemetry System -- Instrumentation was provided for the following functions: (a) accelerations on the sled, (b) acceleration on the stationary nose structure, (c) contact, (d) X-unit input, (e) X-unit discharge, (f) voltage wave form across one of the crush switches, and (g) inner nose deformation.

Two accelerometers (±100 and ±500) were mounted aft of the contact plate on the sled, and two accelerometers (±50 and ±100) were mounted on the rear face of the concrete cube.

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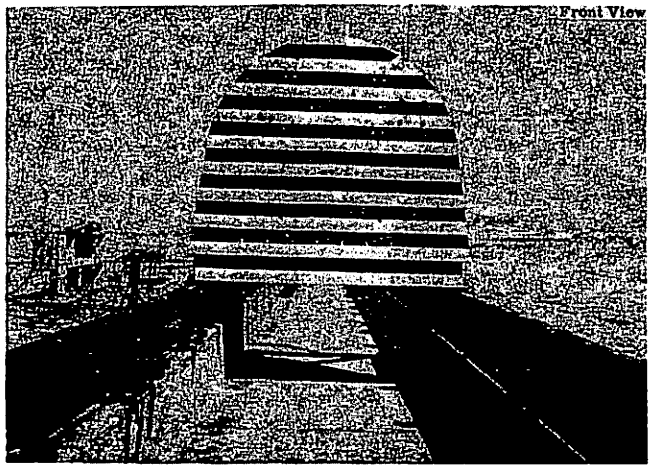

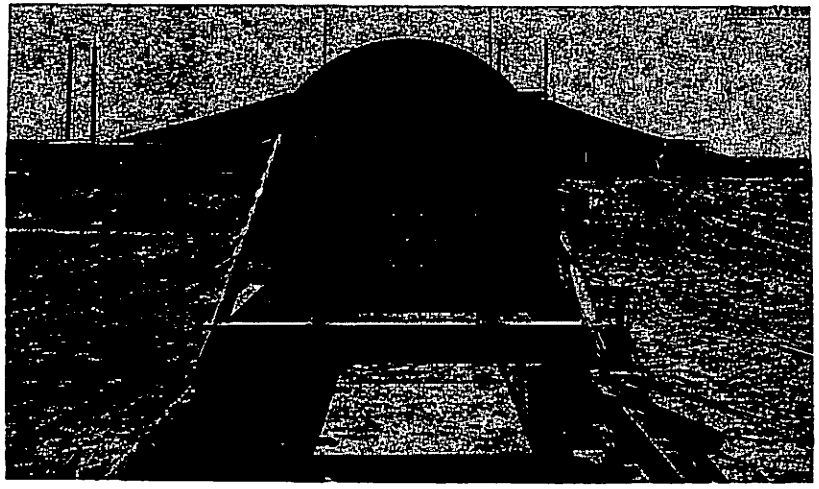

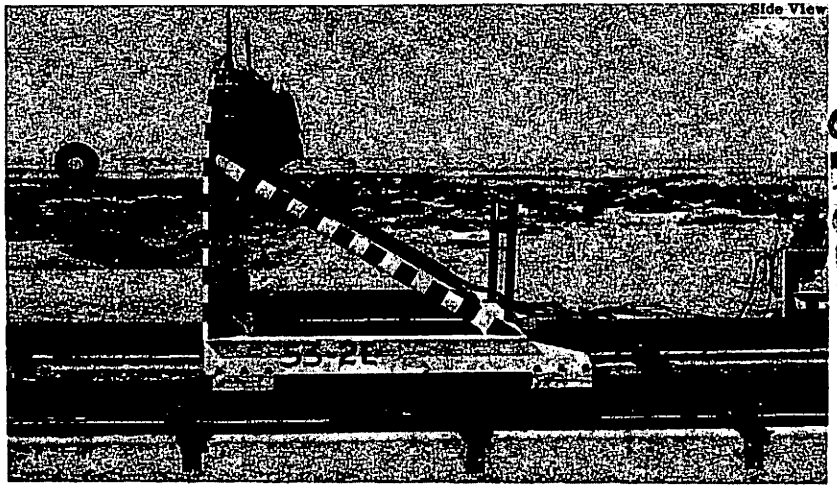

Figure 1. Test Sled

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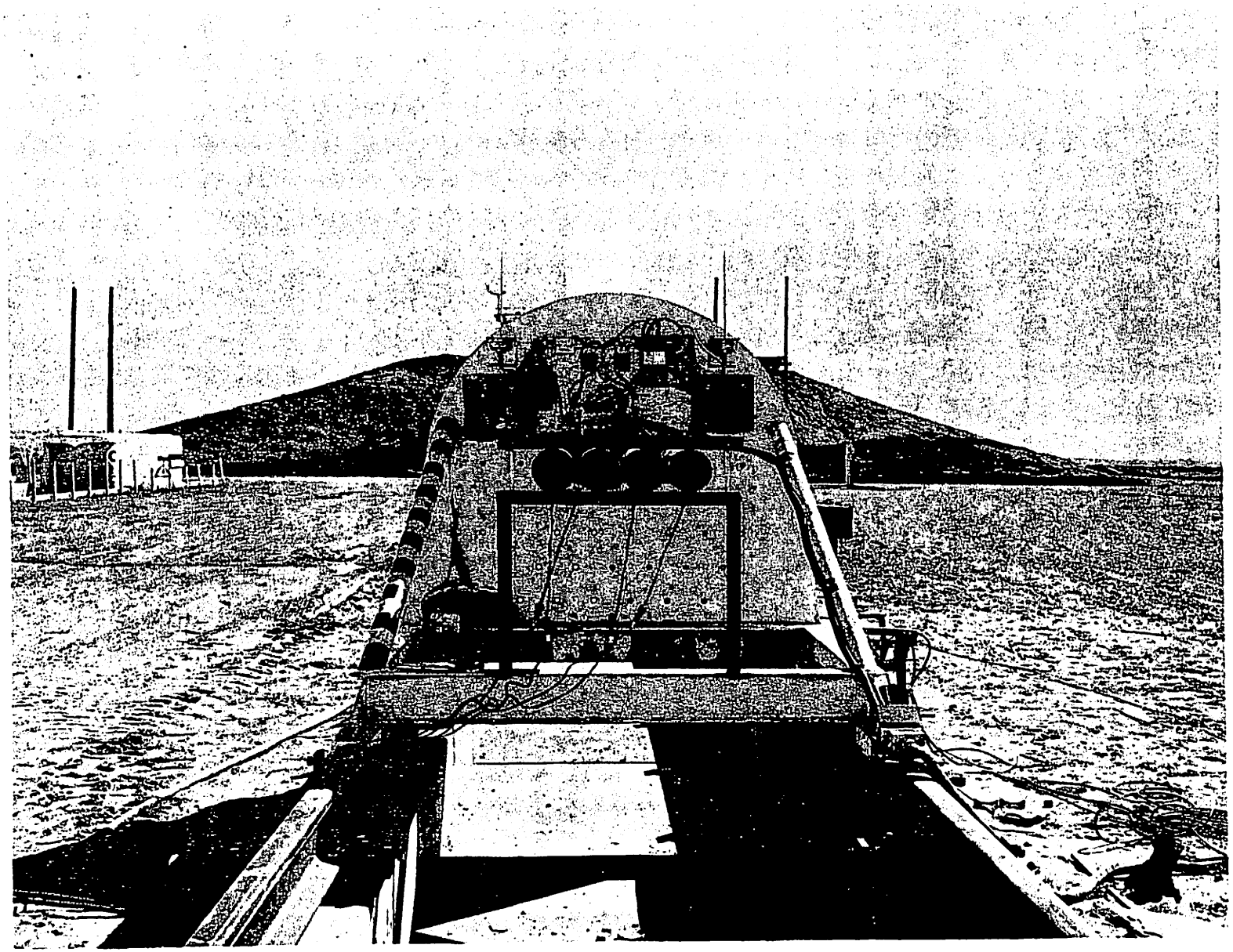

Figure 2. Sled and Rocket Assembly

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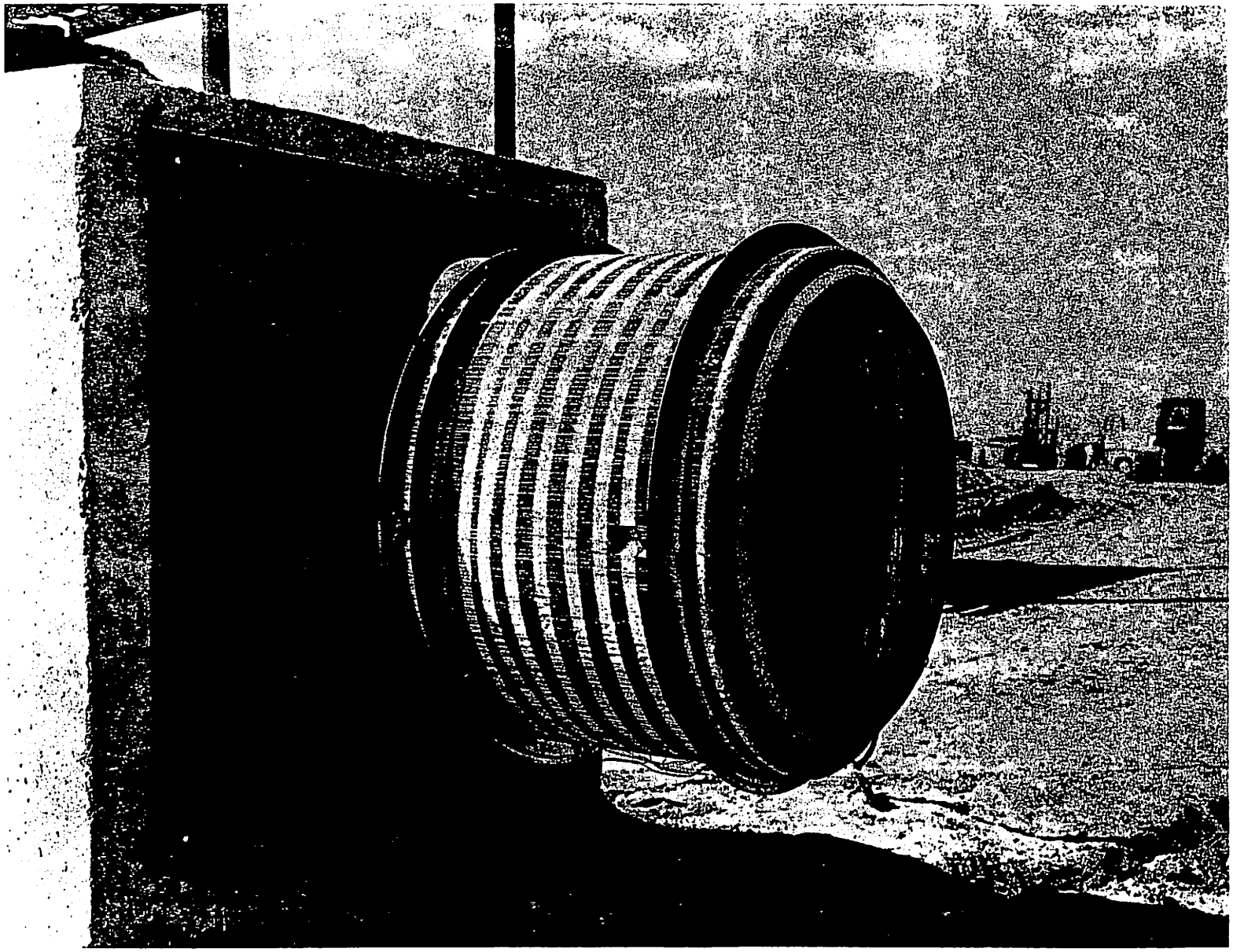

Figure 3. Test Nose Assembly (Mounted)

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Figure 4. Nose Assembly after Impact

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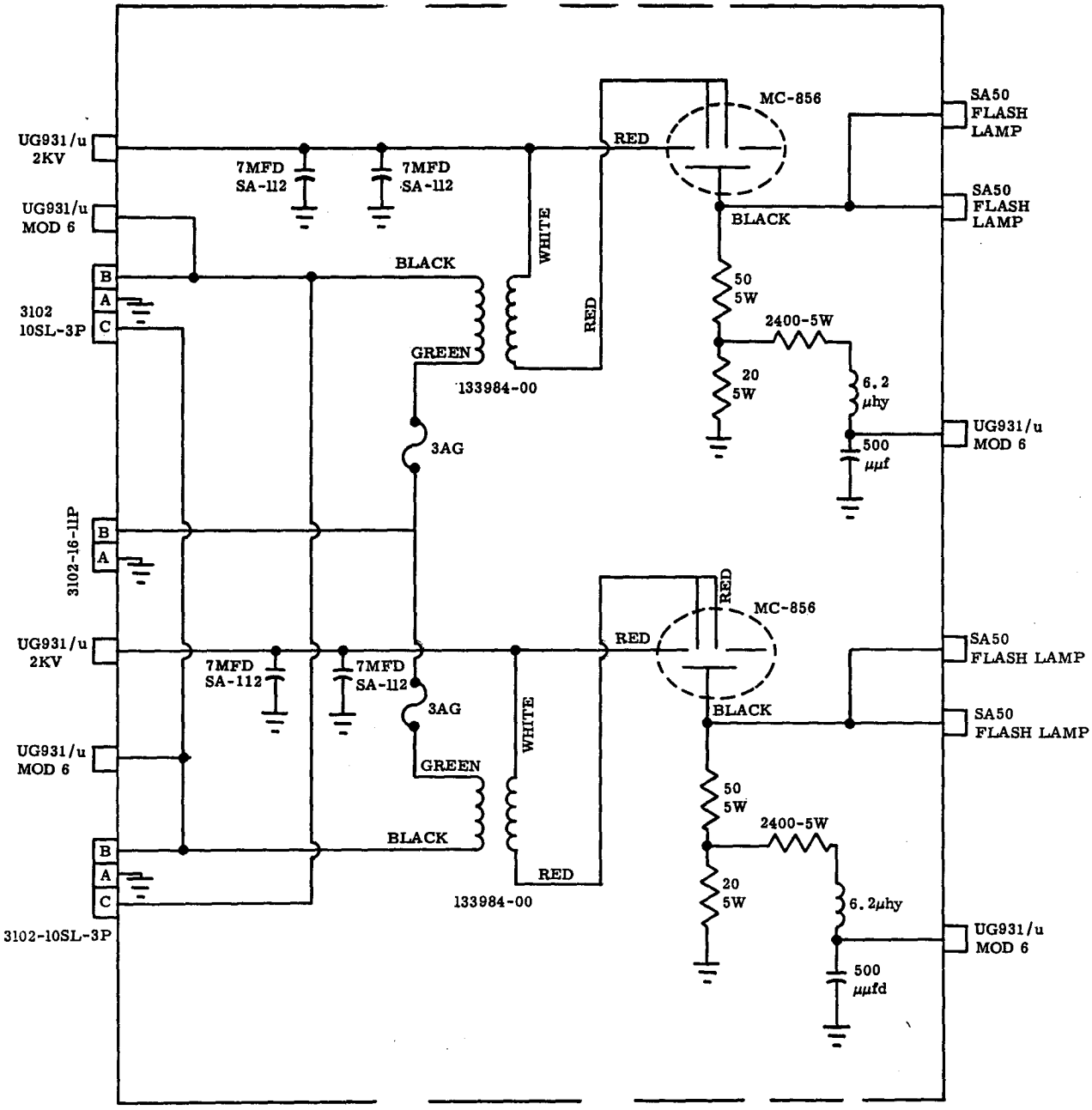

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Figure 5. Electrical System Block Diagram

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Because of the expected fast rise times on the impact accelerations, crystal accelerometers were used.

Contact, the wave form across one of the crush switches, two X-unit inputs, four X-unit discharges, and deformation were to be obtained from Mod 6 by r-f transmission. All of the impact data was obtained by r-f transmission.

Summary of Test Results

Sled Performance

The sled was launched 198 feet from the stationary nose, and the impact velocity was 300 fps. The rockets were not fully expended when the sled left the track; therefore, the sled tilted during the 62 feet of free flight. The tilting of the sled created an impact angle of about 40 degrees from the vertical plane.

Electrical System Performance

The flash lamps indicated that all four of the X-units operated after impact. The following table shows when each of the flash lamps began to glow. The times are taken from track switch V_1.

Flash Lamp	Crush Switch Location	Time in Milliseconds from V_1
F5	Rear (X-unit No. 5)	193.322
F2	Front (X-unit No. 2)	193.352
F4	Rear (X-unit No. 4)	193.425
F6	Front (X-unit No. 6)	196.707

Mod 6 Data

All of the Mod 6 data was recorded except one X-unit input and one X-unit discharge. Table I shows the time sequence of the recorded data, and the records are shown in Figures 6 through 9.

TABLE I

Item	Description	Time in Milliseconds from V_1
T_0	Contact switch	191.659
T_1	Input to X-unit 2	192.250
T_5	Discharge from X-unit 5	192.890

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53-2E
Mod VI 235.5 mc
40 kc

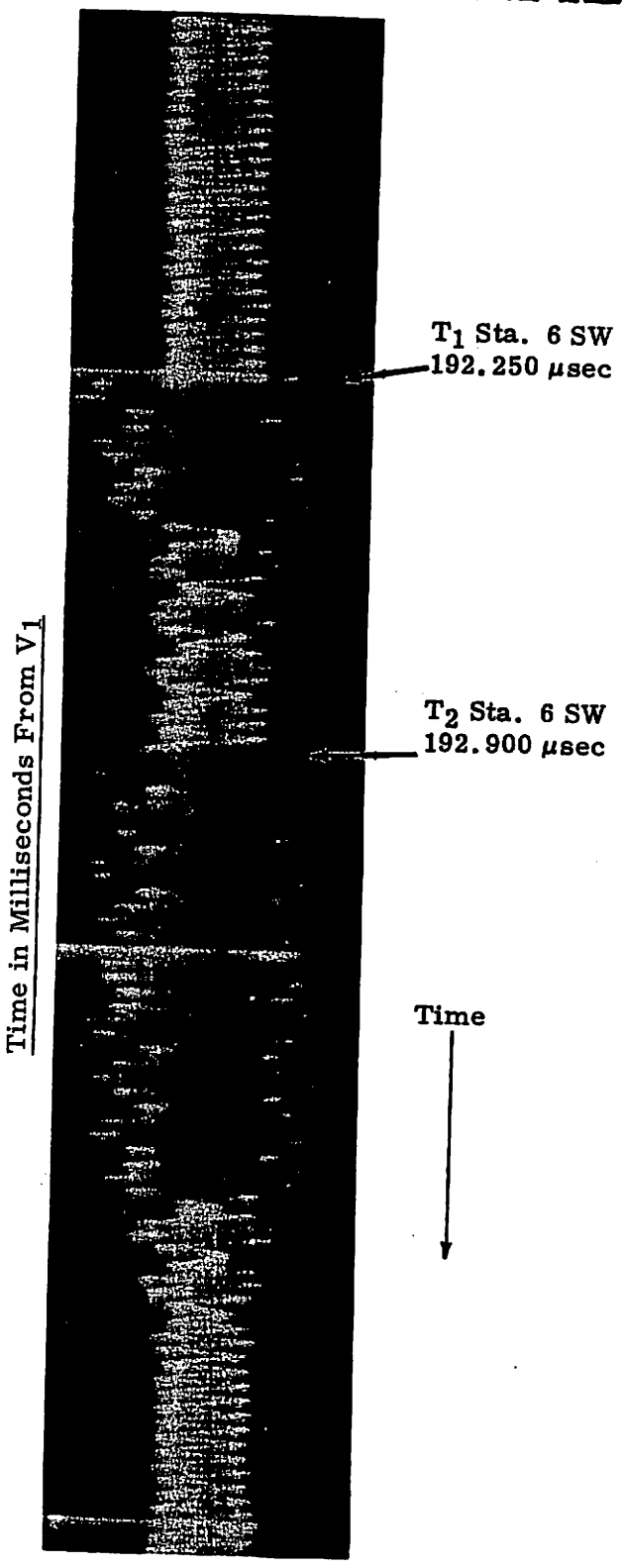

Figure 6. Mod 6 Data (235.5 mc - 40 kc)

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53-2E
Mod VI 221.5 mc
70 kc

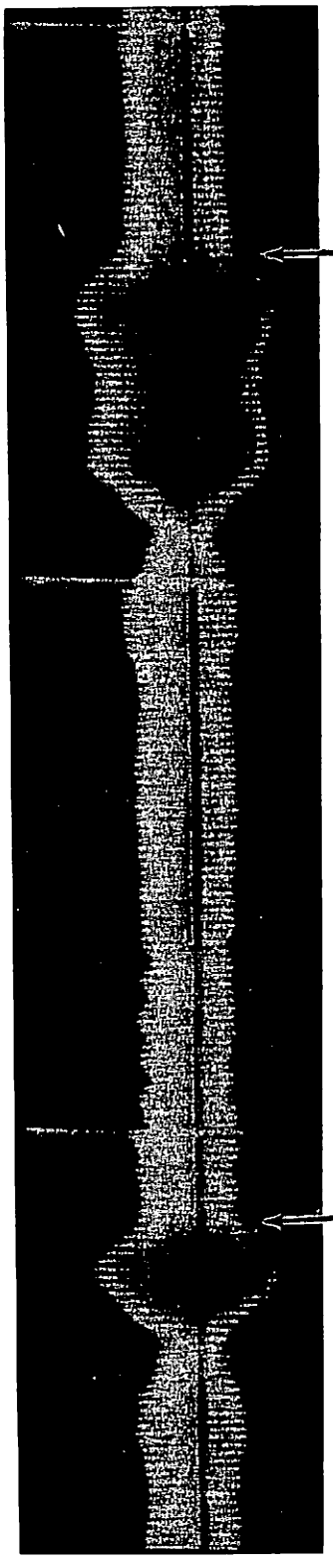

Figure 7. Mod 6 Data (221.5 mc - 70 kc)

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53-2E
Mod VI 235.5 mc
70 kc

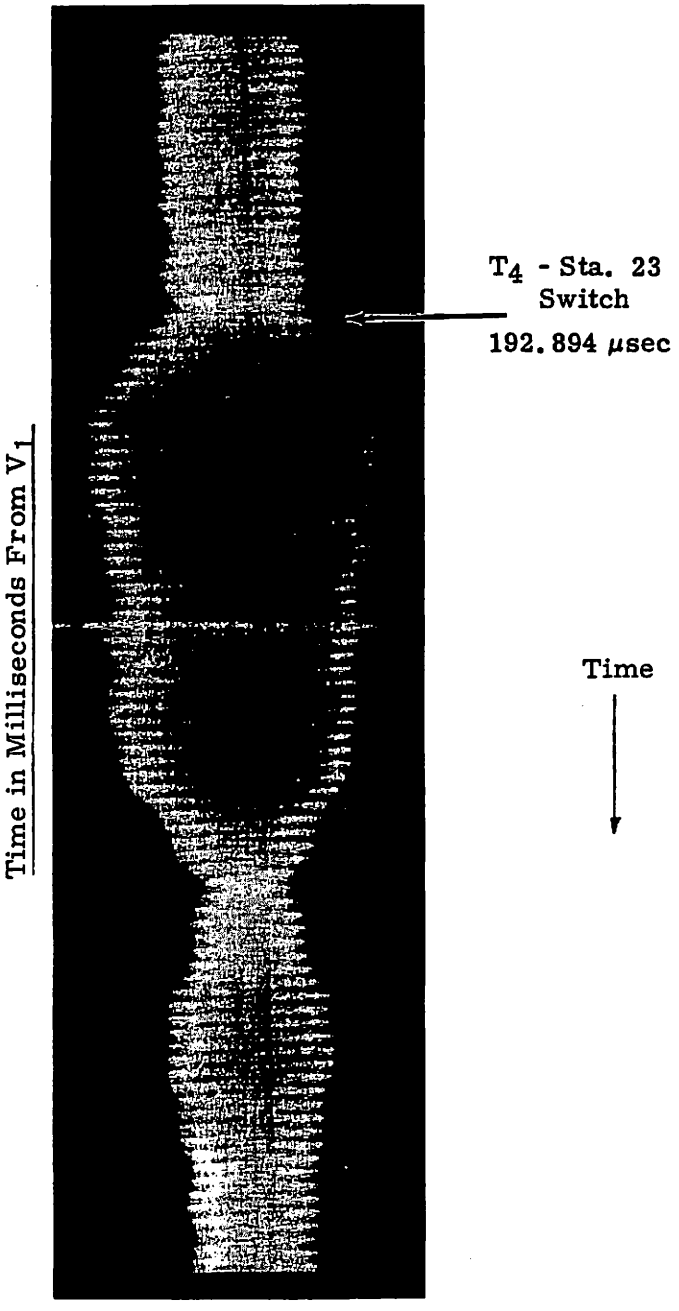

Figure 8. Mod 6 Data (235.5 mc - 70 kc)

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53-2E
Mod VI 221.5 mc
40 kc

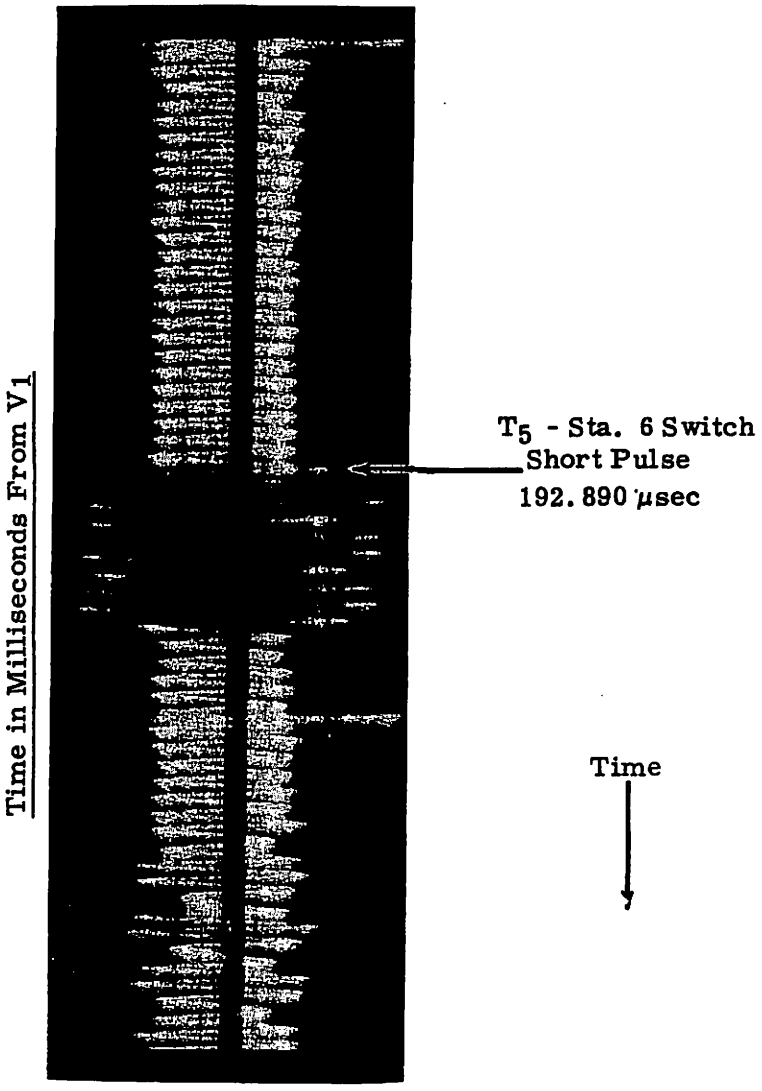

Figure 9. Mod 6 Data (221.5 mc - 40 kc)

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TABLE I (cont)

Item	Description	Time in Milliseconds from V_1
T_4	Discharge from X-unit 4	192.890
T_2	Discharge from X-unit 2	192.900
T_3	Input to X-unit 4	Missing
T_6	Discharge from X-unit 6	Missing
T_7	Deformation	193.424

The recorded wave form across the crush switch did not yield usable data to determine the quality of the switch closure.

Acceleration Data

The acceleration wave forms from the ±50-g instrument on the rear of the concrete structure and from the ±500-g instrument on the moving target were recorded. These wave forms are shown in Figures 10 and 11.

Conclusions

The "turn-around" target-on-the-sled arrangement proved to be a successful approach for testing the nose assembly at an impact velocity of approximately 300 fps.

The sled tilted during free flight; tilting could be eliminated by determining a more exact burning time for, or relocating, the rockets.

The Mod 6 data indicate that there was a sufficient time between X-unit discharge and deformation. There was a large time discrepancy between the flash lamp data and the Mod 6 data. It is felt that this difference was introduced during the attempt to tie the two time bases together during data reduction. Attempts are being made to increase the accuracy between the two records on future tests.

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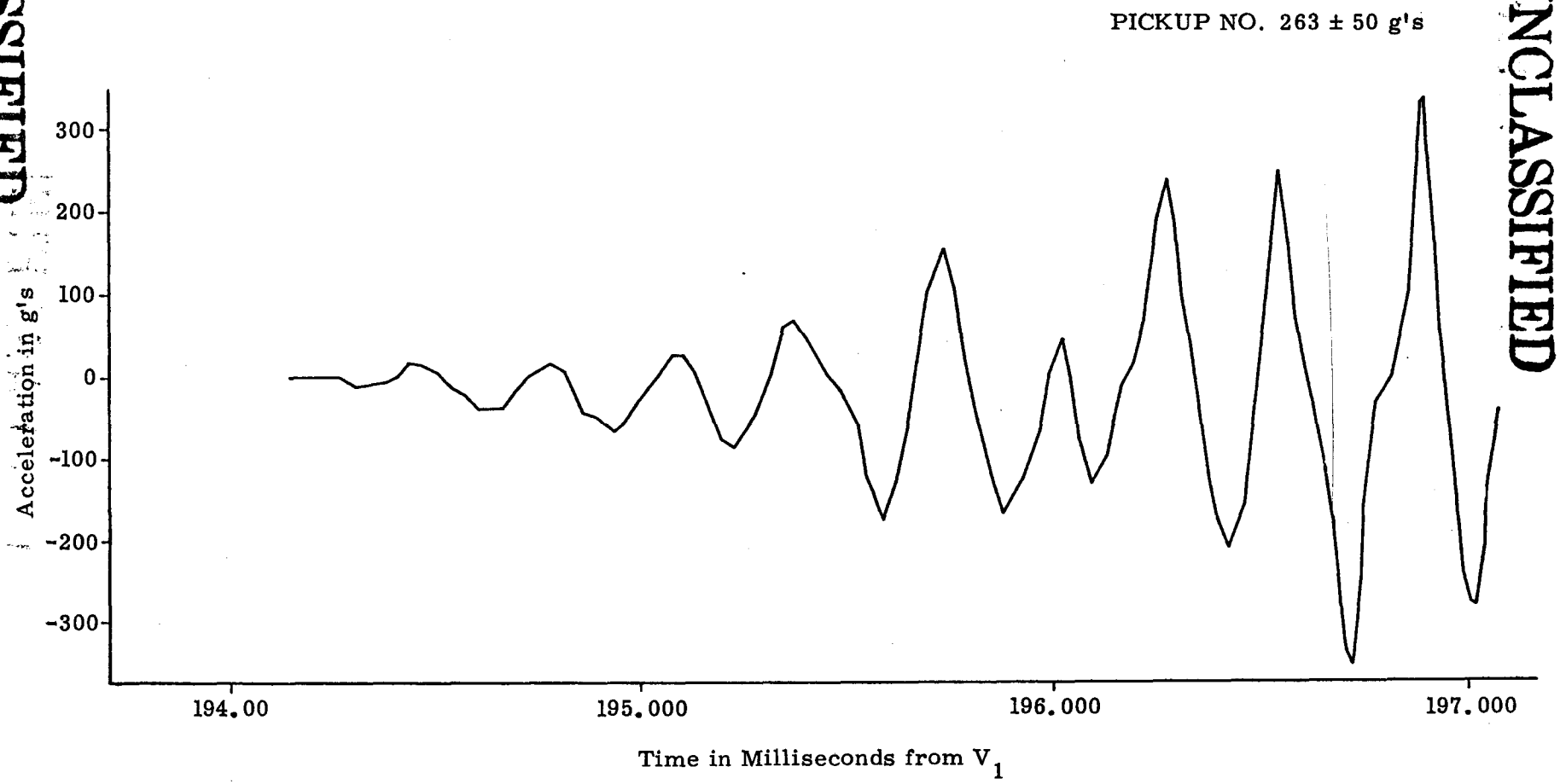

Figure 10. Longitudinal Acceleration vs. Time (Rear Face of Target)

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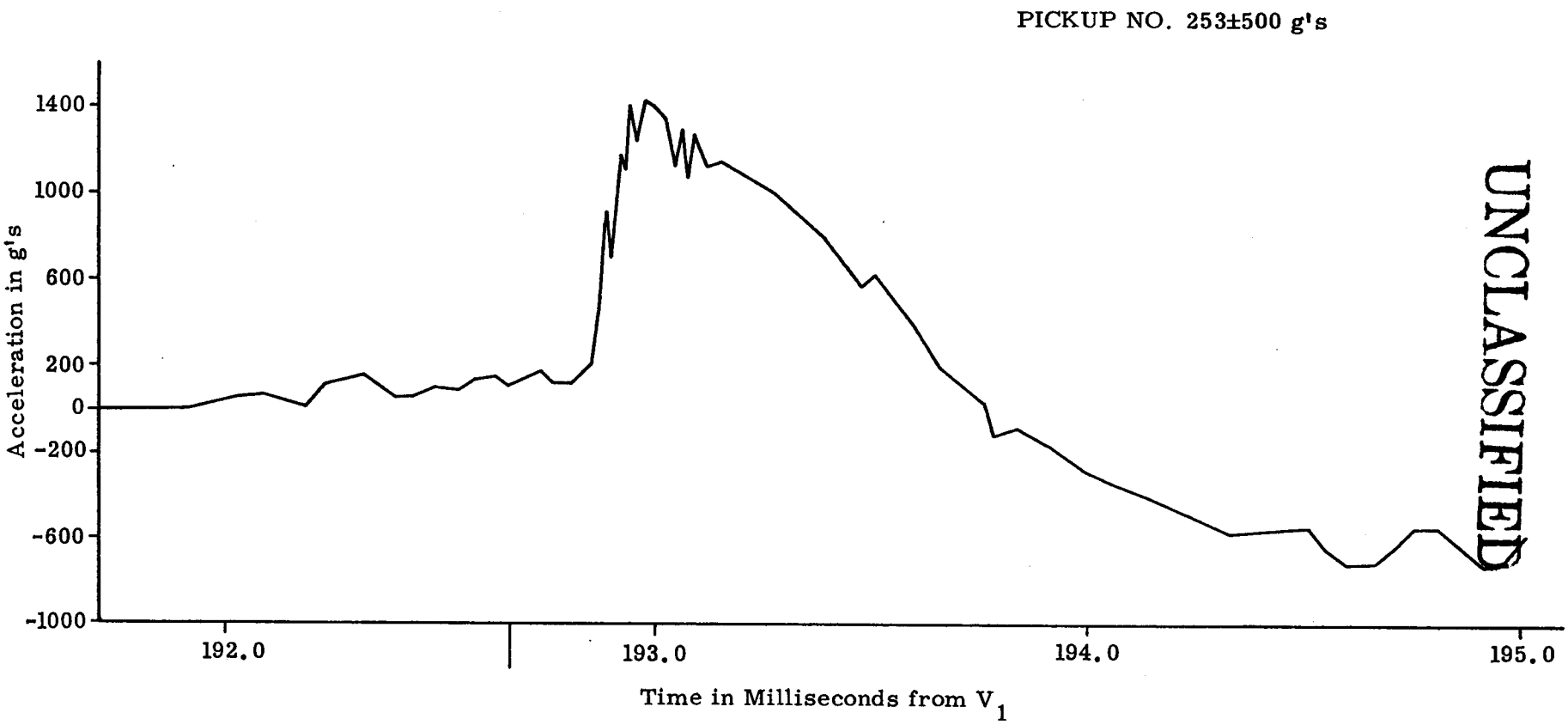

Figure 11. Longitudinal Acceleration vs. Time (Near CG of Sled)

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