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July 1967

Progress Report

2400 QUARTERLY REPORT (U)
April - June 1967

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
1st Review Date: 8/18/98	Determination (Circle Numbers)
Authority: ADC ADD	1. Classification Retained
Name: W Loyne	2. Classification Changed to: U
2nd Review Date: 8/19/98	3. Contains No DOE Classified Information
Authority:	4. Coordinate With:
Name: RB Craner	5. Contains UCAI? Nr
	6. Comments: OK for Openmet

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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW DOWNGRADING OR DECLASSIFICATION STAMP	
CLASSIFICATION CHANGED TO: U	AUTHORITY: R. B. Craner
Emelda Selph 8/19/98	
PERSON CHANGING MARKING & DATE	RECORD ID: 98SN3732
W. C. Loyne 8/25/98	
PERSON VERIFYING MARKING & DATE	DATED: 8/19/98

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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 8/17/98
Authority: ADD
Name: R B Cramer
2nd Review Date: 8/19/98
Authority: ADD
Name: WC Layne
Determination (Circle Numbers):
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DEC 16 1957
Case No. 771.00
Ref. Sym: 1612 (637)
Project No. TM-687
File: TX-28, 3-2

MR. W. J. DENISON - 1224

Re: TX-28-X1 Impact Fuzing System Drop Tower Test

INVENTORIED
SEP 14 '65
3428-3

CDI No.
ACCOUNTING CARD
FILE No. TX-28-X1
3-2

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Summary of Results

Two drop tests at 100 fps impact velocities, one onto dirt and one onto a concrete target, were made with a TX-28-X1 nose section attached to a dummy case, to evaluate the reliability of the impact fuzing crystal system at low velocity impacts.

During the first drop, on dirt, the oscillograph record showed that the x-unit discharged 0.017 seconds after initial impact; however, there was no indication of fuzing crystal voltage output. The Fastax film showed that the flash unit connected to the forward fuzing crystal and to the x-unit, respectively, fired at 0.011 seconds and 0.017 seconds after impact. The long delay indicated that the x-unit may have fired from impact forces rather than from fuzing crystal voltage.

During the drop onto concrete, the forward fuzing crystal generated 317 volts at impact and 850 volts 0.0013 seconds later; the x-unit discharged 0.0014 seconds after impact. Only 69 volts were generated by the aft fuzing crystal prior to x-unit discharge. No measurable longitudinal acceleration was recorded on the x-unit prior to its discharge; the peak acceleration of 1617 g occurred 0.025 seconds after impact.

No contact chatter was recorded on the radar switches monitored during either drop.

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Object of Test

The object of this test was to evaluate the reliability of the impact fuzing system proposed for the TX-28-X1, when subjecting the test vehicle to impact velocities of 100 fps onto both dirt and concrete targets.

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Reason for Test

This test was requested in a Work Order Authorization from W. R. Hoagland, 1224, to P. H. Adams, 1612, dated September 12, 1957.

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AUTHORITY: W.C. Layne
Emelda Selph 8/25/98
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RECORD ID: 98SN3767
WC Layne 8/25/98
PERSON VERIFYING MARKING & DATE
DATED: 8/19/98

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Summary of Past Tests

A drop test with the unit impacting at 100 fps on a steel target was performed by Division 1224 on November 5, 1956. No test report was written, but test results are available in Division 1224 files.

During this test, only camera coverage was obtained. Fastax coverage indicated that the fuzing crystals and x-unit operated properly.

Setup for Test

Figure 1 shows the test vehicle suspended from the drop tower.

Figure 2 is an overall view showing the test vehicle raised to drop position.

Components tested are listed in Table I.

Test equipment used consisted of one Consolidated amplifier, 20 KC carrier, Type 1-127, Serial No. 2017, and one William Miller, Type CR-1A recording oscillograph, Serial No. 12. Camera coverage consisted of two 16 mm Fastax cameras, 4000 frames per second; one 8 mm Fastax camera, 8000 frames per second; and one Bell and Howell 16 mm tracking camera, 200 frames per second.

One accelerometer, No. A-1, was mounted as shown in Fig. 3. The accelerometer was a Statham Model A5A-1000-350 with Serial No. 5384, range of ± 1000 g, and natural frequency greater than 1500 cps.

Figure 4 shows the location of the cathode followers and the three battery packs used to supply power to the x-unit, flash unit, and cathode followers, respectively.

Procedure

For both drop tests, the nose section of a TX-28-X1 was bolted through an adapter plate to a 20-inch diameter dummy weight (Fig. 3), to simulate the ballistic shape of the complete weapon.

The output voltage of two fuzing crystals, one mounted on the forward bulkhead of the TX-28-X1 and one mounted on the aft casing wall, were monitored during both drops. This was accomplished by feeding each crystal output to a cathode follower with an input impedance simulating the fuzing load during actual operation. The output of the cathode followers was recorded on the Miller CR-1A recording oscillograph.

Two flash bulbs were mounted on the test vehicle during the drops (Fig. 1); one connected to fire when an output voltage of 300 volts was received from a crystal on the forward bulkhead of the TX-28-X1, and one connected to fire when the x-unit discharged. Discharge of the x-unit was also recorded on the oscillograph by recording the voltage drop across a resistance network connected in parallel with the x-unit voltage supply.

The switches in the XMC-627 and XMC-628 radar units were monitored for contact chatter during both drops.

The time of impact was recorded on the oscillograph by a sync switch on the nose of the TX-28-X1 during both drops, and also by a crystal accelerometer mounted on the concrete target during the second drop.

Two test drops were made from a height of 155 feet, giving impact velocities of approximately 100 fps. The first drop was on a dirt target; the second was on a concrete target 6-inches thick. Three Fastax cameras and one tracking camera were used to photograph the test drops.

Results

During the first test drop, on a dirt target, the unit penetrated about four feet into the soil. The oscillograph record showed no evidence of fuzing crystal voltage output; however, the x-unit discharged approximately .017 seconds after initial impact. A study of the Fastax film taken during the drop showed that the flash unit connected to the forward fuzing crystal and to the x-unit, respectively, fired at 0.011 seconds and 0.017 seconds after impact.

The longitudinal acceleration recorded on the x-unit during this drop was very low; between impact and the time of x-unit firing, the peak acceleration was 27 g.

No contact chatter was recorded from the two radar switches monitored.

The TX-28-X1 nose section and x-unit were damaged as shown in Figs. 5 and 6, respectively.

The absence of fuzing crystal output voltage indication on the oscillograph during the impact on dirt was questioned. To gain additional information, a dummy weight was instrumented and subjected to three impacts of 100 fps on a dirt target, while monitoring the output of two contained fuzing crystals. During these three drops, the peak crystal voltage recorded varied from 30 V to 70 volts, considerably below the voltage required to discharge the x-unit.

During the second drop of the TX-28-X1, on a concrete target, the forward fuzing crystal monitored generated 317 volts at impact and 850 volts 0.0013 seconds later with the x-unit discharging .0014 seconds after impact. Only 69 volts were generated by the aft crystal prior to x-unit discharge.

The longitudinal acceleration recorded on the x-unit prior to its discharge was very small. The peak acceleration of 1617 g occurred long after x-unit discharge, at .025 second after impact. This recorded acceleration may not be accurate, as it was considerably above the calibrated range of the accelerometer.

The radar switches monitored showed no indication of contact chatter prior to x-unit fire.

Figure 7 shows the unit after impacting onto concrete.

A section of the oscillograph record of drop No. 2 is shown in Fig. 8. The fuzing crystals and the accelerometer output were each recorded on two channels with different gains to insure a measureable record.

Conclusions

The proposed impact fuzing system for the TX-28-X1 operates marginally at low impact velocities of 100 fps, when impacting on a concrete surface. An impact in soft soil apparently does not generate sufficient crystal voltage for proper fuzing.

G. M. WILLSON - 1612-1

Approved by: PAUL H. ADAMS - 1612

GMW:1612-1:as

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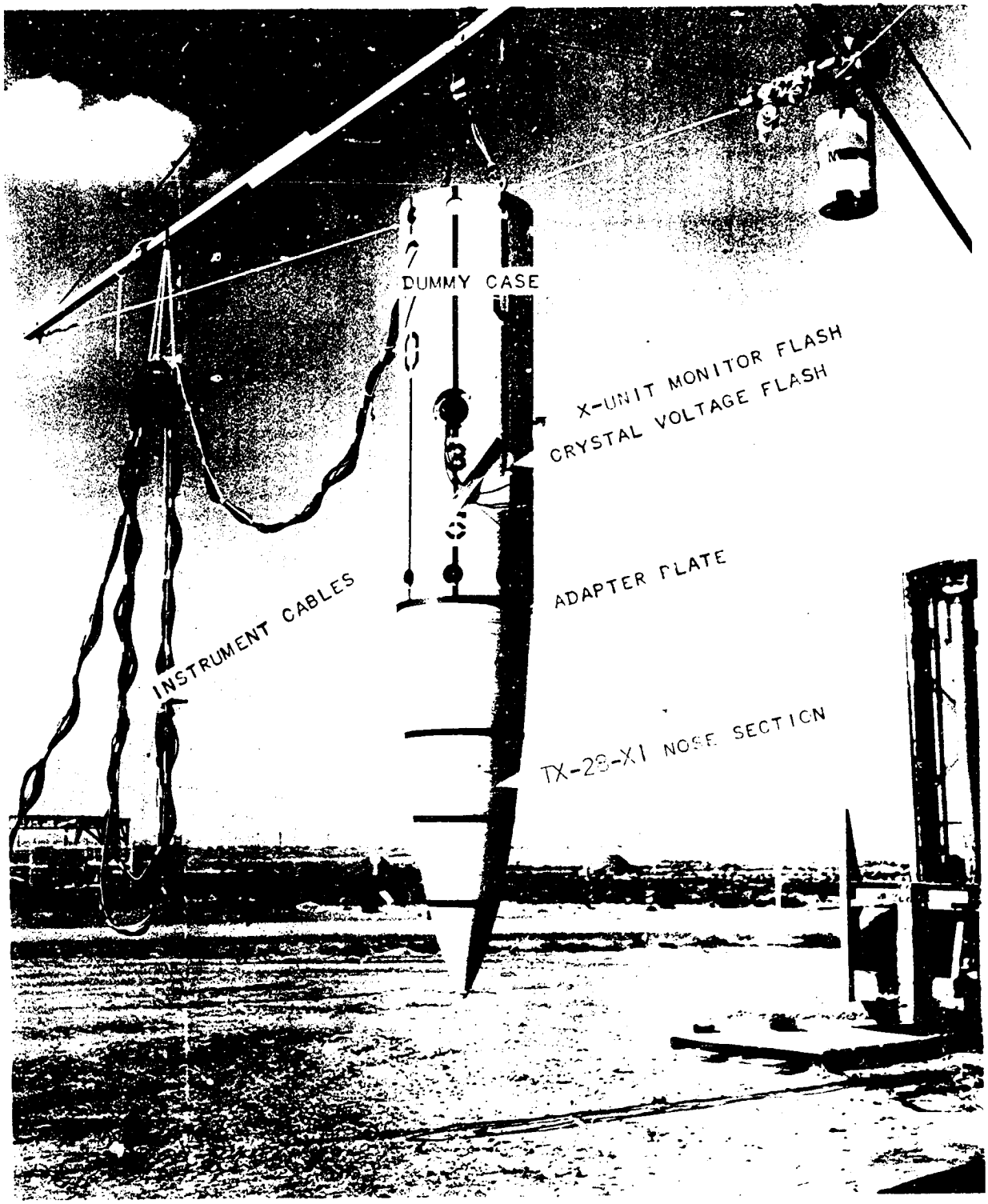

FIG. 1 -- CLOSEUP OF THE TX-28-X1 TEST VEHICLE SUSPENDED FROM THE DROP TOWER -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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TEST VEHICLE

INSTRUMENT CABLES

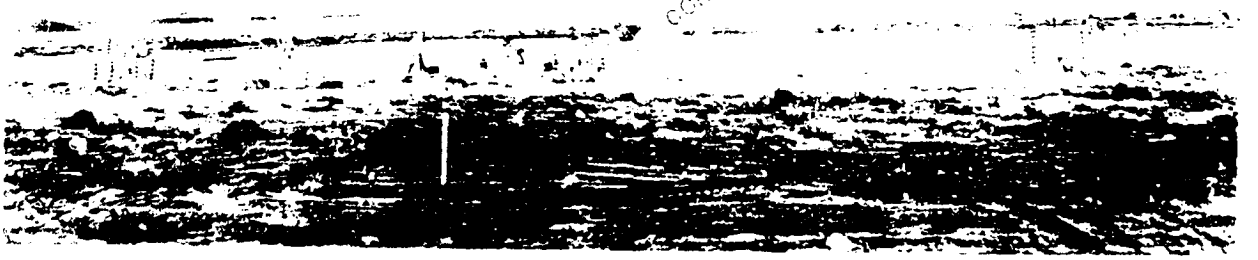

FIGURE 2 -- OVERALL VIEW SHOWING THE TEST VEHICLE RAISED TO DROP POSITION -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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PROJECT NO. TM-687

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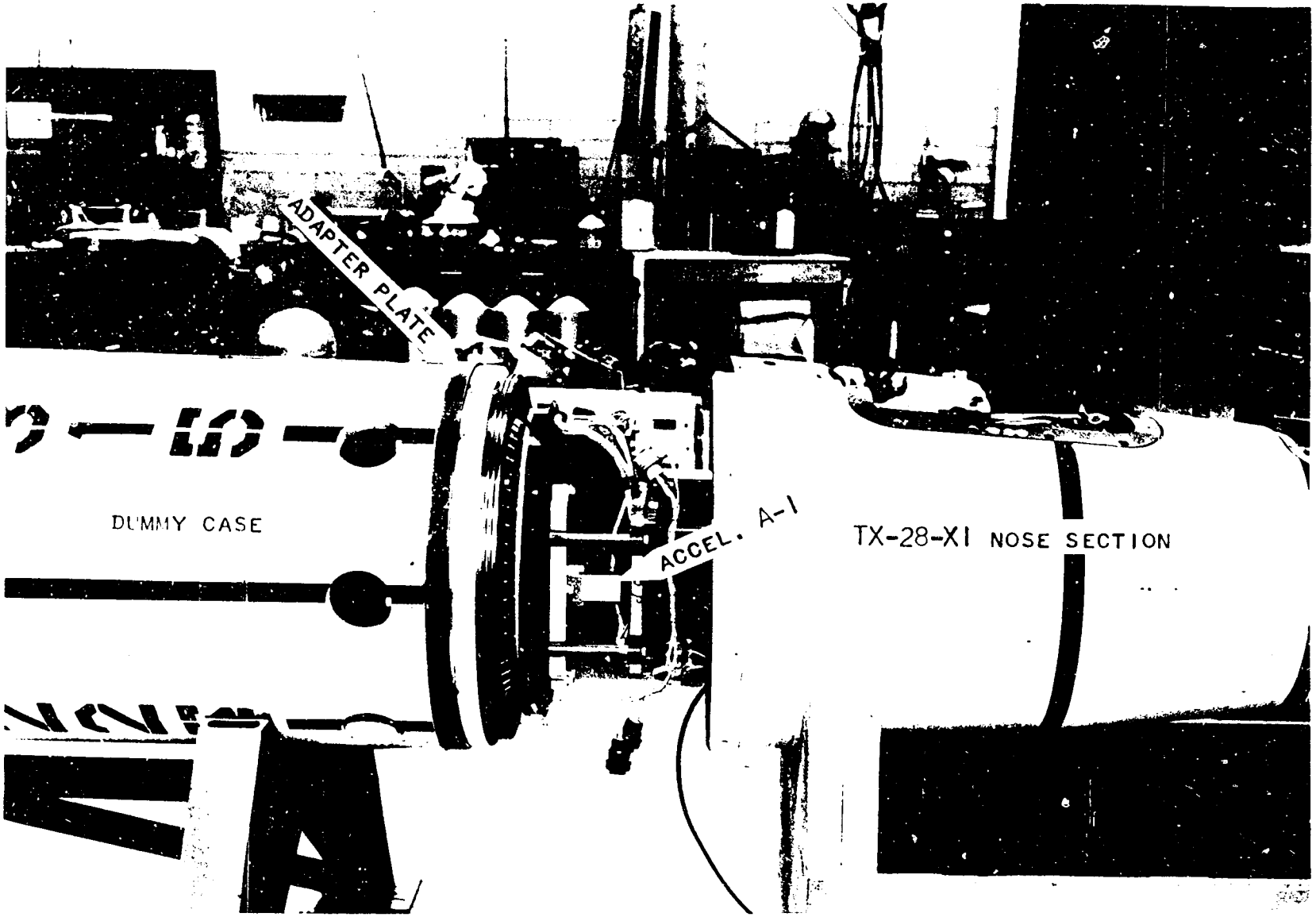

FIG. 3 -- ACCELEROMETER A-1 MOUNTED ON THE X-UNIT OF THE TX-28-XI -- TX-28-XI IMPACT FUZING SYSTEM DROP TOWER TEST.

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REF. SYM: 1612 (637)
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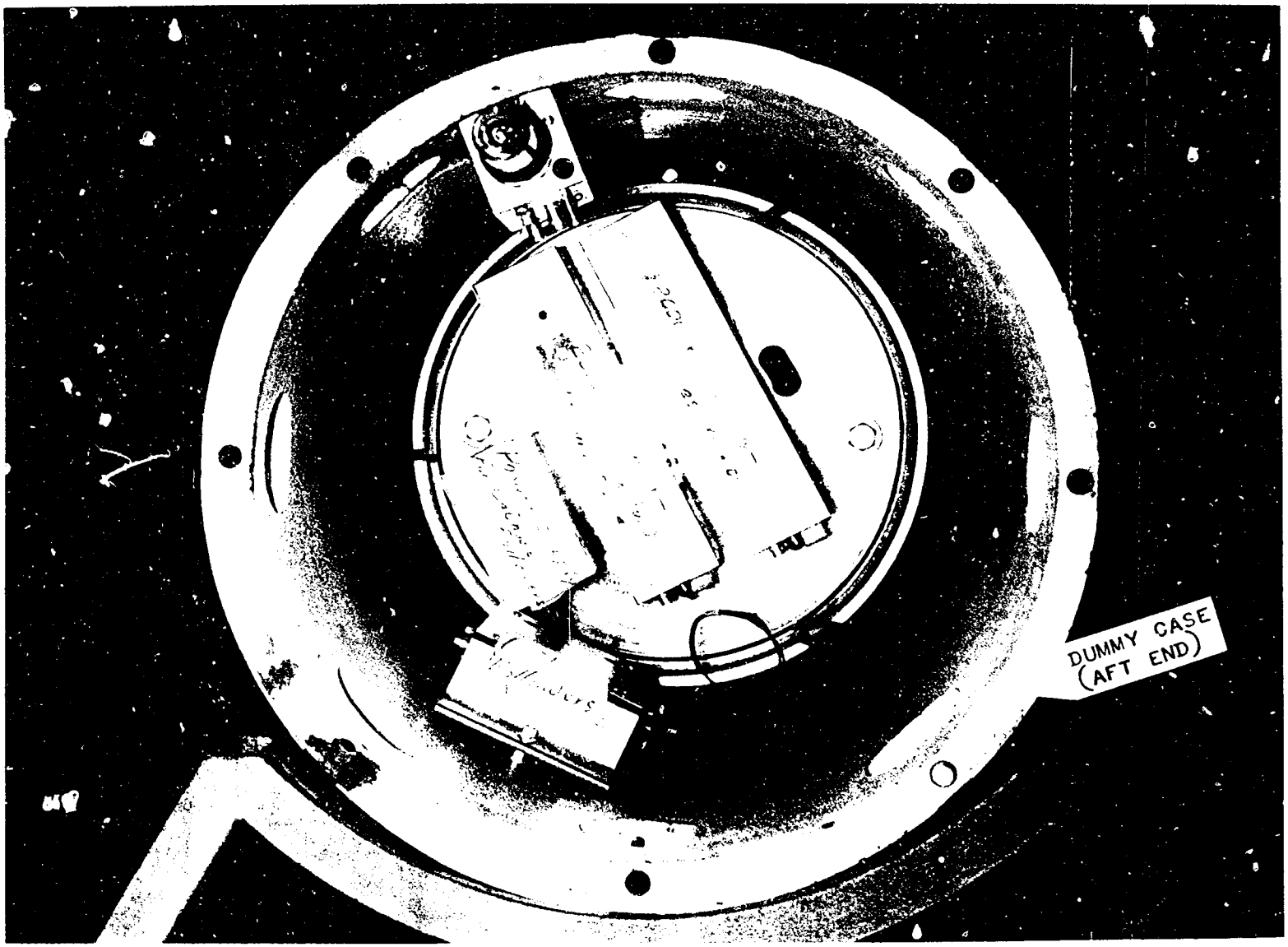

FIG. 4 -- VIEW SHOWING LOCATION OF THE CATHODE FOLLOWERS AND POWER SUPPLIES USED FOR INSTRUMENTATION -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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FIG. 5 -- VIEW OF THE TX-28-X1 AFTER IMPACT ON A DIRT TARGET -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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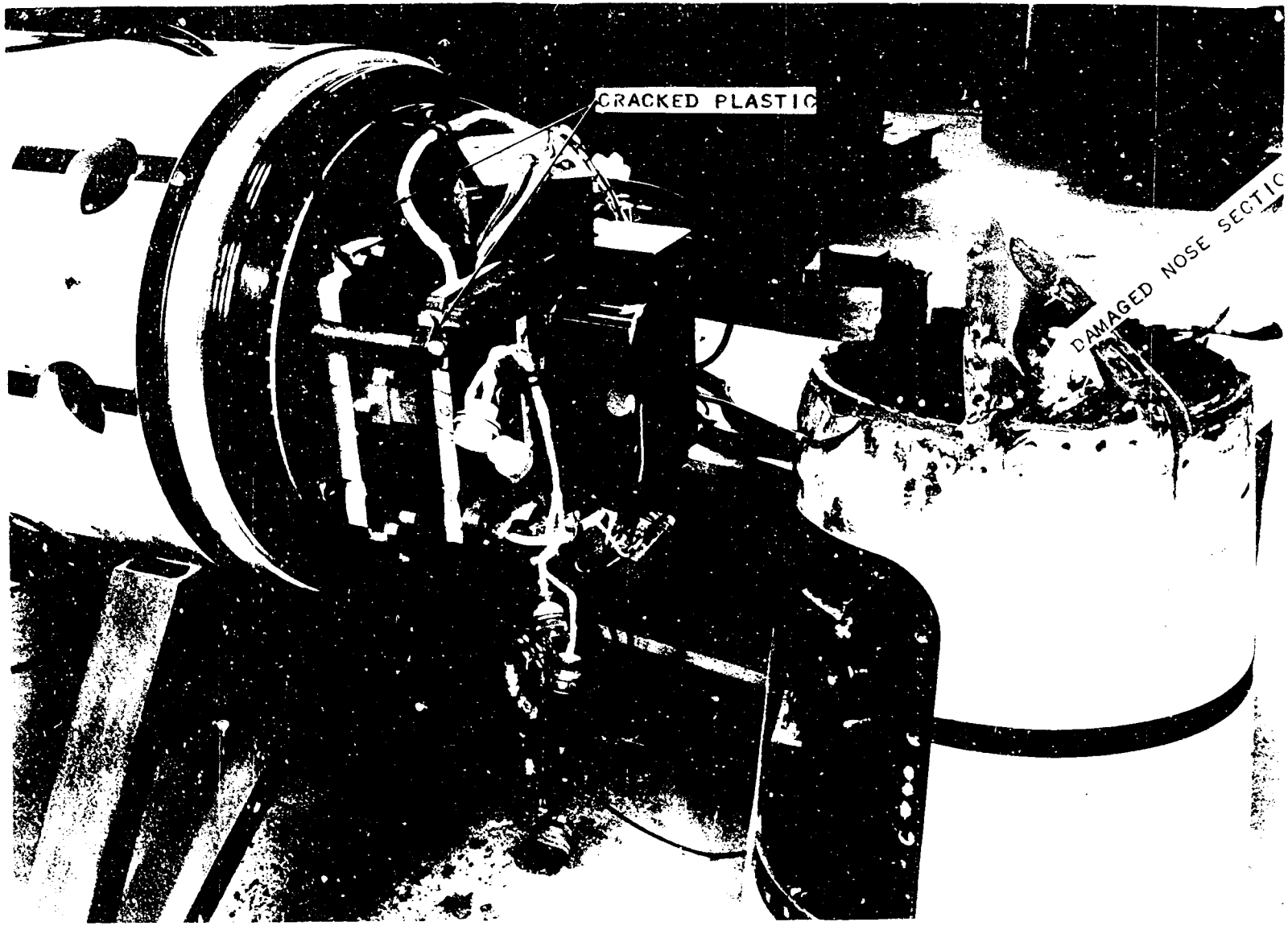

FIG. 6 -- VIEW SHOWING DAMAGE TO THE NOSE SECTION AND X-UNIT DURING IMPACT ON A DIRT TARGET -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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FIG. 7 -- VIEW OF THE TEST VEHICLE AFTER IMPACTING ON A CONCRETE TARGET -- TX-28-XI IMPACT FUZING SYSTEM DROP TOWER TEST.

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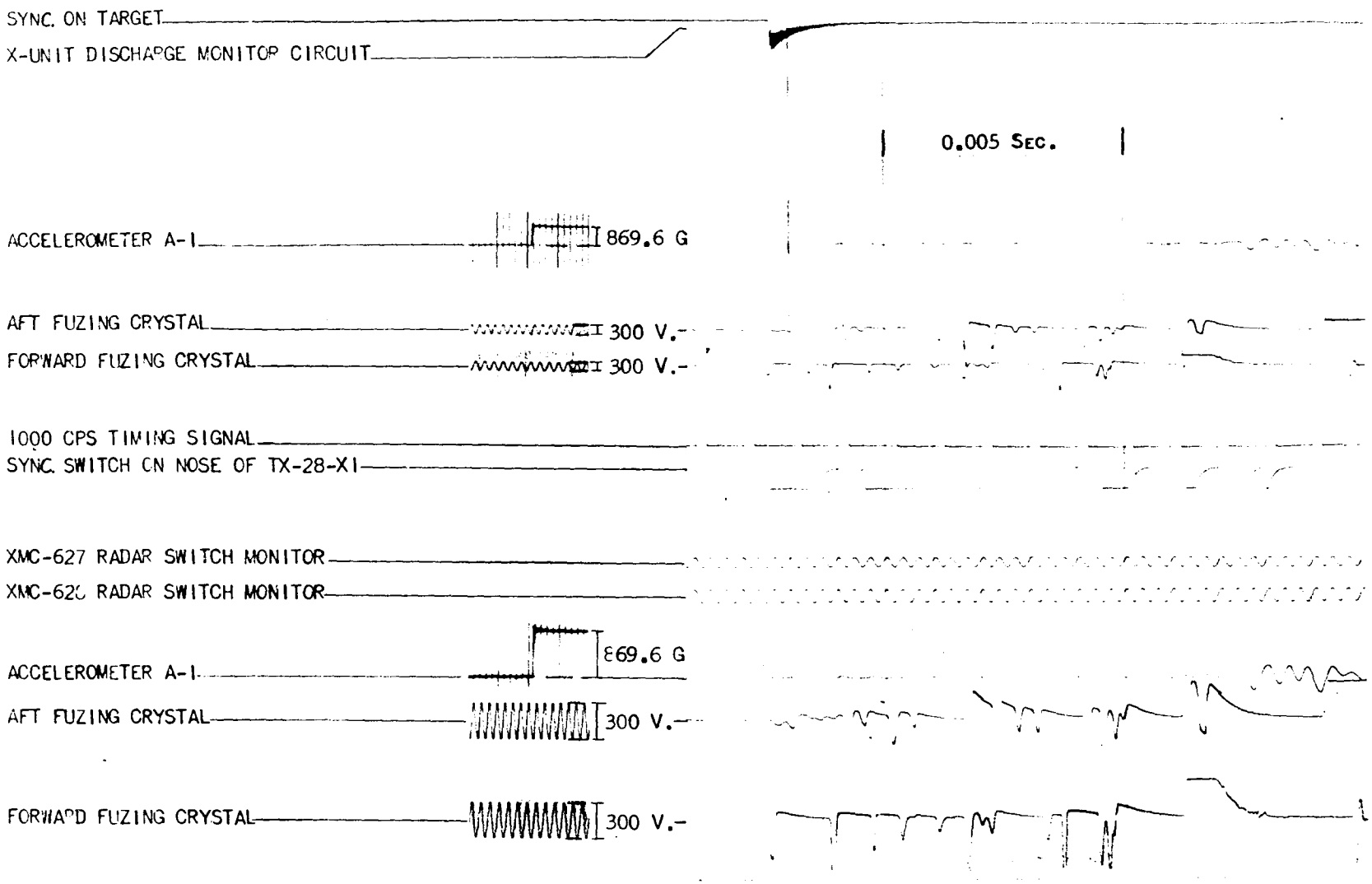

FIG. 8 -- OSCILLOGRAPH RECORD OF TEST DROP NO. 2, ONTO CONCRETE -- TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST.

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Project No. TM-687

TABLE I

COMPONENTS TESTED DURING TX-28-X1 IMPACT FUZING SYSTEM DROP TOWER TEST

Component and MC Number	Drawing No.	Serial No.	Test Used
XMC-627 Radar Set	310188	AA-1016-I6	Drop 1
XMC-628 Radar Set	310189	AA-1006-H6	Drop 1
XMC-713 Battery Pack, Thermal	310295-01	SC-021X-F7	Drop 1
XMC-695 X-Unit	310268	X-45	Drop 1
XMC-710 Fuze Subassembly	310292	--	Drop 1
MC-810 Fuze, Impact (3 ea.)	310416	--	Drop 1
XMC-627 Radar Set	310188	AA-1001-H6	Drop 2
XMC-628 Radar Set	310189	AA-1016-I6	Drop 2
XMC-713 Battery Pack, Thermal	310295-01	SC-023X-F7	Drop 2
XMC-695 X-Unit	310268	X-46	Drop 2
XMC-710 Fuze Subassembly	310292	--	Drop 2
MC-810 Fuze, Impact (3 ea.)	310416	--	Drop 2

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