UNCLASSIFIED

AD NUMBER

ADB019843

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies only; test and evaluation; Mar 1977. Other requests shall be referred to AFWL, [DES], Kirtland AFB, NM 87117.

AUTHORITY

AFWL Ltr, Nov 7. 1986

THIS PAGE IS UNCLASSIFIED

AFWL-TR-77-1

AFWL-TR-77-1

AD B019843

DDC FILE COPY

AIRCRAFT SHELTER-DICE THROW DATA REPORT

Air Force Weapons Laboratory
Kirtland Air Force Base, NM 87117

March 1977

Final Report

Distribution limited to US Government agencies only because of test and evaluation of military systems (March 1977). Other requests for this document must be referred to AFWL (DES), Kirtland AFB, NM 87117.

This research was sponsored by the Defense Nuclear Agency under Subtask: SC301, Work Unit: 01, Work Unit Title: Aircraft Shelter-Dice Throw Test.

DDC JUL 15 1977 C

Prepared for
Director
DEFENSE NUCLEAR AGENCY
Washington, DC 20305

AIR FORCE WEAPONS LABORATORY
Air Force Systems Command
Kirtland Air Force Base, NM 87117

AFWL-TR-77-1

This final report was prepared by the Civil Engineering Division, Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico, under Job Order 21011017. Capt H. T. Webster (DES) was the Laboratory Project Officer-in-Charge.

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This technical report has been reviewed and is approved for publication.

HARRY T. WEBSTER
Captain, USAF
Project Officer

FOR THE COMMANDER

J. M. WARREN
Lt Colonel, USAF
Chief, Survivability Branch

FRANK J. LEECH
Lt Colonel, USAF
Ch, Civil Engineering Research Division

DO NOT RETURN THIS COPY. RETAIN OR DESTROY.

REPRODUCTION QUALITY NOTICE

This document is the best quality available. The copy furnished to DTIC contained pages that may have the following quality problems:

- Pages smaller or larger than normal.
- Pages with background color or light colored printing.
- Pages with small type or poor printing; and or
- Pages with continuous tone material or color photographs.

Due to various output media available these conditions may or may not cause poor legibility in the microfiche or hardcopy output you receive.

☐ If this block is checked, the copy furnished to DTIC contained pages with color printing, that when reproduced in Black and White, may change detail of the original copy.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
(11) 1. REPORT NUMBER AFWL-TR-77-1	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
(6) 4. TITLE (and Subtitle) AIRCRAFT SHELTER-DICE THROW DATA REPORT.		(9) 5. TYPE OF REPORT & PERIOD COVERED Final Report.
		6. PERFORMING ORG. REPORT NUMBER
(10) 7. AUTHOR(s) Harry T. Webster, Capt., USAF Joel C. Bradshaw III, 1Lt, USAF Louis M. Swartz		8. CONTRACT OR GRANT NUMBER(s) In-House
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Force Weapons Laboratory (DES) Kirtland Air Force Base, NM 87117		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 6372F 01 21011017
11. CONTROLLING OFFICE NAME AND ADDRESS Director Defense Nuclear Agency Washington, D.C. 20305		(11) 12. REPORT DATE March 1977 13. NUMBER OF PAGES 438
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Air Force Weapons Laboratory (DES) Kirtland Air Force Base, NM 87117 (12) 414p.		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Distribution limited to US Government agencies only because of test and evaluation of military systems (March 1977). Other requests for this document must be referred to AFWL (DES), Kirtland AFB, NM 87117.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(16) 2101 (17) 10

18. SUPPLEMENTARY NOTES

This research was sponsored by the Defense Nuclear Agency under Subtask: SC301, Work Unit: 01, Work Unit Title: Aircraft Shelter-Dice Throw Test.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Nuclear Weapons Effects
Airblast
Ground Shock
Dynamic Structural Response
Protective Structures

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the data for the AIRCRAFT SHELTER-DICE THROW Test. This test was a part of the DICE THROW Series conducted by Field Command Defense Nuclear Agency at White Sands Missile Range, New Mexico. The test was conducted on 6 October 1976 at 0800 hours. The test subjected a scaled model of a proposed aircraft shelter closure and three scaled models of aircraft shelters to the airblast effects from the detonation of 570,000kg (630 tons) of ammonium nitrate/fuel oil (AN/FO) to evaluate the blast response of the —> (over)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

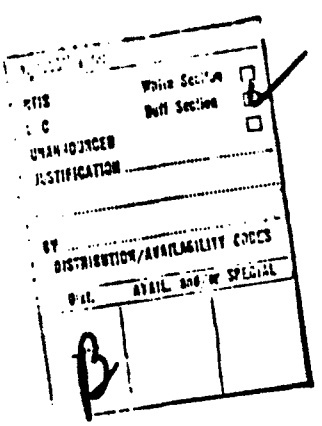
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Ø13150

closure and shelters.

CONTENTS

SECTION		PAGE
I	INTRODUCTION	5
	1. Background	5
	2. Objective	5
	3. Scope	6
II	TEST DESCRIPTION	7
	1. Site Location And Layout	7
	2. Charge Configuration	7
	3. Test Configuration	7
	REFERENCES	59
	APPENDIX	
	A. As-Built Construction Drawings	60
	B. Instrumentation	78
	C. Photographic Documentation	89
	D. Aircraft Shelter "A" Data Presentation	96
	E. Aircraft Shelter "B" Data Presentation	193
	F. Aircraft Shelter "C" Data Presentation	254
	G. Aircraft Shelter "D" Data Presentation	339



ILLUSTRATIONS

FIGURE		PAGE
1	AIRCRAFT SHELTER-DICE THROW Test Site Vicinity	8
2	AIRCRAFT SHELTER-DICE THROW Test Site Location	8
3	AIRCRAFT SHELTER-DICE THROW Test Site Layout for AFWL Test Structures	9
4	AIRCRAFT SHELTER-DICE THROW ANFO Charge Configuration	10
5	Upgraded Aircraft Shelter Closure - Shelter "A", Scaled	12
6	Shelter "A" As-Built Configuration	13
7	Shelter "A" Roller Units For Closure Located In Foundation Trench	14
8	Shelter "A" Closure During Installation	15
9	Shelter "A" Closure In An Open Position	16
10	Shelter "A" Photograph Of Damage Incurred On Closure Resulting From The Blast	17
11	Shelter "A" Side View Of Damage Incurred On Closure	18
12	Shelter "A" View Of Damage Incurred On Closure Near Lower End	19
13	Stress-Strain Curve For #2 Rebar	20
14	First Generation (TAB VEE) Shelter Arch-Shelter "B", Scaled	27
15	Shelter "B" As-Built Configuration	28
16	Shelter "B" Damage Incurred On Side Of Shelter	29
17	Shelter "B" Damage Incurred On Rear Wall Of Shelter	30
18	Upgraded First Generation (TAB VEE) Shelter Arch-Shelter "C", Scaled	35
19	Shelter "C" As-Built Configuration	36
20	Shelter "C" Debris On Shelter Resulting From Blast	37
21	Shelter "C" Cracks On Front Of Shelter Resulting From Blast	38
22	Shelter "C" Cracks On Roof Of Shelter Resulting From Blast	39
23	Hard Flush Aircraft Shelter - Shelter "D", Scaled	45

ILLUSTRATIONS (Cont'd)

Figure		Page
24	Shelter "D" Approximately 30% Complete	46
25	Shelter "D" Approximately 95% Complete	47
26	Shelter "D" Completed And Charge Configuration In Background	48
27	Shelter "D" Diagonal Cracks On Top Of Corner Resulting From Blast	49
28	Shelter "D" Cracks Running Parallel On Top Of Roof Resulting From Blast	50
29	Shelter "D" Damage Inside Of Shelter	51
30	Shelter "D" Damage On Corner Of Shelter	52
31	Shelter "D" Displacement Of Steel From Inside Of Shelter	53

TABLES

NUMBER		PAGE
1	Shelter "A" Results Of Concrete Cylinder Strength Tests For Arch And Foundation	22
2	Shelter "A" Results Of Concrete Cylinder Strength Tests For Closure	23
3	Shelter "A" Instrumentation, 93 Electronic Measurements	25
4	Shelter "B" Results Of Concrete Cylinder Strength Tests (MPa)	32
5	Shelter "B" Measurement Numbers	34
6	Shelter "C" Results Of Concrete Cylinder Strength Tests (MPa)	41
7	Shelter "C" Measurement Numbers	44
8	Shelter "D" Results Of Concrete Cylinder Strength Test (MPa)	55
9	Shelter "D" Measurement Numbers	58

SECTION I

INTRODUCTION

1. BACKGROUND

The AIRCRAFT SHELTER-DICE THROW Project was part of the DICE THROW Series of High Explosive Tests conducted by Field Command Defense Nuclear Agency (FCDNA) at White Sands Missile Range, New Mexico. The project dealing with Aircraft Shelters was conducted by the Air Force Weapons Laboratory (AFWL) and was jointly funded by the Air Force Civil Engineering Center (AFCEC) and the Defense Nuclear Agency (DNA). This test concluded the DICE THROW Series which included a charge configuration development program (PRE-DICE THROW I), and a calibration program (PRE-DICE THROW II).

The AFWL's participation in the DICE THROW Series was directed toward satisfying Air Force Civil Engineering requirements in the area of airbase structures and involved research in support of the hardened strategic structures program (ref. 1).

The test was conducted on 6 October 1976 at 0800 hours.

2. OBJECTIVE

The overall objective of this project was to obtain experimental data for the development of hardened aircraft shelters by measuring and recording the following:

a. The loading and dynamic response of a one-third scale, proposed aircraft shelter closure subjected to face-on airblast pressure (ref. 5).

b. The response of a one-third scale TAB VEE shelter arch.

c. One-third scale upgraded TAB VEE shelter arch when exposed side on to an airblast environment (ref. 4).

d. The airblast and ground motion effects on a buried surface flush aircraft shelter (ref. 6).

3. SCOPE

The purpose of this report is to present a summary of the test data. This summary will include the following:

(a) A description of the site location and layout.

(b) A description of the test shelters.

(c) The configuration of the explosive.

(d) Test instrumentation to outline the specifics of the instrumentation systems used to obtain motion, displacement, and stress data, the requirements for measurements, measurement list, measurement locations, and placement.

(e) The raw and corrected data plots.

SECTION II

TEST DESCRIPTION

1. SITE LOCATION AND LAYOUT

The AIRCRAFT SHELTER-DICE THROW test was conducted on the White Sands Missile Range, New Mexico. The test site is located 21 km (13 miles) southeast of the Stallion Range Center in the northern portion of White Sands Missile Range. The Stallion Range Center is located 138 km (86 miles) south of Albuquerque, New Mexico, on Route I-25, to the San Antonio, New Mexico, exit 19 km (12 miles) east on New Mexico Route 380 and 29 km (18 miles) south on WSMR Route 7. The site is at an elevation of 1,442 m (4,730 ft) above sea level in the northern portion of the Jornada Del Muerte Basin. The topography of the area is even, and the nearest mountains are approximately 13 km (8 miles) to the east. Figure 1 shows the site vicinity plan, figure 2 shows the site location plan, and figure 3 shows the layout of the AFWL Shelters.

2. CHARGE CONFIGURATION

There were 570,000 kg (630 tons) of ammonium nitrate/fuel oil (AN/FO) which simulated a nuclear blast and shock environment for the various structures fielded in the test. The AN/FO was placed at ground zero as shown in figure 3. Figure 4 illustrates the AN/FO stack and the specifications of the charge.

3. TEST CONFIGURATION

The AIRCRAFT SHELTER-DICE THROW Test provided a simulated nuclear blast and shock environment for target response and was used to confirm the empirical predictions and calculations for shock response of the shelters. One-third size models of a prototype TAB VEE shelter, TAB VEE upgrade closure, and a hard-flush shelter were tested. A brief description of each model is given below.

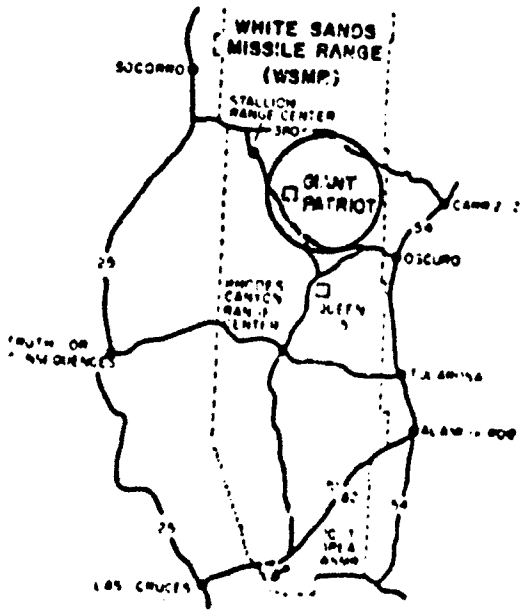


Figure 1. AIRCRAFT SHELTER-DICE THROW Test Site Vicinity Plan

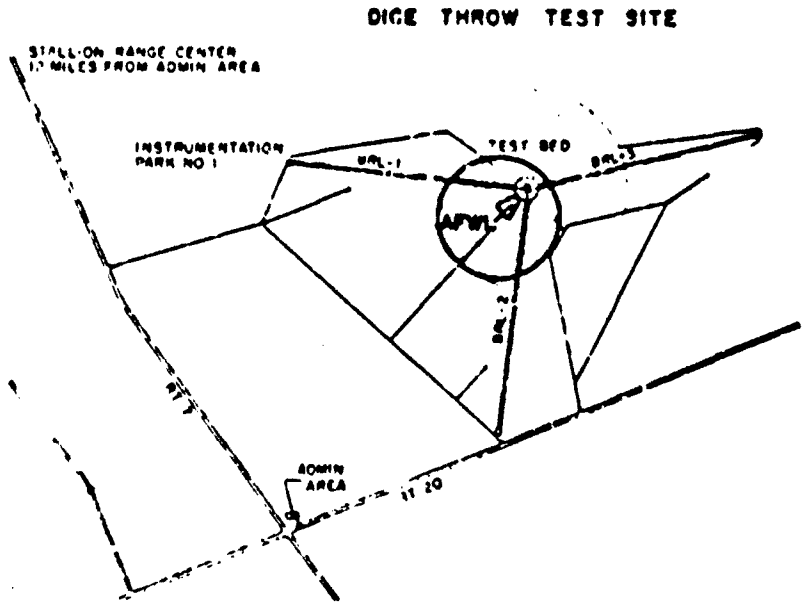


Figure 2. AIRCRAFT SHELTER-DICE THROW Test Site Location Plan

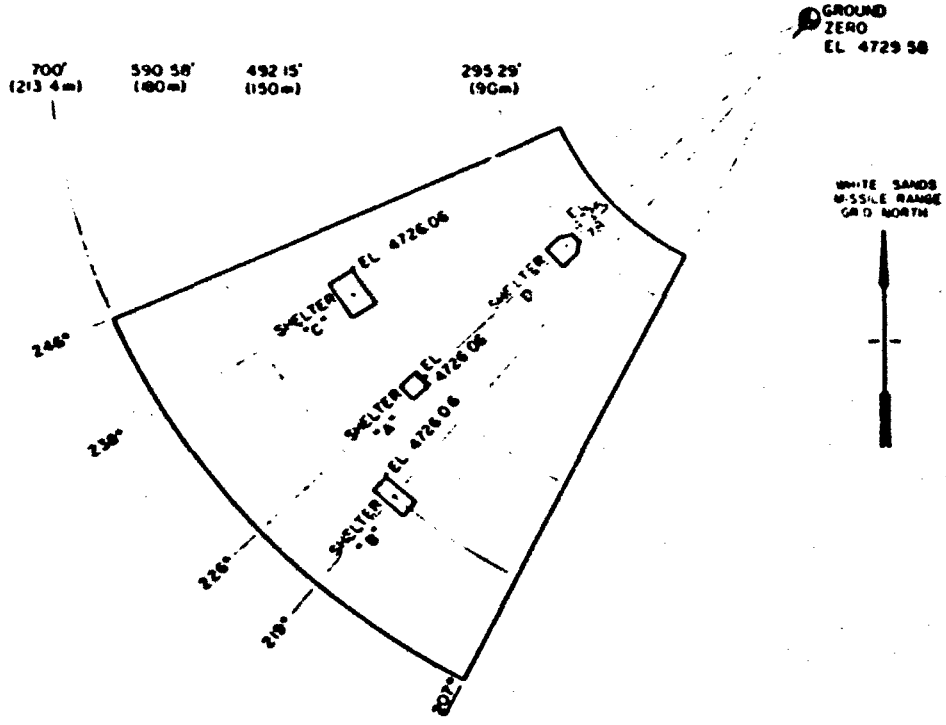
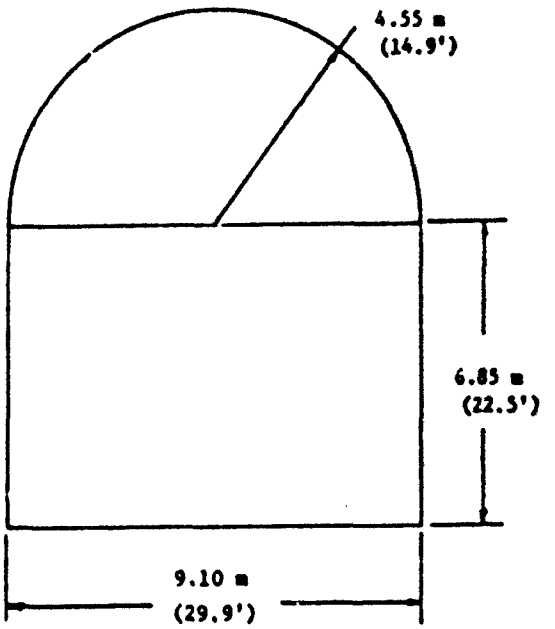


Figure 3. AIRCRAFT SHELTER-DICE THROW Test Site Layout For AFWL Test Structures



- Constructed with 22.7 kg (50 lb) bags of AN/FO and voids filled with loose AN/FO
- Initiation system consists of seven combination pentolite/octal boosters and Reynolds RP-1 detonators
- Charge density 8.5 to 9.0 kg/m^3 (0.031 to 0.033 lb/in^3)
- Detonation velocity from 4000 to 4750 m/sec (13,00 to 15,000 ft/sec)

Figure 4. AIRCRAFT SHELTER-DICE THROW AN/FO Charge Configuration

a. Upgraded Aircraft Shelter Closure - Shelter "A", Scaled

The MIXED COMPANY Event (ref. 2) indicated that the Shelter Closure was much weaker than the arch. Because of this, it was decided that any future upgrade of the shelter should first consider upgrading the closure. A closure system was designed and developed in sufficient detail to permit testing of the system. The closure was sized for the first Generation Shelter (14 m [48'] span) and consists of a massive one-piece reinforced concrete slab, with reinforcing webs along the outer edge and at the center line.

A one-third scale model of this closure was placed face-on to the blast at a range of 150 m (492.13 ft). At this range the blast was expected to produce measurable inelastic response of the closure. However, it was not expected to produce sufficient deformation of the closure to prevent it from opening after the test. For test purposes, a short length of shelter arch was constructed to support the closure. A sketch of the closure and the support arch are shown in Figure 5. For test purposes this shelter was designated as Aircraft Shelter "A". Figure 6 is a photograph of the as-built configuration of shelter "A". The closure rolls on roller units located in a foundation trench as shown in figure 7. Figure 8 illustrates the closure during installation, and figure 9 shows the closure in the open position.

The actual inelastic response experienced by the closure did not appear to be sufficient to prevent post-test opening. However, the closure did experience sufficient rigid-body displacement to prevent it from opening after the test.

Visual observation of the closure indicated its general response was to move upward, with the top of the closure moving towards the shelter arch, and the bottom of the closure moving away from the arch, and coming to rest on the top of the foundation slot. Some shear failure was also observed in the closure panels.

Figures 10, 11, and 12 are photographs of the damage incurred on the closure.

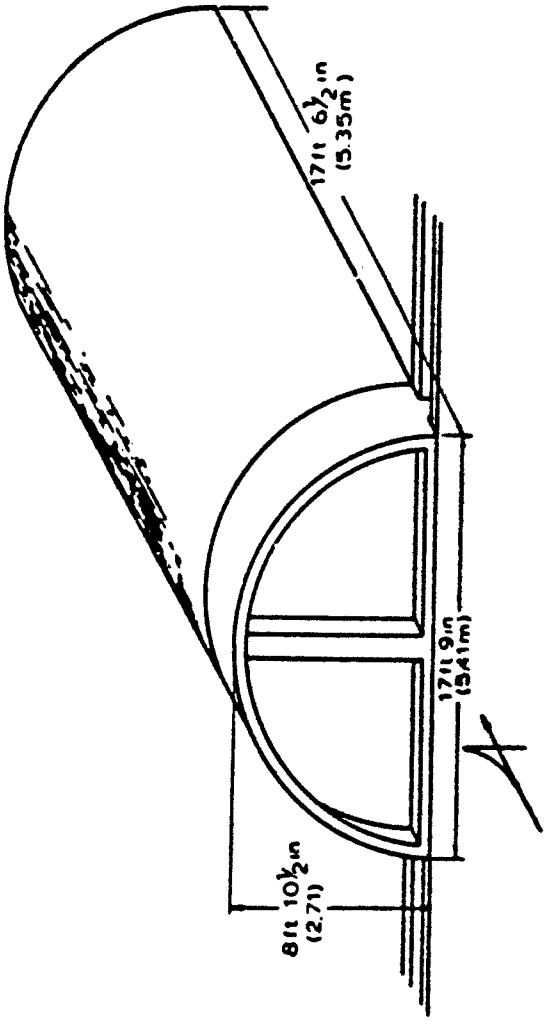


Figure 5. Upgraded Aircraft Shelter Closure - Shelter "A", Scale:

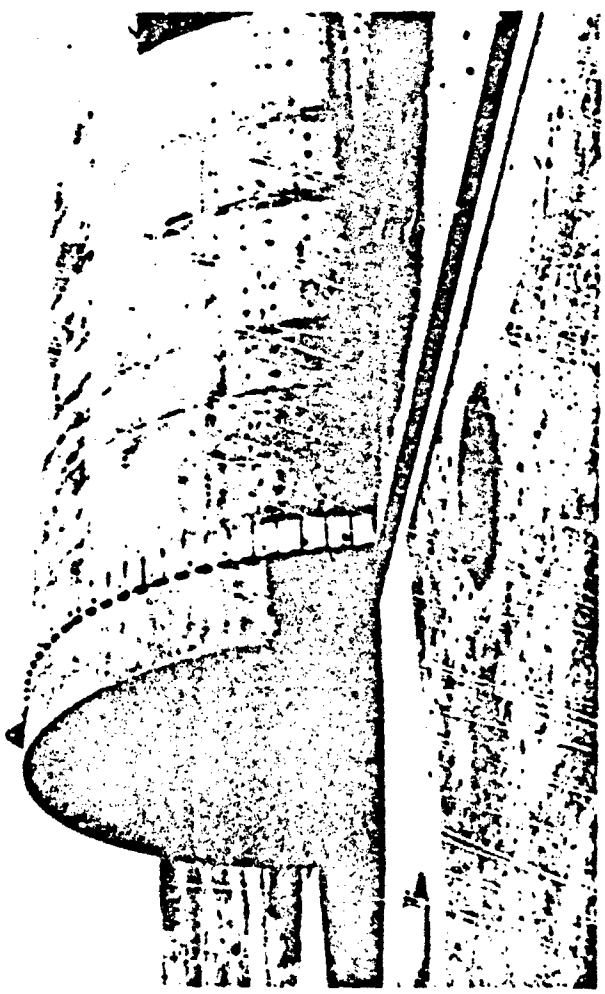


Figure 6. Shelter "A" As-Built Configuration

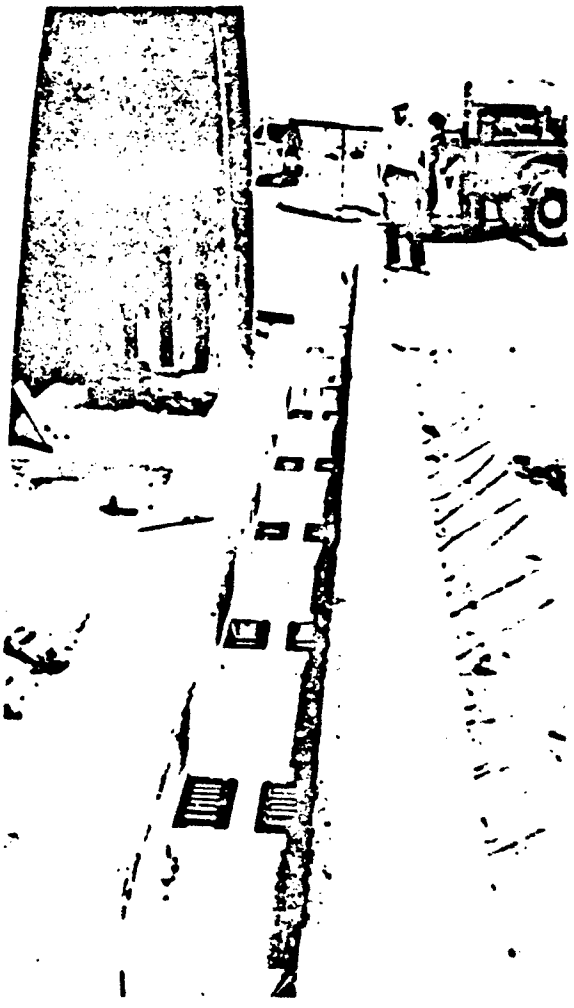


Figure 7. Shelter "A" Roller Units For Closure Located In Foundation Trench

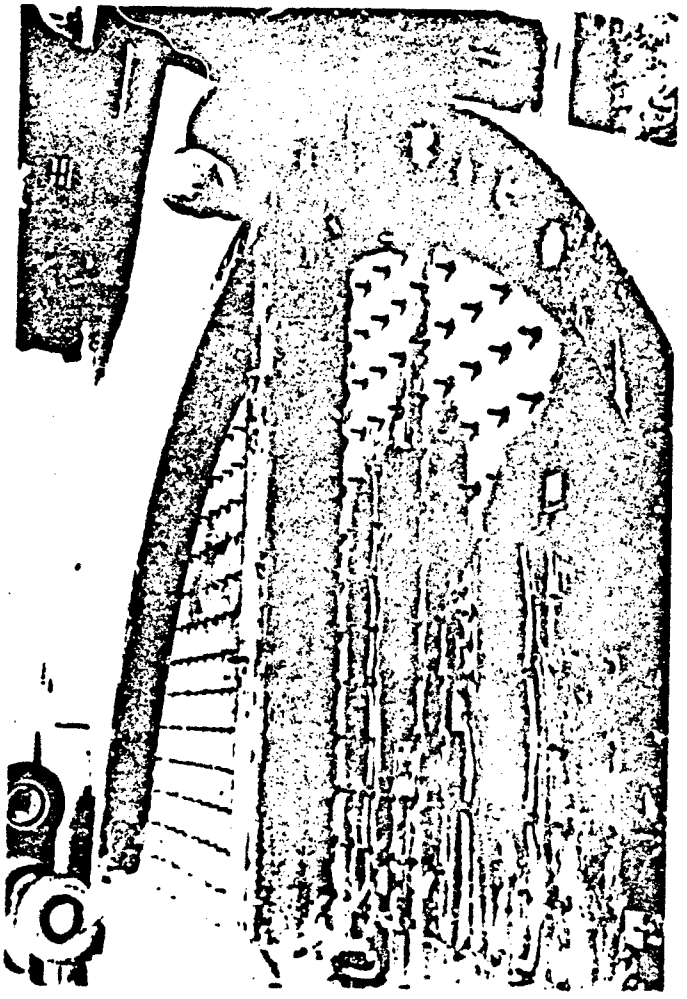


Figure 8. Shelter "A" Closure During Installation

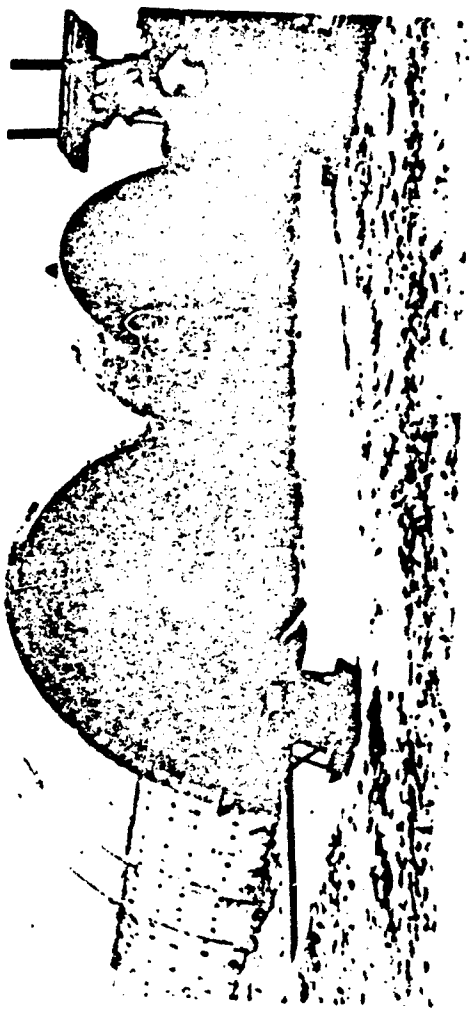


Figure 9. Shelter "A" Closure In An Open Posttion

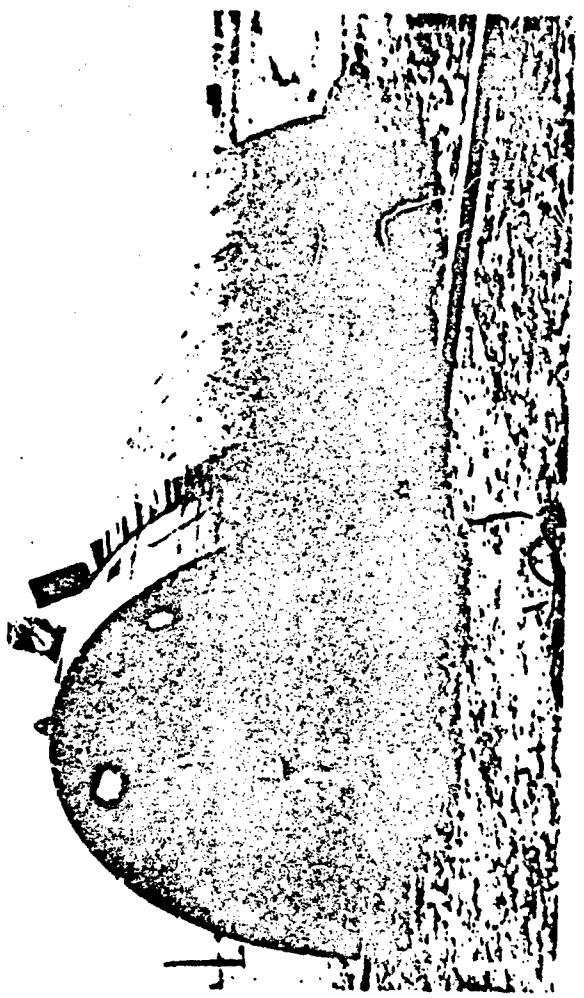


Figure 10. Shelter "A" Photograph Of Damage Incurred On Closure Resulting From The Blast

Figure 11. Shelter "A" Side View Of Damage Incurred On Closure

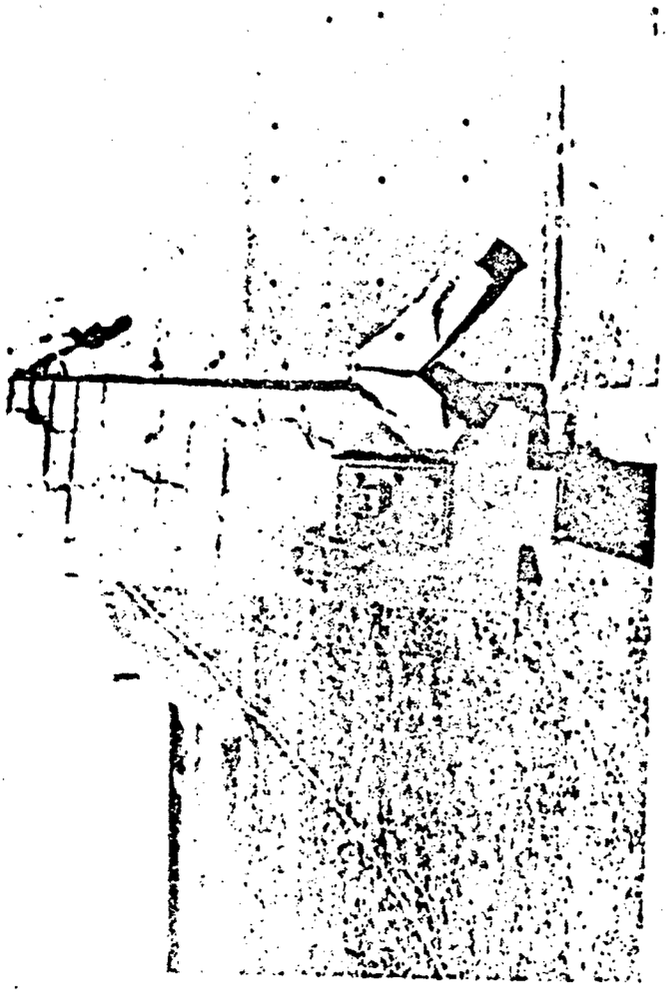


Figure 12. Shelter "A" View Of Damage Incurred On Closure Near Lower End

resulting from the blast.

(1) As-Built Construction Details

The upgraded shelter closure was fabricated by the Civil Engineering Research Facility (CERF) on Kirtland AFB, NM. It was later transported to the test site and erected on the previously constructed foundation slot and adjacent supporting shelter arch.

Photographically reduced construction drawings of the closure, foundation slot, and arch are included in Appendix A. The drawings were continuously updated as the actual construction progressed and thus reflect the as-built configuration.

Two types and sizes of reinforcing steel bar were used in the model construction of the arch and foundation slot. The no. 3 bar (9.5 mm [3/8 inch]) diameter) conformed to ASTM specification A-615, with a yield strength of 410 MPa (60 ksi). The no. 2 bar was 6 mm (.236 inches) diameter reinforcing steel with strength characteristics similar to grade 60 steel (490 MPa, 71 ksi). Figure 13 is a plot of the stress/strain characteristics of the no. 2 bar.

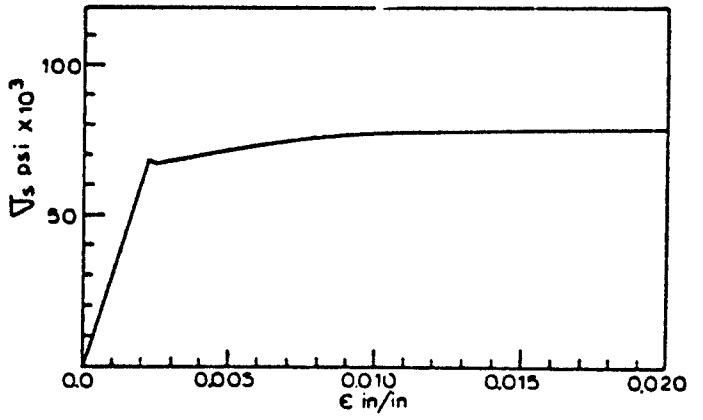


Figure 13. Stress-Strain Curve For #2 Rebar

The steel used in constructing the closure consisted of no. 10 gage (3.4 mm [.236 inches]) thick hot rolled steel plate conforming to ASTM specification A-415, with a yield strength of 280 MPa (40 ksi).

The concrete used for the on-site construction of the shelter consisted of 20 mm (3/4 inch) maximum sized aggregate for the foundation and floor slab; and 10 mm (3/8 inch) maximum sized aggregate for the arch. The mix was designed to have a nominal 28 day strength of 28 MPa (4,000 psi). Tests were conducted on sample cylinders and the results are compiled in Tables 1 and 2. The average cylinder strength for the arch and foundation on shot day was 34.8 MPa (5,000 psi). The average cylinder strenyth for the closure on shot day was 27.9 MPa (4,000 psi).

The arch and closure support structure foundations were backfilled at the approximate optimum moisture content and compacted to approximately 90% AASHO density. The footings rested on undisturbed native material.

(2) Instrumentation

Instrumentation for the shelter and closure consisted of 93 active electronic measurements including blast pressures, accelerometers, velocity gages, displacement gages, and strain gages. Four pressure sensitive gages were also installed in the foundation slot to measure bearing stress transmitted to the foundation slot from the closure.

As-built instrumentation layout details are contained in Appendix A. For other details on the electronic measurements see Appendix B.

All high speed camera and technical motion picture documentation were lost; however, for information purposes, the locations and perspectives of the cameras are presented in Appendix C.

(3) Data Presentation

The data presentation consists of the following corrected and raw data plots:

Table 1. Shelter A Results Of Concrete Cylinder Strength

Tests For Arch And Foundation (MPa)

Cylinder No.	Age At Testing 7 Days	14 Days	28 Days	Shot Day	Remarks
083-31	19.51 (2,829.7 psi)				
083-32		20.45 (2,966.0 psi)			
083-33			31.03 (4,500.5 psi)		Shelter Floor
083-34			30.68 (4,449.7 psi)		Shelter Floor
083-9		19.85(2,879.0 psi)			Door, Foundation
093-9			25.51(3,699.9 psi)		Door, Foundation
033-1	19.03(2,760.1 psi)				Footings
083-16			27.86(4,040.7 psi)		Arch
083-17			29.59(4,292.2 psi)		Arch
CERF-1				37.33(5,409.9 psi)	Arch
CERF-2				33.85(4,909.5 psi)	Wall Footing
CERF-6				31.94(4,63[illegible]3.4 psi)	Door, Foundation
CERF-19				31.17(4,5[illegible] psi)	Arch
CERF-20				31.92(4,629.6 psi)	Arch
CERF-33				35.[illegible]3(5,0[illegible]2.9 psi)	Floor
CERF-36				29.34(5,721.4 psi)	Apron
CERF-37				37.[illegible]3,5,[illegible] psi)	Apron
083-18			29.85(4,330.9 psi)		Arch
093-19			30.34(4,400.6 psi)		Arch
083-20			29.37(4,249.1 psi)		Arch
083-21			31.30(4,539.7 psi)		Arch
083-22			30.68(4,449.7 psi)		Arch
083-23			29.10(4,220.6 psi)		Arch

Table 2. Shelter A Results Of Concrete Cylinder Strength Tests For Closure (MPa)

Cylinder No.	Age At Testing 7 Days	28 Days	Shot Day	Remarks
1	22.56 (3,272.0 psi)			1st Truck Load
2	23.29 (3,377.9 psi)			1st Truck Load
3		28.41 (4,120.5 psi)		1st Truck Load
4		26.09 (3,784.0 psi)		1st Truck Load
5		25.85 (3,749.6 psi)		1st Truck Load
6		29.39 (4,262.6 psi)		1st Truck Load
7	24.75 (3,589.7 psi)			2nd Truck Load
8	24.02 (3,483.8 psi)			2nd Truck Load
9		25.61 (3,714.4 psi)		2nd Truck Load
10		27.92 (4,049.4 psi)		2nd Truck Load
11			27.92 (4,049.4 psi)	2nd Truck Load
12			27.80 (4,032.0 psi)	2nd Truck Load

(a) Pressure-time

(b) Velocity-time

(c) Acceleration-time

(d) Displacement-time

(e) Strain-time

(f) Interface Pressure-time

Table 3 shows the measurement numbers for the above measurements that pertain to shelter "A". These same measurement numbers are contained on the header of each plot.

A table precedes each set of data plots, listing by the above measurement numbers, the corrections performed on that particular measurement.

The data for shelter A is presented in Appendix D.

Table 3. Shelter "A" Instrumentation,

93 Electronic Measurements

Blast Press.	Accel.	Vel.	Displ.	Strain Steel	Strain Rebar	Interface Pre.
29	101	225	301	461	493	551
30	102	226	302	462	494	552
31	103	227	303	463	495	553
32	104	228	304	464	496	3
33	4	229	305	465	497	
34		230	5	466	498	
35		231		467	499	
36		7		468	500	
37				469	501	
38				470	502	
39				471	503	
40				472	504	
41				473	505	
42				474	506	
43				475	514	
44				476	515	
45				477	516	
46				478	17	
18				479		
				480		
				481		
				482		
				48		
				484		
				485		
				486		
				487		
				488		
				489		
				490		
				491		
				492		
				507		
				508		
				509		
				510		
				511		
				512		
				513		
				39		

b. First Generation (TAB VEE) Shelter Arch-Shelter "B", Scaled

A modified one-third size TAB VEE arch structure was tested at an overpressure range consistent with a similar test on the MIXED COMPANY test series (ref. 2). The shelter was oriented side-on to the blast at a range of 180 m (600 ft) to provide data to correlate with the MIXED COMPANY DATA. At this range the blast was expected to produce measurable inelastic response of the arch.

The model was a modified TAB VEE arch in that the doubly corrugated steel liner with 457 mm (18 inches) of lightly reinforced concrete used in the TAB VEE hardened shelters was represented by a scaled reinforced concrete T-beam without a steel liner. A separate effort to determine which type and configuration of T-beam would be most equivalent to the prototype shelter section was undertaken and is reported in reference 3. Figure 14 presents a sketch of the First Generation (TAB VEE) Shelter Arch. For test purposes this shelter has been designated as Shelter "B". Figure 15 is a photograph of the as-built configuration of Shelter "B".

Visual observation of shelter B indicated a considerable amount of inelastic response did occur. The arch deformed approximately 185 mm at the crown. Severe cracking was noticeable throughout the exterior and interior of the arch. The backwall was partially separated from the arch. Severe cracking and spalding were also evident inside the arch. The stiffener collar was severely damaged with large extensive cracks and spalding; however, it was quite obvious that the arch was much stiffer at the collar location.

Figures 16 and 17 are post-test photographs of the structure.

(1) As-Built Construction Details

This shelter was constructed by Falcon, Inc. of Socorro, NM. Photographically reduced as-built construction drawings of the shelter are contained in Appendix A.

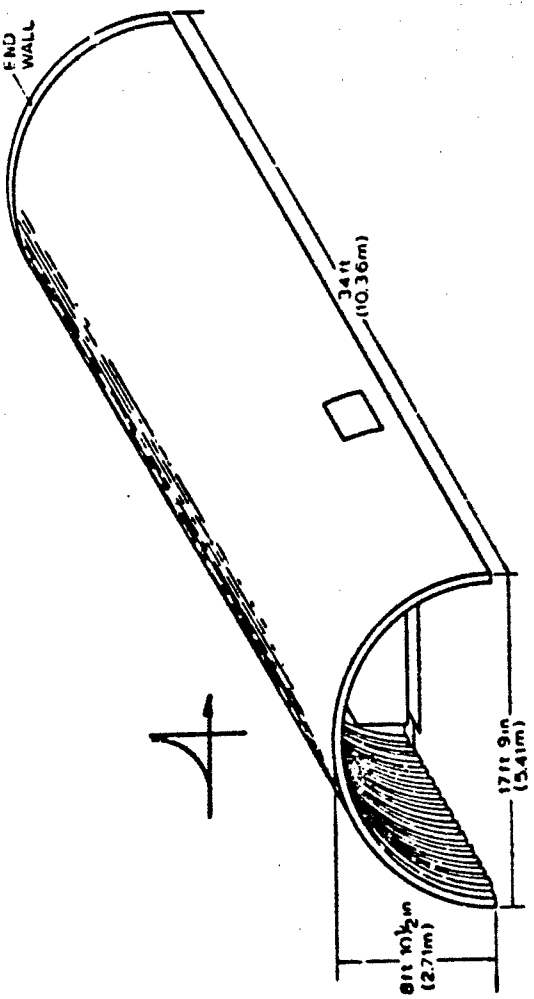


Figure 14. First Generation (TAB VEE) Shelter Arch - Shelter "B", Scaled

Figure 15. Shelter "B" As-Built Configuration

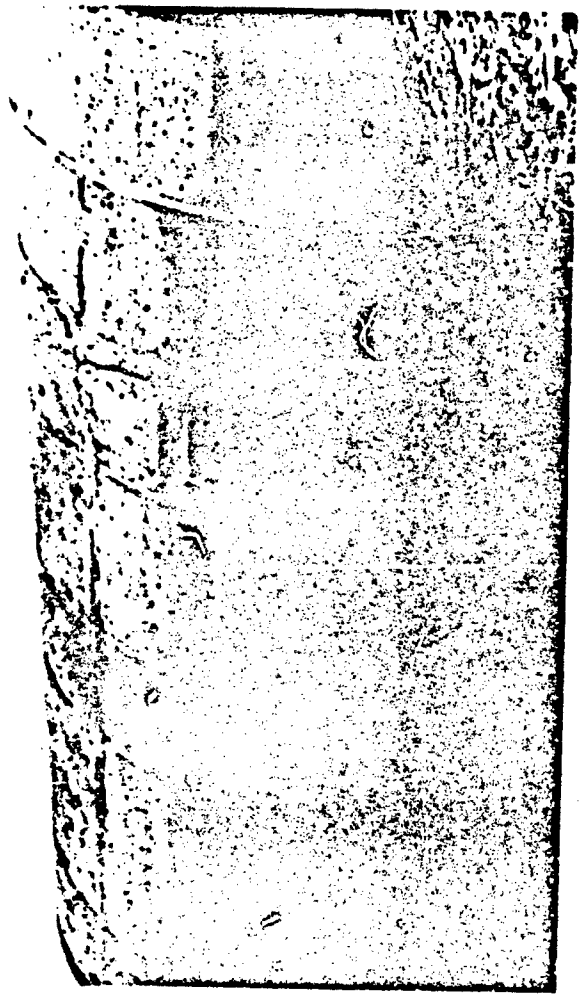


Figure 16. Shelter "B" Damage Incurred On Side Of Shelter

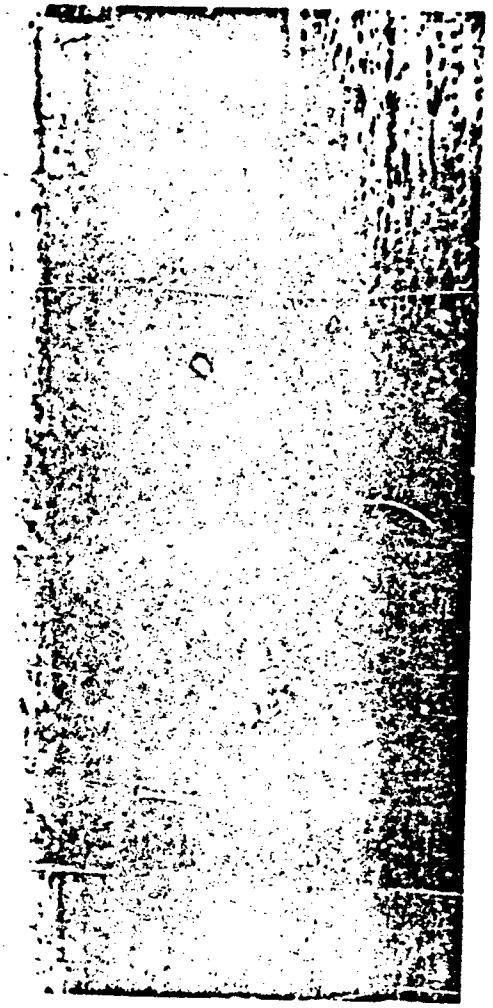


Figure 17. Shelter "B" Damage Incurred on Rear Wall Of Shelter

Two types and sizes of reinforcing steel were used in the model construction of the arch. The no. 3 bars (9.5 mm [3/8 inches]) conformed to ASTM specifications A-615, with a yield strength of 410 MPa (60 ksi). The no. 2 bar was 6 mm diameter reinforcing steel with strength characteristics similar to grade 60 stee. (490 MPa, 71 ksi). Figure 13 contains the stress/strain characteristics of these bars.

The concrete used for the construction of the shelter consisted of 20 mm (3/4 inches) maximum sized aggregate for the foundation, and 10 mm (3/8 inches) maximum sized aggregate for the arch. The mix was designed for a nominal 28 day strength of 38 MPa (4,000 psi). The concrete for the foundation was ready-mix concrete, transported approximately 72 km (45 miles) to the site. The arch concrete was produced on site, and placed with a concrete pump.

Tests were conducted on sample cylinders of the concrete used for various parts of the shelter. Table 4 shows the results of the cylinder tests. The average concrete cylinder strength on shot day was 34.4 MPa (5,000 psi).

The structure foundation was backfilled at the approximate optimum moisture content and compacted to approximately 96% modified AASAO density. The footings rested on undisturbed native material.

(2) Instrumentation

Instrumentation for the shelter consisted of 54 active electronic measurements, including blast pressures, accelerometers, velocity gages, and strain gages.

As-built instrumentation layout details are contained in Appendix A. For other details on the electronic measurements see Appendix B.

All high speed camera and technical motion picture documentation were lost; however, for information purposes, the locations and perspectives of the cameras are presented in Appendix C.

Table 4. Shelter "B" Results Of Concrete Cylinder Strength Tests (MPa)

Cylinder No.	7 Days	14 Days	28 Days	Shot Day	Remarks
083-36		24.89 (3,610 psi)			Rear Wall
083-37			27.03 (3,920 psi)		Rear Wall
083-14			30.68 (4,450 psi)		Door Area
083-10	20.34 (2,950 psi)				Footing
083-11	20.13 (2,920 psi)				Footing
083-12			27.58 (4,000 psi)		Footing
083-13			19.37 (2,810 psi)		Footing
083-15			30.68 (4,450 psi)		Door Area
083-32	23.44 (3,400 psi)				Door Area
083-33	26.6 (3,860 psi)				Door Area
083-34			35.58 (5,160 psi)		Door Area
083-35			35.10 (5,090 psi)		Door Area
CERF-2				33.30 (4,830 psi)	Footing
CERF-8				33.16 (4,810 psi)	"
CERF-14				31.44 (4,560 psi)	Interm. Door
CERF-32				35.58 (5,160 psi)	Arch
CERF-33				36.82 (5,340 psi)	"
CERF-34				32.34 (4,690 psi)	"
CERF-35				40.75 (5,910 psi)	"
CERF-53				31.92 (4,630 psi)	Rear Wall

(3) Data Presentation

The data presentation consists of the following corrected and raw data plots:

(a) Pressure-time

(b) Velocity-time

(c) Acceleration-time

(d) Strain-time

Table 5 shows the measurement numbers for the above measurements that pertain to shelter "B". These same measurement numbers are contained on the header of each data plot.

A table precedes each set of data plots, listing by the above measurement numbers the corrections performed on that particular measurement.

The data for shelter "B" is presented in Appendix E.

C. Upgraded First Generation (TAB VEE) Shelter Arch - Shelter "C", Scaled

This upgraded TAB VEE arch structure was tested, oriented side-on to the blast at a range of approximately 150 meters (500 ft). This shelter is the same as Shelter "B", but with a heavy overlay of concrete. As with Shelter "B", end walls were constructed at each end of the structure to prevent entry of blast pressure. This shelter was also a modified one-third linearly scaled model with the same reinforced concrete T-beam as shelter "B", replacing the corrugated steel liner. The upgraded portion of the model is an overlay of reinforced concrete, which is 508 mm (20 inches) thick at the crown and flared to 1.21 m (4 feet) at the foundation. A general description of the shelter is provided in figure 18. Figure 19 is a photograph of the as-built configuration of shelter "C".

Visual inspection of shelter "C" indicates, as expected, structural response remained elastic. There was very little cracking of the structural concrete.

Figures 20, 21, and 22 are post-test photographs of the structure.

Table 5. Shelter B, Measurement Numbers

Blast Pres.	Accel.	Vel.	Strain
1	105	201	401
2	106	202	402
3	107	203	403
4	108	204	404
5	4	205	405
6		206	406
7		207	407
8		208	408
9		209	409
10		210	410
11		211	411
12		212	412
13		232	413
14		233	414
14		234	415
		235	416
		16	417
			418
			419
			420
			20

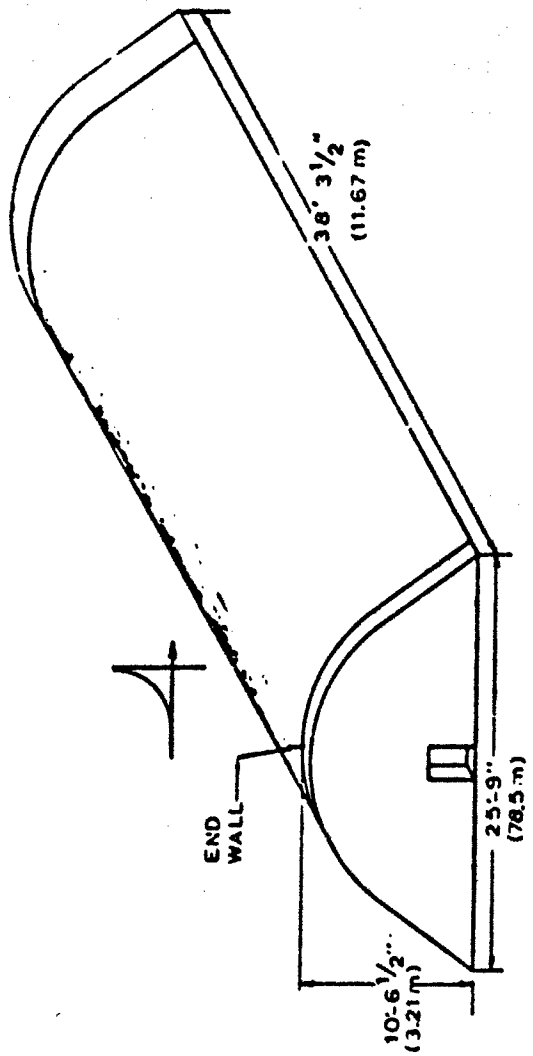


Figure 18. Upgraded First Generation (TAB VEE) Shelter Arch - Shelter "C", Scaled

Figure 19. Shelter "C" As-Built Configuration

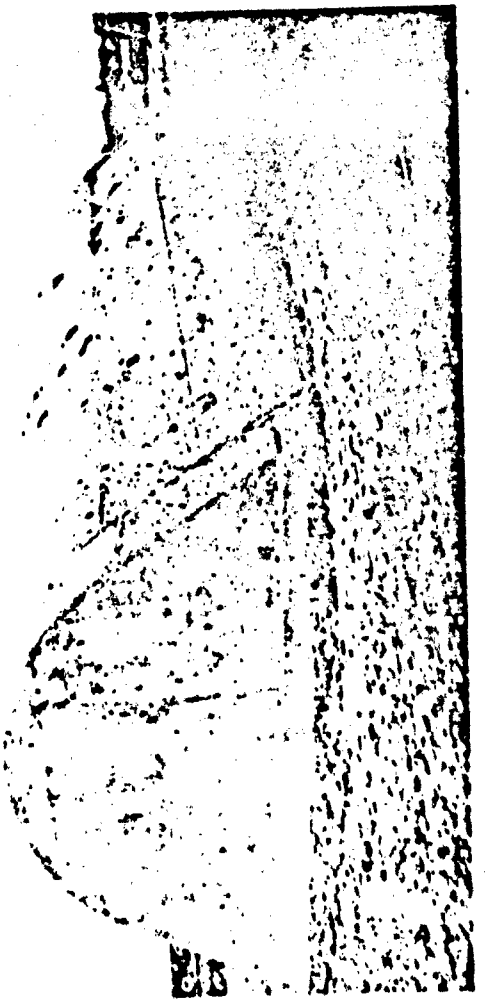


Figure 20. Shelter "C" Debris On Shelter Resulting From Blast

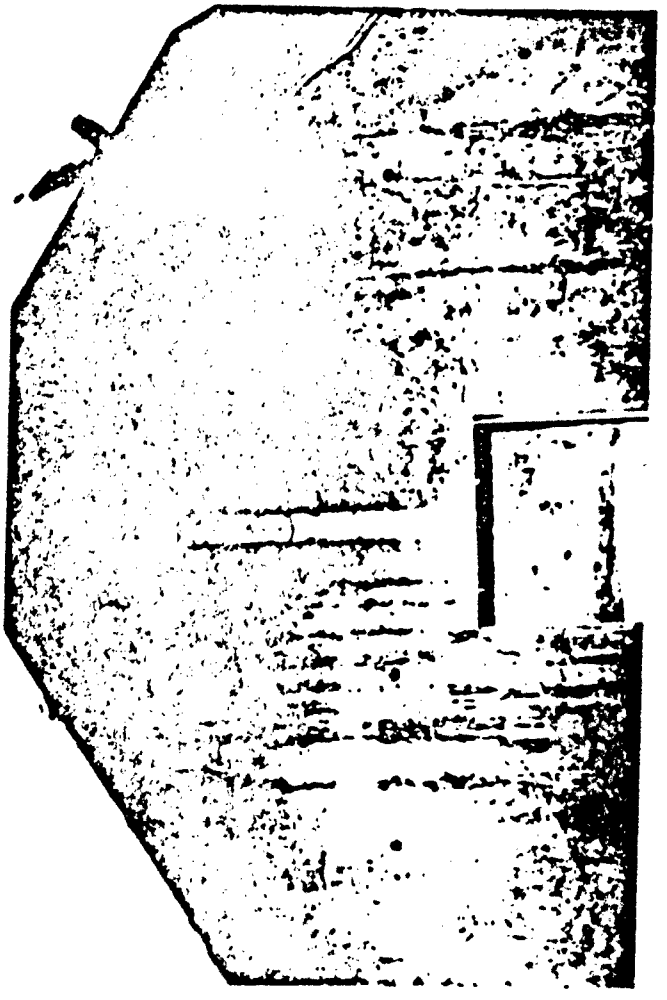


Figure 21. Shelter "C" Cracks On Front Of Shelter Resulting From Blast

Figure 22. Shelter "C" Cracks On Roof Of Shelter Resulting From Blast

(1) As-Built Construction Details

This shelter was also constructed by Falcon Inc. of Socorro, NM. As built construction drawings of the shelter are contained in Appendix A.

The same types and sizes of reinforcing steel were used in this shelter as in shelter "B".

The same concrete mix, hauling, and placing procedures were used for shelter "C" as for shelter "B". Table 6 contains the results of the sample concrete cylinder tests taken on the concrete used in the shelter. The average concrete cylinder test strength on test day was 31.3 MPa (4500 psi).

The structure was backfilled at the approximate optimum moisture content and compacted to approximately 98% modified AASHO density. The footings rested on undisturbed native material.

(2) Instrumentation

Instrumentation for the test structure consisted of 74 active electronic measurements, including blast pressures, accelerometers, velocity gages, and strain gages.

As-built instrumentation layout details are contained in Appendix A. For other details on the electronic measurements see Appendix B.

All high speed camera and technical motion picture documentation were lost; however, for information purposes, the locations and perspectives of the cameras are presented in Appendix C.

(3) Data Presentation

The data presentation consists of the following corrected and raw data plots:

(a) Pressure-time

(b) Velocity-time

(c) Acceleration-time

(d) Strain-time

Table 6. Shelter "C" Results Of Concrete Cylinder Strength Tests (MPa)

Cylinder No.	Age At Testing 7 Days	14 Days	28 Days	Shot Day	Remarks
083-4	22.48 (3,260 psi)				Footing
083-5			27.23 (4,890 psi)		"
083-6	21.86 (3,170 psi)				"
083-7			35.58 (5,160 psi)		"
083-24			33.37 (4,840 psi)		Arch
083-26			33.65 (4,880 psi)		"
083-27			32.89 (4,770 psi)		"
083-28			34.13 (4,950 psi)		"
083-28			31.03 (4,500 psi)		"
083-29			29.92 (4,340 psi)		"
083-38		27.23 (3,950 psi)			Upgrade Footing
083-39			28.48 (4,130 psi)		" "
083-40		21.72 (3.150 psi)			Upgrade Backwall
083-41			28.20 (4,090 psi)		" "
083-42			30.41 (4,410 psi)		" "
083-43			30.96 (4,490 psi)		" "
083-44		26.75 (3,880 psi)			Upgrade Front Wall
083-45			29.92 (4,340 psi)		" " "
083-46			31.65 (4,590 psi)		" " "
083-47	21.72 (3,150 psi)				Upgrade Side Footing
083-48			27.99 (4,060 psi)		" " "
083-49			29.72 (4,310 psi)		" " "
083-50			30.41 (4,410 psi)		" " "
083-53			27.71 (4,020 psi)		Upgrade Overlay
083-54			27.92 (4,050 psi)		" "
083-55			27.92 (4,050 psi)		" "
083-56			29.44 (4,270 psi)		" "
083-57			29.51 (4,280 psi)		" "
083-58			28.20 (4,090 psi)		" "
083-59			28.48 (4,130 psi)		" "
083-60			27.99 (4,060 psi)		" "
083-61			28.61 (4,150 psi)		" "
083-62			28.96 (4,200 psi)		" "
083-63			28.89 (4,190 psi)		" "
083-64			28.20 (4,090 psi)		" "
083-65			27.72 (4,070 psi)		" "

Table 6 (Cont'd)

Cylinder No.	Age At Testing 7 Days	14 Days	28 Days	Shot Day	Remarks
083-66			29.37 (4,260 psi)		Upgrade Overlay
083-67			27.58 (4,000 psi)		" "
083-68			27.58 (4,000 psi)		" "
083-69			30.13 (4,370 psi)		" "
083-70			29.58 (4,290 psi)		" "
CERF-3				36.20 (5,250 psi)	Arch
CERF-4				33.23 (4,820 psi)	Footing
CERF-5				36.13 (5,240 psi)	Arch
CERF-24				35.92 (5,210 psi)	"
CERF-25				40.27 (5,840 psi)	"
CERF-26				33.51 (4,860 psi)	"
CERF-27				35.10 (5,090 psi)	"
CERF-28				37.44 (5,430 psi)	"
CERF-29				36.34 (5,260 psi)	"
CERF-31				35.37 (5,130 psi)	"
CERF-41				28.41 (4,120 psi)	Upgrade Overlay
CERF-42				27.37 (3,970 psi)	" "
CERF-43				28.06 (4,070 psi)	" "
CERF-44				25.36 (3,680 psi)	" "
CERF-45				20.34 (2,950 psi)	" "
CERF-46				29.72 (4,310 psi)	" "
CERF-47				27.79 (4,030 psi)	" "
CERF-48				24.06 (3,490 psi)	" "
CERF-49				22.06 (3,200 psi)	" "
CERF-50				31.72 (4,600 psi)	Upgrade Footing
CERF-51				29.79 (4,320 psi)	" "
CERF-52				33.79 (4,900 psi)	" "

Table 7 shows the measurement numbers for the above measurements that pertain to shelter "C". These same measurement numbers are contained on the headers of the data plots.

A table precedes each set of data plots which lists by the above measurement numbers the corrections performed on each measurement.

The data for shelter "C" is presented in Appendix F.

D. Hard Flush Aircraft Shelter - Shelter "D", Scaled

The fourth structure tested in the event was a one-third size model of a Boeing designed underground aircraft shelter. The model did not include a hydraulic elevator system as in the prototype design. This item was eliminated as a cost savings factor. Figure 23 is a sketch of the Hard Flush Aircraft Shelter. For test purposes, this shelter was designated as Shelter "D". Figures 24 and 25 are photographs of shelter during construction. Figure 26 is a photograph of the completed shelter with the AN/FO charge in the background.

The purpose of testing the model was to obtain experimental verification of the airblast and related ground shock protection level afforded by this advanced shelter concept.

The shelter was buried at a distance of 90 m (295.3 ft) from ground zero with the top flush with the ground. The shelter was exposed to 2.1 MPa (265 psi) incident overpressure level.

Visual observation of the test structure post-test indicated it sustained minor damage only. There were diagonal cracks at the top corners of walls toward ground zero, (see Figure 27). There were also several cracks running parallel on top of the roof, perpendicular to the ground zero azimuth, (see Figure 28). Damage inside the shelter was limited to minor cracks, and one large spall on the fixed cantilever roof. See Figures 29 and 30. A large steel frame placed in the shelter to support hydraulic jacks, for lifting of the roof pre- and post-test was moved only about 6 mm, (1/4 inch), (see Figure 31).

Table 7. Shelter C, Measurement Numbers

Blast Pres.	Accel	Vel	Strain	
15	109	213	421	-Continued-
16	110	214	422	452
17	111	215	423	453
18	112	216	424	454
19	4	217	425	455
20		218	426	456
21		219	427	457
22		220	428	458
23		221	429	459
24		222	429	460
25		223	431	41
26		224	432	
27		236	433	
28		237	434	
14		238	435	
		239	136	
		16	437	
			438	
			439	
			440	
			441	
			442	
			443	
			444	
			445	
			446	
			447	
			448	
			449	
			450	
			451	
			452	

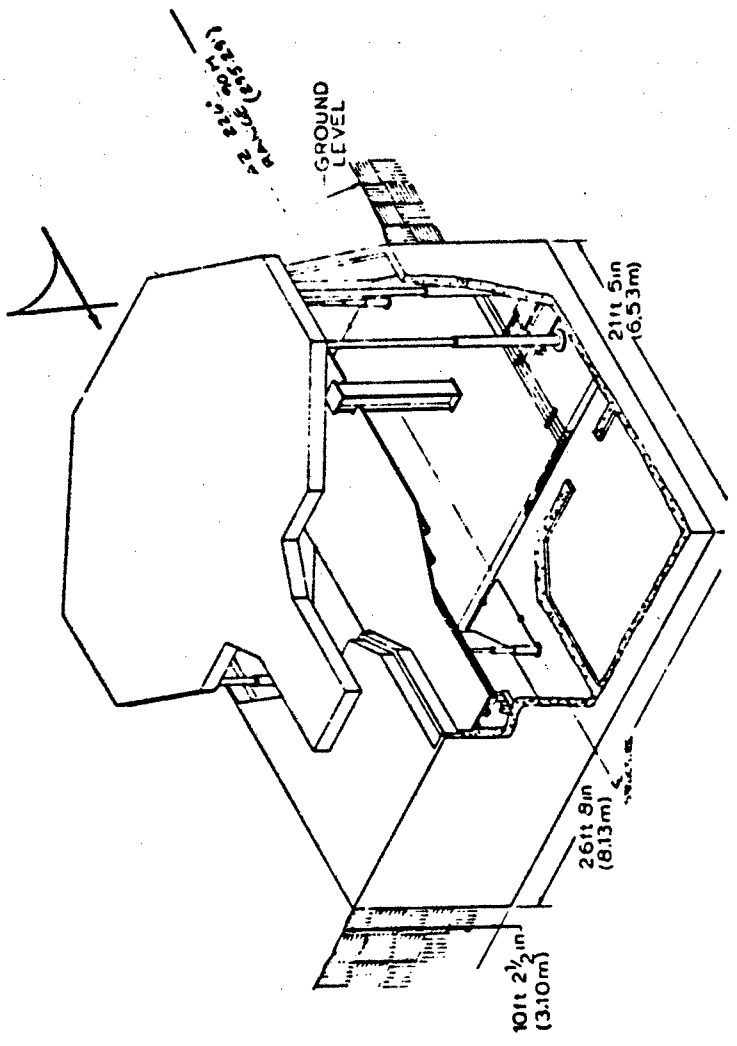


Figure 23 Hard Flush Aircraft Shelter - Shelter "D", Scaled

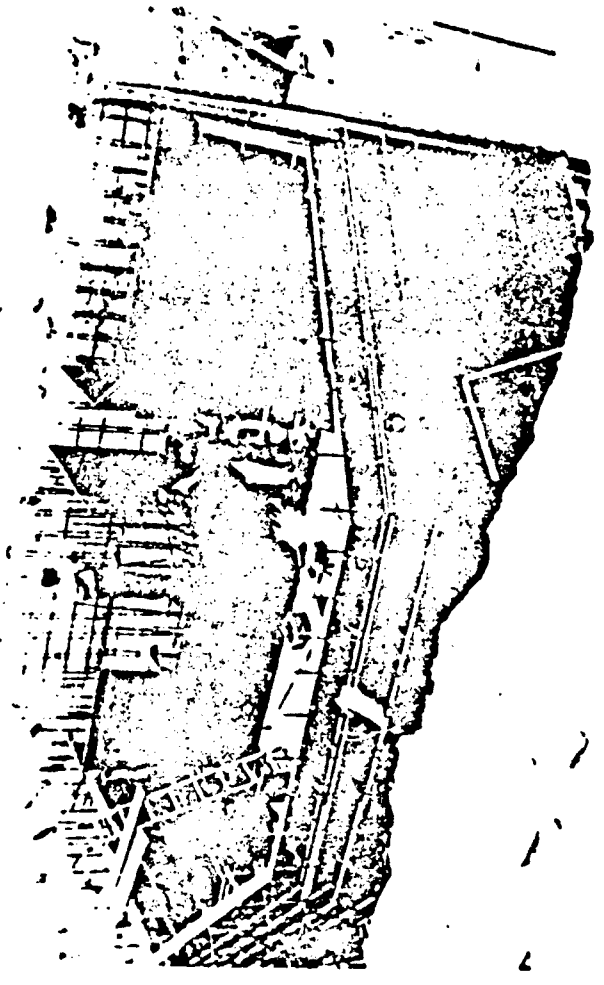


Figure 24. Shelter "D" Approximately 30 Complete

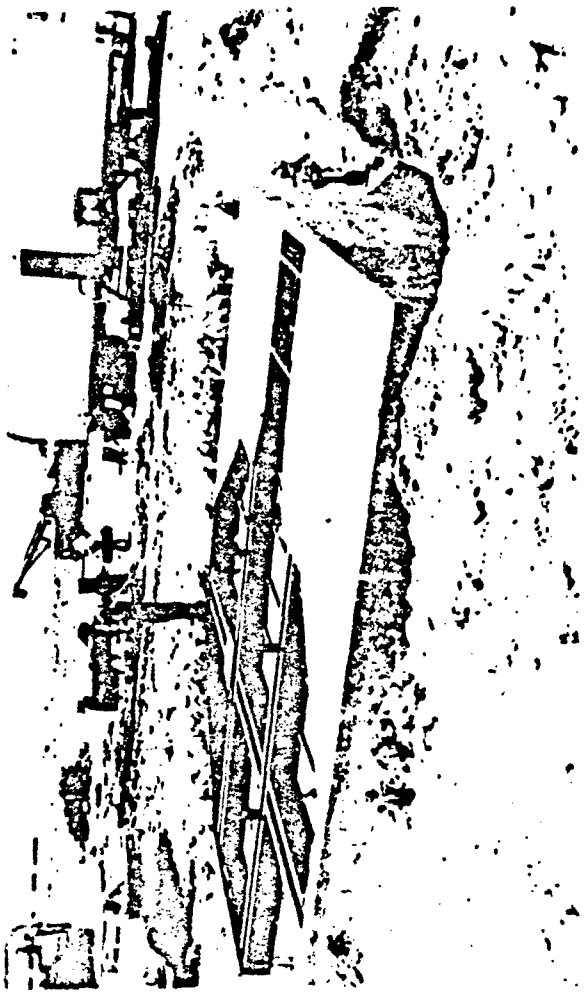


Figure 25. Shelter "D" Approximately 95% Complete

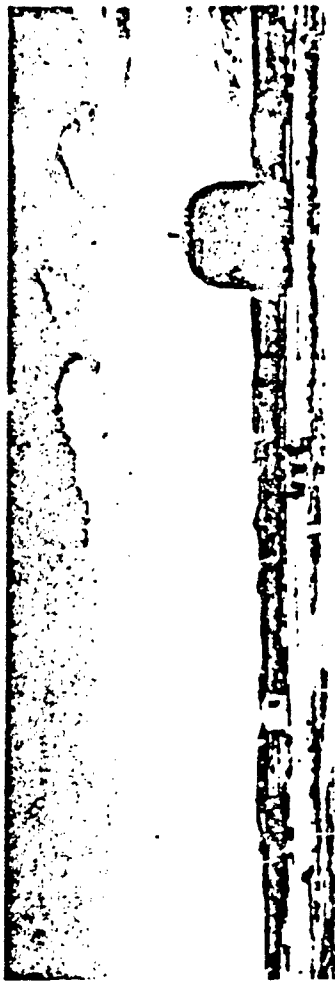


Figure 26. Shelter "D" Complete and Charge Configuration In Background

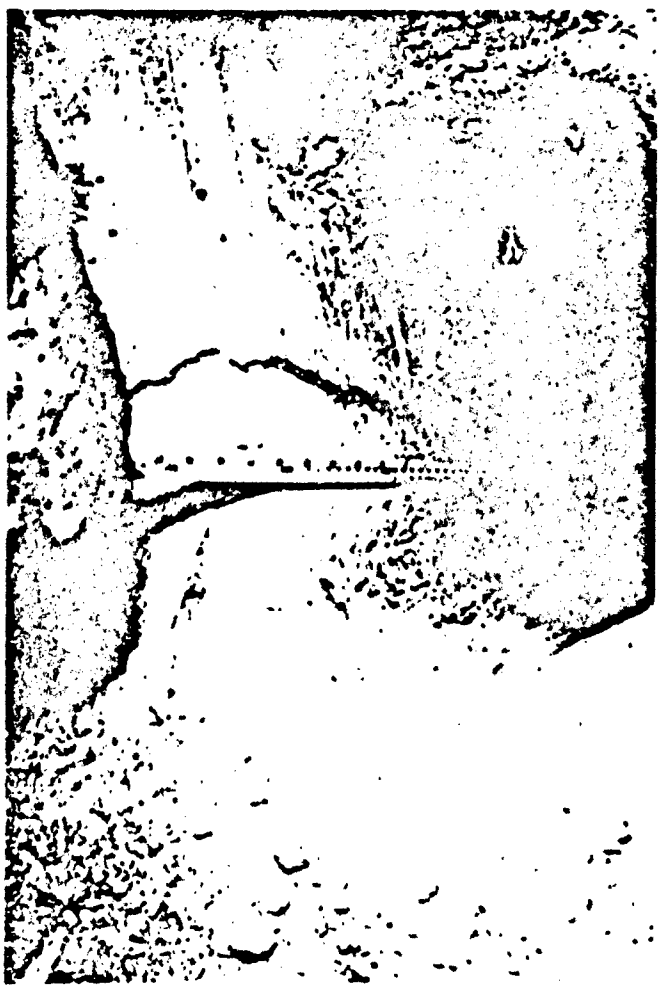


Figure 27. Shelter "D" Diagonal Cracks On Top Of Corner Resulting From Blast

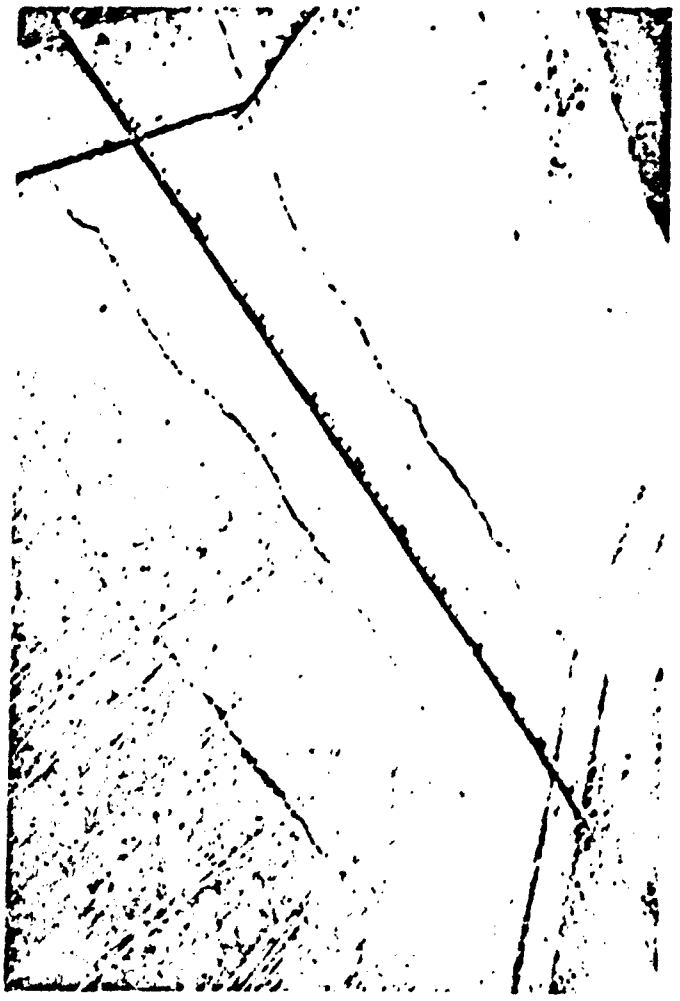


Figure 28. Shelter "D" Cracks Running Parallel On Top Of Roof Resulting From Blast

Figure 29. Shelter "D" Damage Inside Of Shelter

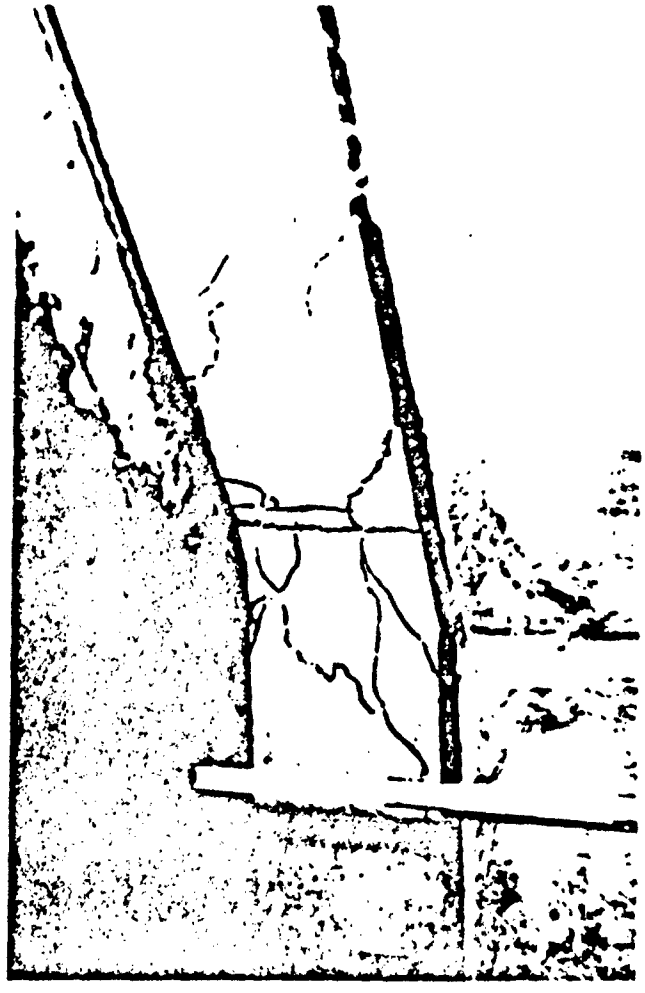


Figure 30. Shelter "D" Damage On Corner Of Shelter

Figure 31. Shelter "D" Displacement Of Steel From Inside Of Shelter

(1) As-Built Construction Details

The Hard Flush Aircraft Shelter was constructed by the Rutherford Construction Company of Albuquerque. Photographically reduced as-built construction drawings of the shelter are contained in Appendix A.

Four different sizes of reinforcing steel were used in the model construction, all of which conformed tc ASTM Specifications A-615, Grade 60, with a yield strength of 410 MPa (60 ksi).

Seven different thicknesses of steel plates were used in the construction. All plates conformed to ASTM Spec. A-36.

The concrete was batched on site and consisted of 20 mm (3/4 inch) maximum-sized aggregate. The mix was designed to have a nominal 28-day strength of 28 MPa (4,000 psi). Tests were conducted on sample cylinders of the concrete used for the various parts of the shelter. Table 8 shows the results of the concrete cylinder tests. The average strength of these tests on test day was 33.5 MPa, (4,850 psi).

The shelter walls were backfilled at the approximate optimum moisture content and compacted to an average modified AASHO density of 94.5 percent.

(2) Instrumentation

Instrumentation for the shelter consisted of 76 active electronic measurements, 16 of which were in the free field. The 16 free field gages were on the centerline of the structures, and 3 m (9.8 ft) from either edge of the structure toward and away from ground zero. Other measurements included blast pressures, accelerometers, velocity gages, strain gages, and interface pressure gages. The As-Built instrumentation layout details are contained in Appendix A. For other details on the electronic measurements, see Appendix B.

All high speed cameras and technical motion picture documentation of the shelter during the test event were also lost because of a switch being accidentally activated prior to the test event. However, for information purposes, the

Table 8. Shelter "D" Results Of Concrete Cylinder Strength Tests (MPa)

CYLINDER NO.	7 Days	28 Days	Shot Day	Remarks
103-27	25.16 (3650 psi)			Movable Roof
103-28	26.40 (3930 psi)			" "
103-29	25.79 (3740 psi)			" "
103-30		34.96 (5070 psi)		" "
103-31		32.13 (4660 psi)		" "
103-32		34.34 (4980 psi)		" "
103-33		33.95 (4910 psi)		" "
103-21	21.10 (3060 psi)			Shelter Head Works
103-22	22.61 (3280 psi)			" "
103-23	20.82 (3020 psi)			" "
103-15	27.09 (3930 psi)			Shelter Walls
103-16	21.72 (3150 psi)			Shelter Walls
103-17	21.24 (3080 psi)			Shelter Walls
106-5	23.30 (3380 psi)			Shelter Footings
106-6	23.92 (3470 psi)			" "
106-7	21.10 (3060 psi)			" "
103-18		31.65 (4590 psi)		Shelter Walls
103-19		33.37 (4840 psi)		" "
103-20		33.65 (4880 psi)		" "
103-8		29.72 (4310 psi)		Shelter Footing
103-9		30.20 (4380 psi)		" "
103-24		31.30 (4540 psi)		Shelter Headworks
103-25		30.68 (4450 psi)		" "
103-26		29.23 (4240 psi)		" "

Table 8. (Cont'd)

CYLINDER NO.	7 Days	28 Days	Shot Day	Remarks
CERF-9			32.96 (4730 psi)	Shelter Footings
CERF-10			31.85 (4620 psi)	" "
CERF-11			33.65 (4930 psi)	" "
CERF-12			33.51 (4860 psi)	" "
CERF-15			33.23 (4820 psi)	Interior Floor
CERF-16			33.61 (5310 psi)	" "
CERF-17			34.34 (4980 psi)	Shelter Wall
CERF-21			29.23 (4240 psi)	" "
CERF-22			32.89 (4770 psi)	Shelter Headworks
CERF-23			30.32 (4470 psi)	" "
CERF-38			36.20 (5250 psi)	Moveable Roof
CERF-39			36.33 (5270 psi)	" "
CERF-40			36.74 (5330 psi)	" "

locations and perspectives of the cameras are presented in Appendix C.

One of the photo poles shown in Appendix C behaved much like a passive scratch gage and showed the relative vertical motion of the shelter floor and the bottom of the moveable roof. The photo pole is labeled "Target for Camera #1" in Appendix C, and a photograph of it is shown in Figure C-3. The scratch on the pole indicated a relative vertical motion of approximately 35 mm (1-5/16").

(3) Data Presentation

The data presentation consists of the following corrected and raw data plots:

(a) Pressure-time

(b) Velocity-time

(c) Acceleration-time

(d) Strain-time

(e) Interface Pressure-time

Table 9 shows the measurement numbers for the above measurements that pertain to shelter "D". These same measurement numbers are contained on the headers of the plots.

A table precedes each set of data plots which lists by the above measurement numbers the corrections performed on each measurement.

The data for Shelter D is presented in Appendix G.

Table 9. Shelter D, Measurement Numbers

Blast Press.	Accel	Vel	Interface Pres	Strain
47	113	240	554	517
48	114	241	555	518
49	115	242	556	519
50	116	243	557	520
51	117	246	558	521
52	118	247	559	522
53	119	248	560	523
7	120	249	561	524
	121	250	562	525
	122	251	9	526
	123	256		527
	124	253		528
	125	254		529
	126	255		530
	127	256		531
	128	257		532
	129	258		533
	17	259		534
		18		535
				536
				537
				538
				539
				540
				541
				25

REFERENCES

1. Swartz, Louis M. "Aircraft Shelter-DICE THROW TEST And Instrumentation Plan, Volume 1: Test Plan", AFWL-DE-TN-76-003, Kirtland Air Force Base, NM, February 1976.

2. Plamondon, M.A., Kruger, Lt, Pahl, Maj, "Response Of Air Force Structures in the MIXED COMPANY Event", AFWL-TR-74-13, Kirtland Air Force Base, NM, April 1974.

3. Walker, Larry A. "Shelter Section Model Behavior", Eric H. Wang, Civil Engineering Research Facility Letter Report ABS-6, Albuquerque, NM, May 1976.

4. Chang, Lt. "Predictions for the Response of Air Force Arch Structures in the DICE THROW Event", AFWL-DE-TN-76-017, Kirtland Air Force Base, NM, September 1976.

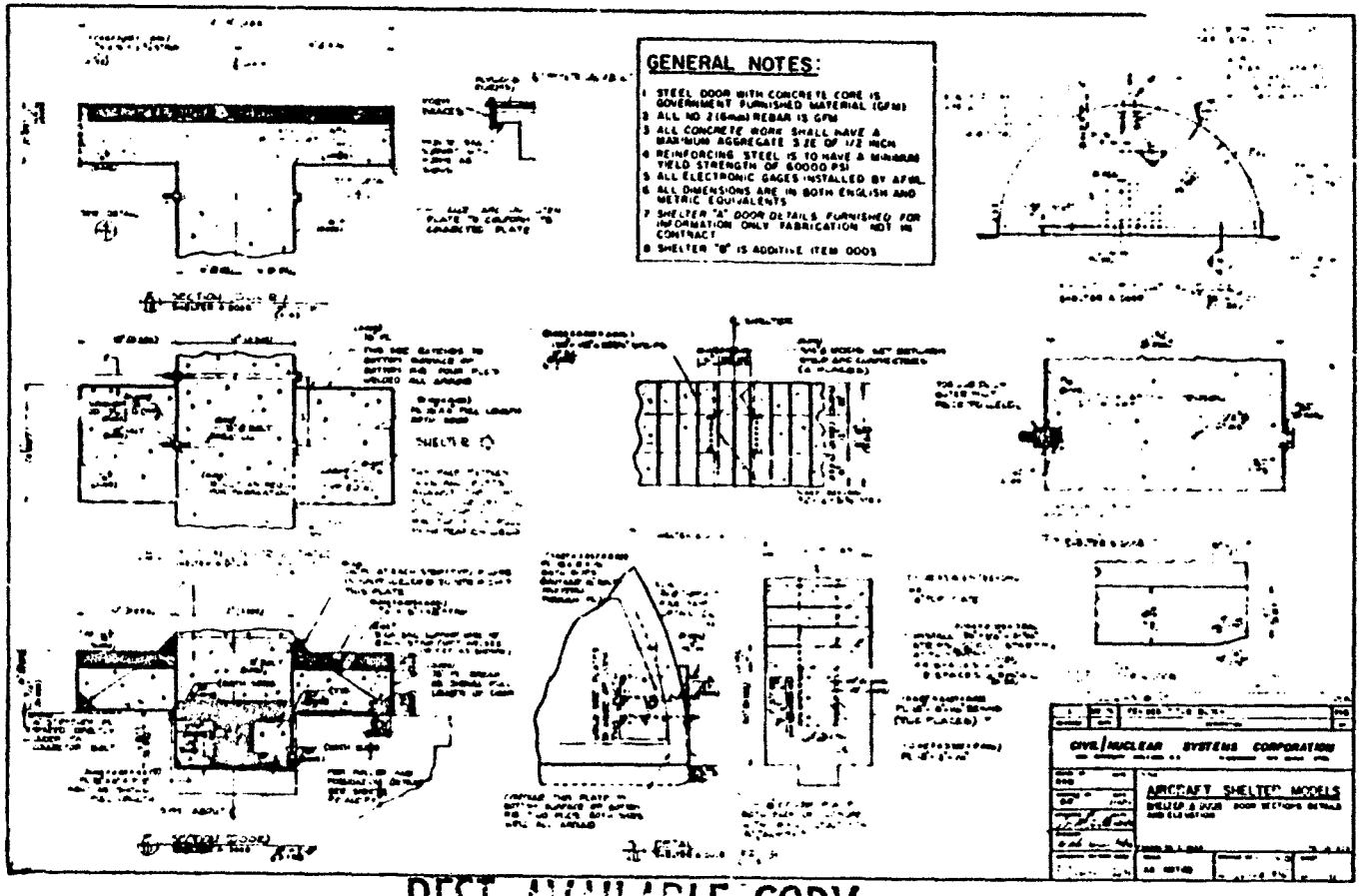
5. Duffey, T.A., dela Garza, W., Bultmann, E.H., Crawford, R.E., "Design and Pre-Test Report for a One-Third Scale Model Aircraft Shelter Closure", AFWL-DE-TN-76-009, Kirtland Air Force Base, NM, April 1976.

6. Choate, Capt. "Hard Flush Aircraft Shelter", AFWL-TR-76-163, Kirtland Air Force Base, NM, June 1976.

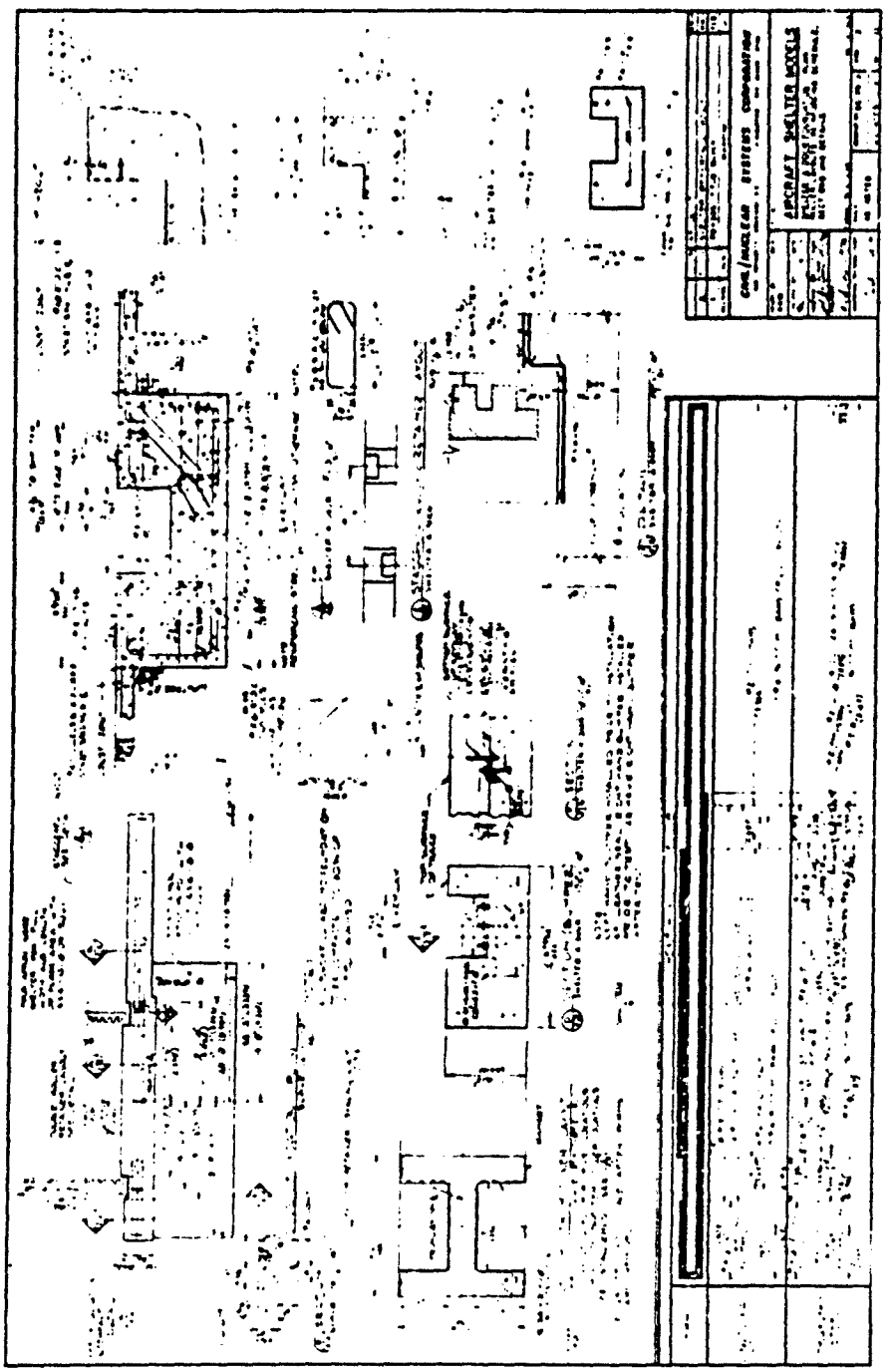
7. Letter Report, Chown, W.C., to AFWL/DES-S, "600-Ton AN/FO Airblast Loadings", 3 Volumes, August 1976.

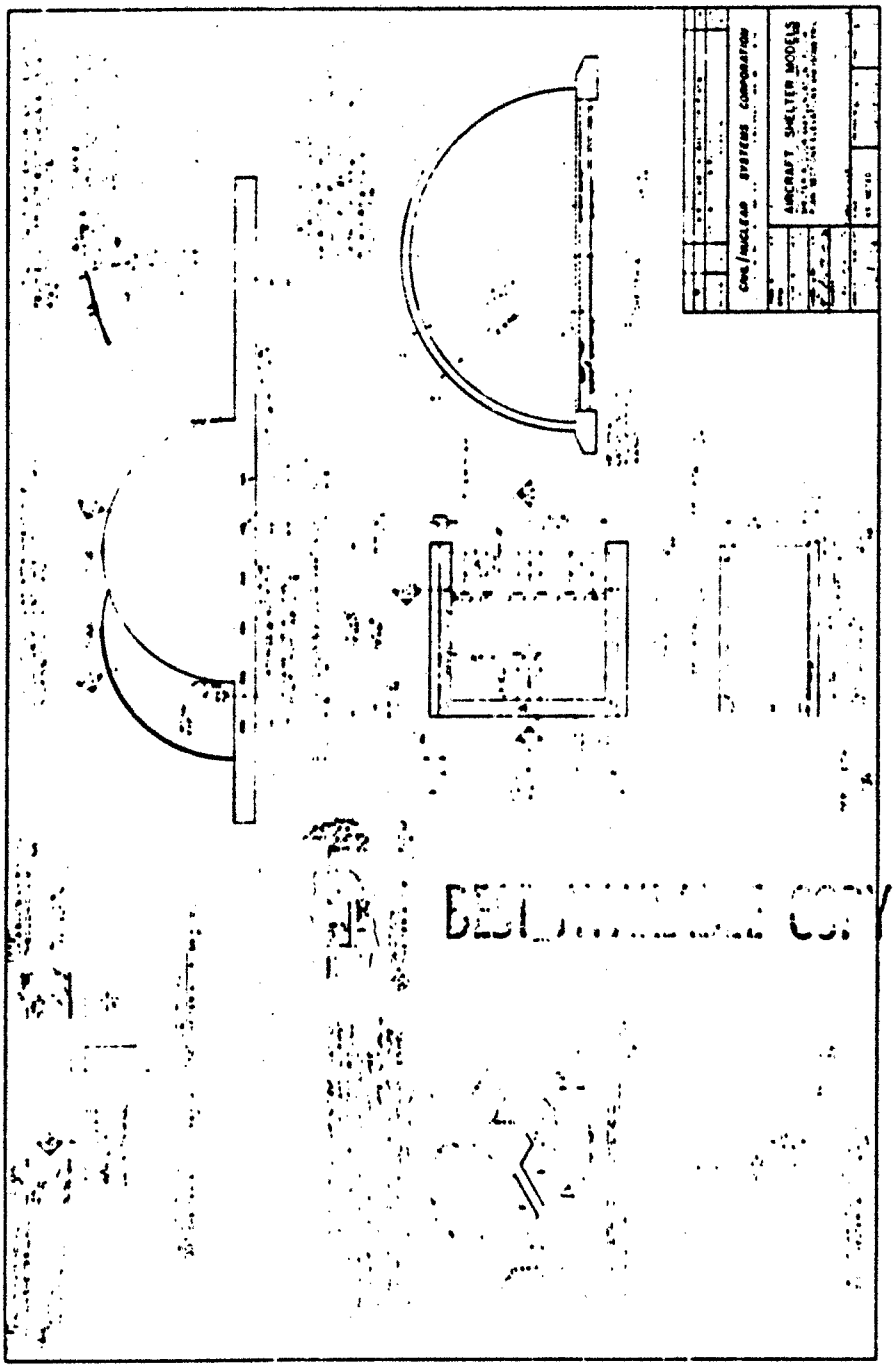
APPENDIX A

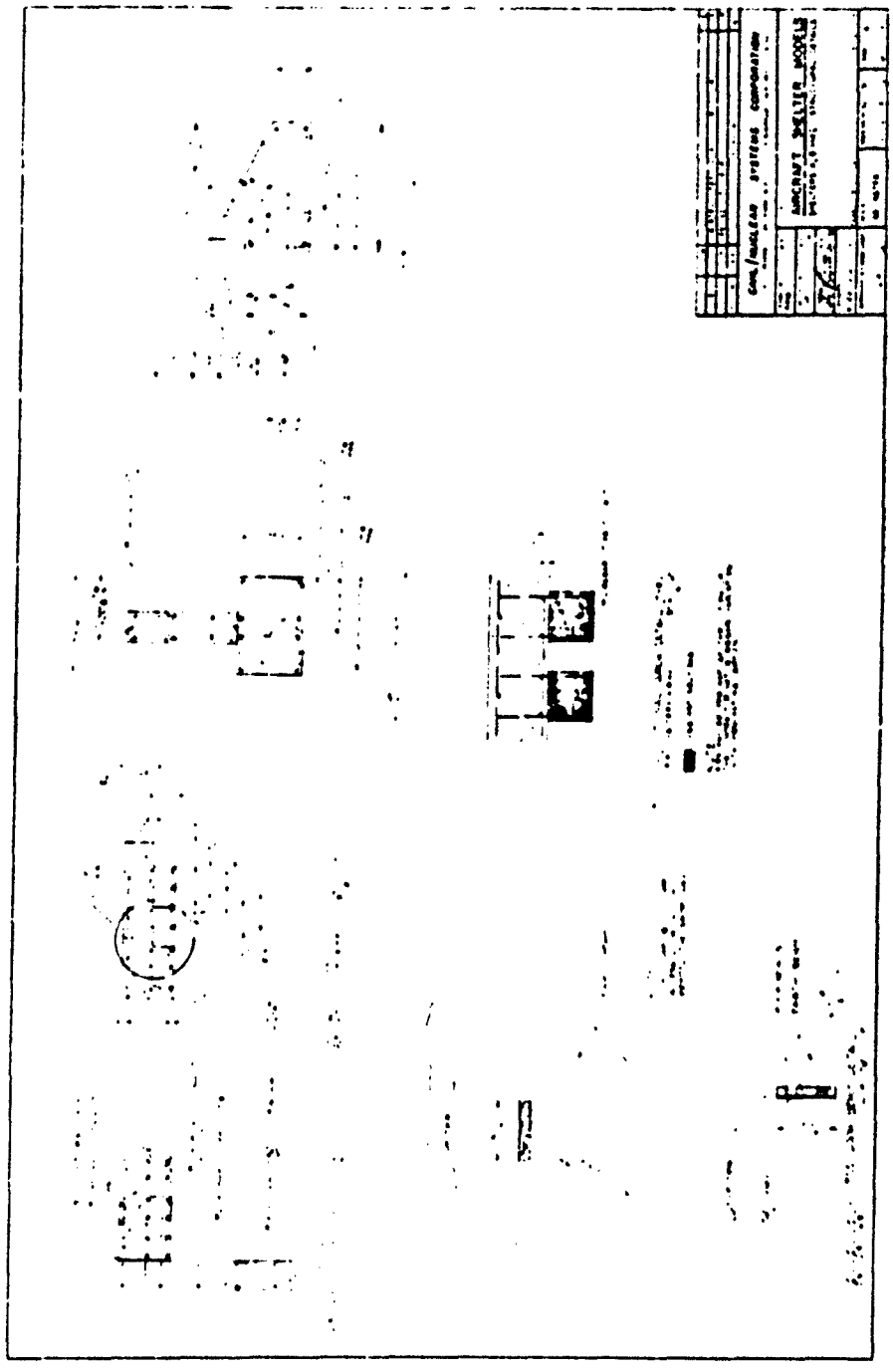
AS-BUILT CONSTRUCTION DRAWINGS

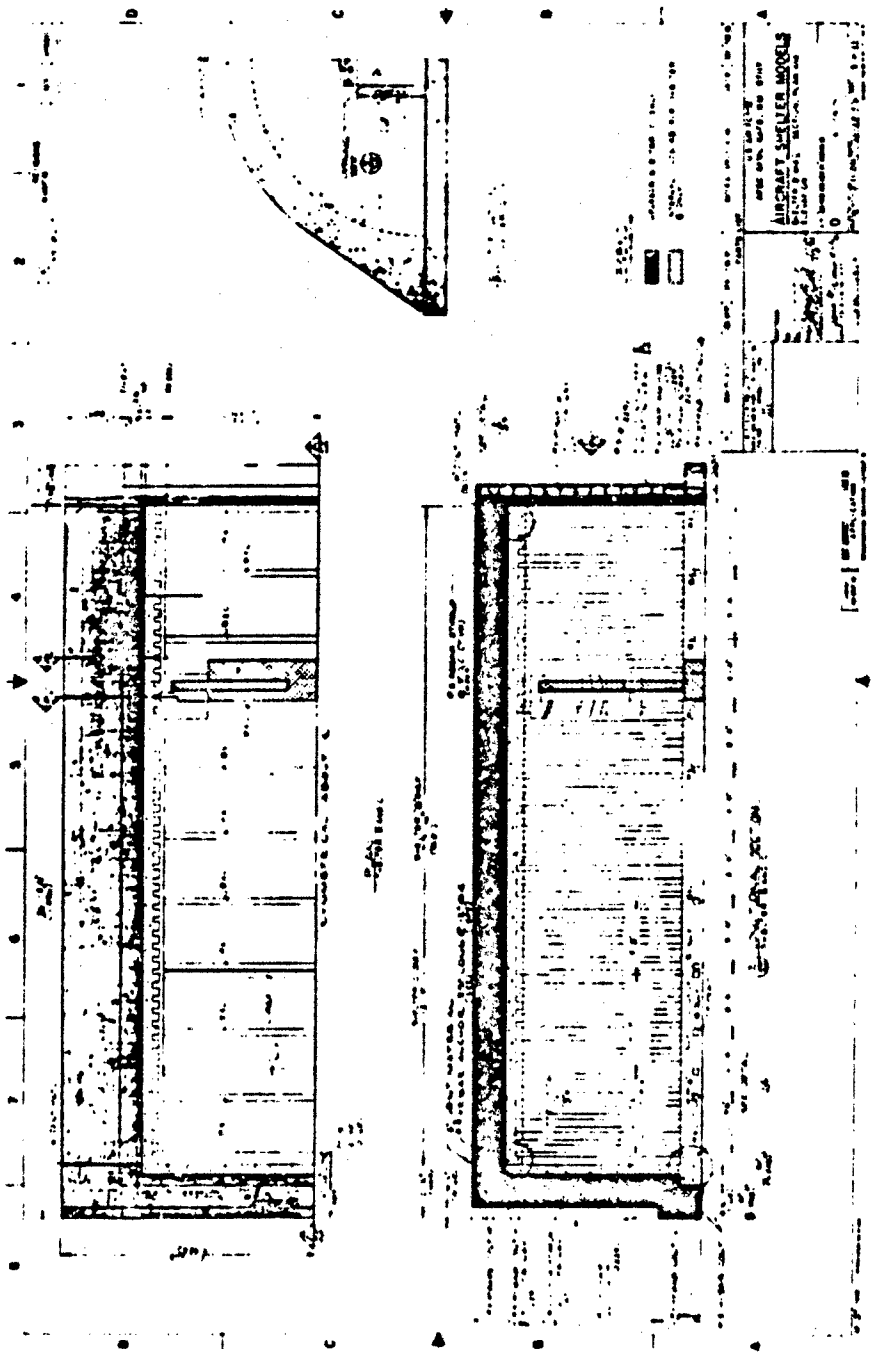


BEST AVAILABLE COPY

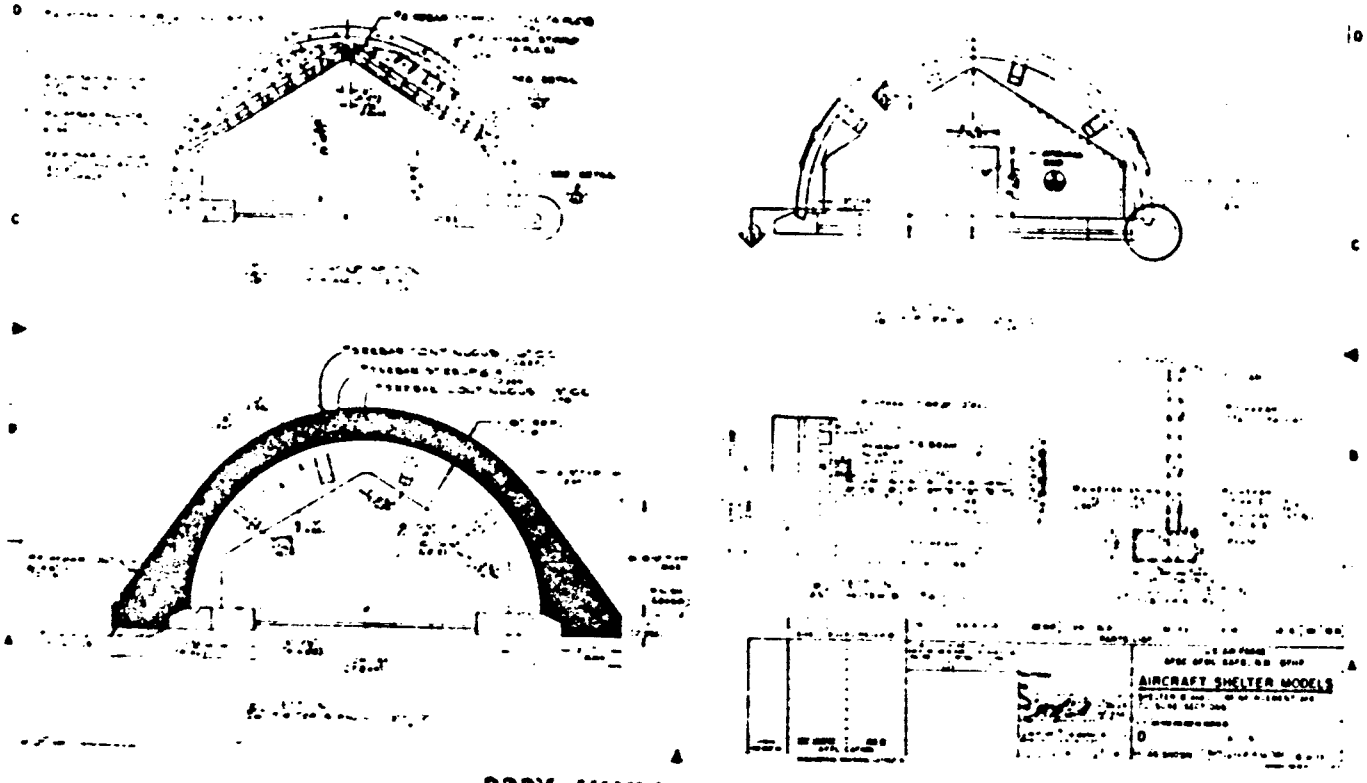



AIRCRAFT SHELTER MODELS

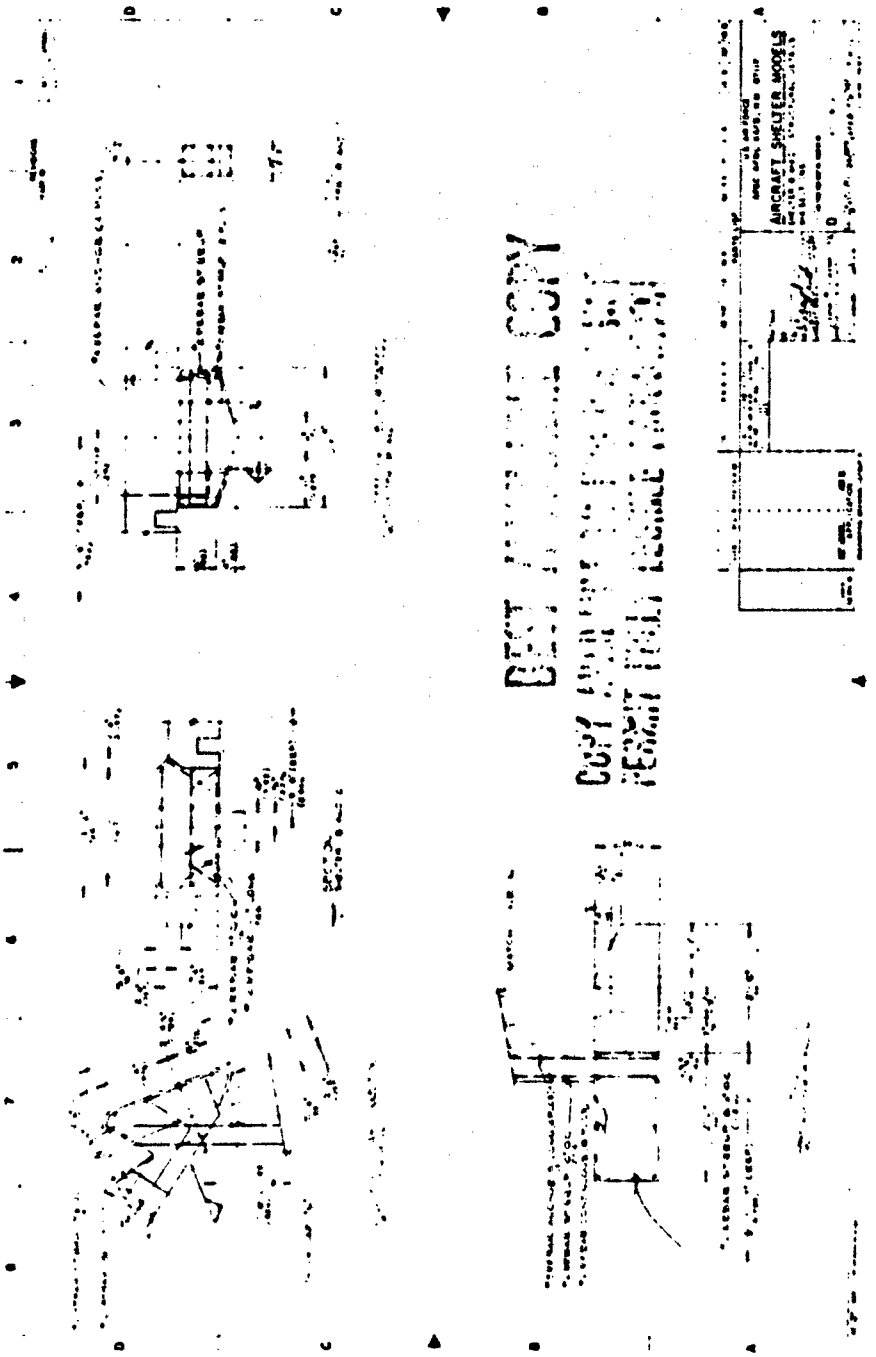


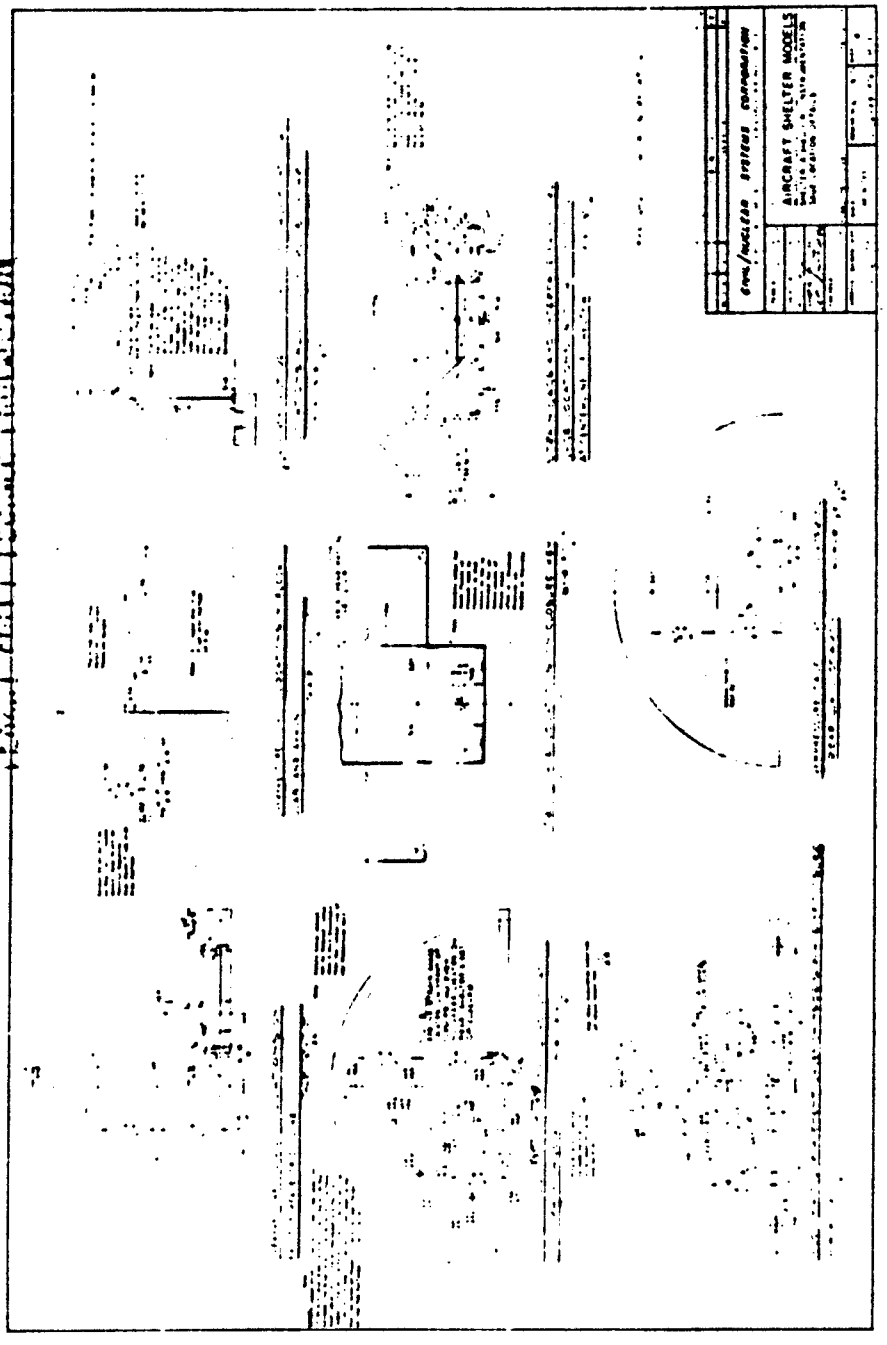


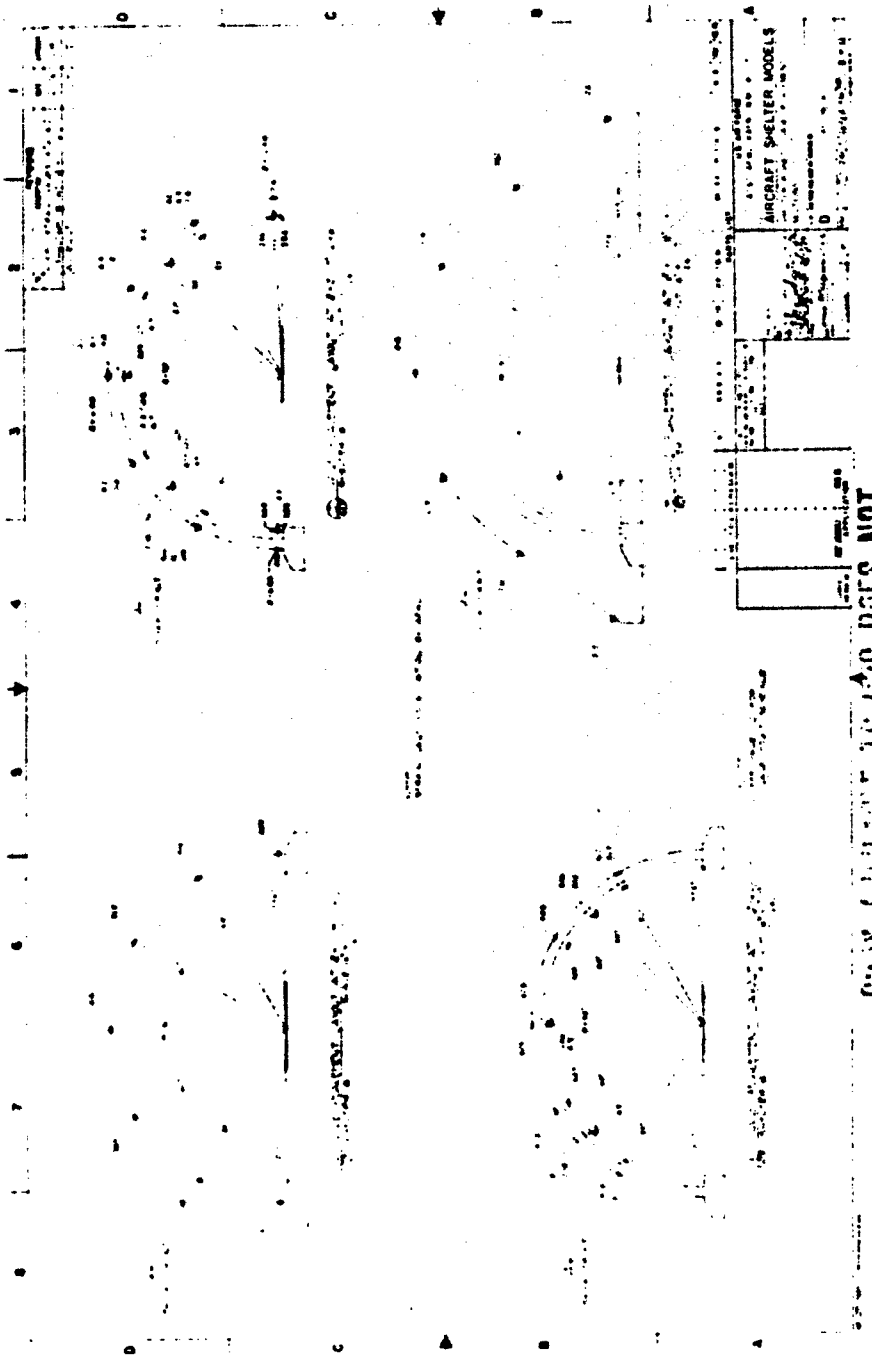
BEST AVAILABLE COPY



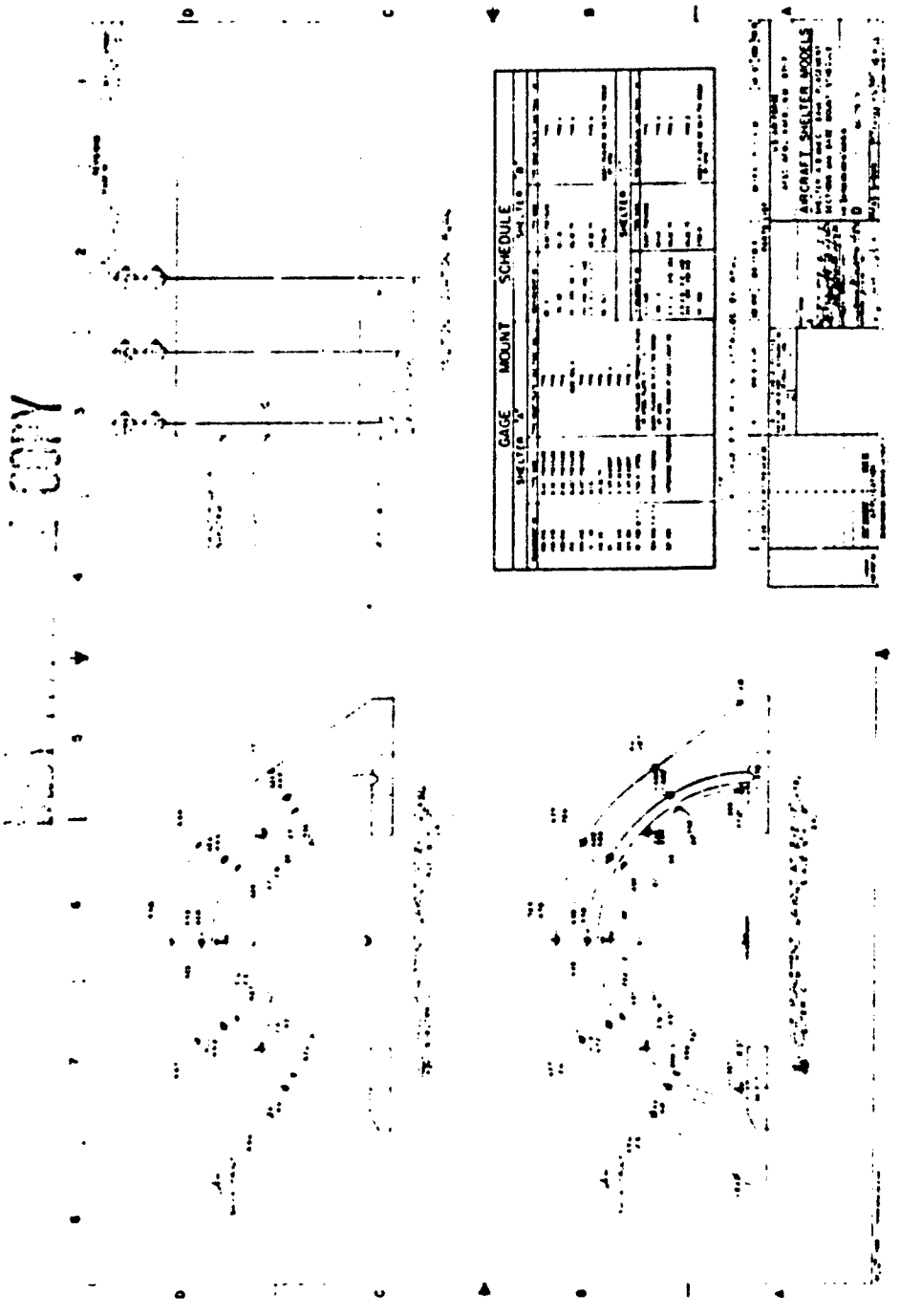
COPY FURNISHED TO DDC DOES NOT
PERMIT FULLY LEGIBLE REPRODUCTION

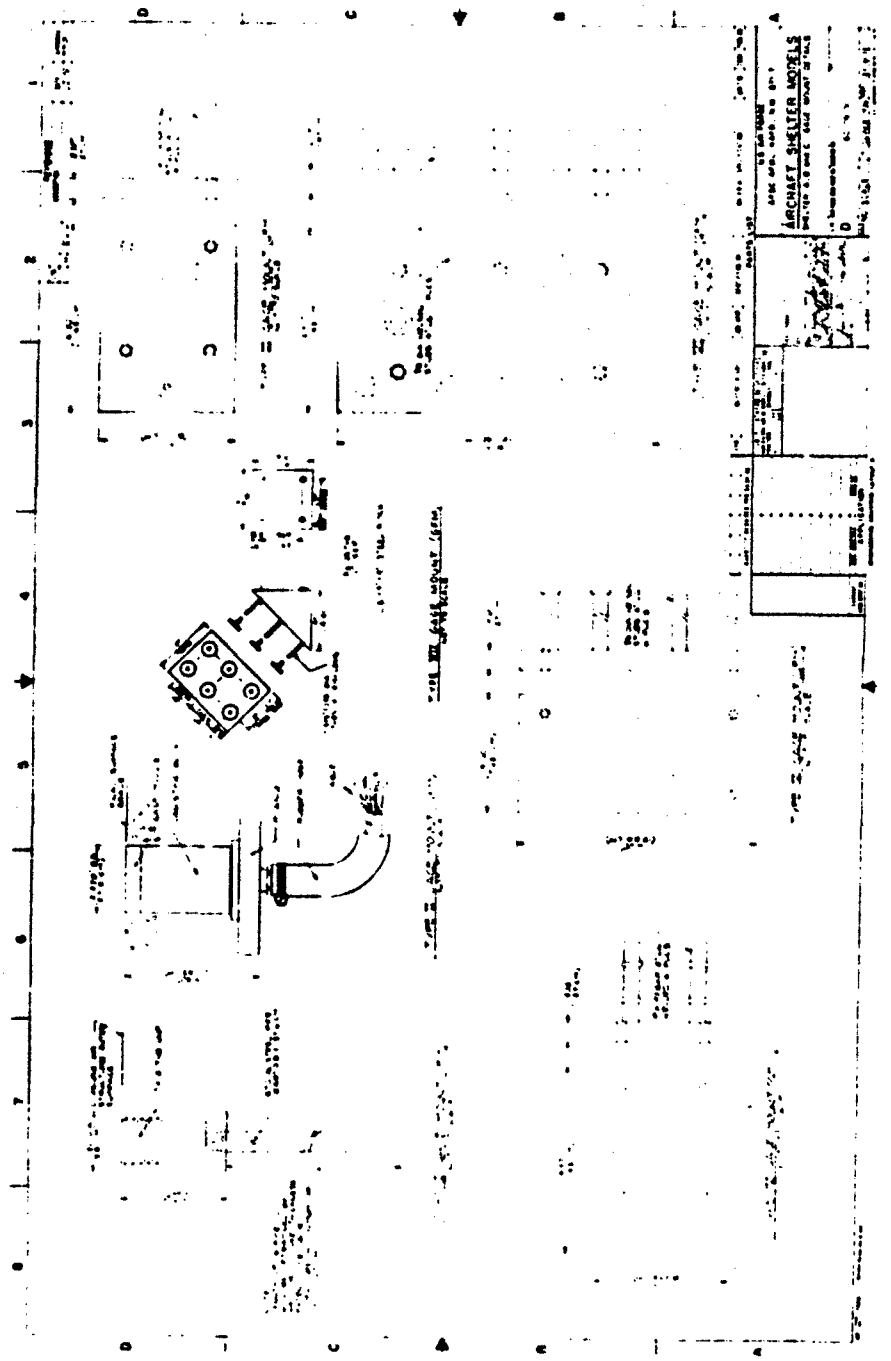




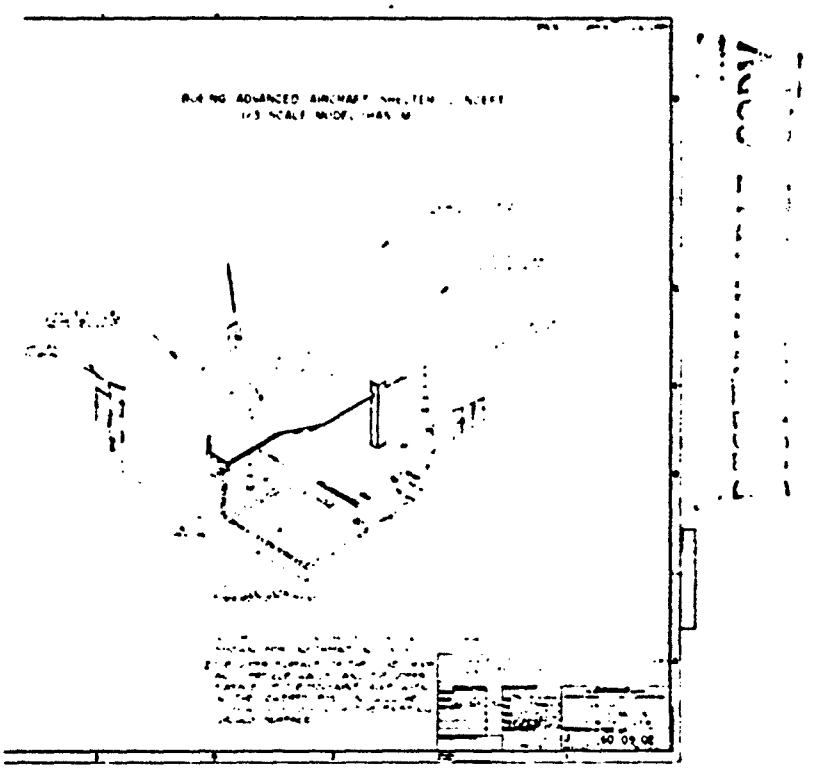


COPY AVAILABLE TO DTIC DOES NOT
PERMIT FULLY LEGIBLE PRODUCTION

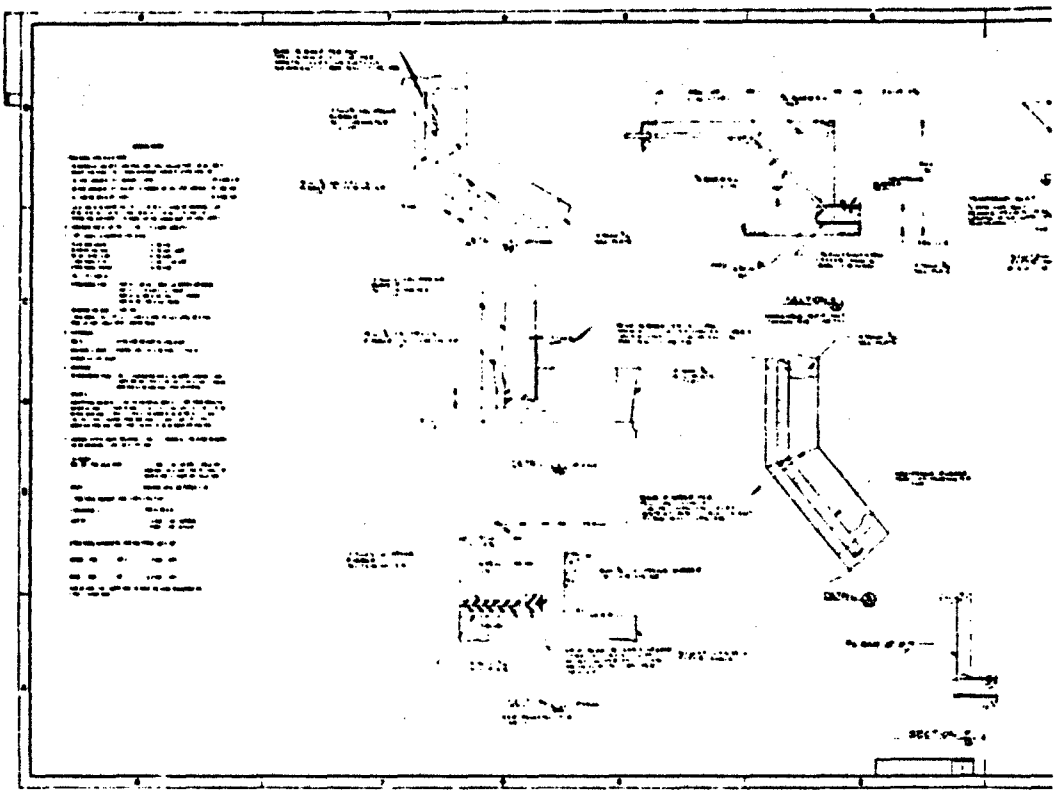

GAGE MOUNT SCHEDULE
AIRCRAFT SHELTER MODELS



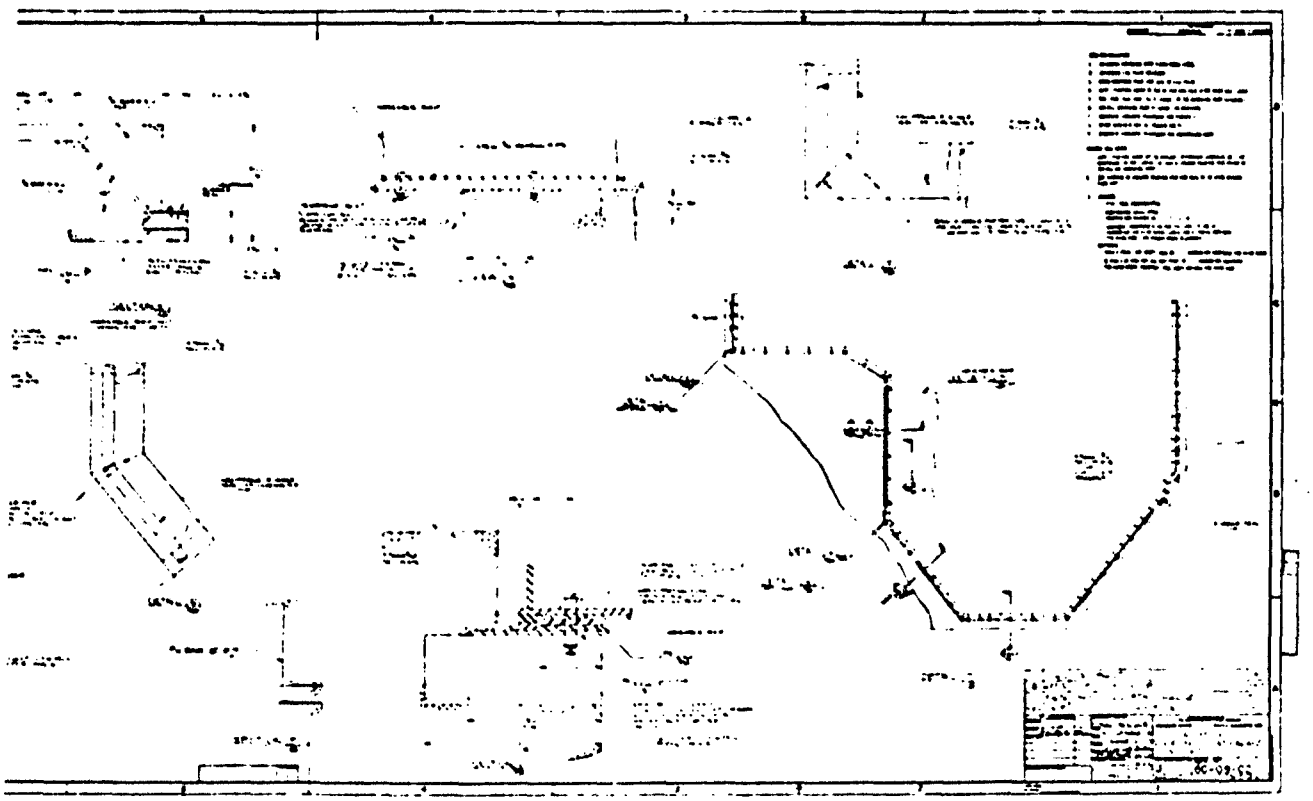
copy



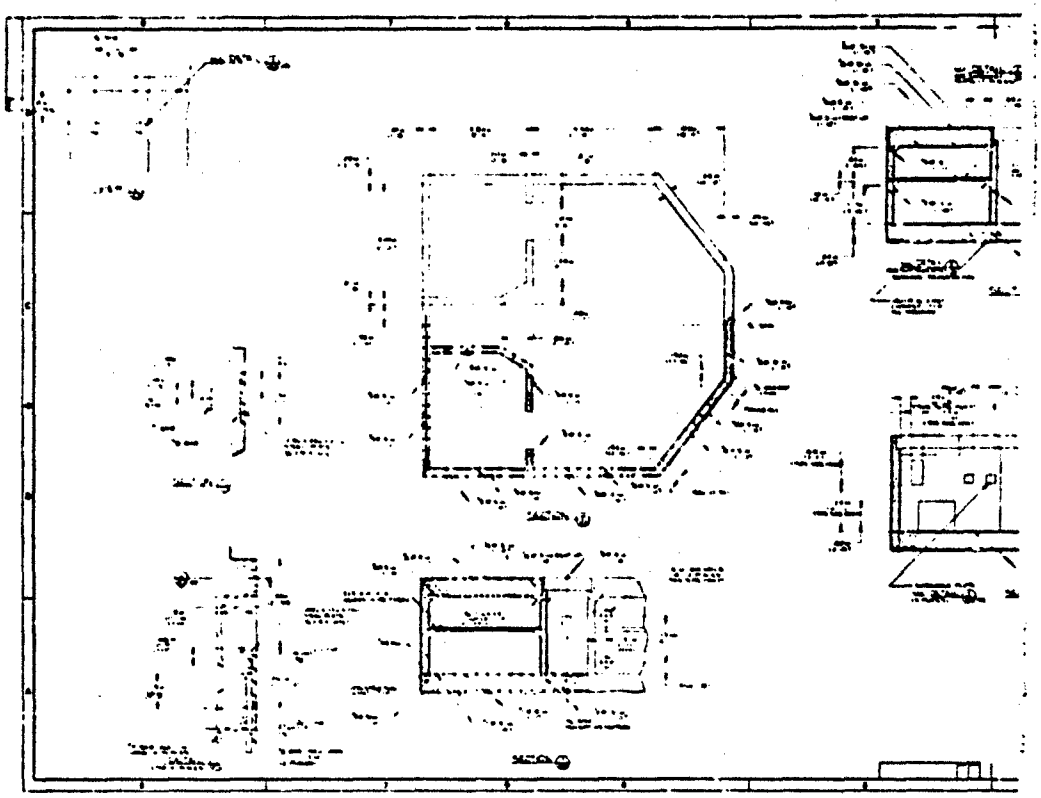
BEST AVAILABLE COPY

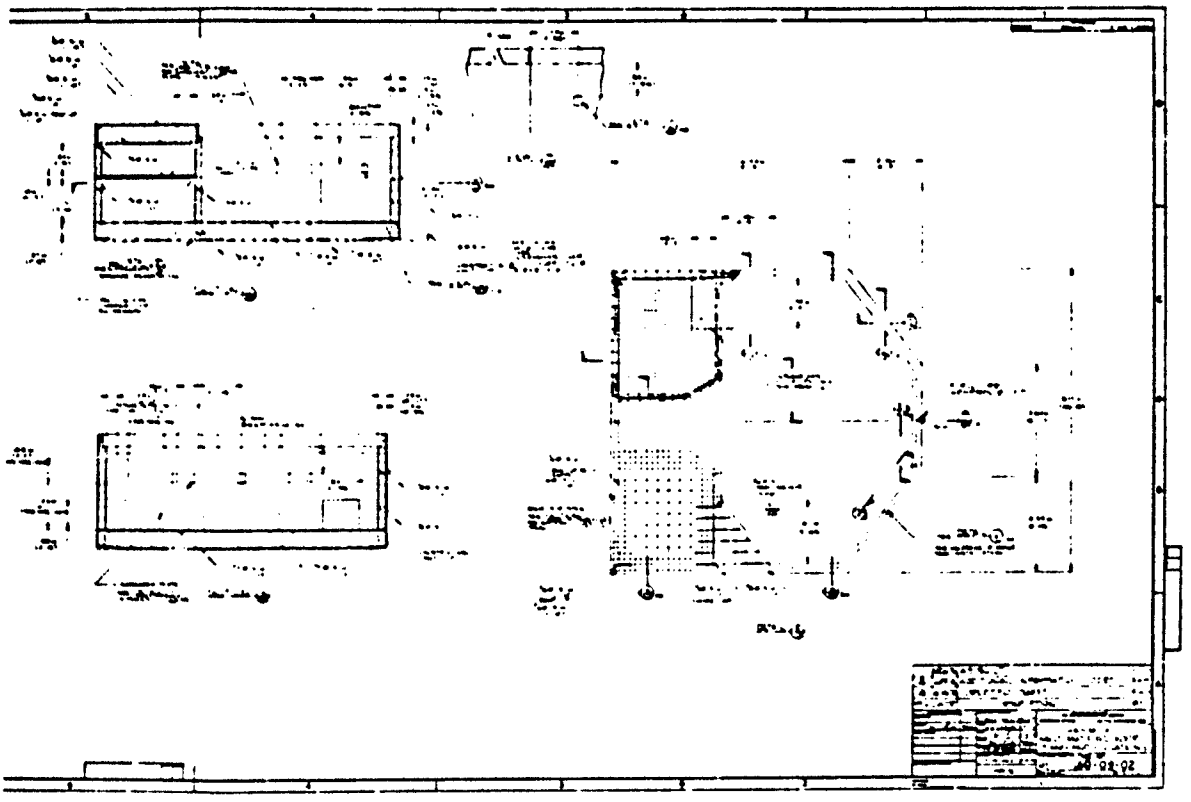


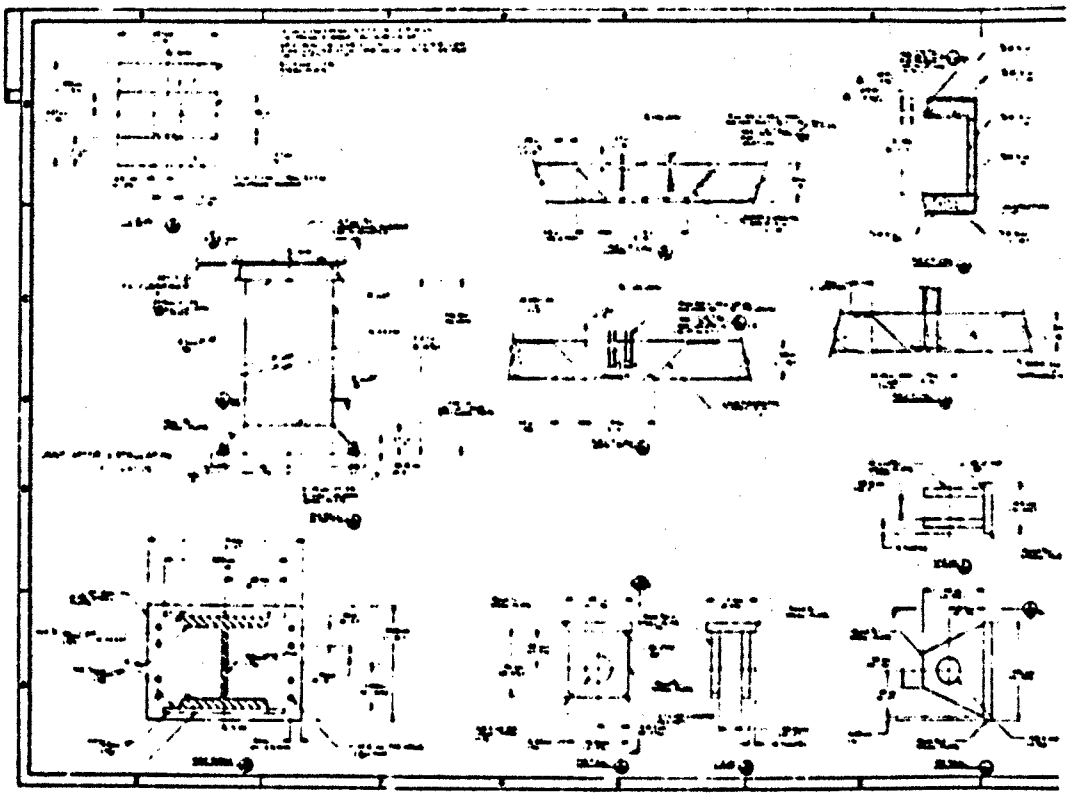
Y

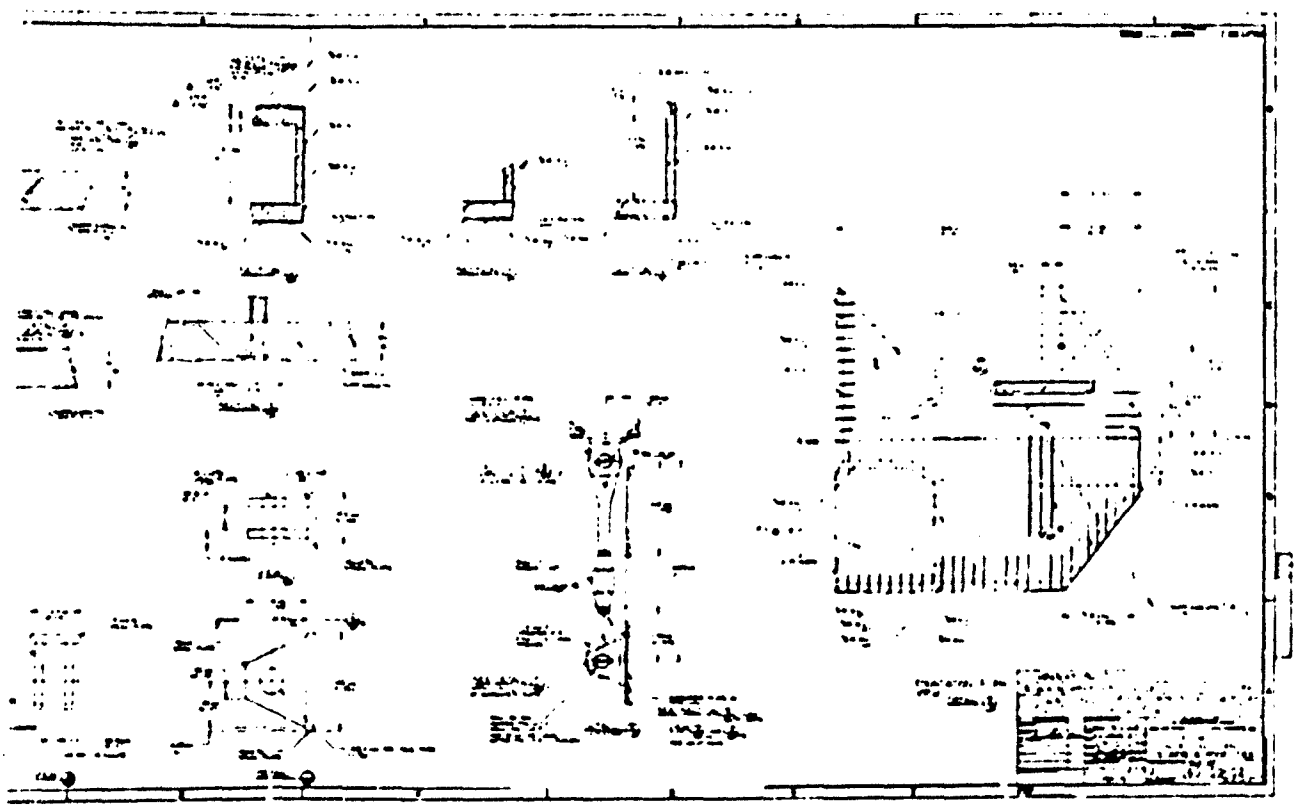


COPY

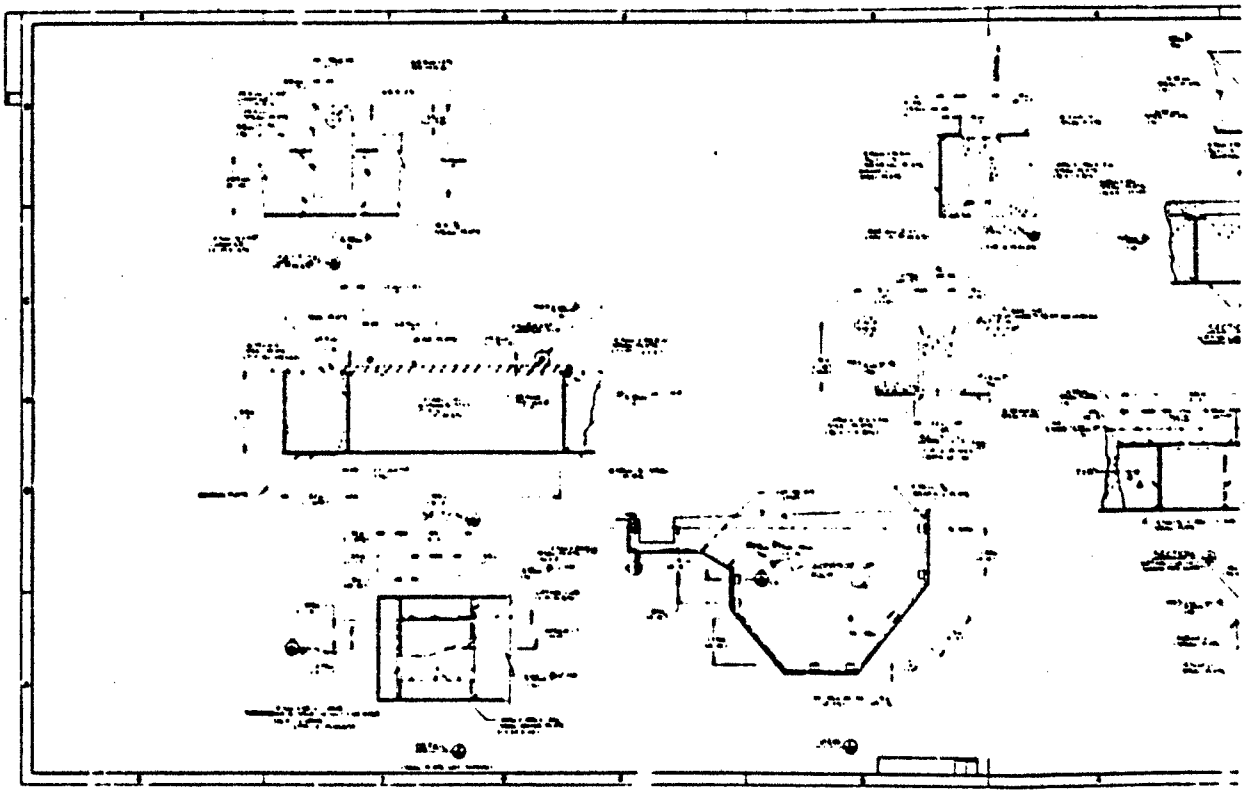


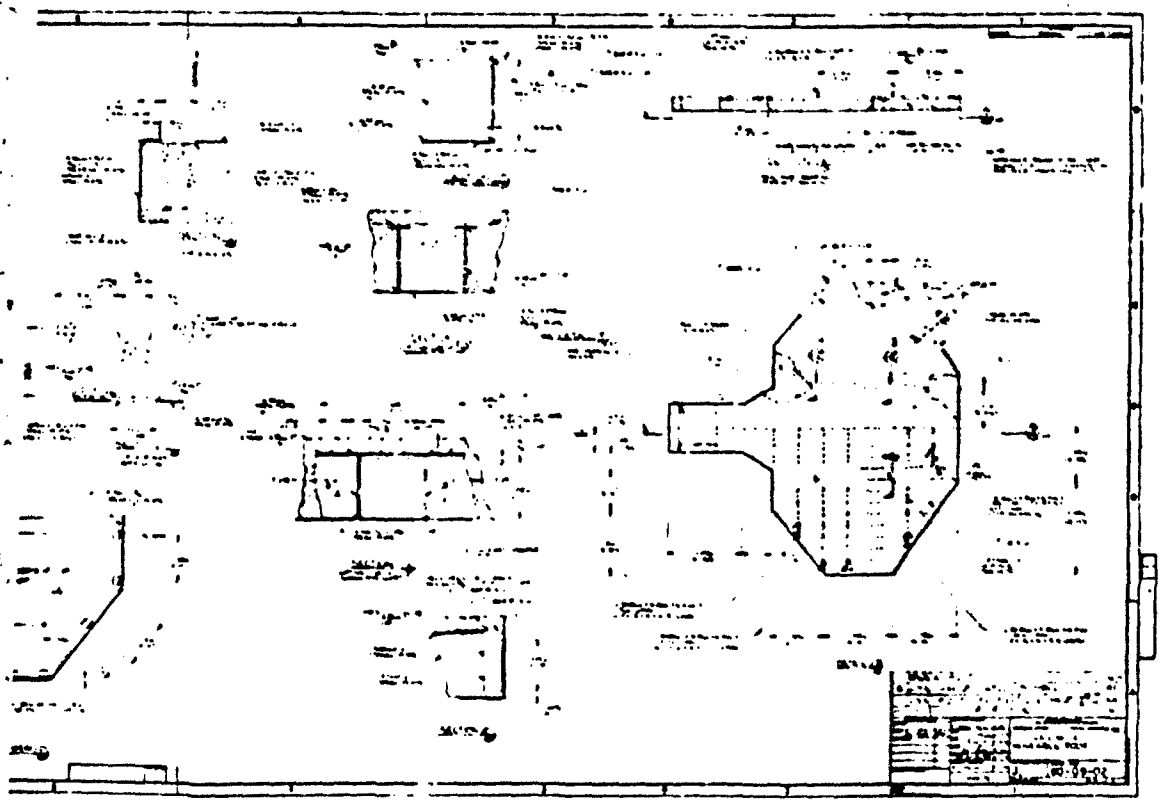




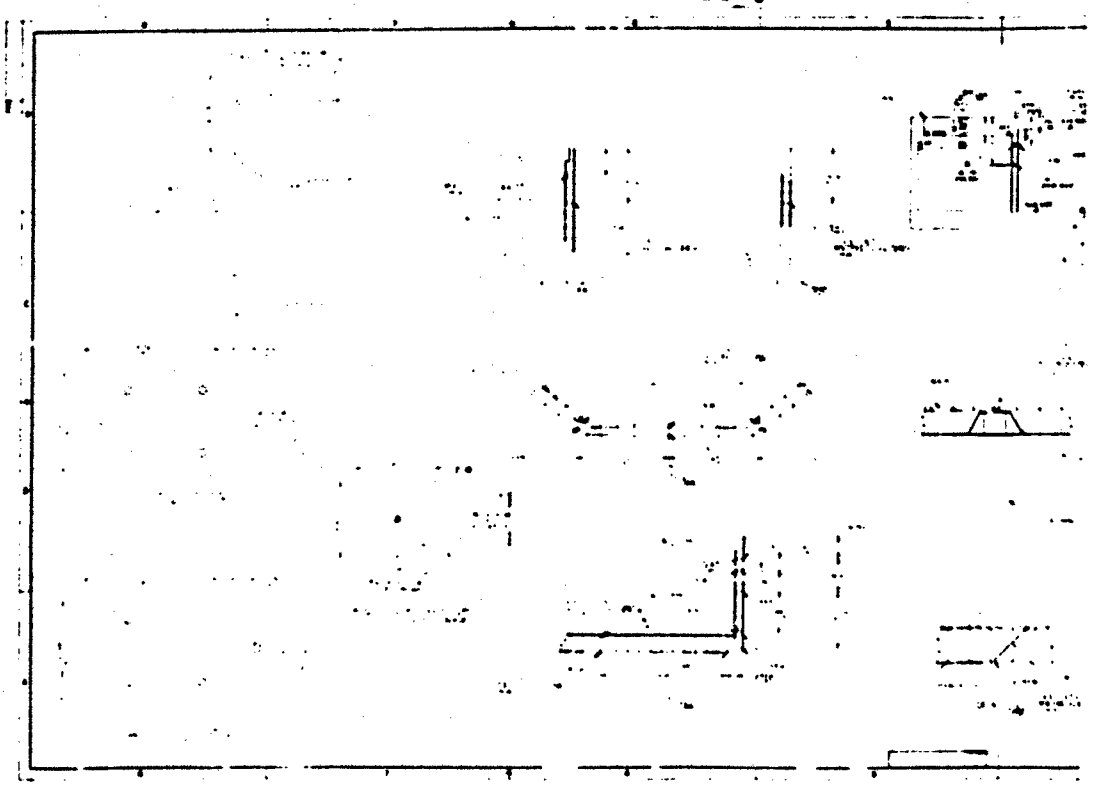


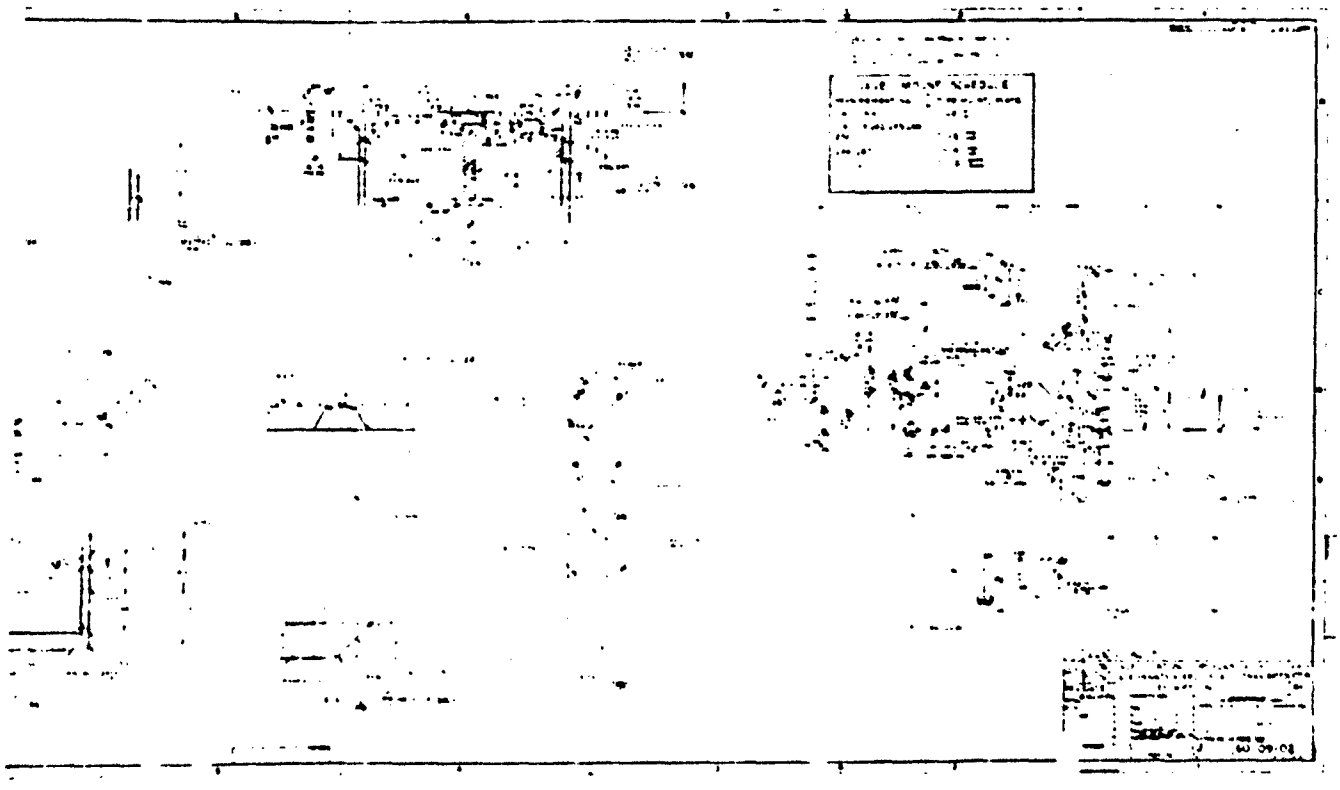
BEST AVAILABLE COPY





BEST AVAILABLE COPY





APPENDIX B

INSTRUMENTATION

The instrumentation details and specifications contained in this appendix have been obtained from AFWL Technical Note DE-TN-76-003, DICE THROW Instrumentation Plan. The information contained in this appendix is not all inclusive of the information contained in the above Technical Note, which should be referenced, for further required information.

1. MEASURAND/POLARITY CONVENTION

The convention used in setting up transducer output polarities was as follows:

a. Steel strains - tension is positive

b. Blast pressure, normal interface pressure - compression positive

c. Acceleration and velocity - motions downward, radially outward, longitudinally away from ground zero and azimuthally clockwise are positive.

d. Relative displacement - Distance between points increase is positive.

2. TRANSDUCERS

The different types of transducers for each type of measurement, and specifications for those transducers are given below.

a. Velocity Measurements. Both vertical and horizontal velocity measurements were made using the Sandia DX type velocity gages manufactured by Bell and Howell. Their specifications follow:

(i) Horizontal Velocity Transducer 364137

PERFORMANCE SPECIFICATIONS

Range:	$\pm$ 1 to $\pm$500 ft/sec
	($\pm$.3 to $\pm$150 m/s)
Undampened Natural Frequency:	3 Hz $\pm$ 0.25 Hz

Resolution:	Infinite
Linearity of Undampened Gauge:	0.5 % of full scale
Repeatability of Undampened Gauge:	0.5% of full scale
Hysteresis of Undampened Gauge:	±0.25% of full scale
Shock Load:	500 "g" any axis (50 km/s²)

The transducer performance is not degraded by 5 half-sine acceleration pulses of .30 ms in duration and 5000 "g" (50 km/s²) magnitude. Special pivots were secured within the head assembly, when subjected to the above environment, no degradation will occur beyond the specification parameters. The E-core will remain tight and in place during the shock excursion.

Temperature Sensitivity of full range:	Less than 1.5% per °C
Output:	AC differential, compatible with carrier oscillators and amplifiers
Power Output:	1 watt maximum
Output Impedance:	(28 + j0 0.18) ohms full bridge nominal
Excitation:	3 kHz 10V RMS
Physical Specifications:	See DOD: CED 364137
Weight:	520 grams

(2) VErtical Velocity Transducer 364142

PERFORMANCE SPECIFICATIONS

Range:	±1 to ±500 ft/sec (±.3 to ±150 m/s)
Undampened Natural Frequency:	3 Hz ±0.25 Hz
Resolution:	Infinite
Linearity of Undampened Gauge:	0.5% of full scale
Repeatability of Undampened Gauge:	0.5% of full scale
Hysteresis of Undampened Gauge:	±0.25% of full scale

Zero Adjust:	Capability Provided
Shock Load:	5000 "g" any axis (~50 km/s^2)

The transducer performance will not be degraded by 5 half-sine acceleration pulses of .30 ms in duration and 5000 "g" (50 km/s^2) magnitude. The special pivots are secured within the head assembly, and when subjected to the above environment, no degradation will occur beyond the specification parameters. The E-core will remain tight and in place during the shock excursion.

Temperature Sensitivity of full range:	
Output:	AC differential, compatible with carrier oscillators and amplifiers.
Power Output:	1 watt maximum
Output Impedance:	(28 + jω 0.18) ohms full bridge nominal
Excitation:	3kHz 10V RMS
Physical Specifications:	See DOD: CED 364142
Weight:	520 grams

The velocity gage used a silicon fluid compound manufactured by Dow Corning, Series 210, as a damping fluid. The gage velocity range and response was changed by using damping fluids of different viscosities. The viscosities available and the corresponding approximate linear ranges are:

Viscosity (Centistokes)	Approximate Linear Range (Ft/Sec)
	Brass Pendulum
7000 (7x10^{-3} m^2/s)	
5000	
3000	200 (60 m/s)
2000	100 (30 m/s)
1000	75 (23 m/s)

Viscosity (Centistokes)	Approximate Linear Range (Ft/Sec)
500	30 (10 m/s)
200	18 (5 m/s)

Because the damping fluid viscosity is temperature dependent, a number of thermistors were installed at velocity transducer locations. Accurate calibration of these thermistors enabled the temperatures at the velocity gage locations to be determined through measurement of the thermistor resistances. These temperature determinations were made frequently and logged.

b. Acceleration

Acceleration measurements were made on the shelter closure and shelters using the following acceleration transducers:

Endevco Model 2260C-500 MI 500 g (5 km/s^2)

Endevco Model 2260C-250 MI 250 g (2.5 km/s^2)

Specifications for these gages are as follows:

(1) Accelerometer, Model 2260C-500 MI.

This instrument is a general purpose, moderate range accelerometer of the piezoresistive type. It has a strain gage bridge with active arms and two fixed resistors of 500Ω each. Provision is made for shunt calibration in a 6-wire system. Its frequency range extends from static to 3500 Hz.

ENDEVCO PIEZITE Type P-9 semiconductor crystal material is used.

CHARACTERISTICS

Dynamic Range	±500 g
Sensitivity	0.35mV/g nominal
Combined Linearity and Hysteresis	±1% maximum of reading to 500g

Frequency Response	±5%, 0 to 3500Hz, ±10%, 0 to 4500 Hz
Mounted Natural Frequency	18 kHz nominal
Damping	.01 of critical
Transverse Sensitivity	3% maximum in any transverse axis
Temperature Response	
Compensated Range	-65°F to +250°F
Thermal Sensitivity Shift	-6%/0/-7% at -65°F/+75°F/250°F nominal
Thermal Zero Shift	+12 mV maximum at -65°F and 250°F Reference +75°F
Zero Balance	± mV maximum at rated excitation and 75°F
Electrical	
Rated Excitation	10.00 Vdc
Resistance (room temperature)	
Input	330Ω nominal
Output	375Ω nominal
Internal Fixed Resistors	500 ±1%
Connector	has integral 6 conductor cable with shield and jacket
Insulation Resistance	greater than 100 MΩ at 100 Vdc, all leads to case
Warmup Time	1 minute
Physical	
Dimensions	1.0" x .61 diameter, 5/8" hex base
Weight	1.0 oz.
Material	Type 416 stainless steel
Finish	Mirror polish
Mounting	Provision for 10-32 x 1/8" stud
Marking	Manufacturer's name; Model number - Range; Serial Number

Environmental	
Temperature Range	
Operating	-65°F to +250°F
Non-Operating	-100°F to +300°F
Humidity	Epoxy sealed
Acceleration Limits (any direction)	
Static	±1500 g
Sinusoidal	±1000g at frequencies below 3500 Hz
Shock	+1500g half sine pulse, 300μ sec or longer duration

ACCESSORIES	
Instructional Manual	
Calibration Card	
Stud	2981-3
Shipping Box	
CALIBRATION SUPPLIED	
Sensitivity	
Input Impedance	
Output Impedance	
Maximum Transverse Sensitivity	
Mounted Resonance Frequency	
Zero Measurand Output	

(2) Accelerometer Model 2260C-250MI

This instrument is a general purpose, moderate range accelerometer of the piezoresistive type. It has a strain gage bridge with two active arms and two fixed resistors of 500. each. Provision is made for shunt calibration in a 6-wire system. Its frequency range extends from static to 2500 Hz.

ENDEVCO PIEZITE Type P-9 semiconductor crystal material is used.

CHARACTERISTICS

Dynamic Range	±250g
Sensitivity	0.7 mV/g nominal
Combined Linearity and Hysteresis	±1. maximum of reading to 250g
Frequency Response	±5 , 0 to 2500 Hz, ±10., 0 to 3000 Hz
Mounted Natural Frequency	14 kHz nominal
Damping	.01 of critical
Transverse Sensitivity	3 maximum in any transverse axis
Temperature Response	
Compensated Range	-65°F to +250°F
Thermal Sensitivity Shift	-6 /0/-7 at -65°F/+75°/250°F nominal
Thermal Zero Shift	+12 mV maximum at -65°F and +250F; Reference +75°F
Zero Balance	± mV maximum at rated excitation and 75°F

Electrical

Rated Excitation	10.00 Vdc
Resistance (room temperature)	
Input	330.. nominal
Output	375.. nominal
Internal Fixed Resistors	500.. ±1
Cable	Has integral 6 conductor cable with shield and jacket.
Insulation Resistance	Greater than 100M at 100 Vdc, all leads to case.
Warmup Time	1 minute

Physical

Dimensions	1.0" x .81 diameter, 1.5" hex base

SPECIFICATIONS FOR PRESSURE TRANSDUCERS

	HKS-5-375-500	XFS-1-190-200	XTS-1-190-100	XTMS-1-190-25
Pressure				
Rated (psi)	500 (3.5 MPa)	200 (1.4 MPa)	100 (690 kPa)	25 (170 kPa)
Maximum (psi)	750 (5.2 MPa)	400 (2.8 MPa)	200 (1.4 MPa)	50 (350 KPa)
Output-nominal (mV)	125	100	100	75 mV
Acceleration Sensitivity				
Perpendicular (% FS/g)	.0001	.00013	.0002	.002
Transverse (% FS/g)	.00002	.000026	.00004	.00004
Natural Frequency (kHz)	350	200	160	50
Bridge Type	Fully active four arm Wheatstone bridge diffused into silicon diaphragm			
Bridge Excitation	5V DC or AC	7.5-10V DC or AC	7.5-10V DC or AC	15-20V DC or AC
Bridge Impedance	350 ohms nom.	500 ohms nom.	500 ohms nom.	500 ohms nom.
Zero Balance	±7% FS	±3% FS	±3% FS	±3% FS
Combined Non-Linearity and Hysteresis	±1% FS	±0.5% FS	±.05% FS	±1% FS
Repeatability	0.25%	.25%	.25%	±0.25%
Operating Temperature	-65°F to +300°F (-55°C to 150°C)	0°F to 250°F (-20°C to 80°C)	0°F to 250°F (-20°C to 80°C)	0°F to 250°F (-20°C to 120°C
Change of Sensitivity with Temperature	±6%/100°F	±2.5%/100°F	±2.5%/100°F	±2%/100°F
Resolution	Infinite	Infinite	Infinite	Infinite

STRAIN GAGE SPECIFICATIONS

	Model CEA-06-062uw-350	Model CEA-06-125-uw-350
Resistance in ohms	350 ± .3%	350 ± .3%
Gage length	1.57mm	3.18mm
Overall length	5.59mm	8.26mm
Grid width	3.05mm	4.57mm
Overall width	3.05mm	4.57mm

The gages feature large integral copper solder tabs and a completely encapsulated grid. The CEA gage series is a general-purpose strain gage. The constantan grids are completely encapsulated in polyimide, with large, integral, copper-coated terminals. This gage is primarily used for general purpose static and dynamic stress analysis.

Temperature

Range: -100°F to +400°F (-75°C to +205°C)

Strain Range: ±3% for gage lengths under 1/8" (3.2 mm). ±5% for 1/8" and over.

Fatigue Life:

Strain level in

Microstrain: ±1500

Number of cycles: 10^7

The gage is self-temperature - compensated.

APPENDIX C

PHOTOGRAPHIC DOCUMENTATION

All high speed camera and technical motion picture documentation of the closure during the test event were lost because of a switch being inadvertently activated prior to the test event. However, for information purposes the locations and perspectives of the cameras are presented in this appendix. Photographs of the camera placement and targets are contained in Figures C-1 through C-5.

1. Shelter A

Six cameras were to be utilized on this shelter. Two outside cameras were to document the gross response of the closure, concentrating on the door/shelter interface. Four cameras positioned inside the shelter were to record: (a) the movement of the closure, especially the rebound behavior, (b) the relative displacement of the arch crown to the footings, and (c) the interface characteristics of the arch and interior door support collar. The locations of the cameras relative to the structure are shown in Figures C-1, C-2, & C-4.

The two outside cameras were high speed (1000 fps); the inside cameras were 400 fps.

2. Shelter B

One camera was placed inside the shelter to observe the relative displacement of the arch crown to the footings. This camera was located on the shelter floor near the rear wall looking forward toward the front of the arch. The shelter ceiling and much of the sidewalls near the mid-shelter length were in the field of view. This camera had a depth of focus such that the interface between the arch and the interior door support were to be clearly visible. The camera used in this shelter was a 400 fps camera.

3. Shelter c

Shelter "C" was to have the same photographic coverage as Shelter B.

4. Shelter D

Four cameras were to be used in this shelter to record motion of the shelter roof. These cameras were located as shown in Figures C-3 and C-5. Motion of the roof was to be recorded through observation of relative motion between moving and stationary (reference) targets. As shown in Figures C-3 and C-5, targets were fabricated from steel pipe and welded to imbedded steel plates in the shelter roof or floor. All cameras in this shelter were high speed (1000 fps) cameras.

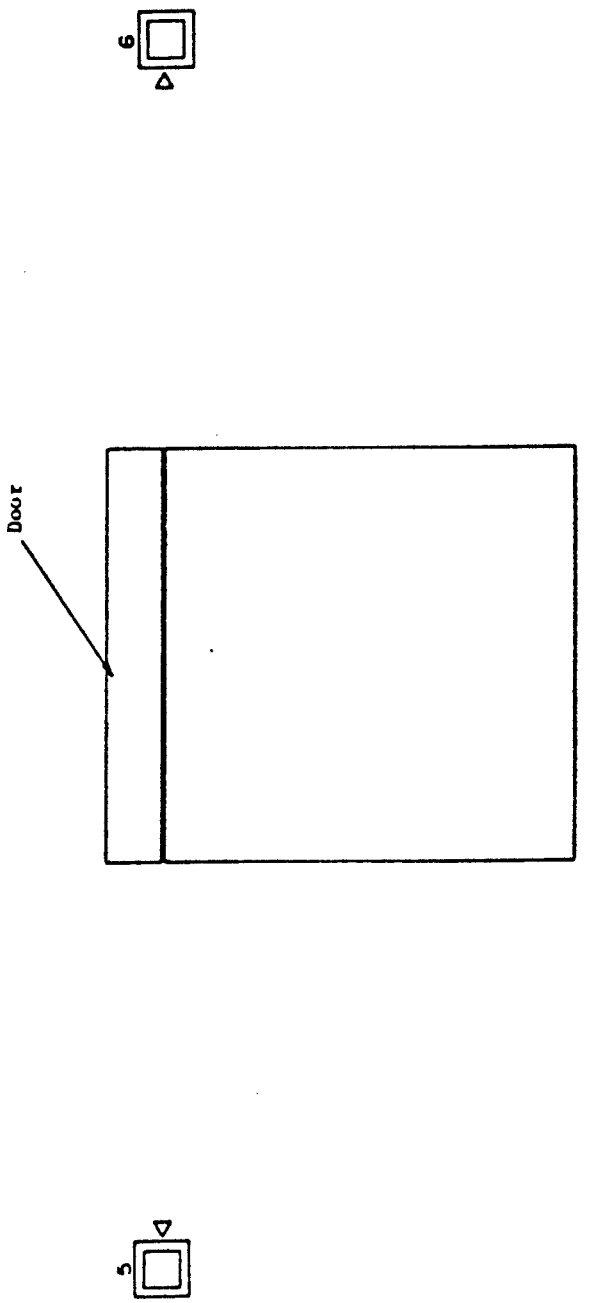


Figure C-1 Shelter A Location Of Cameras No. 5 and No. 6 Outside Of Shelter Viewing Door/Shelter Interface

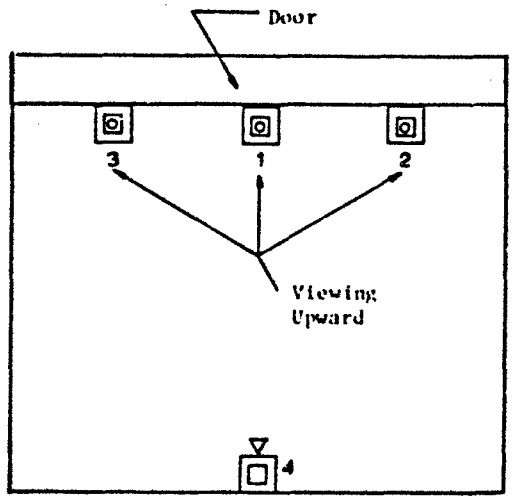


Figure C-2 Shelter "A" Camera Locations, Top View (Internal)

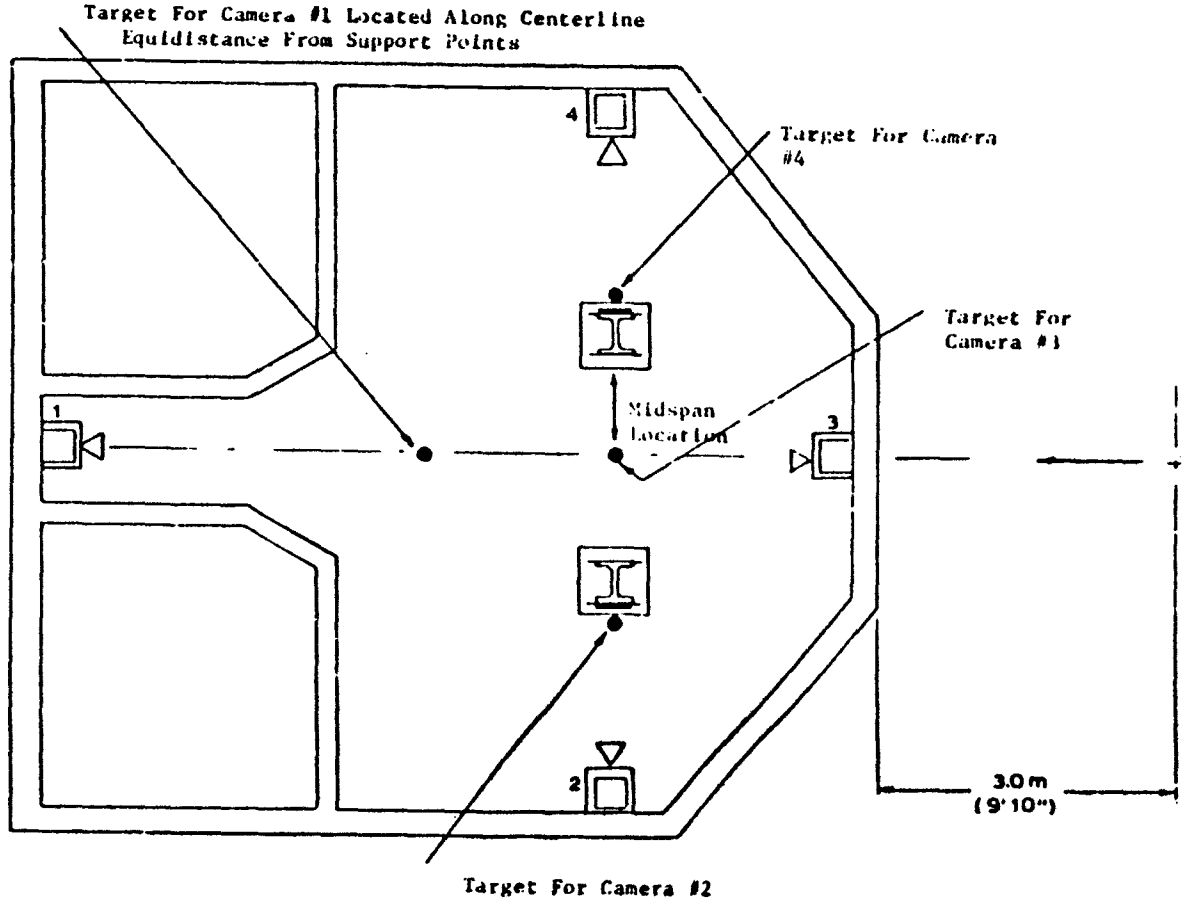
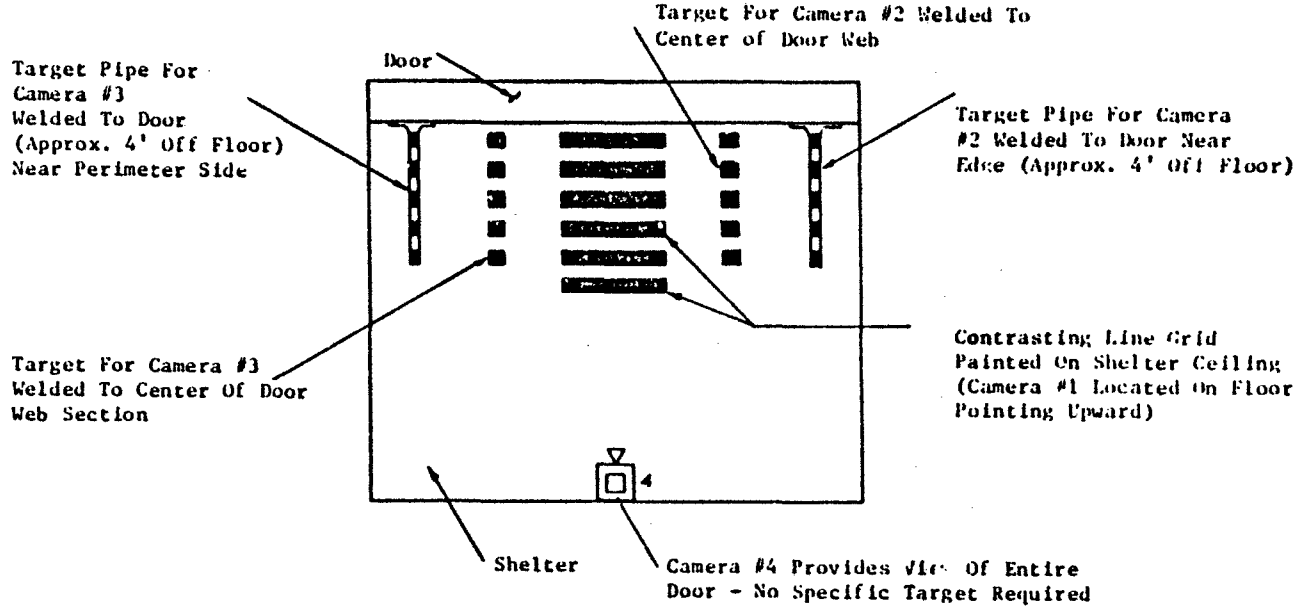


Figure C-3 Shelter "D" Locations Of Camera Nos. 1, 2, 3, and 4



GENERAL NOTE: If Cameras 2 & 3 mounted on sidewalls opposite targets, adjust target heights to avoid interference. If cameras mounted on sidewalls, use grid printed on sidewall as stationary reference OR vertical pipe welded to plate imbedded in floor. (Cameras 2 & 3 could also be mounted on floor looking up).

Figure C-4 Shelter "A" Location Of Targets, Top View (Internal)

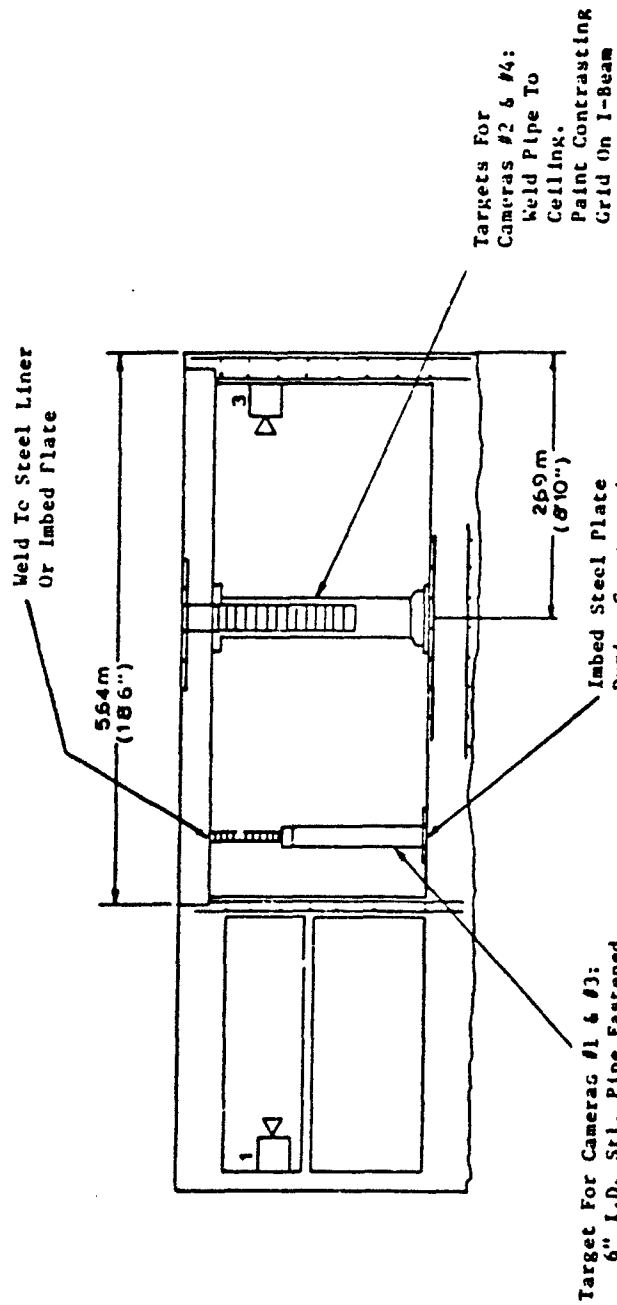


Figure C-5 Shelter "D" Location Of Target Cameras #2 and #3, Side View

APPENDIX D

AIRCRAFT SHELTER "A" DATA PRESENTATION

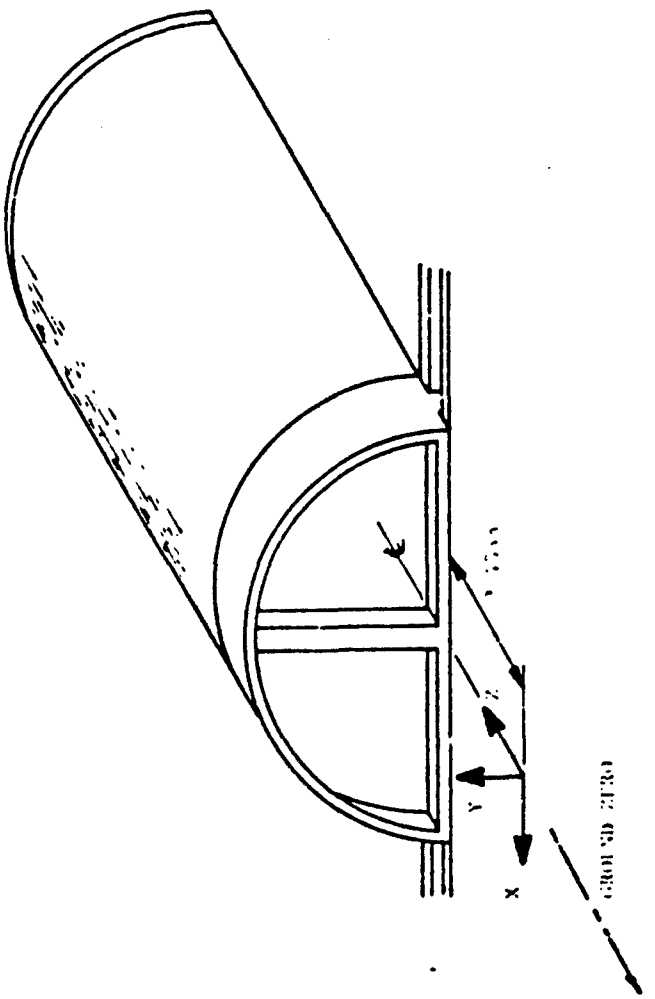


Figure D-3 Aircraft Structure "X" Coordinate System

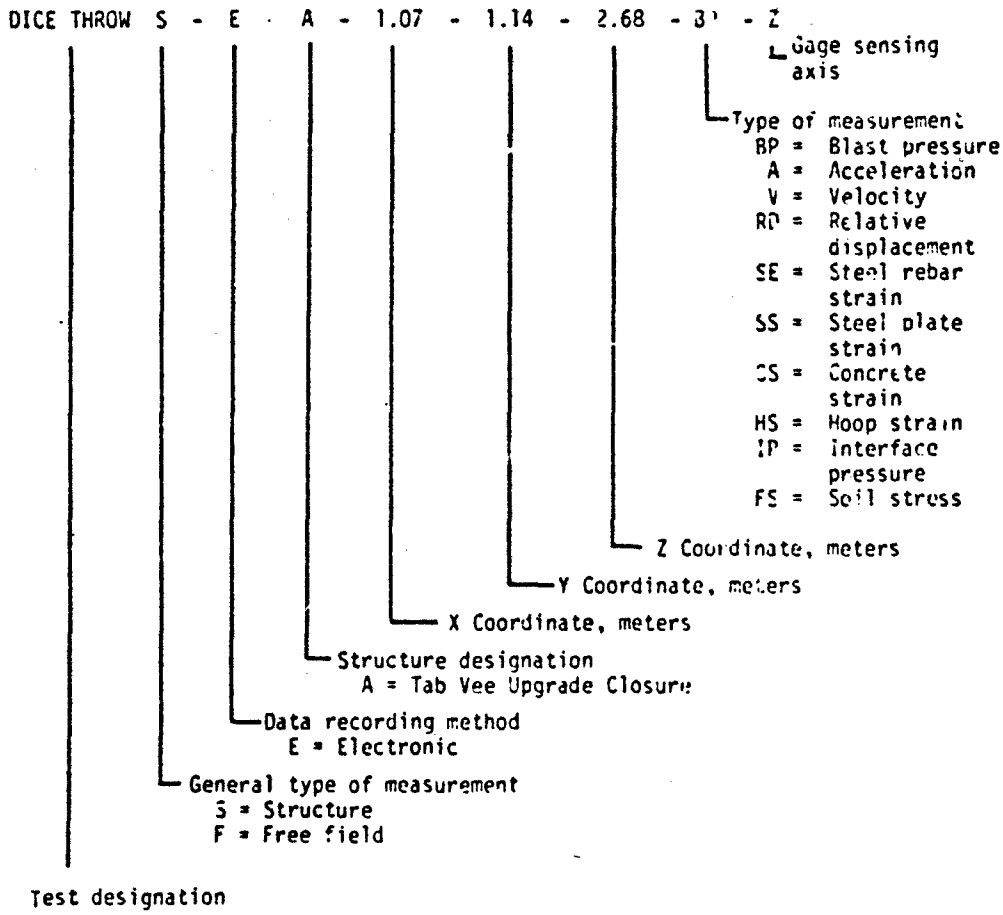


Figure D2. Measurement Designation System

DATA CORRECTIONS

DSP - points have been despiked.

SMT - a modified hanning smooth has been performed.

FIL - a frequency cut-off or a band reject digital filter has been made.

BLC - the data has been baseline corrected.

INV - the polarity has been reversed.

On each page, the corrected plot is at the top and the uncorrected plot is at the bottom. Each acceleration plot is followed by its integral.

DICE THROW, SHELTER A DATA CORRECTIONS

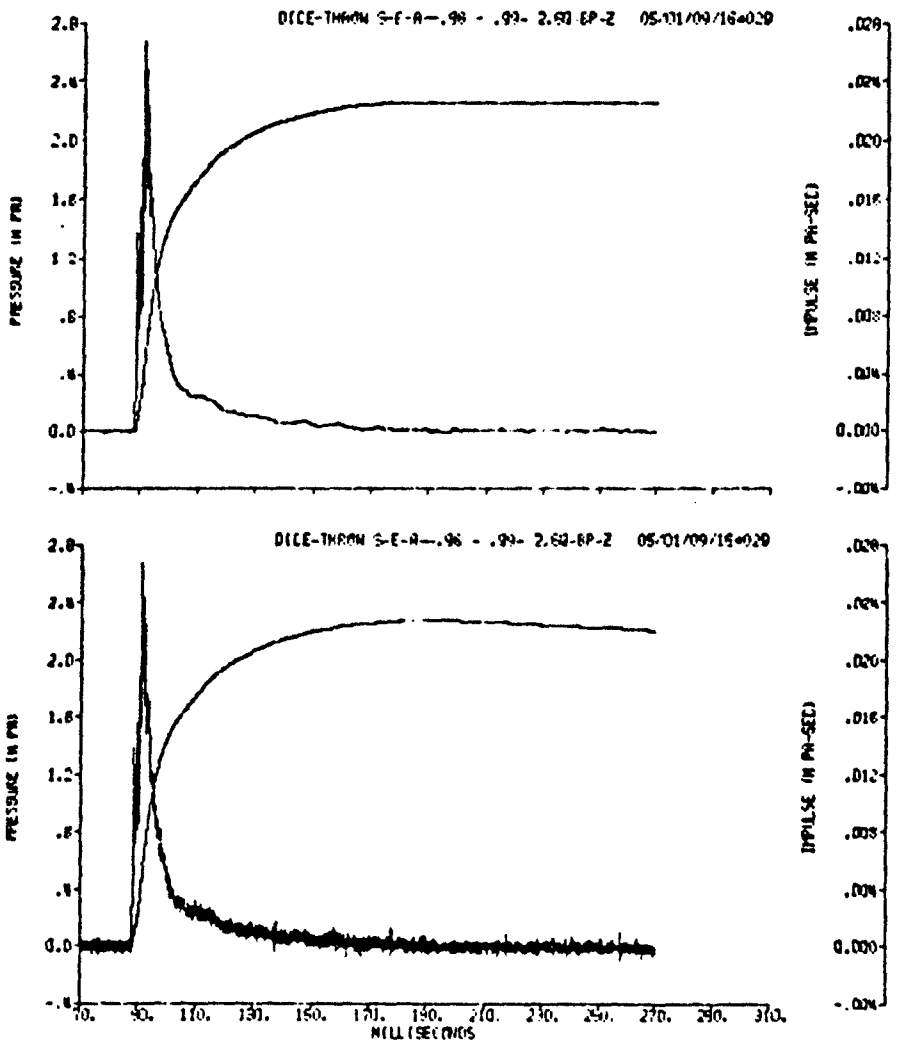
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	TYPE	AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
029	-.96	.99	2.69	BP	Z	DSP, SMT, BLC	Ext Surf Closure
030	-.30	2.06	2.69	BP	Z	DSP, SMT, BLC	Ext Surf Closure
031	-.30	.23	2.69	BP	Z	DSP, SMT, BLC	Ext Surf Closure
032	-1.98	.23	2.69	BP	Z	DSP, SMT	Ext Surf Closure
033	0	2.06	2.44	BP	Z	DSP, SMT	Ext Surf Closure
034	0	1.14	2.44	BP	Z	DSP, SMT, BLC	Ext Surf Closure
035	1.07	1.14	2.69	BP	Z	DSP, SMT, BLC	Ext Surf Closure
036	0	0	1.22	BP	Z	DSP, SMT, BLC	Top and Rear
037	0	0	0	BP	Z	DSP, BLC	Top and Rear
038	1.22	0	1.22	BP	Z	DSP, SMT	Middle and Top
039	0	2.74	5.74	BP	Z	DSP, SMT	Ext Rear Wall
040	0	2.13	6.33	BP	Z	DSP, SMT	Ext Rear Wall
041	0	1.22	8.33	BP	Z	Covered with Soil	Ext Rear Wall
042	1.22	1.22	8.33	BP	Z	DSP, SMT, BLC	Ext Rear Wall
043	0	2.59	3.302	BP	Z	Scratched	Middle on Floor
044	0	0	4.47	BP	Z	DSP, SMT, FIL	Middle on Floor
045	0	0	4.47	BP	Z	DSP, SMT	Middle on Floor
046	0	0	6.908	BP	Z	DSP, SMT	Middle on Floor
101	0	.18	3.25	A	Z	DSP, SMT	Inner Surf of Closure
102	-1.14	1.14	3.00	A	Z	DSP, SMT, BLC	Inner Surf of Closure
103	0	1.02	3.25	A	Z	DSP, SMT	Inner Surf of Closure
104	.99	1.29	3.00	A	Z	DSP, SMT	Inner Surf of Closure
225	0	1.97	3.25	V	Z	DSP, SMT, INV	Top of Closure
226	-1.14	1.14	3.00	V	Z	DSP, SMT, INV	Inside of Closure
227	0	1.02	3.25	V	Z	DSP, BLC, INV	Inside of Closure
228	.99	1.29	3.00	V	Z	DSP, BLC, INV	Inside of Closure
229	-.68	.68	3.00	V	Z	DSP, BLC, INV	Inside of Closure
230	.68	.80	3.00	V	Z	DSP, BLC, INV	Inside of Closure
231	0	2.66	5.68	V	Z	DSP, SMT	Middle Inside on Top

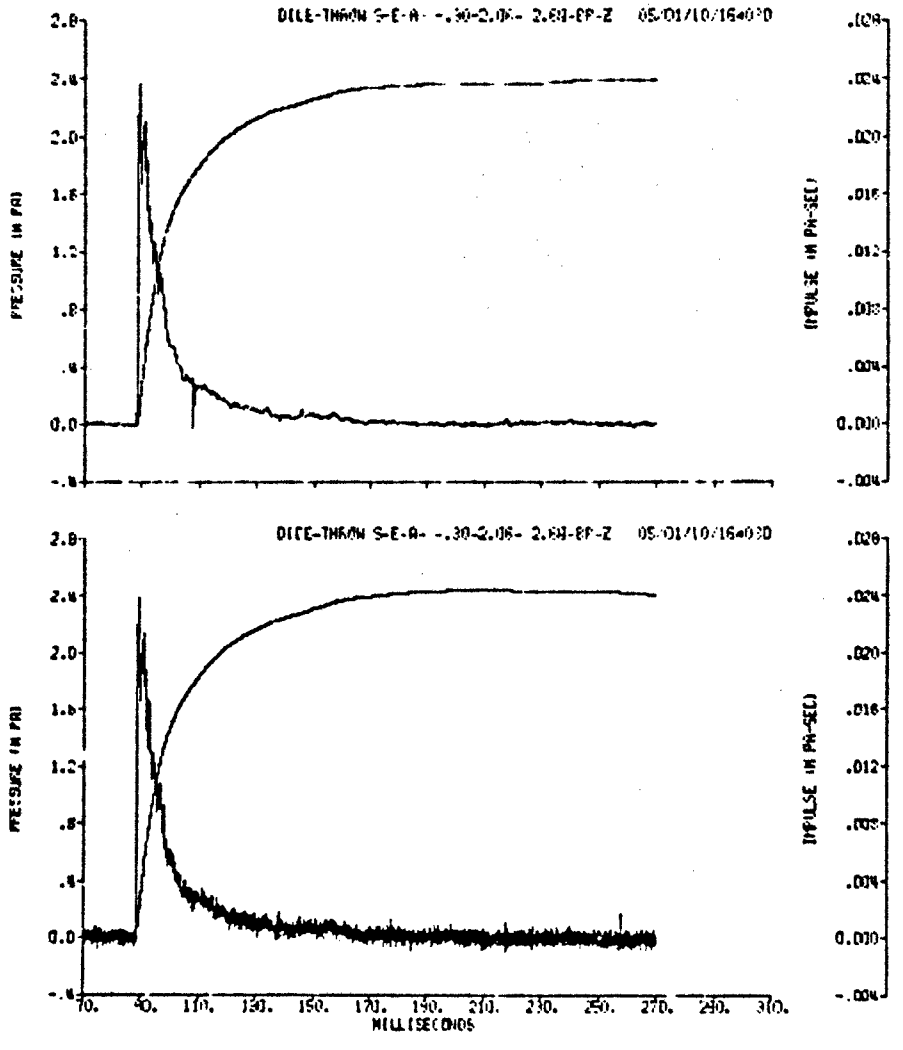
DICE THROW, SHELTER A DATA CORRECTIONS (cont'd)

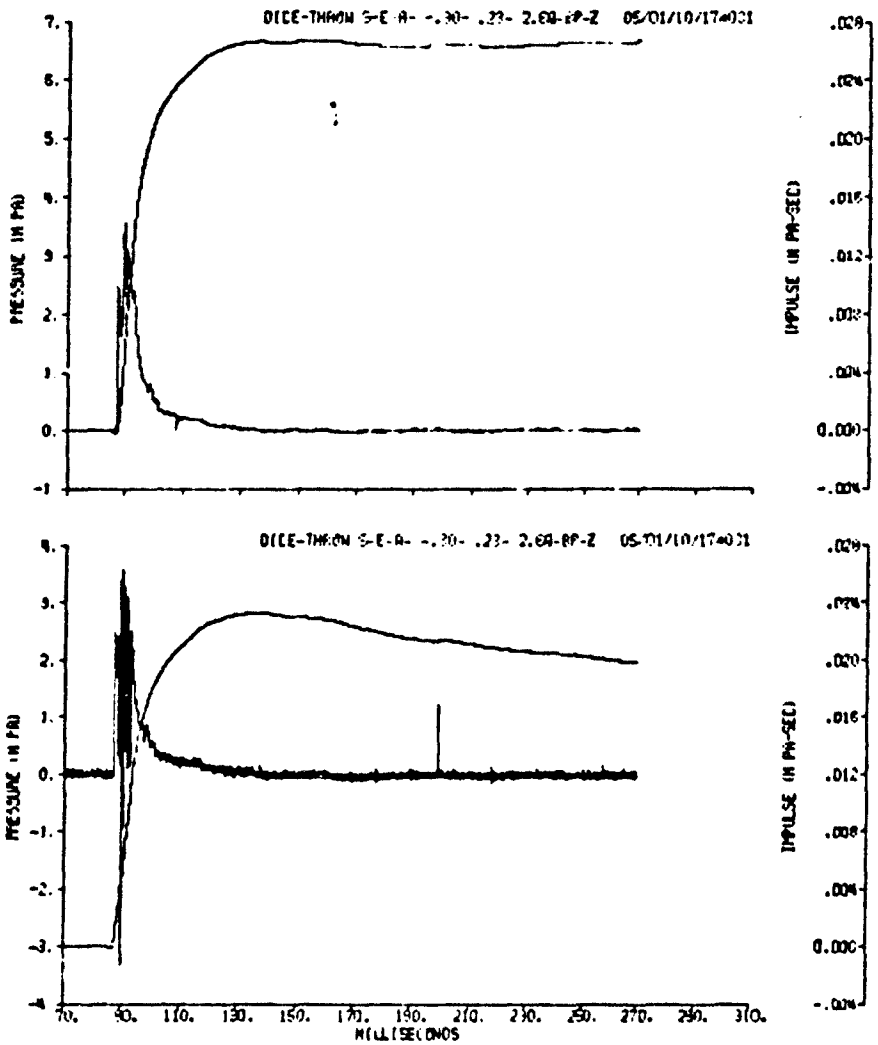
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
301	.68	2.39	3.00	RD	Z	DSP, SMT	Inside Top of Closure
302	.68	2.39	3.00	RD	Z	Passive Gage	Inside Top of Closure
304	.68	0	3.00	RD	Z	Passive Gage, No Data	Inside Bottom of Closure
461	0	2.36	2.44	SS	Y	DSP, SMT	External of Closure, Steel Plate
462	0	2.36	3.25	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
463	0	1.45	2.44	SS	Y	DSP, SMT	External of Closure, Steel Plate
464	0	1.45	3.25	SS	Y	DSP, SMT, FIL	Internal of Closure, Steel Plate
465	0	.38	2.44	SS	Y	DSP, SMT	External of Closure, Steel Plate
466	0	.38	3.25	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
467	0.30	0	2.44	SS	X	DSP, SMT	External of Closure, Steel Plate
468	0.30	0	3.25	SS	X	DSP, SMT	Internal of Closure, Steel Plate
469	1.22	0	2.44	SS	X	DSP, SMT	External of Closure, Steel Plate
470	1.22	0	3.25	SS	X	DSP, SMT	Internal of Closure, Steel Plate
471	.91	.91	2.69	SS	45	DSP, SMT	External of Closure, Steel Plate
472	.91	.91	3.00	SS	45	DSP, SMT	Internal of Closure, Steel Plate
473	.91	.91	2.69	SS	Y	DSP, SMT	External of Closure, Steel Plate
474	.91	.91	3.00	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
475	.91	.91	2.69	SS	X	DSP, SMT	External of Closure, Steel Plate
476	.91	.91	3.00	SS	X	DSP, SMT	Internal of Closure, Steel Plate
477	.46	.46	2.69	SS	Y	DSP, SMT	External of Closure, Steel Plate
478	.46	.46	3.00	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
479	.46	.46	2.69	SS	X	DSP, SMT	External of Closure, Steel Plate
480	.46	.46	3.00	SS	X	DSP, SMT	Internal of Closure, Steel Plate
481	.57	1.74	2.69	SS	Y	DSP, SMT	External of Closure, Steel Plate
482	.57	1.74	3.00	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
483	.57	1.74	2.69	SS	X	DSP, SMT	External of Closure, Steel Plate
484	.57	1.74	3.00	SS	X	DSP, SMT	Internal of Closure, Steel Plate
485	1.36	1.36	2.69	SS	X	DSP, SMT	External of Closure, Steel Plate
486	1.36	1.36	3.00	SS	X	DSP, SMT	Internal of Closure, Steel Plate
487	1.36	1.36	2.69	SS	Y	Scratched	External of Closure, Steel Plate
488	1.36	1.36	3.00	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
489	1.85	.56	2.69	SS	Y	DSP, SMT	External of Closure, Steel Plate

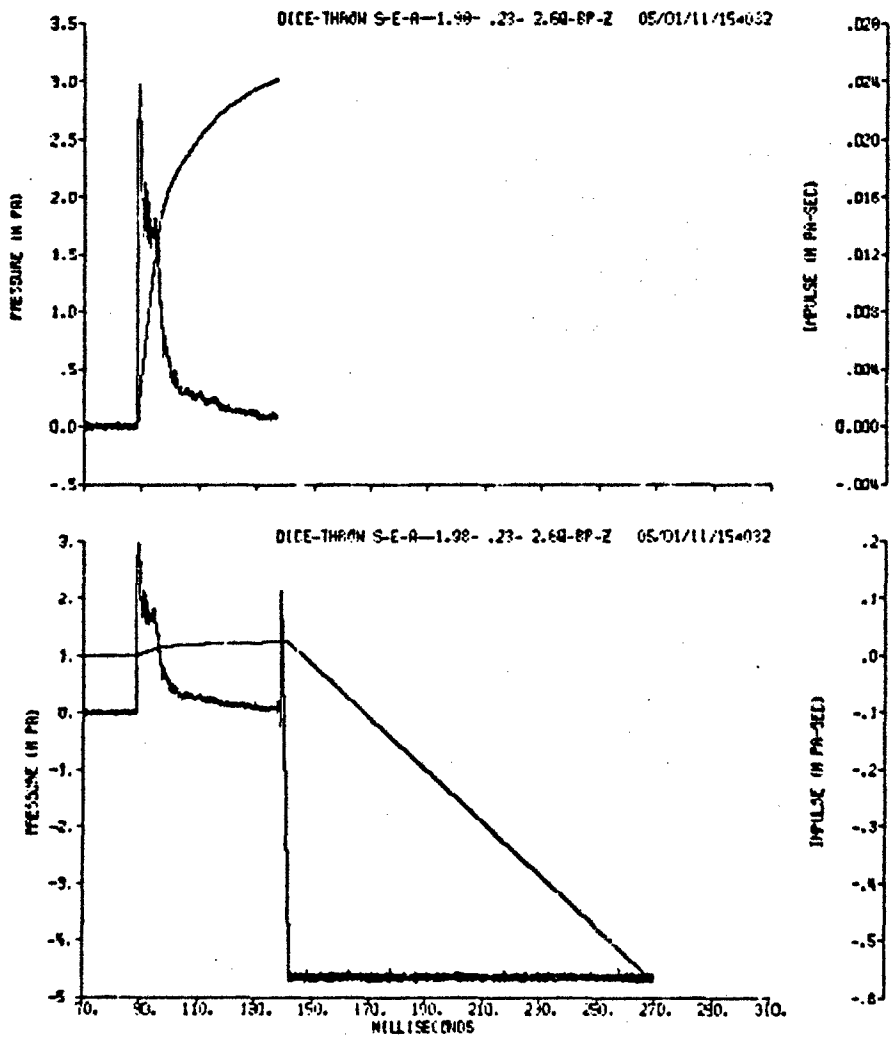
DICE THROW, SHELTER A DATA CORRECTIONS (cont'd)

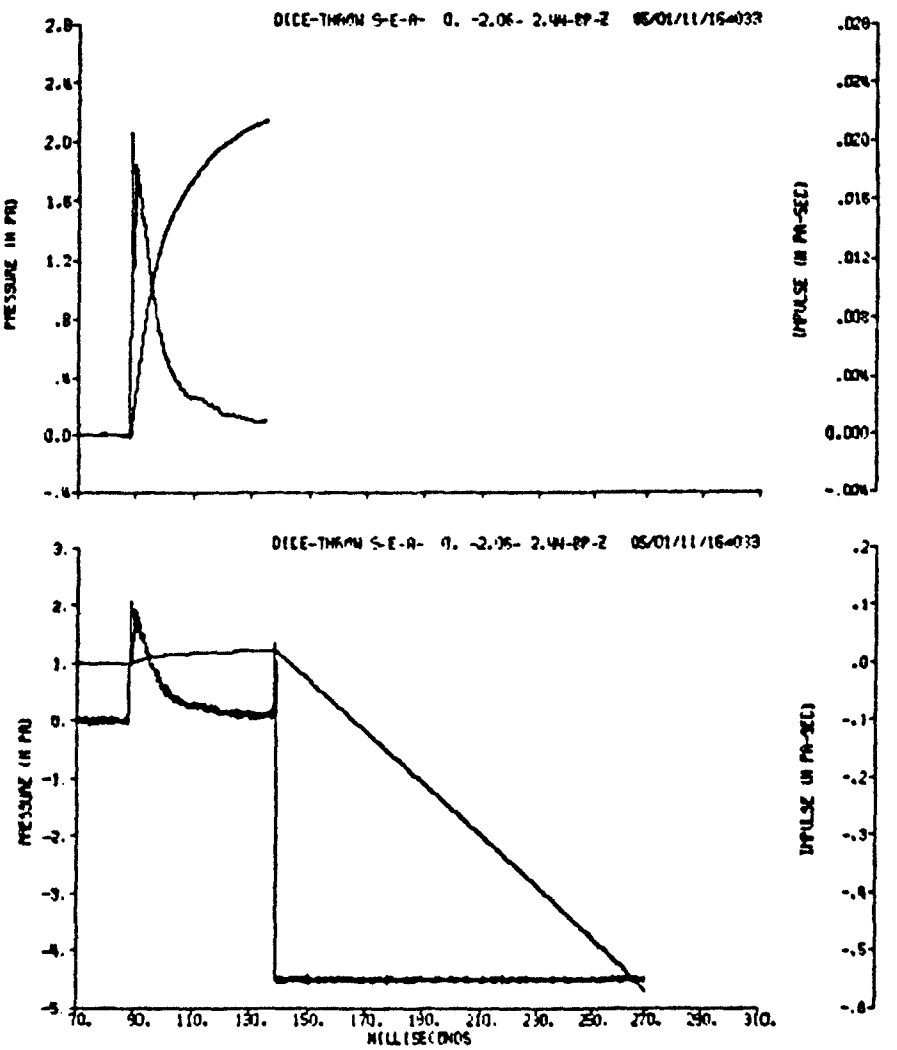
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
490	1.85	.56	3.00	SS	Y	DSP, SMT	Internal of Closure, Steel Plate
491	1.85	.56	2.69	SS	X	DSP, SMT	External of Closure, Steel Plate
492	1.85	.56	3.00	SS	X	DSP, SMT	Internal of Closure, Steel Plate
493	0	-.08	3.17	HS	Z	DSP, SMT	In Foundation
494	0	-.20	3.12	HS	45	DSP, SMT	In Foundation
495	0	-.23	3.17	SE	Z	DSP, SMT	In Foundation
496	0	-.30	3.17	SE	Z	DSP, SMT	In Foundation
497	0	-.35	3.17	SE	Z	DSP, SMT	In Foundation
498	0	-.10	3.33	SE	X	DSP, SMT	In Foundation
499	0	-.20	3.33	SE	X	DSP, SMT	In Foundation
500	0	-.28	3.33	SE	X	DSP, SMT	In Foundation
501	0	-.23	2.84	HS	Z	DSP, SMT	In Foundation
502	0	-.23	2.84	SE	Z	DSP, SMT	In Foundation
503	0	-.30	2.84	SE	Z	DSP, SMT	In Foundation
504	0	-.38	2.84	HS	Z	DSP, SMT	In Foundation
505	0	-.35	2.84	HS	Z	DSP, SMT	In Foundation
506	0	-.20	2.38	SE	X	DSP, SMT	In Foundation
507	0	0	2.74	SS	Z	DSP	Closure Key on Steel Plate
508	0	-.15	2.74	SS	Z	DSP, SMT	Closure Key on Steel Plate
509	0	0	2.94	SS	Z	DSP	Closure Key on Steel Plate
510	0	-.15	2.94	SS	Z	DSP, SMT	Closure Key on Steel Plate
511	0	-.10	2.84	SS	Y	DSP, SMT	Closure Key on Steel Plate
512	0	-.10	2.84	SS	Z	DSP, SMT	Closure Key on Steel Plate
513	0	-.10	2.84	SS	45	DSP, SMT	Closure Key on Steel Plate
514	0	2.52	5.68	SE	Y	DSP, SMT	Crown of Arch
515	0	-.20	3.04	HS	Y	DSP, SMT	In Foundation
516	0	-.20	3.30	HS	Y	DSP, SMT	In Foundation
551	0	-.29	3.47	IP	X	DSP, SMT, BLC	Foundation
552	0	-.42	3.17	IP	Y	DSP, SMT, FIL, BLC	Foundation
553	0	-.42	2.48	IP	Y	DSP	Foundation

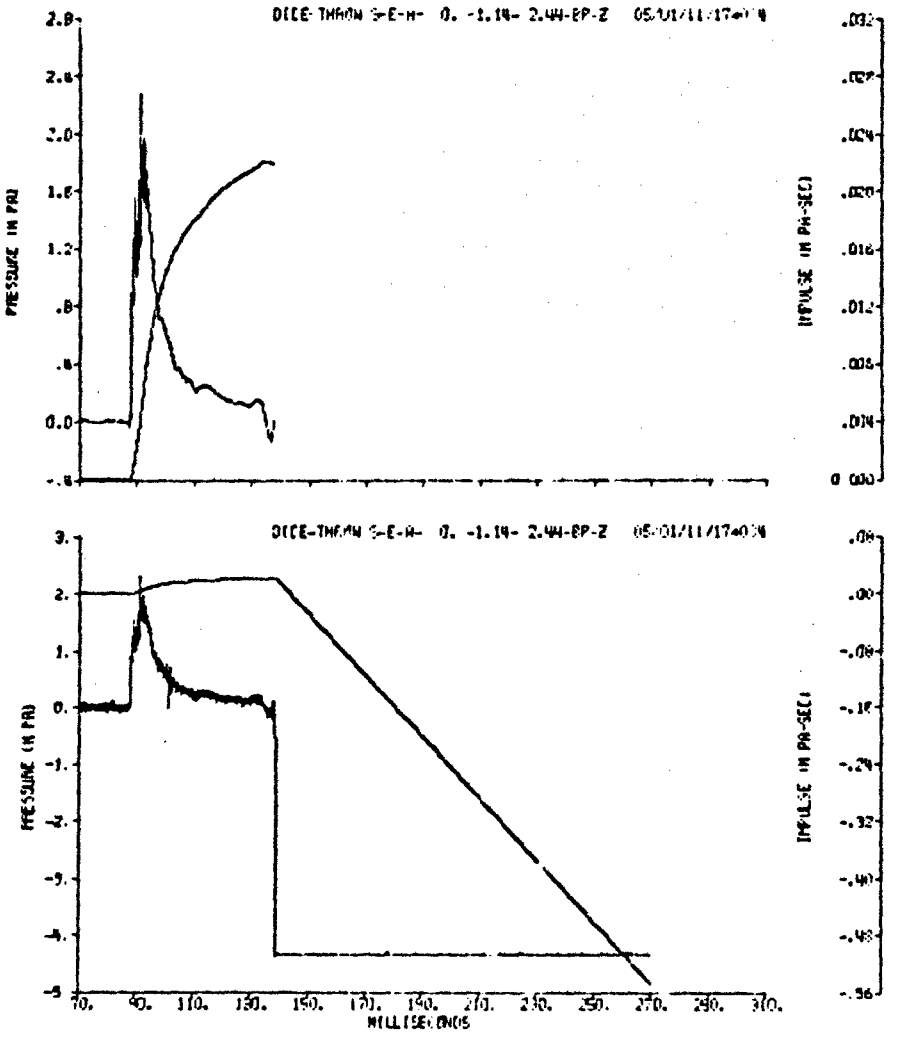

DICE-THROW S-E-A—.96 - .99- 2.60 EP-Z 05/01/09/16=029
PRESSURE IN PSI
IMPULSE IN PSI-SEC
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
.028
.024
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-A—.96 - .99- 2.60 EP-Z 05/01/09/16=029
PRESSURE IN PSI
IMPULSE IN PSI-SEC
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

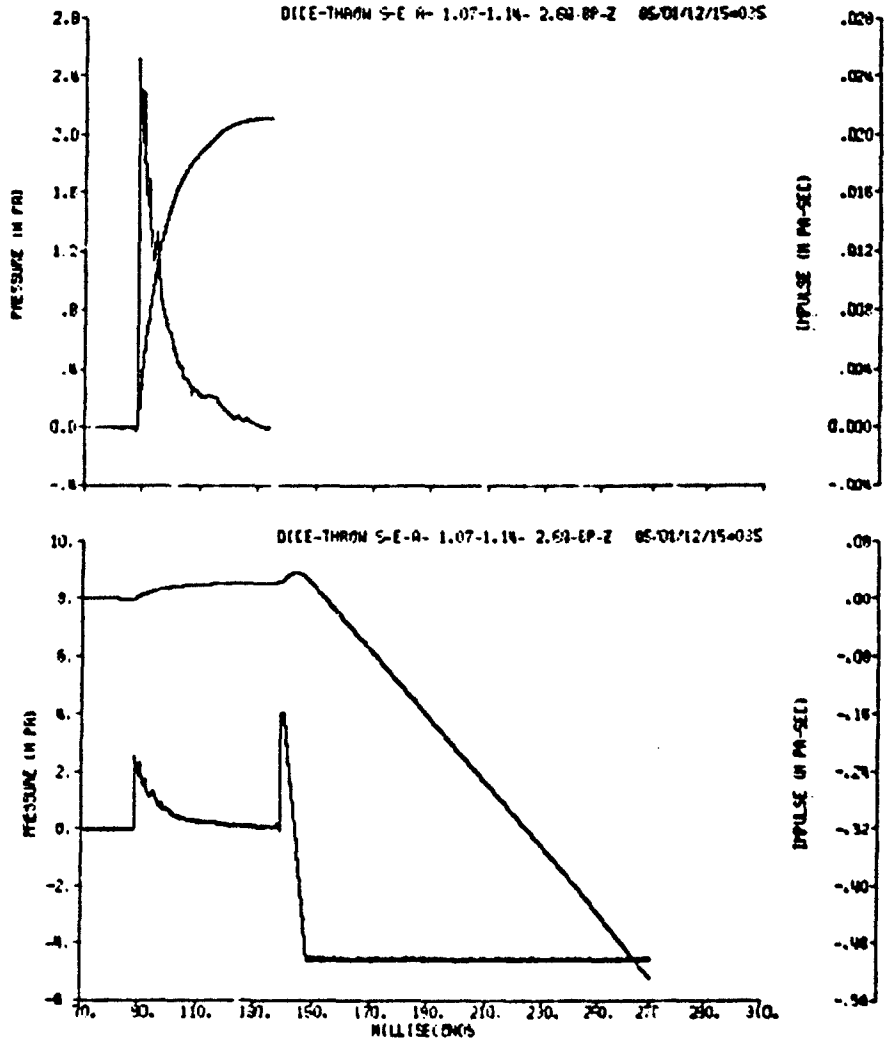

DIFF-TRANS S-E-A- -.30-2.06- 2.60-BP-Z 05/01/10/16e03D
PRESSURE IN PSI
IMPULSE IN PA-SEC
DIFF-TRANS S-E-A- -.30-2.06- 2.60-BP-Z 05/01/10/16e03D
PRESSURE IN PSI
IMPULSE IN PA-SEC
MILLISECONDS

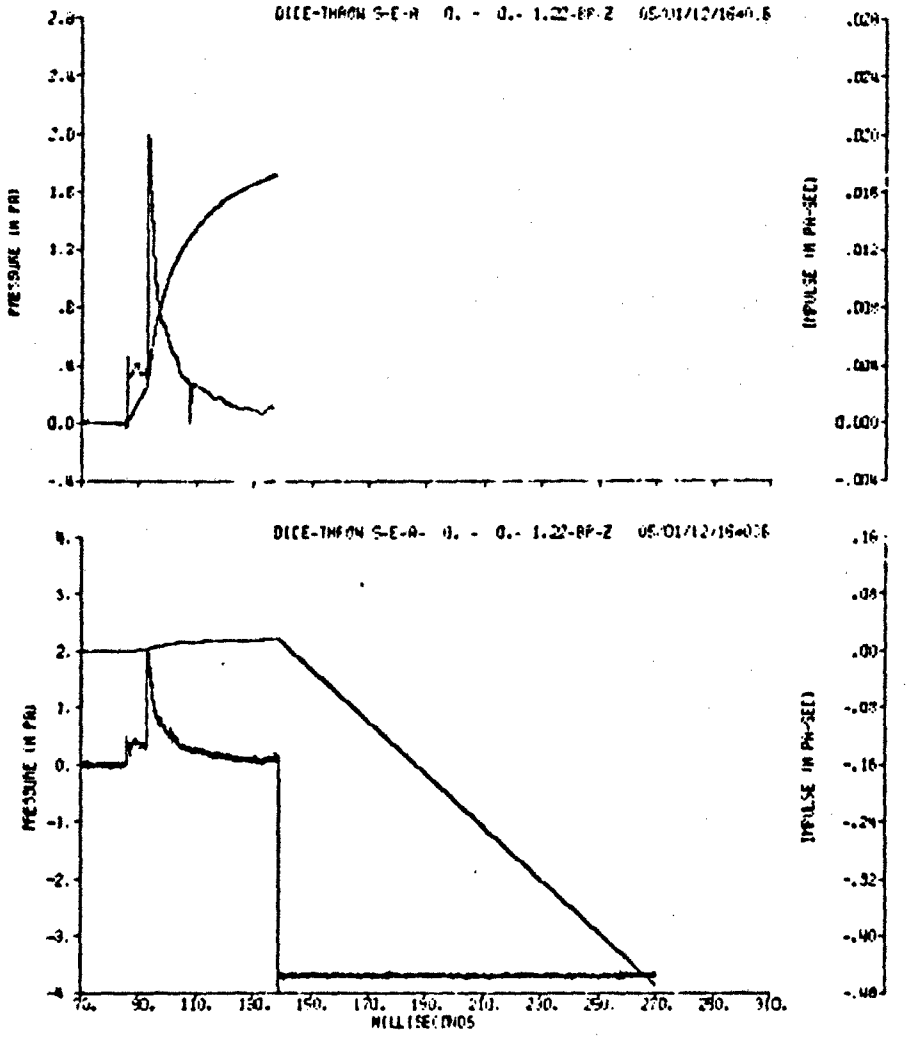

DICE-THROW S-E-A- -.30- .23- 2.68-BP-Z 05/01/10/17+031
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
DICE-THROW S-E-A- -.30- .23- 2.68-BP-Z 05/01/10/17+031
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
MILLISECONDS

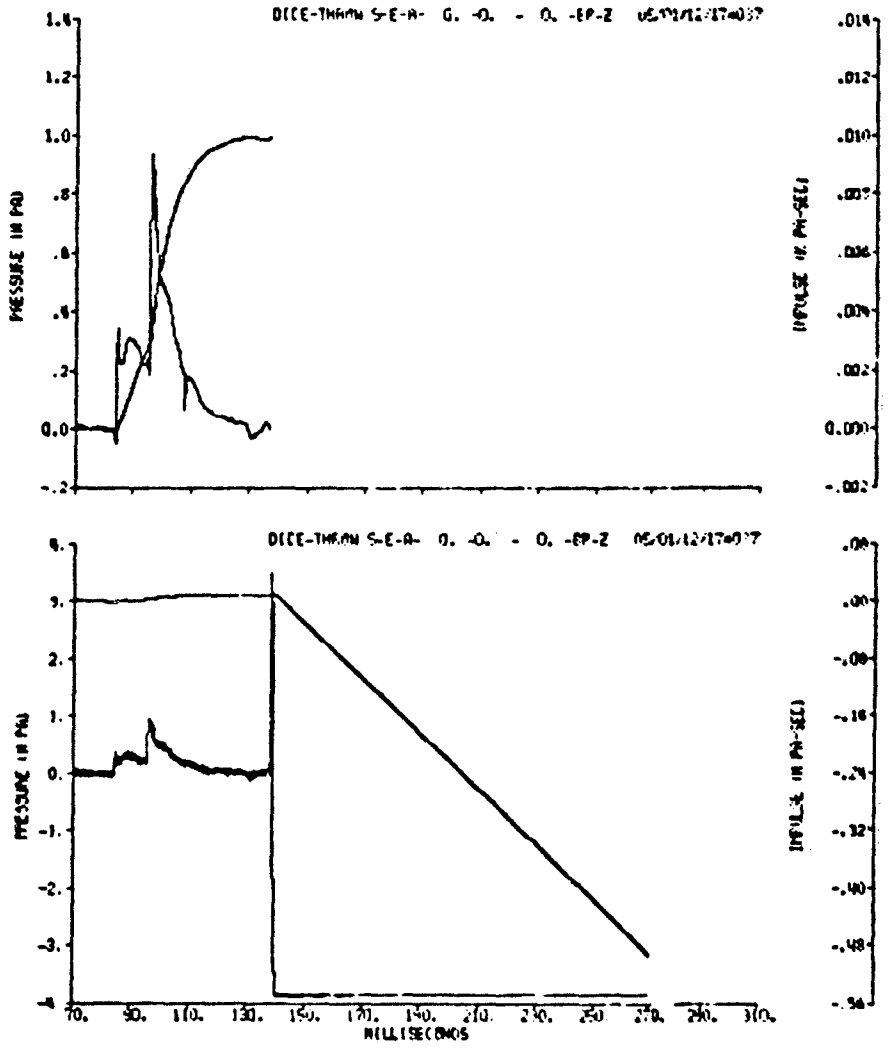

DICE-THROW S-E-A—1.98- .23- 2.68-SP-Z 05/01/11/154032
PRESSURE (N PA)
IMPULSE (N PA-SEC)
3.5
3.0
2.5
2.0
1.5
1.0
.5
0.0
-.5
.028
.024
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-A—1.98- .23- 2.68-SP-Z 05/01/11/154032
PRESSURE (N PA)
IMPULSE (N PA-SEC)
3.
2.
1.
0.
-1.
-2.
-3.
-4.
-5
.2
.1
.0
-.1
-.2
-.3
-.4
-.5
-.6
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

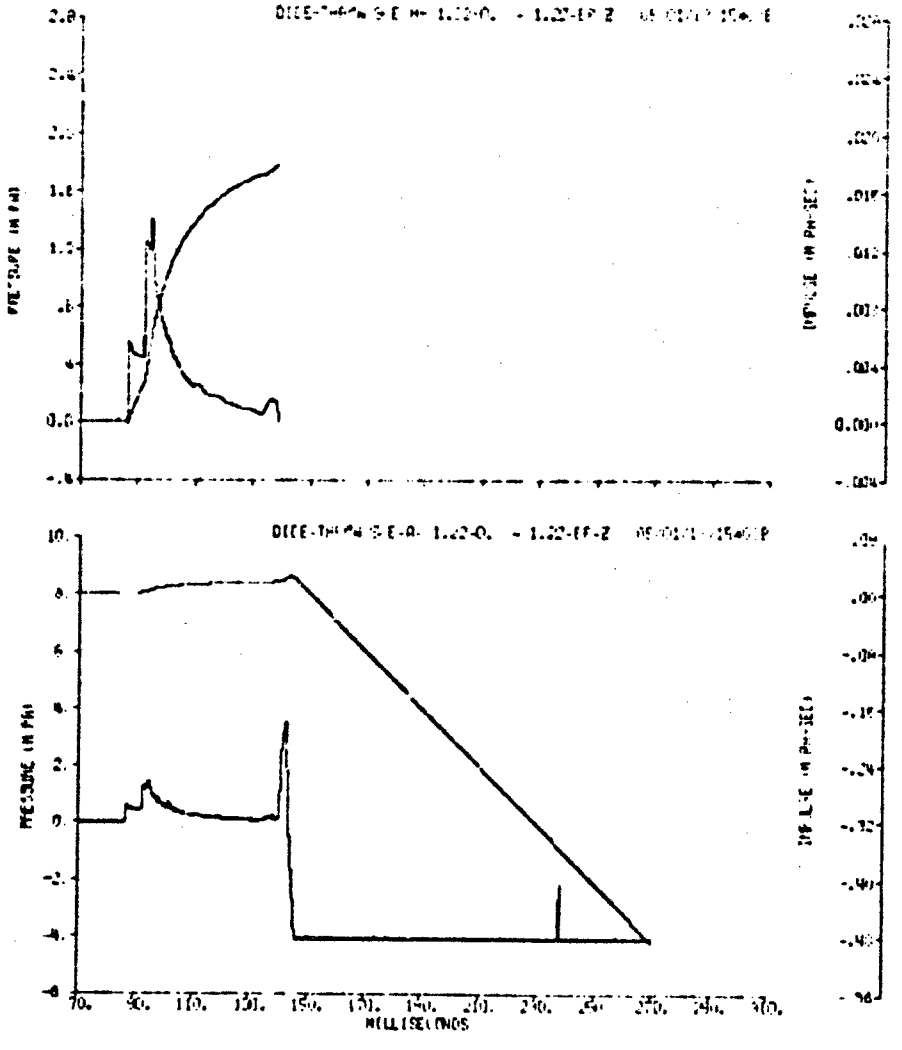

DICE-THROW S-E-A- 0. -2.06- 2.44-BP-Z 05/01/11/16+033
PRESSURE (N PA)
IMPULSE (N PA-SEC)
DICE-THROW S-E-A- 0. -2.06- 2.44-BP-Z 05/01/11/16+033
PRESSURE (N PA)
IMPULSE (N PA-SEC)
MILLISECONDS

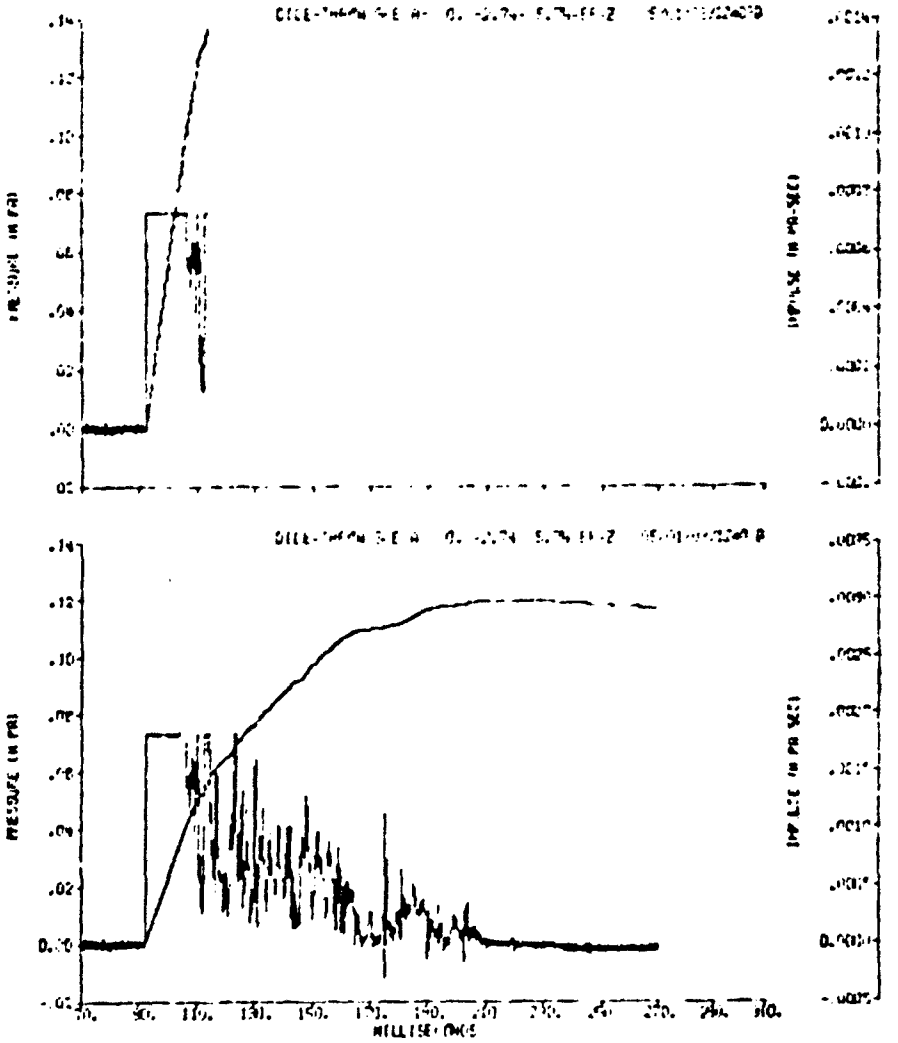

DICE-THROW S-E-H- 0. -1.1N- 2.4W-BP-Z
PRESSURE IN PSI
IMPULSE IN PSI-SEC
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
.032
.028
.024
.020
.016
.012
.008
.004
0.000
DICE-THROW S-E-H- 0. -1.1N- 2.4W-BP-Z
PRESSURE (N PSI)
IMPULSE IN PSI-SEC)
3.
2.
1.
0.
-1.
-2.
-3.
-4.
-5
.08
.00
-.08
-.16
-.24
-.32
-.40
-.48
-.56
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

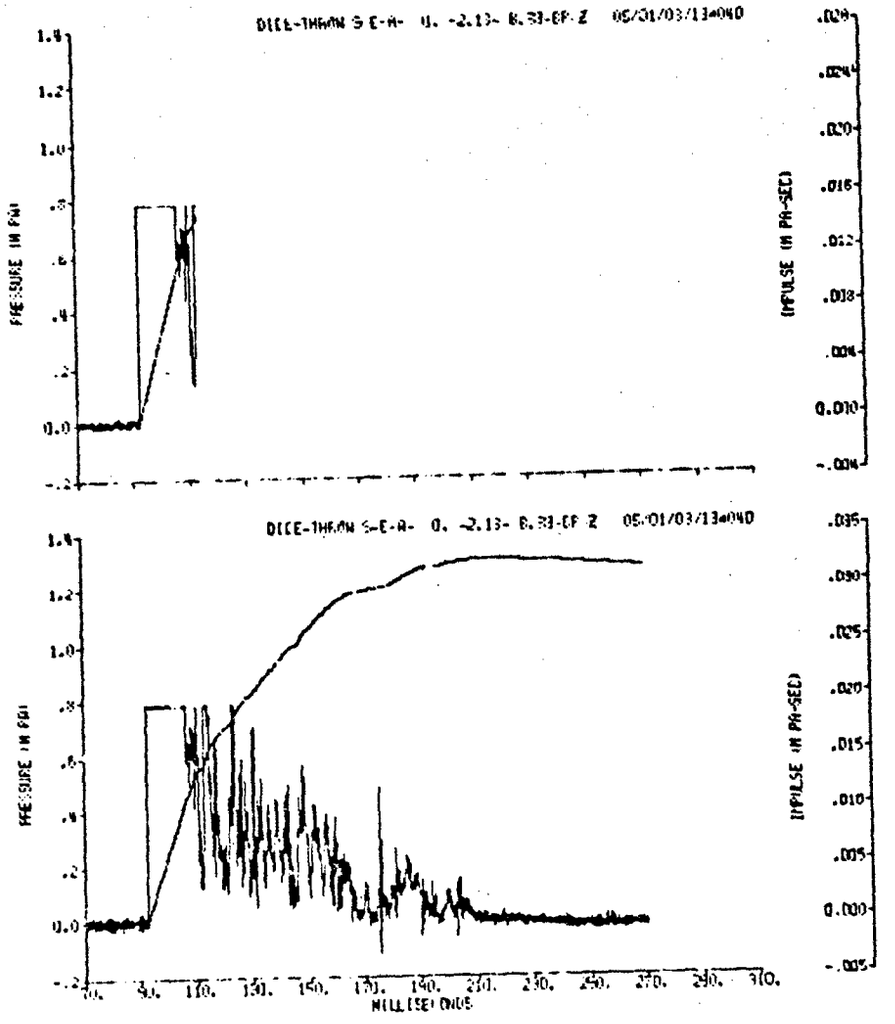

DICE-THROW S-E A- 1.07-1.1%- 2.68-EP-Z 05/01/12/15+035
PRESSURE (N PA)
IMPULSE (N PA-SEC)
2.0
1.6
1.2
.8
.4
0.0
-.4
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-A- 1.07-1.1%- 2.68-EP-Z 05/01/12/15+035
10.
9.
6.
4.
2.
0.
-2.
-4.
.08
.00
-.08
-.16
-.24
-.32
-.40
-.48
-.56
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

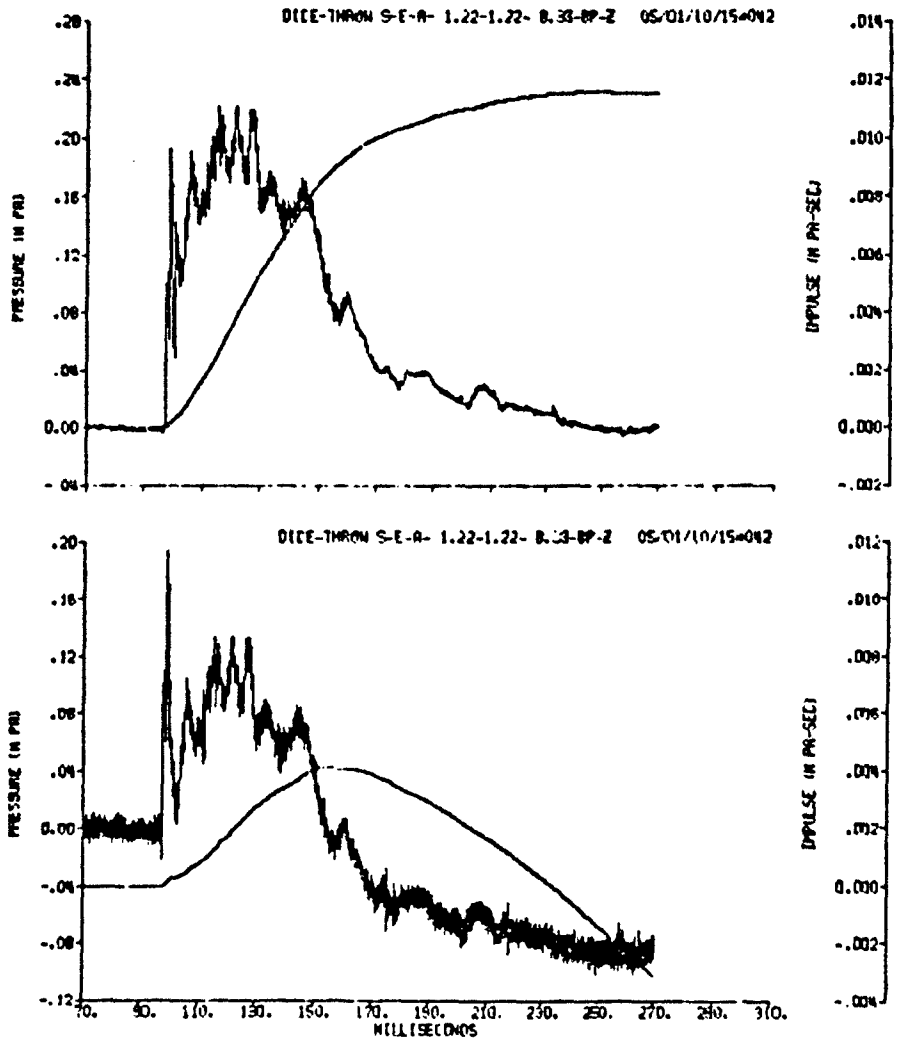

DICE-THROW S-E-A 0. - 0.- 1.22-BF-Z
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-A- 0. - 0.- 1.22-BF-Z
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

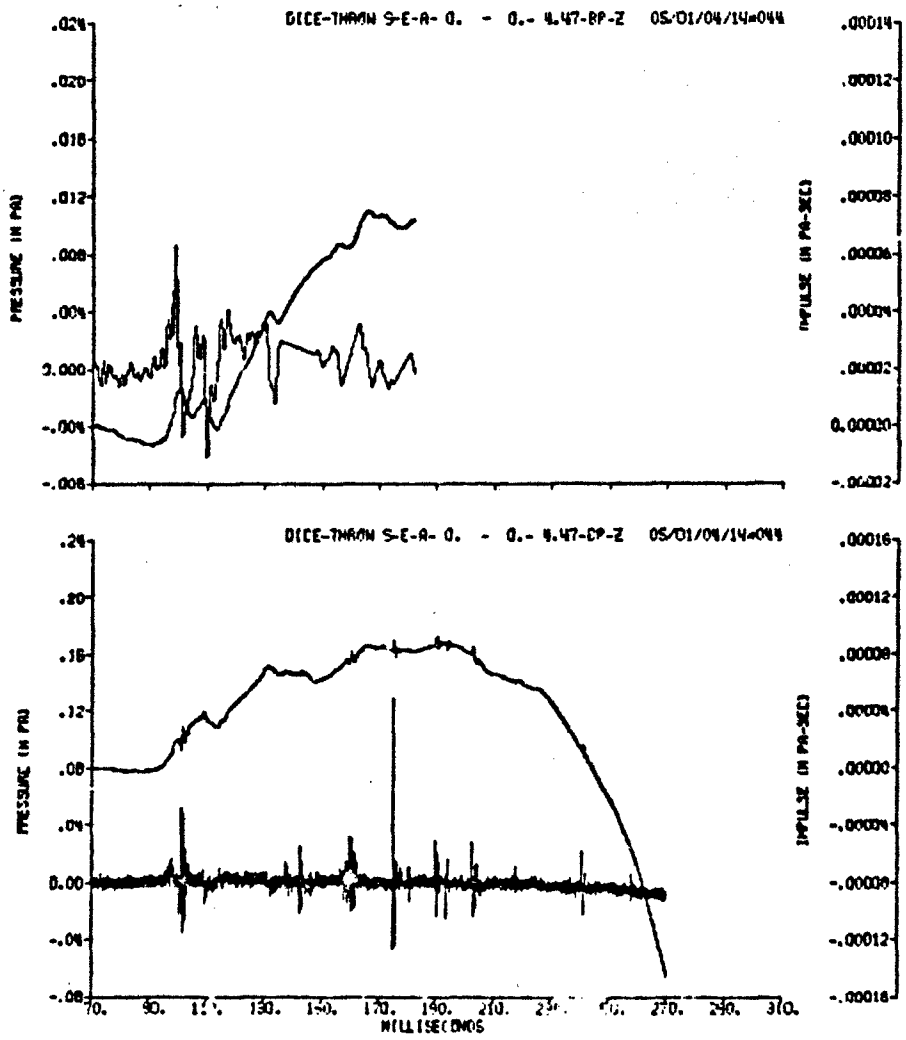

DICE-THROW S-E-A- 0. -0. - 0. -EP-Z
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-A- 0. -0. - 0. -EP-Z
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

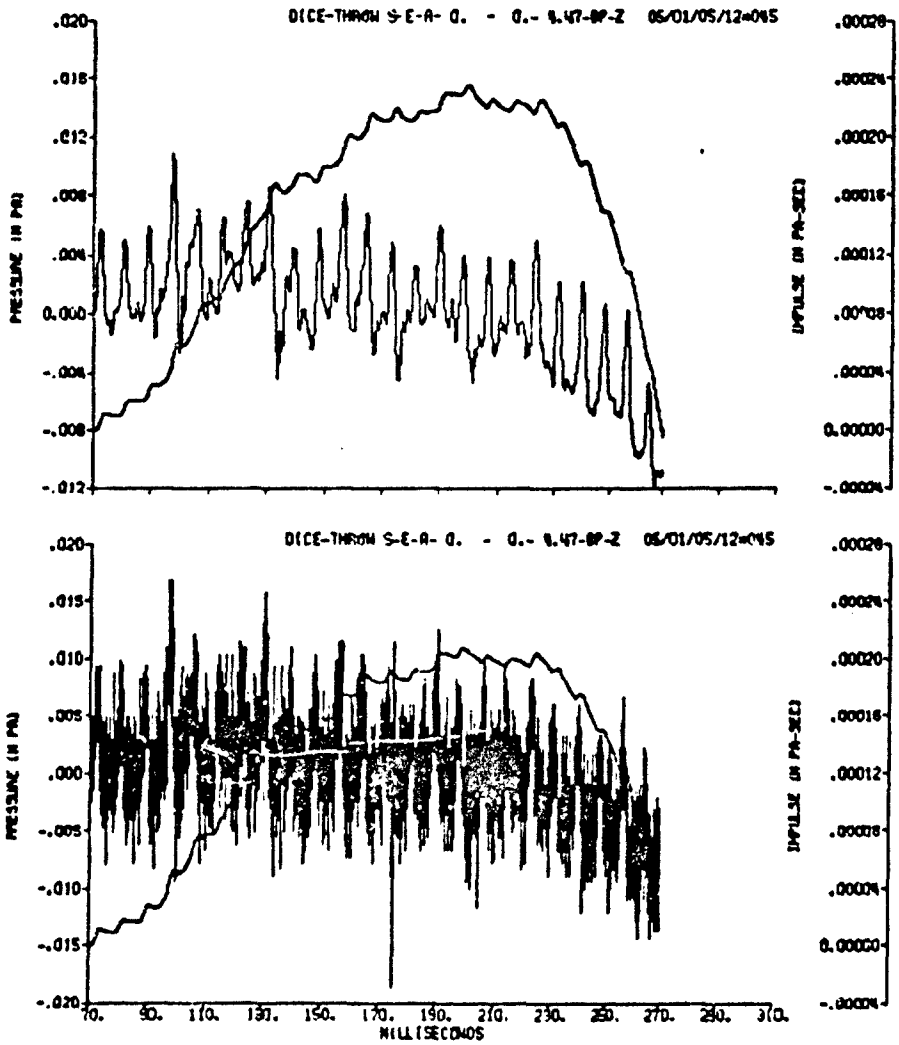


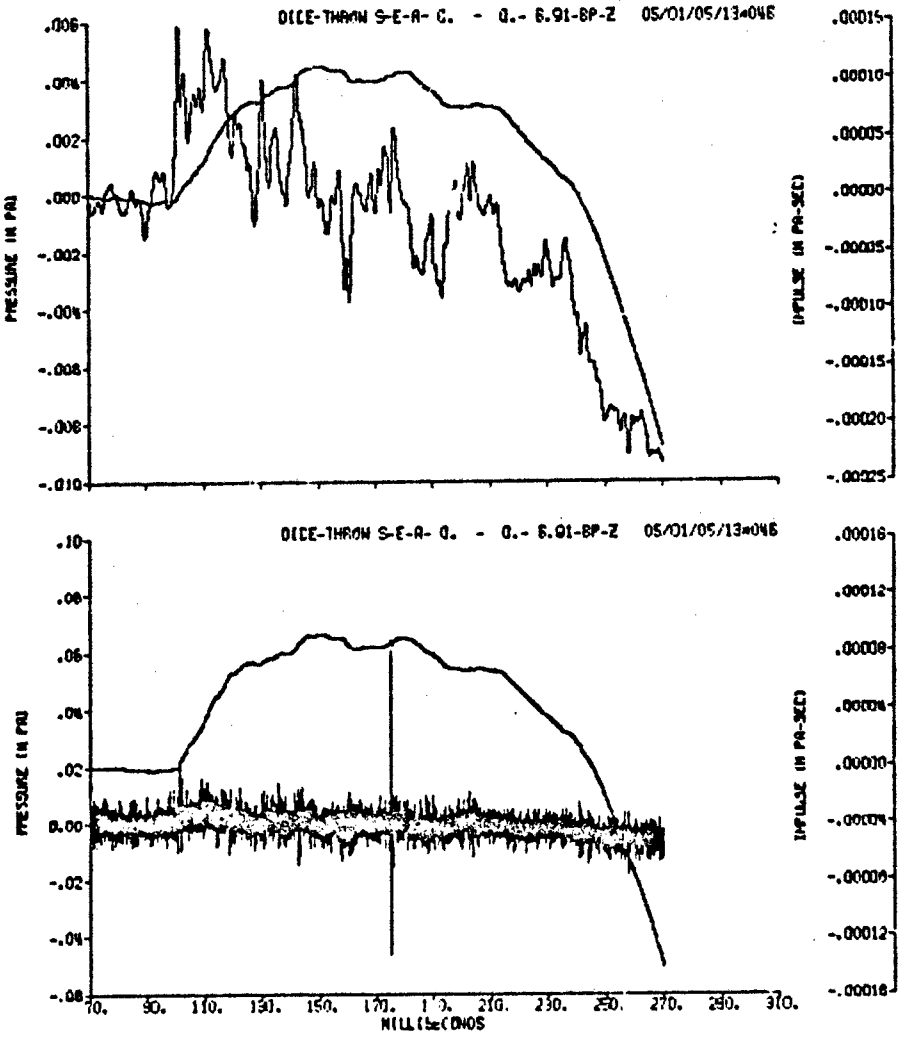


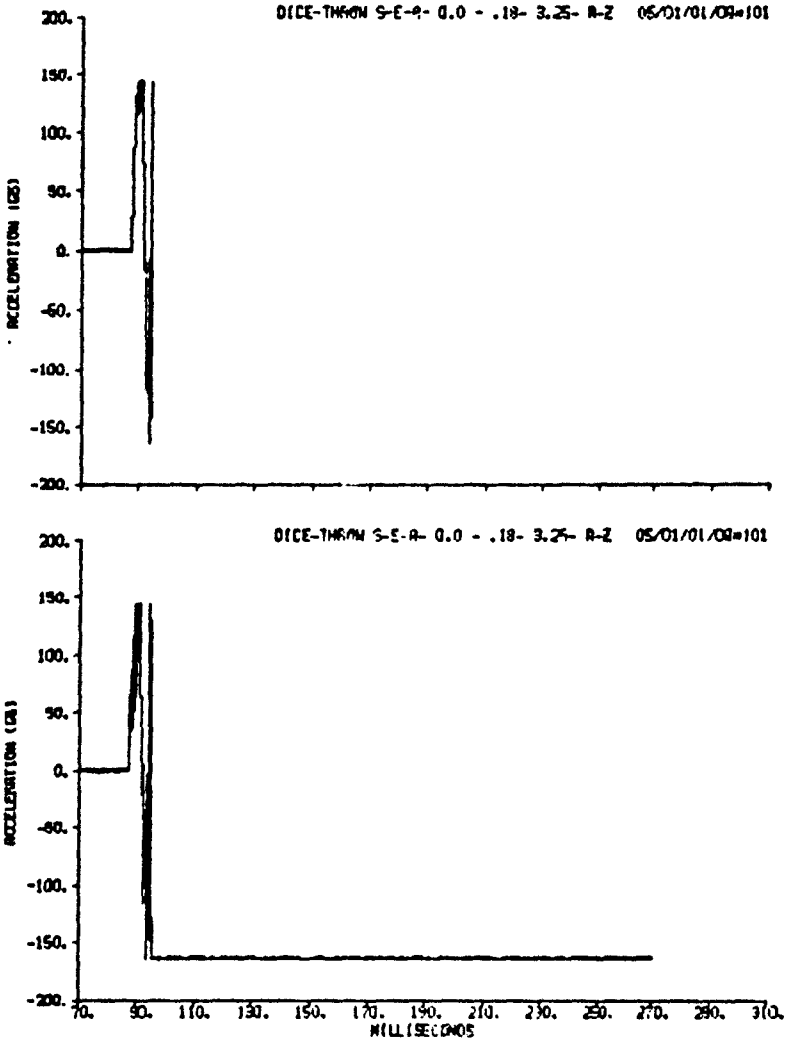

DICE-THROW S-E-A- 0. -2.13- 8.33-OP-Z 05/01/03/13+040
PRESSURE IN PSI
IMPULSE IN PA-SEC
DICE-THROW S-E-A- 0. -2.13- 8.33-OP-Z 05/01/03/13+040
PRESSURE IN PSI
IMPULSE IN PA-SEC
MILLISECONDS

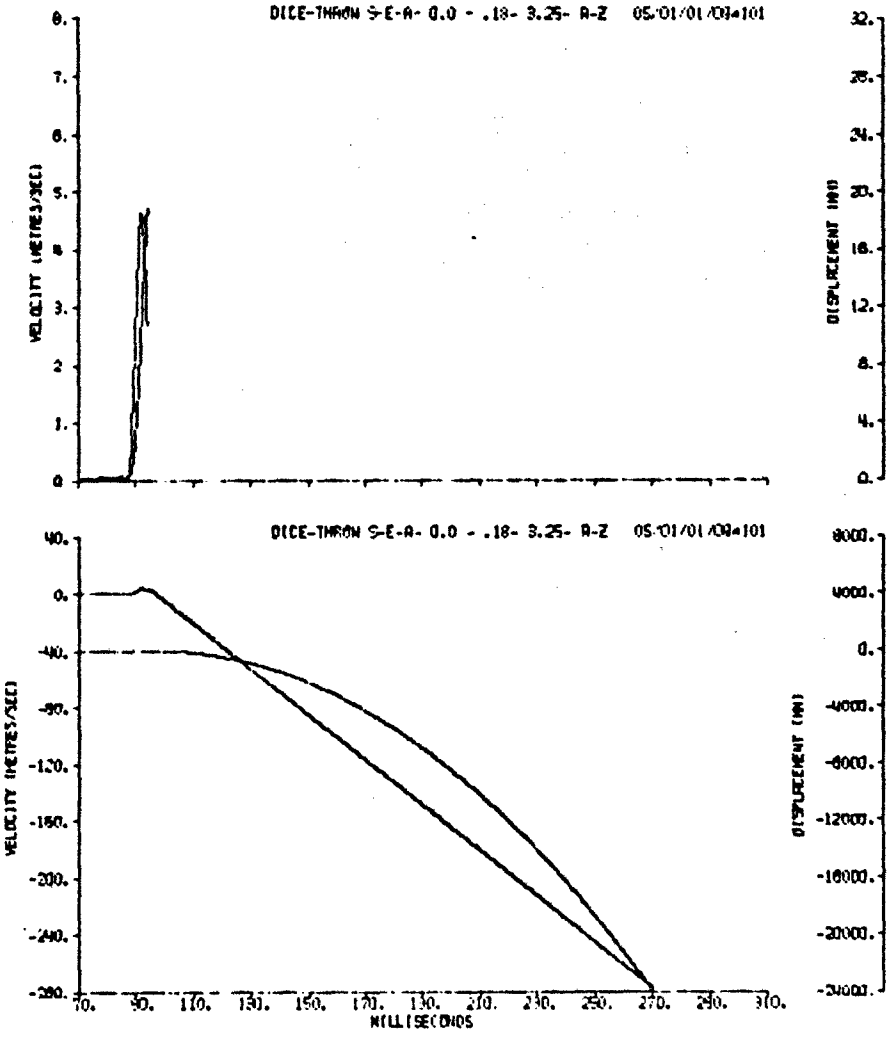

DICE-THROW S-E-A- 1.22-1.22- 8.33-BP-Z 05/01/10/15+042
PRESSURE (N PSI)
IMPULSE (N PA-SEC)
.20
.16
.12
.08
.04
0.00
-.04
.014
.012
.010
.008
.006
.004
.002
0.000
-.002
DICE-THROW S-E-A- 1.22-1.22- 8.33-BP-Z 05/01/10/15+042
PRESSURE (N PSI)
IMPULSE (N PA-SEC)
.20
.16
.12
.08
.04
0.00
-.04
-.08
-.12
.012
.010
.008
.006
.004
.002
0.000
-.002
-.004
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

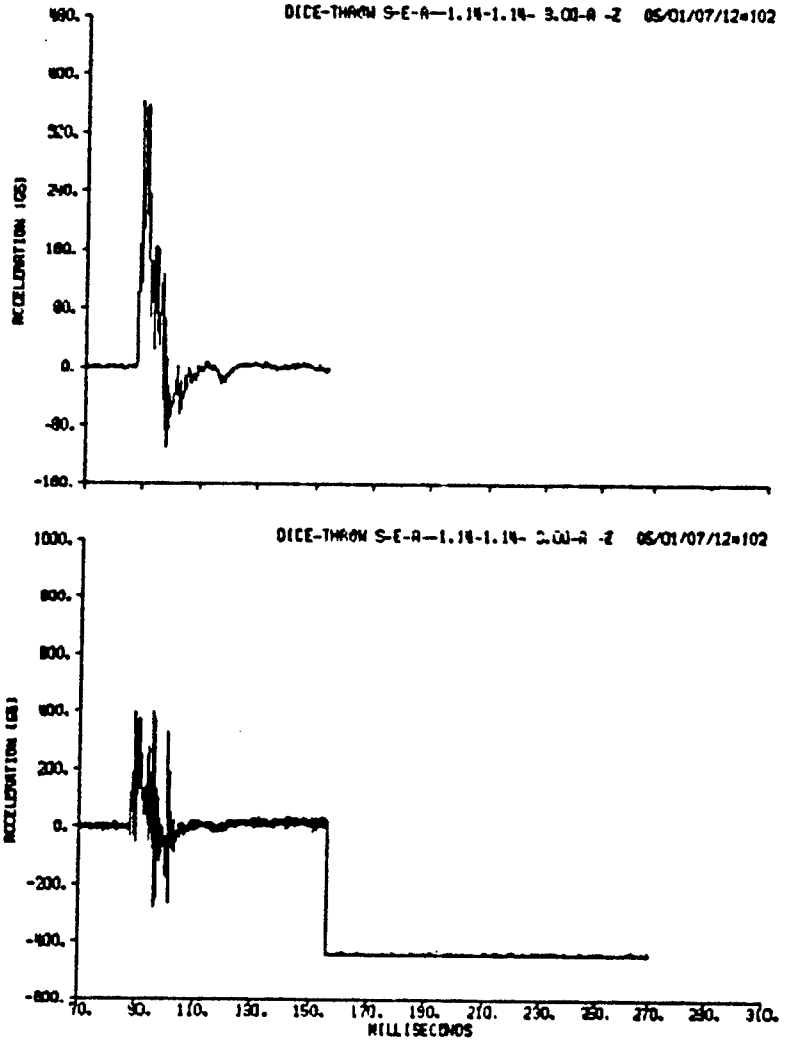

DICE-THROW S-E-A- 0. - 0.- 4.47-BP-Z 05/01/04/14=044
PRESSURE (N PA)
IMPULSE (N PA-SEC)
DICE-THROW S-E-A- 0. - 0.- 4.47-DP-Z 05/01/04/14=044
PRESSURE (N PA)
IMPULSE (N PA-SEC)
MILLISECONDS

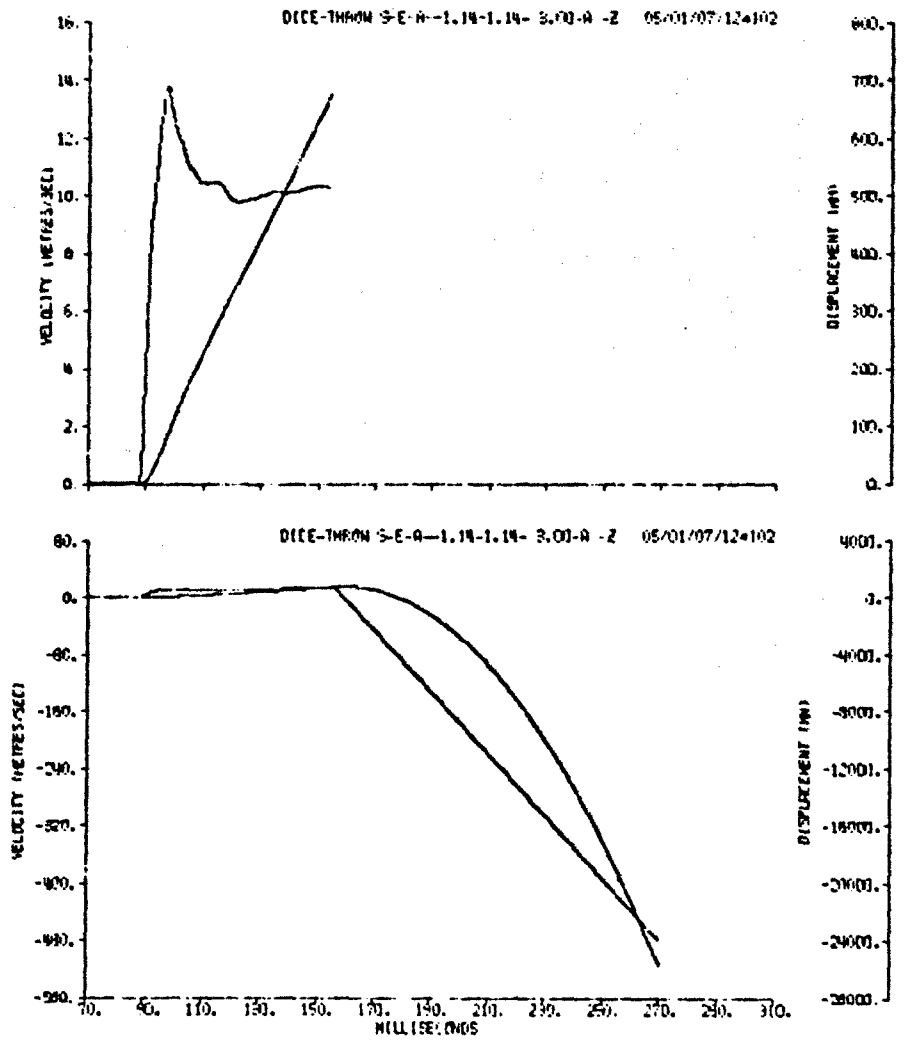

DICE-THROW S-E-A- 0. - 0.- 9.47-BP-Z 05/01/05/12=045
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.020
.016
.012
.008
.004
0.000
-.004
-.008
-.012
.00028
.00024
.00020
.00016
.00012
.00008
.00004
0.00000
-.00004
DICE-THROW S-E-A- 0. - 0.- 9.47-BP-Z 05/01/05/12=045
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.020
.015
.010
.005
.000
-.005
-.010
-.015
-.020
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

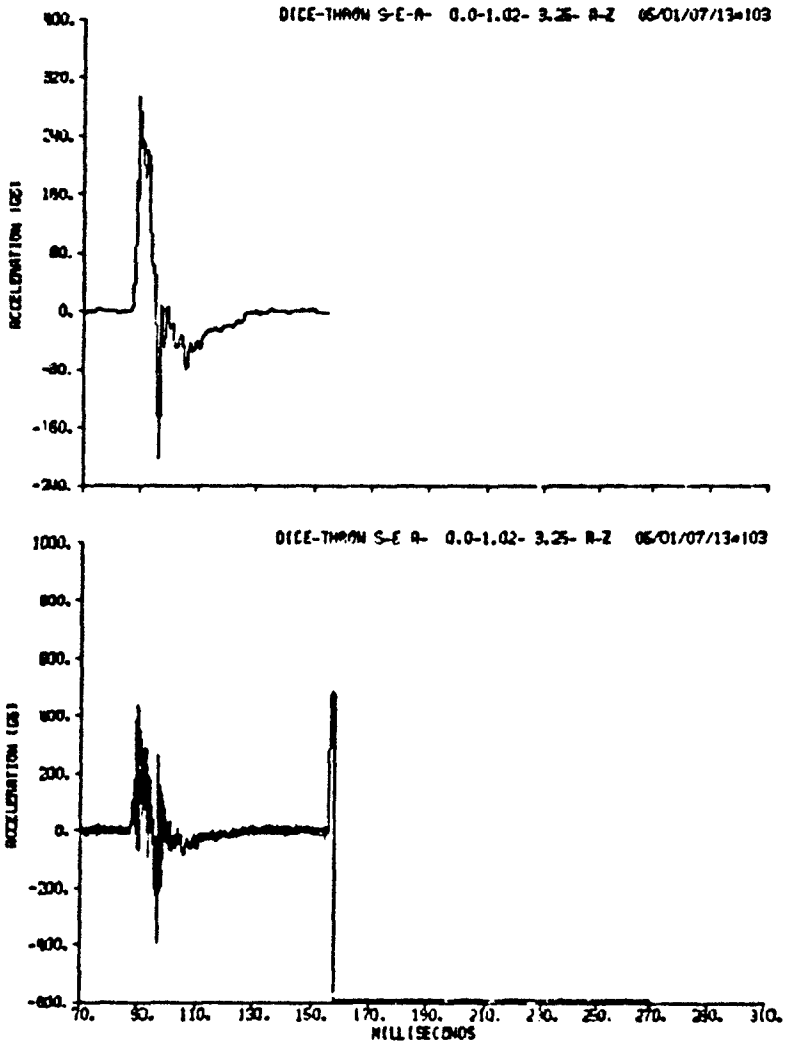

DICE-THROW S-E-A- C. - G.- 6.91-BP-Z 05/01/05/13:046
PRESSURE (IN PA)
IMPULSE (IN PA-SEC)
.006
.004
.002
.000
-.002
-.004
-.006
-.008
-.010
.00015
.00010
.00005
.00000
-.00005
-.00010
-.00015
-.00020
-.00025
DICE-THROW S-E-A- G. - G.- 6.01-BP-Z 05/01/05/13:046
PRESSURE (IN PA)
IMPULSE (IN PA-SEC)
.10
.08
.06
.04
.02
0.00
-.02
-.04
-.08
.00016
.00012
.00008
.00004
.00000
-.00004
-.00008
-.00012
-.00016
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

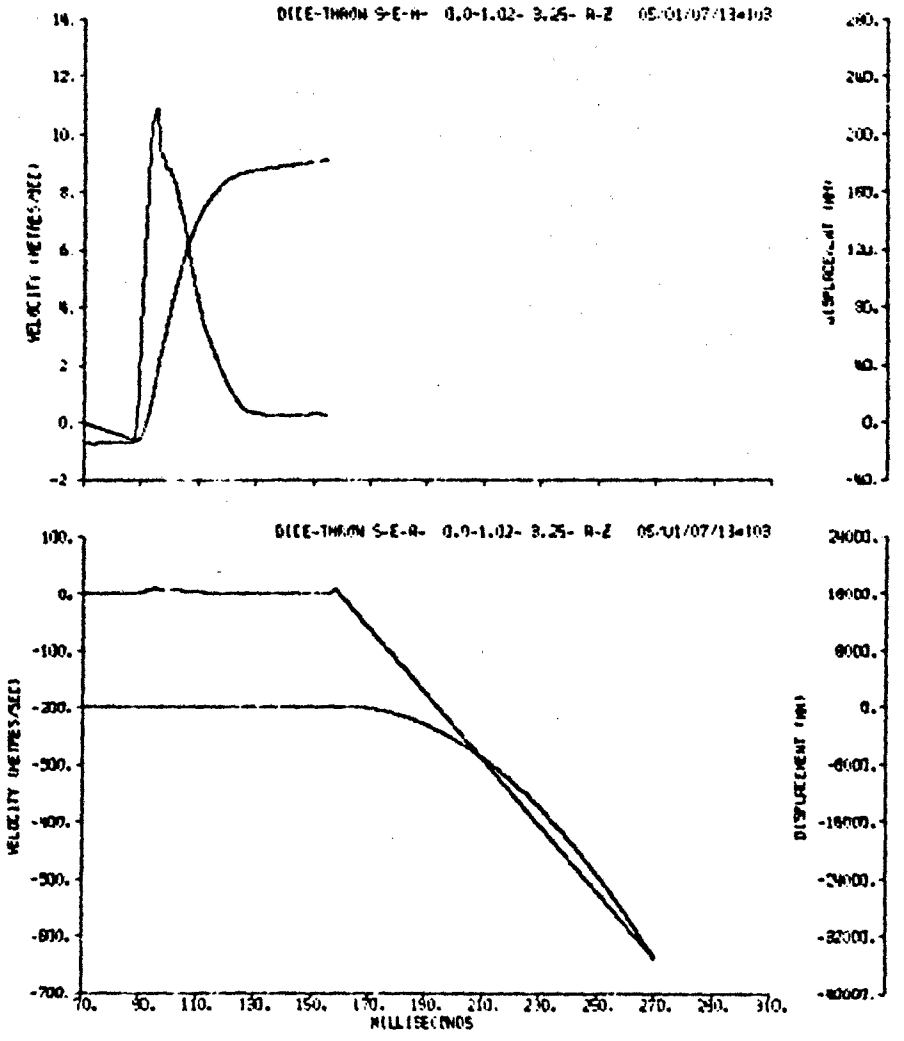

DICE-THROW S-E-A- 0.0 - .18- 3.25- R-Z 05/01/01/01=101
200.
150.
100.
50.
0.
-50.
-100.
-150.
-200.
ACCELERATION (GS)
DICE-THROW S-E-A- 0.0 - .18- 3.25- R-Z 05/01/01/01=101
200.
150.
100.
50.
0.
-50.
-100.
-150.
-200.
ACCELERATION (GS)
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

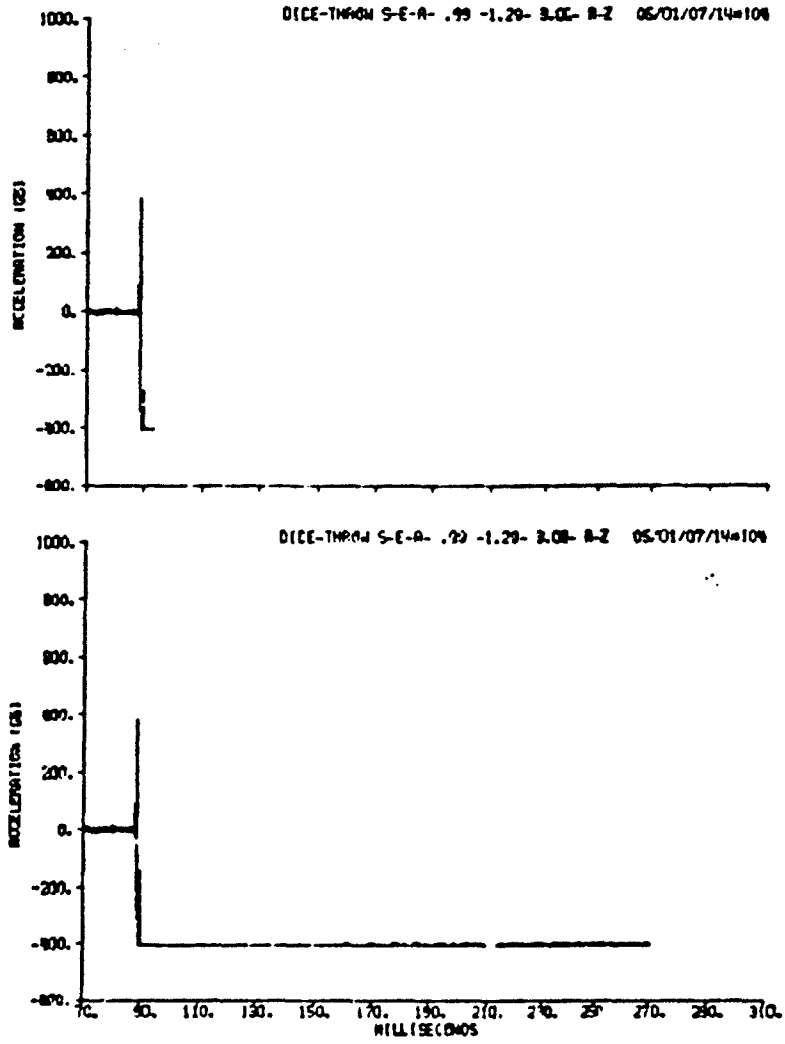

DICE-THROW S-E-A- 0.0 - .18- 3.25- R-Z 05/01/01/09+101
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-A- 0.0 - .18- 3.25- R-Z 05/01/01/09+101
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

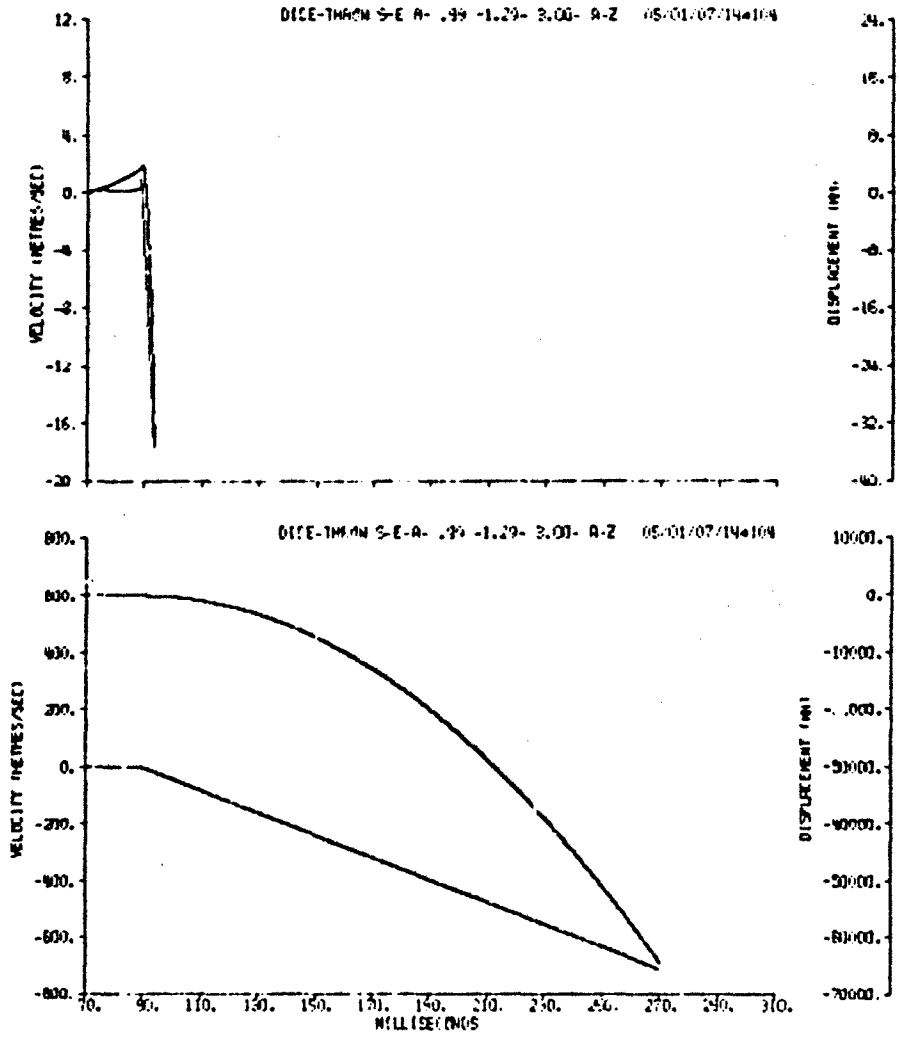

DICE-THROW S-E-A—1.1%-1.1%- 3.00-A -Z 05/01/07/12=102
ACCELERATION (GS)
480.
400.
320.
240.
160.
80.
0.
-80.
-160.
DICE-THROW S-E-A—1.1%-1.1%- 3.00-A -Z 05/01/07/12=102
ACCELERATION (GS)
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

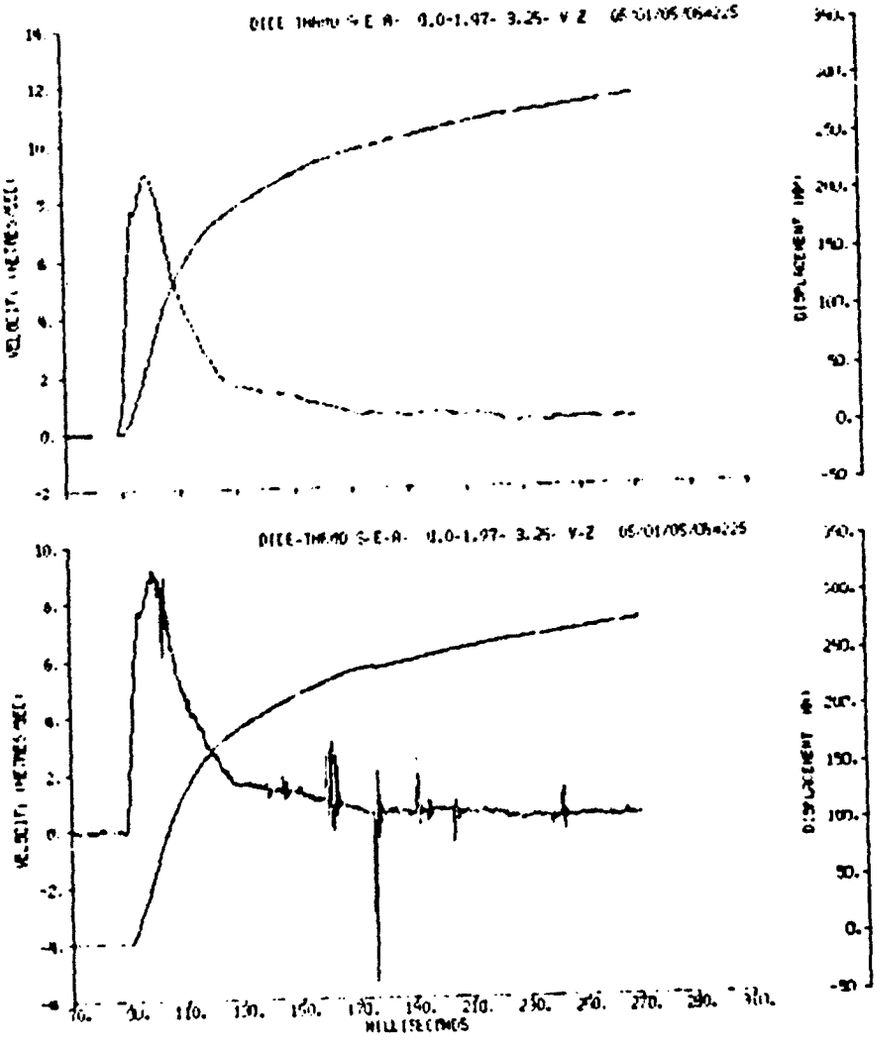

DICE-THROW S-E-A--1.14-1.14- 3.00-A -Z 05/01/07/12+102
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-A--1.14-1.14- 3.00-A -Z 05/01/07/12+102
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

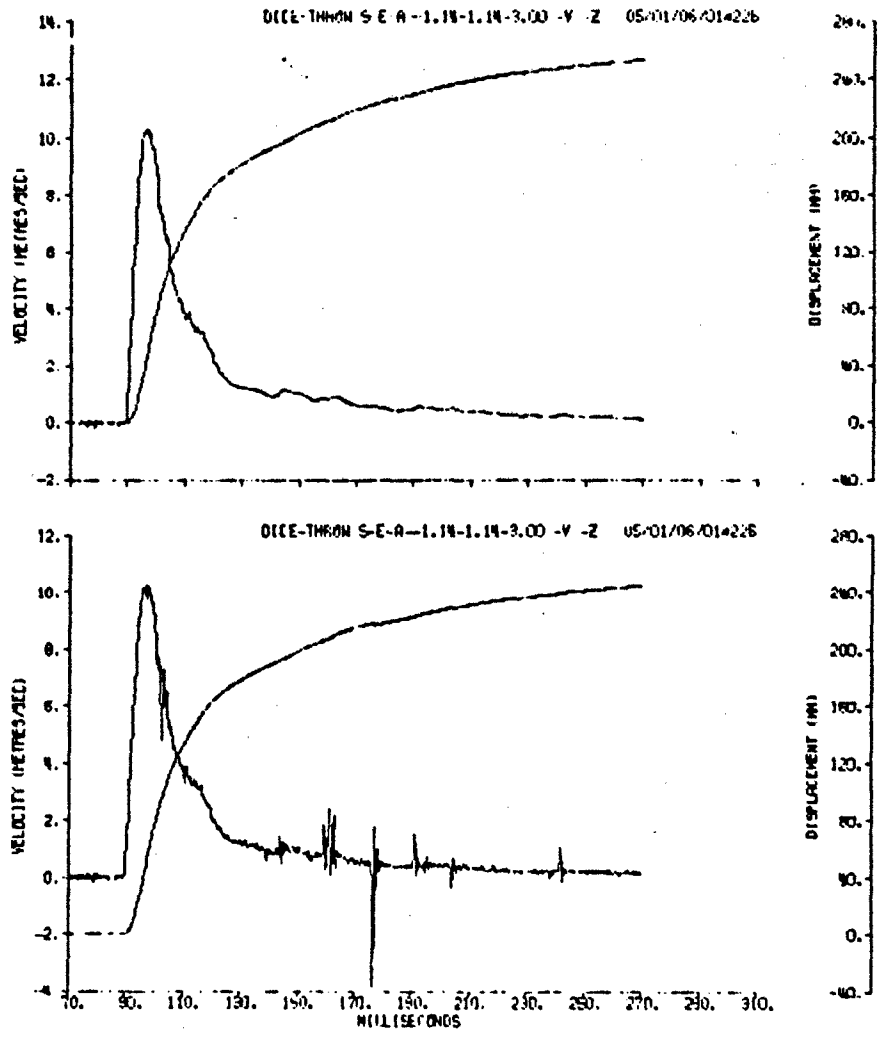

DICE-THROW S-E-A- 0.0-1.02- 3.25- A-Z 05/01/07/13=103
ACCELERATION (GS)
320.
240.
160.
80.
0.
-80.
-160.
-240.
DICE-THROW S-E A- 0.0-1.02- 3.25- A-Z 05/01/07/13=103
ACCELERATION (GS)
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

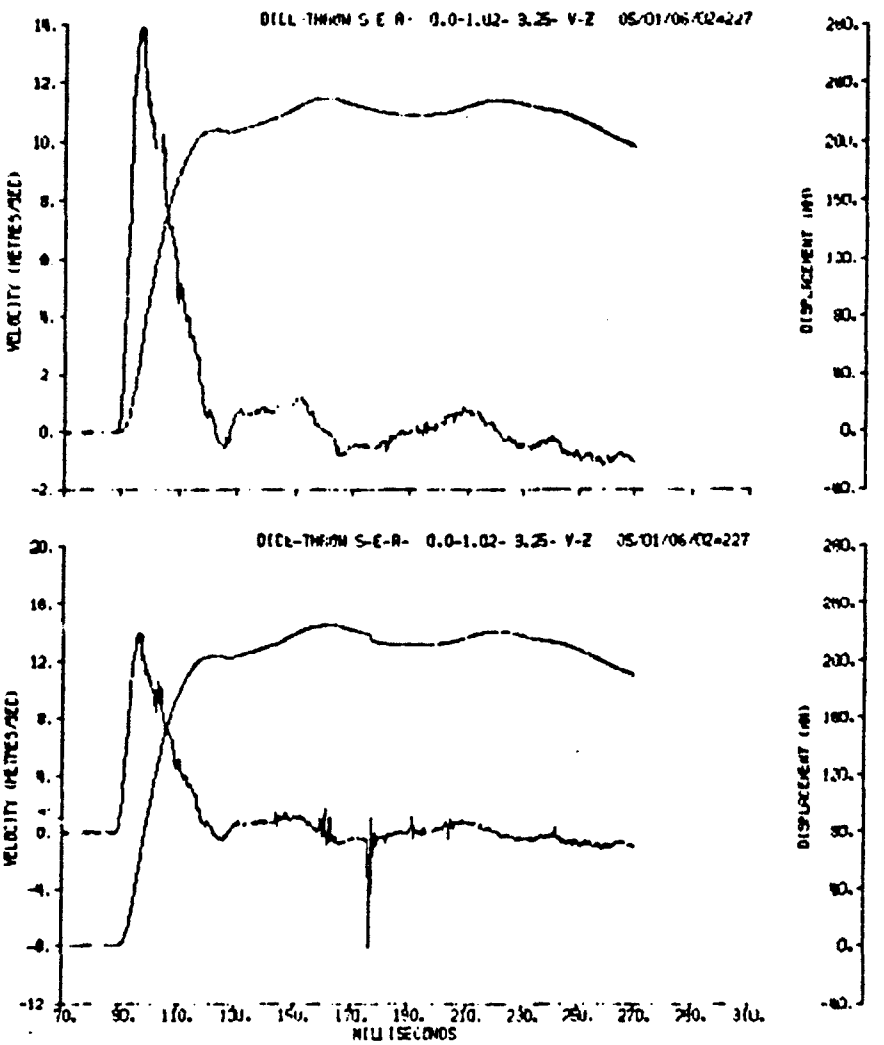

DIXIE-THROW S-E-R- 0.0-1.02- 3.25- R-Z
DIXIE-THROW S-E-R- 0.0-1.02- 3.25- R-Z
MILLISECONDS

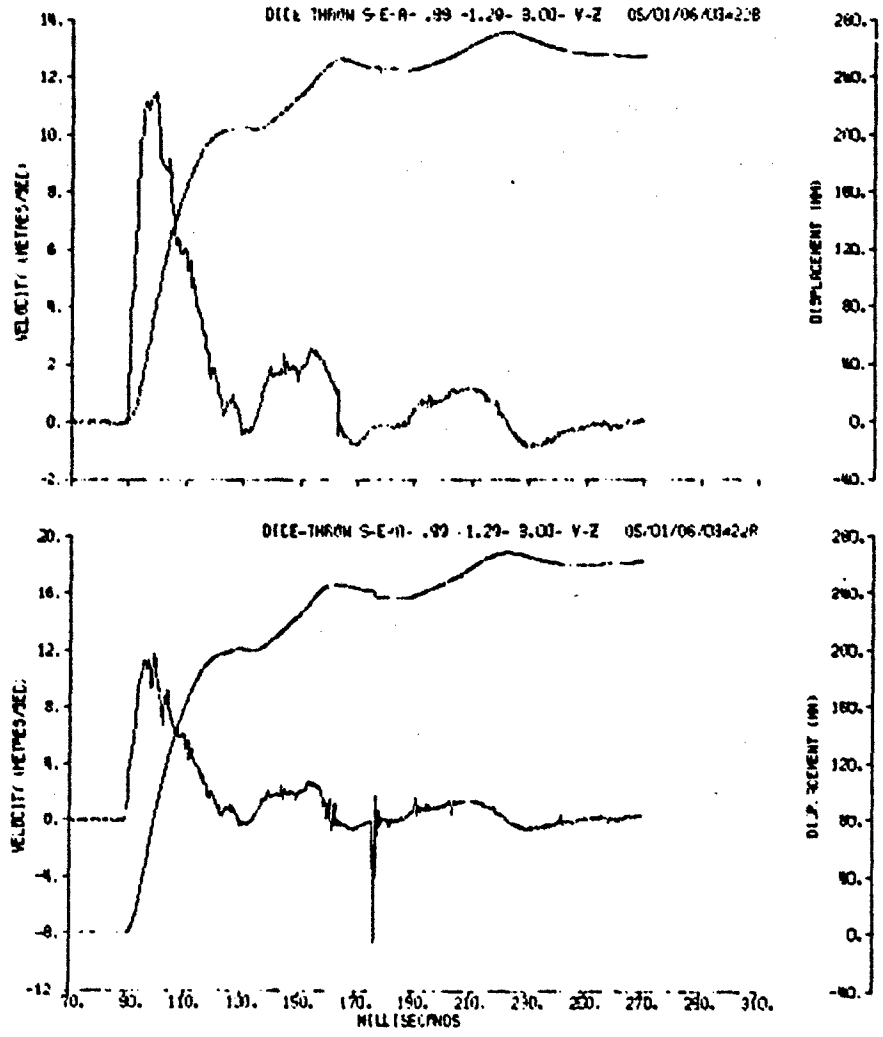

DICE-THROW S-E-A- .99 -1.29- 3.0E- 8-Z 05/01/07/14=106
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
ACCELERATION (GS)
DICE-THROW S-E-A- .22 -1.29- 3.0E- 8-Z 05/01/07/14=106
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
ACCELERATION (GS)
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

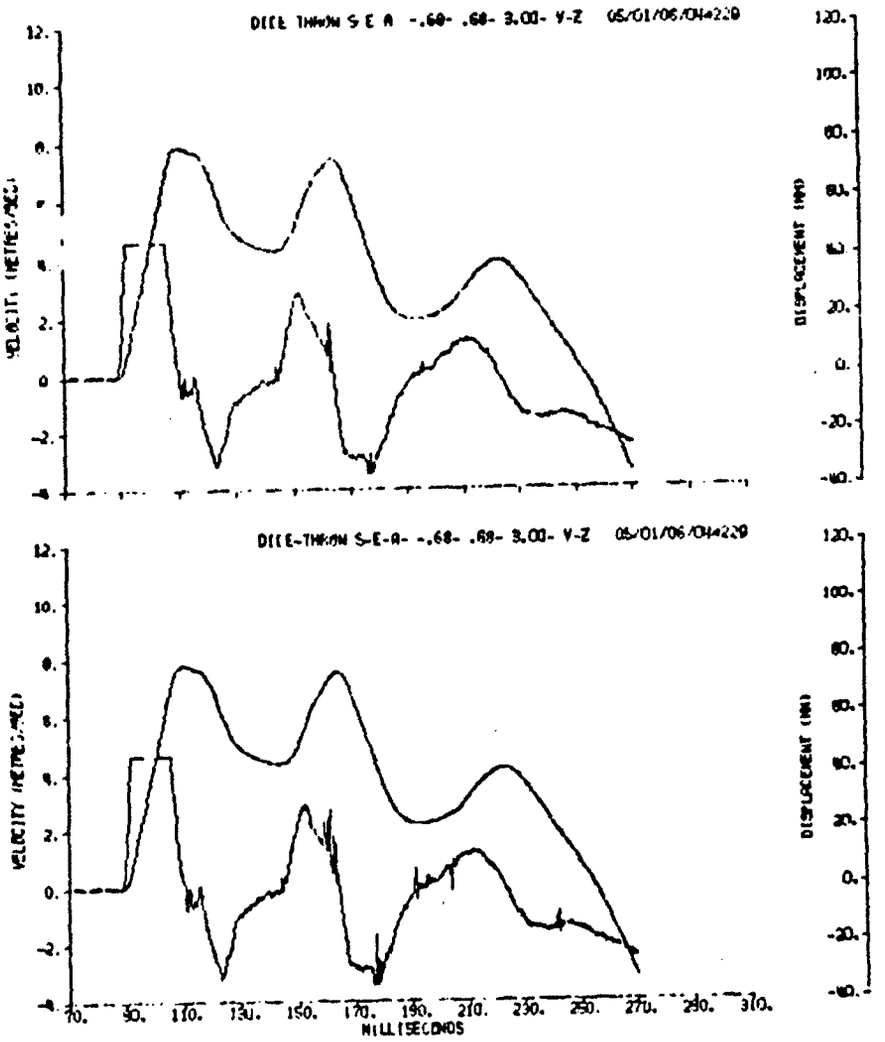

DICE-THROW S-E A- .99 -1.29- 3.00- A-Z 05/01/07/14+104
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
12.
8.
4.
0.
-4.
-8.
-12.
-16.
-20
24.
16.
8.
0.
-8.
-16.
-24.
-32.
-40.
DICE-THROW S-E-A- .99 -1.29- 3.00- A-Z 05/01/07/14+104
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
10000.
0.
-10000.
-20000.
-30000.
-40000.
-50000.
-60000.
-70000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

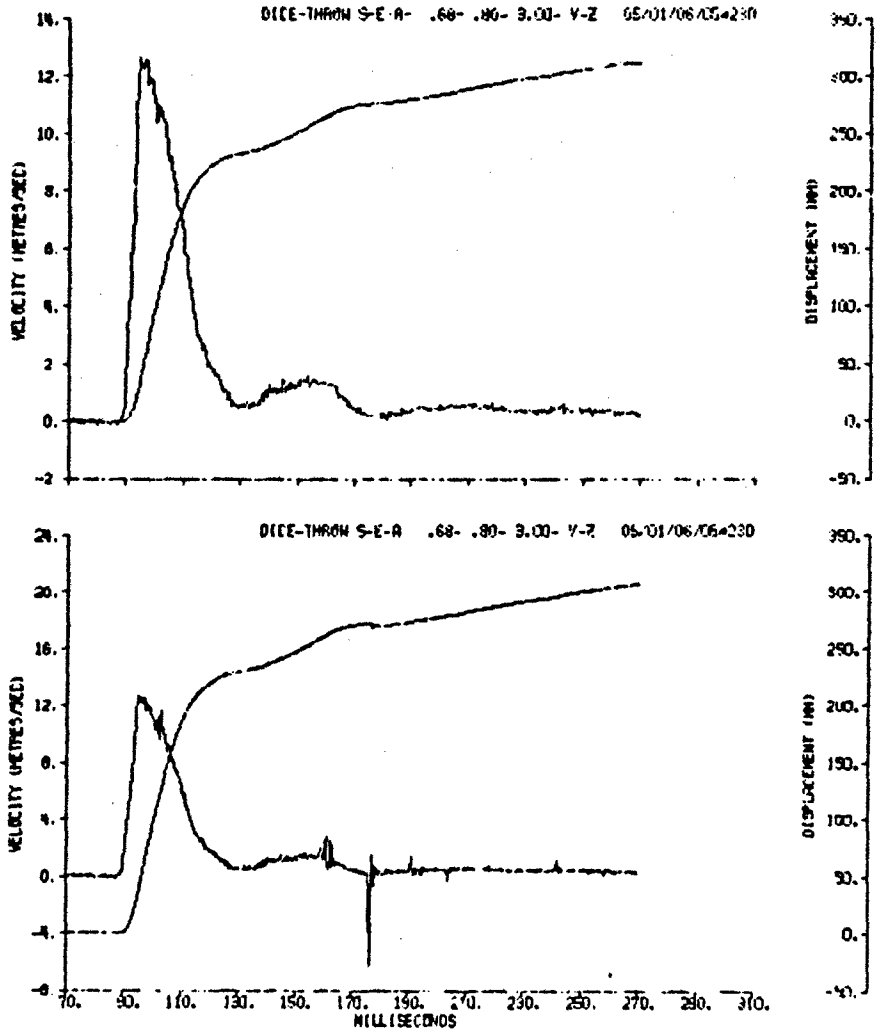


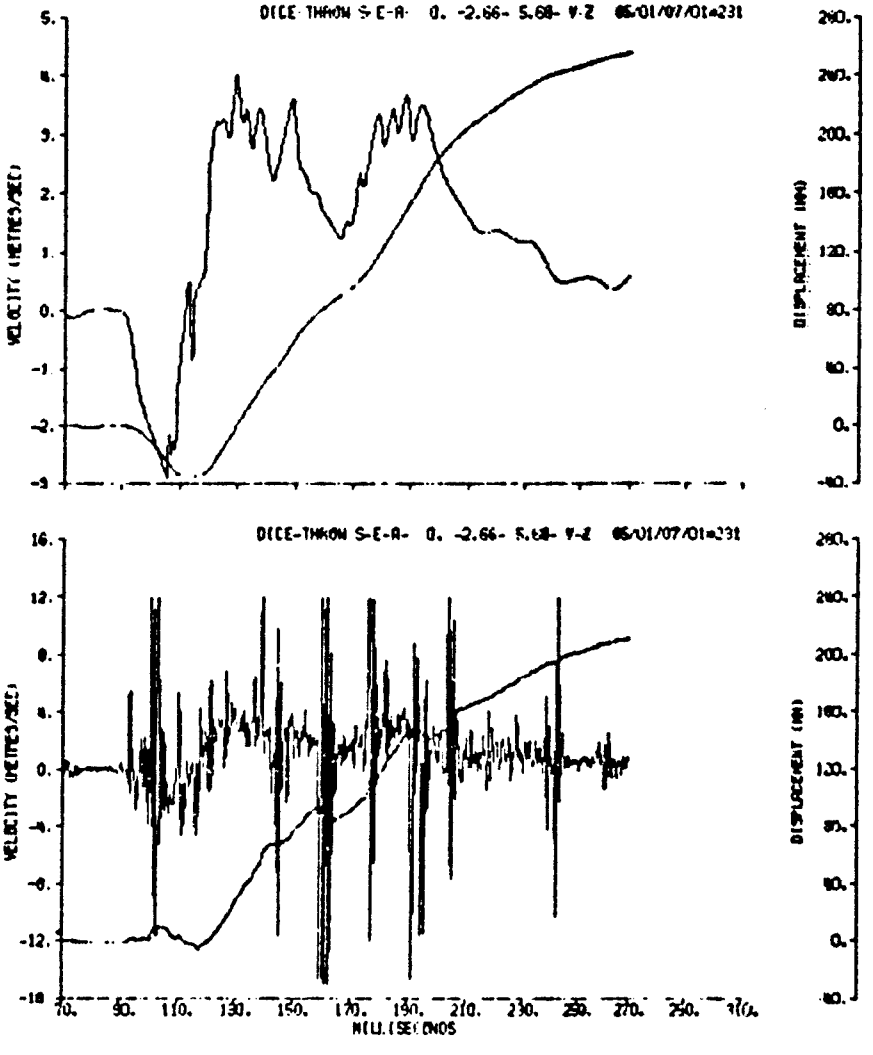

DICE-THROW S E A -1.1N-1.1N-3.00 -V -Z 05/01/06/014226
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-A—1.1N-1.1N-3.00 -V -Z 05/01/06/014226
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

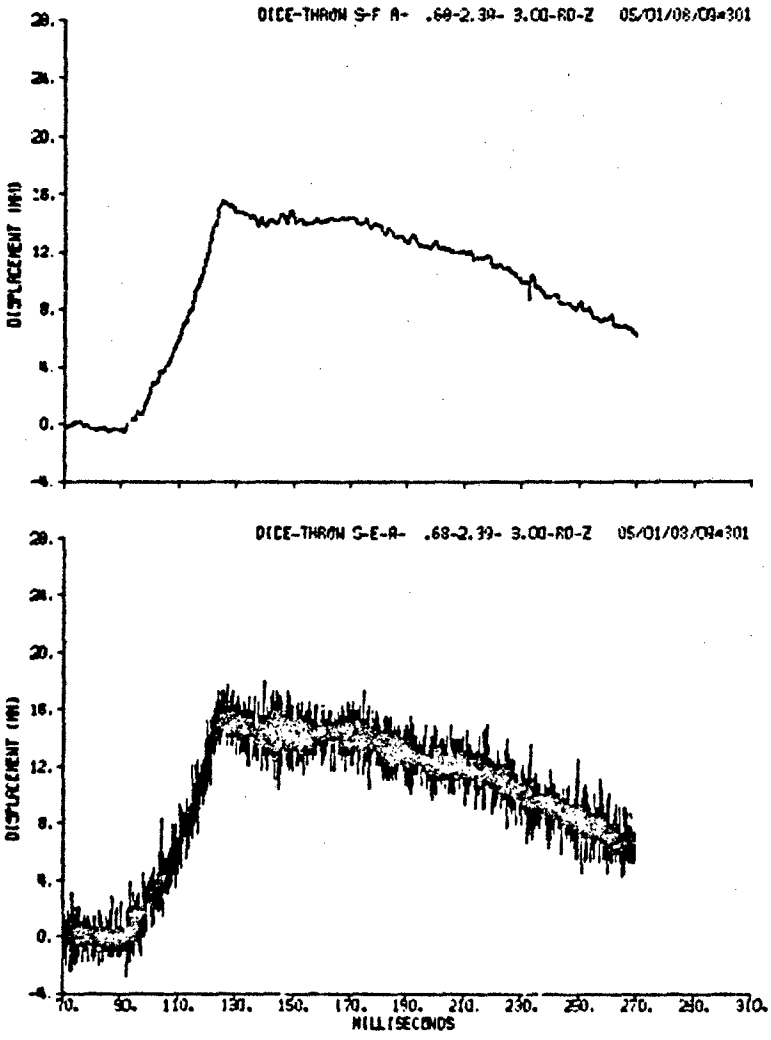

DELL THROW S E A- 0.0-1.02- 3.25- V-Z 05/01/06/02=227
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DELL-THROW S-E-A- 0.0-1.02- 3.25- V-Z 05/01/06/02=227
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

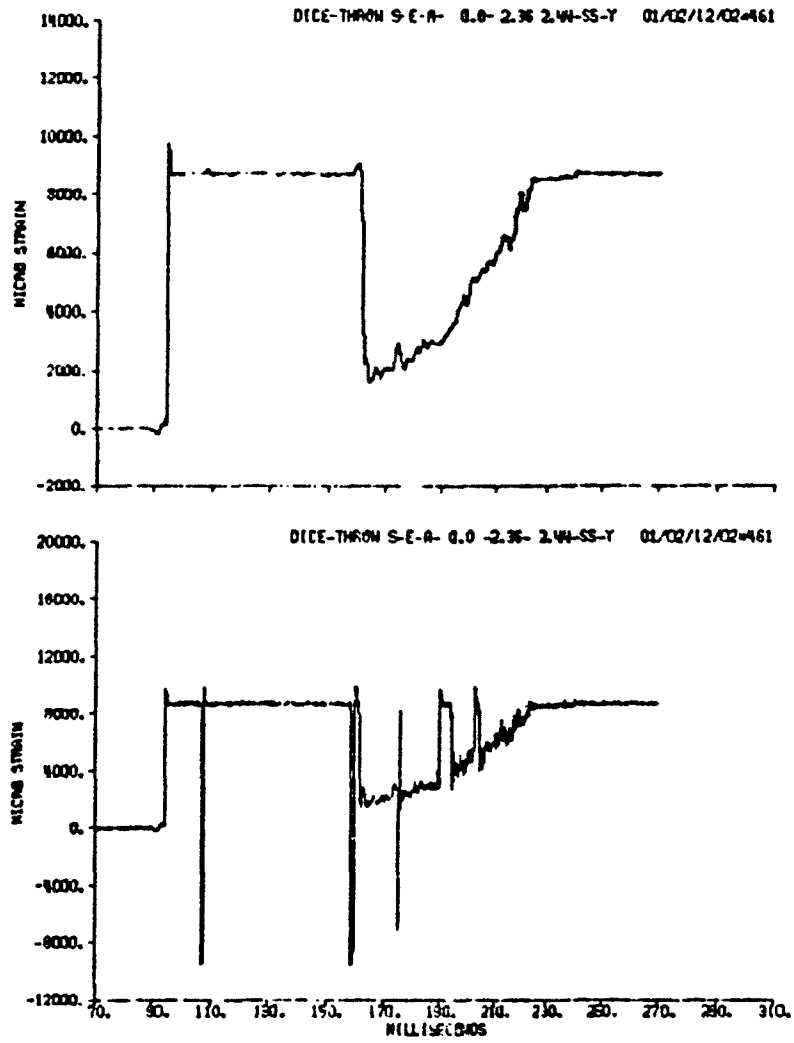

DICE THROW S-E-A- .99 -1.29- 3.00- V-Z 05/01/06/03+22R
DICE-THROW S-E-D- .99 -1.29- 3.00- V-Z 05/01/06/03+22R
MILLISECONDS

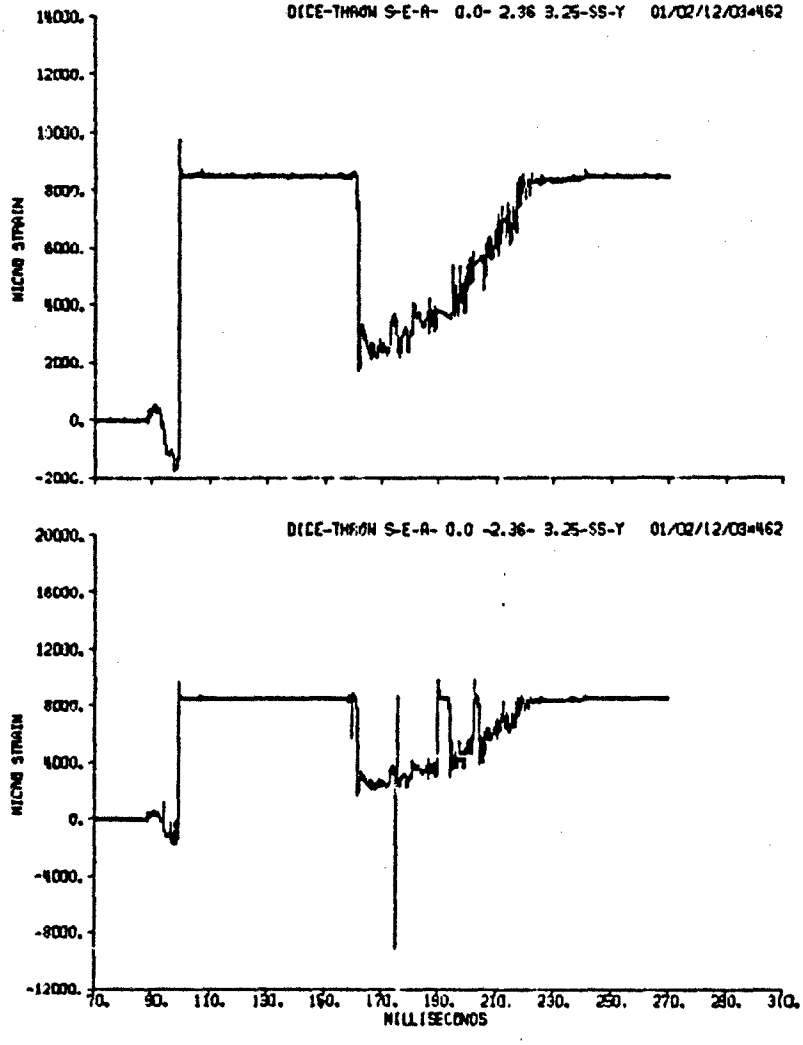

DIEE THRON S E A -.68- .68- 3.00- V-Z 05/01/06/044220
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DIEE-THRON S-E-A- -.68- .68- 3.00- V-Z 05/01/06/044220
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

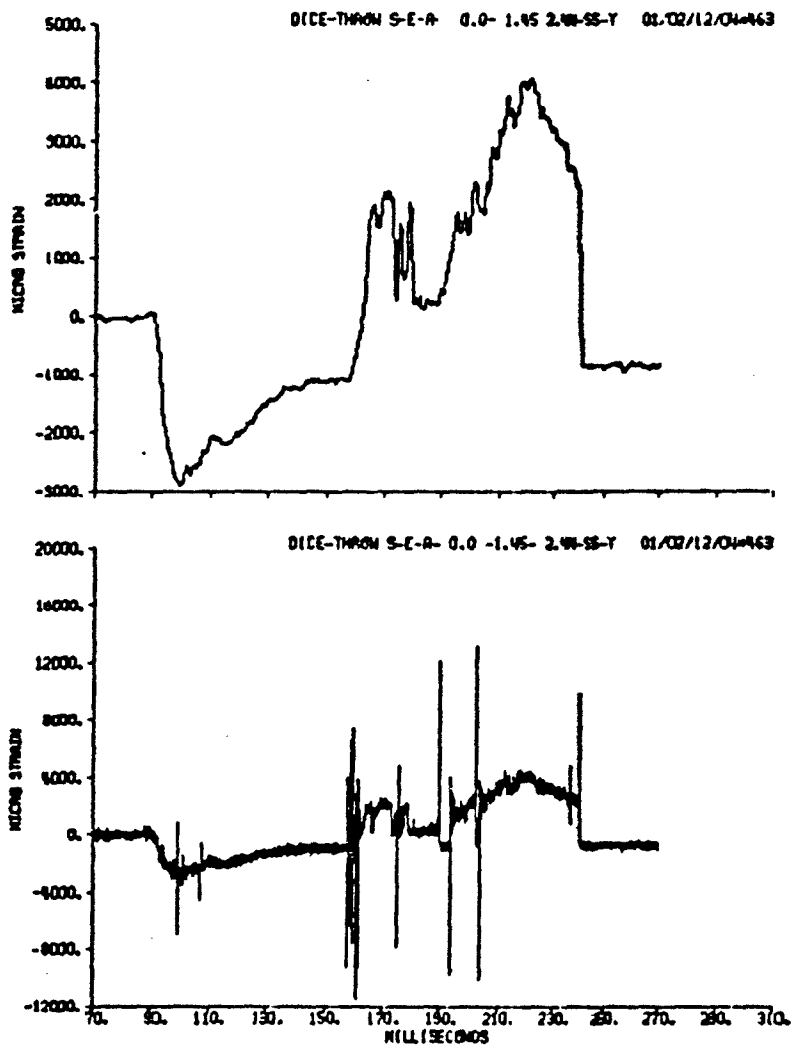

DICE-THROW S-E-A- .68- .80- 3.00- V-Z 05/01/06/06+230
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-A .68- .80- 3.00- V-Z 05/01/06/06+230
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

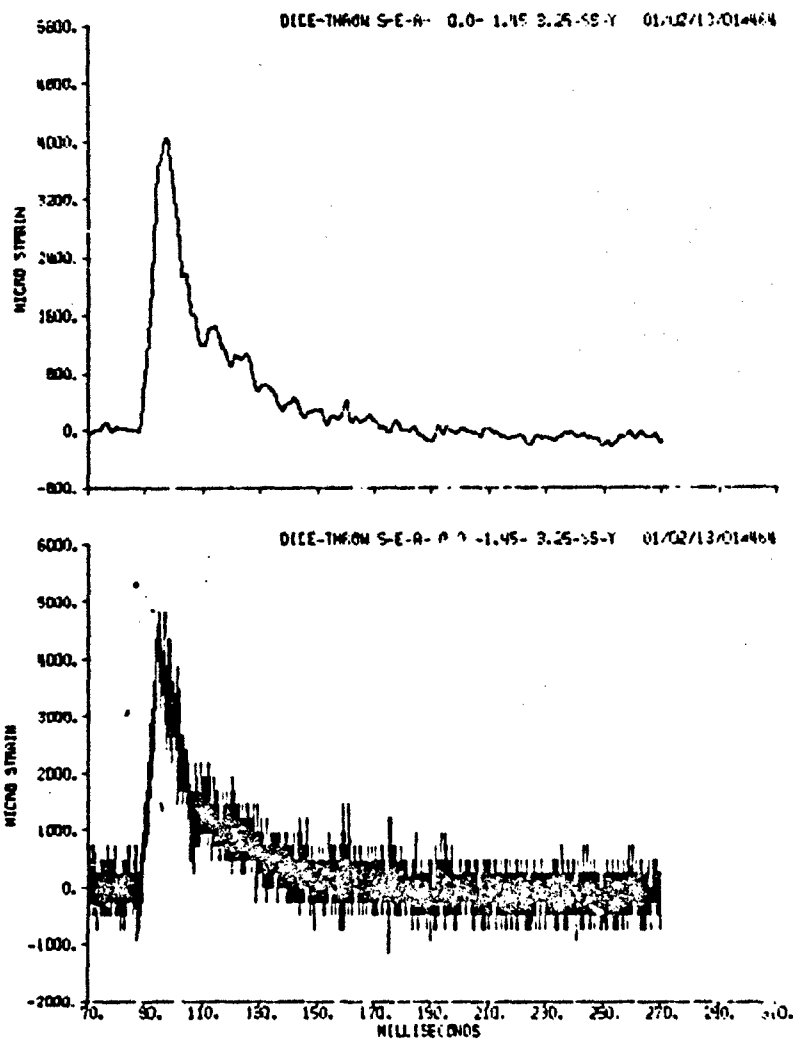

DICE-THROW S-E-A- 0. -2.66- 5.68- V-Z 05/01/07/01=231
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-A- 0. -2.66- 5.68- V-Z 05/01/07/01=231
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

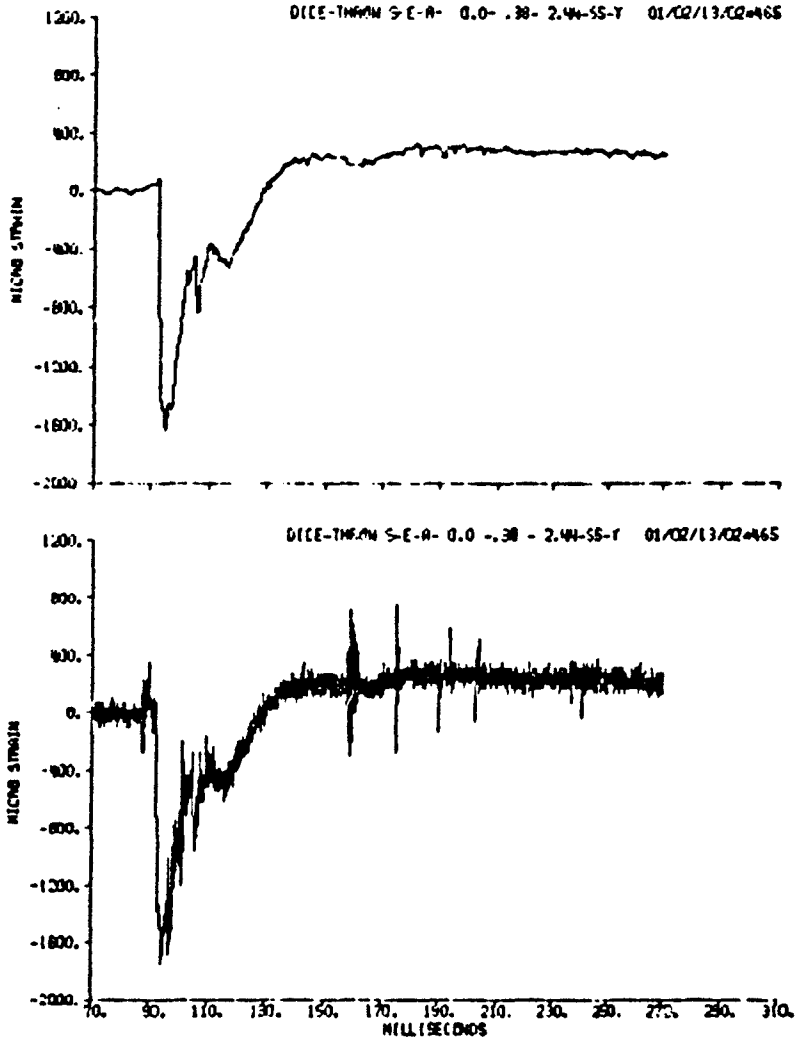

DICE-THROW S-F A- .68-2.39- 3.00-RO-Z 05/01/08/09=301
DISPLACEMENT (IN)
20.
16.
12.
8.
4.
0.
DICE-THROW S-E-A- .68-2.39- 3.00-RO-Z 05/01/08/09=301
DISPLACEMENT (IN)
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

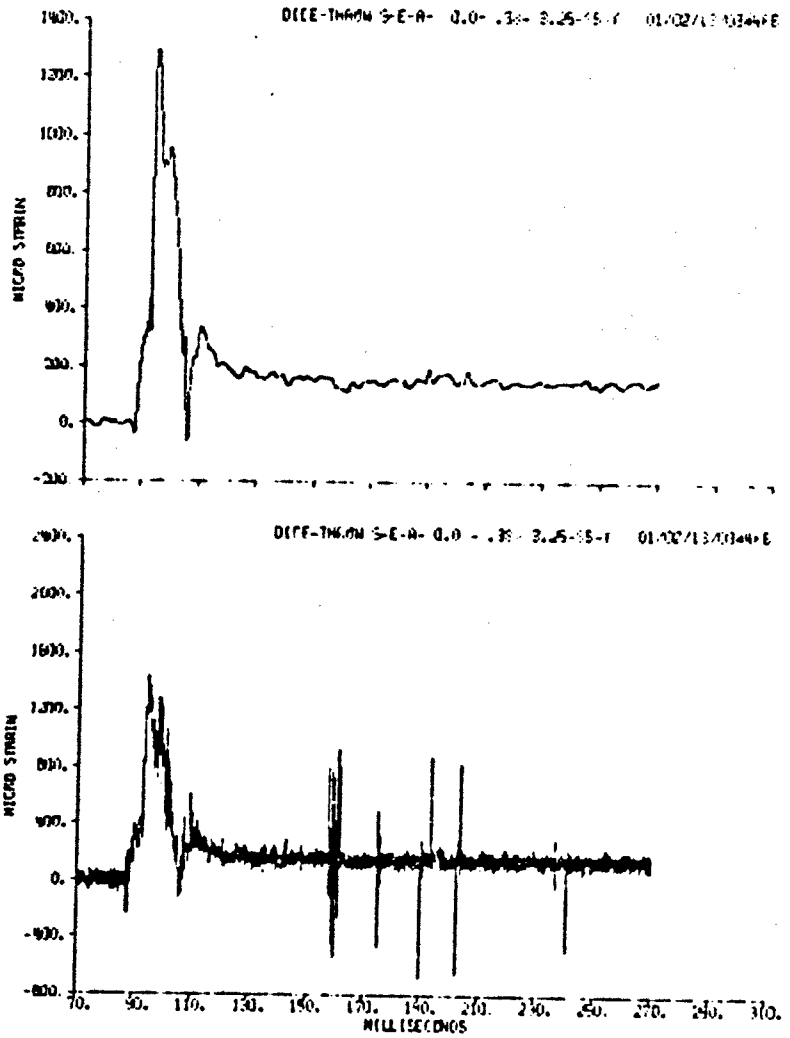

DICE-THROW S-E-A- 0.0- 2.36 2.44-SS-Y 01/02/12/02=461
MICRO STRAIN
14000.
12000.
10000.
8000.
6000.
4000.
2000.
0.
-2000.
DICE-THROW S-E-A- 0.0 -2.36- 2.44-SS-Y 01/02/12/02=461
MICRO STRAIN
20000.
16000.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

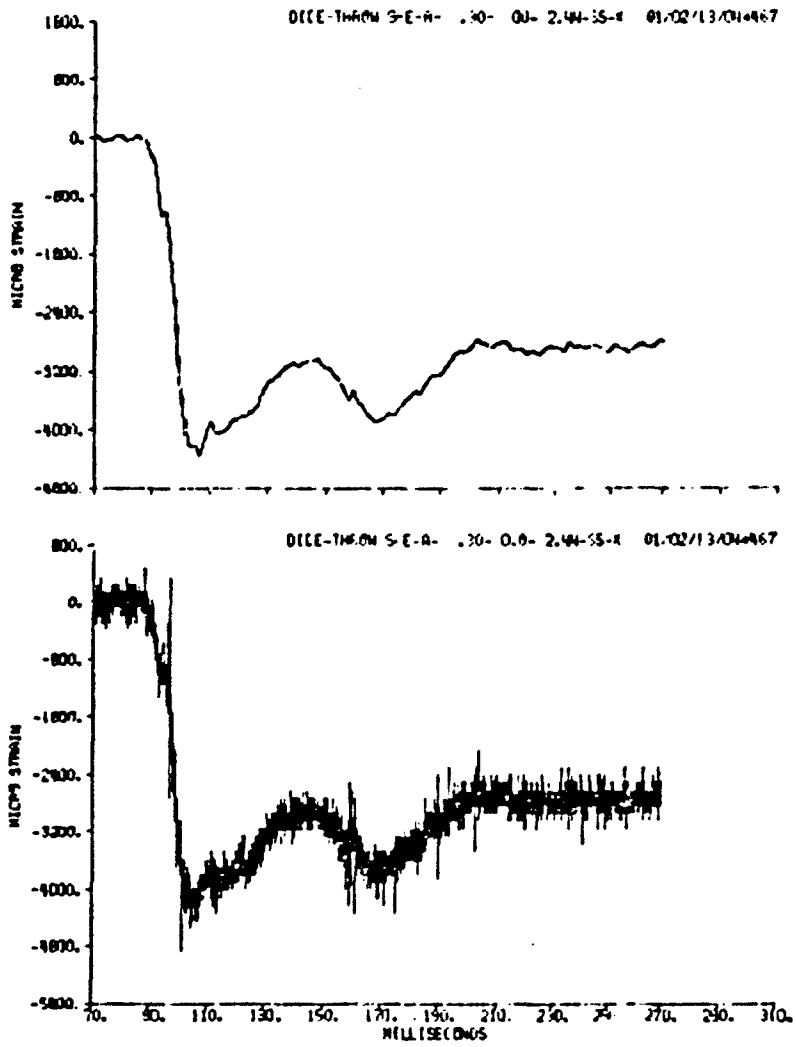

DICE-THROW S-E-A- 0.0- 2.36 3.25-SS-Y 01/02/12/03=462
MICRO STRAIN
14000.
12000.
10000.
8000.
6000.
4000.
2000.
0.
-2000.
DICE-THROW S-E-A- 0.0 -2.36- 3.25-SS-Y 01/02/12/03=462
MICRO STRAIN
20000.
16000.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

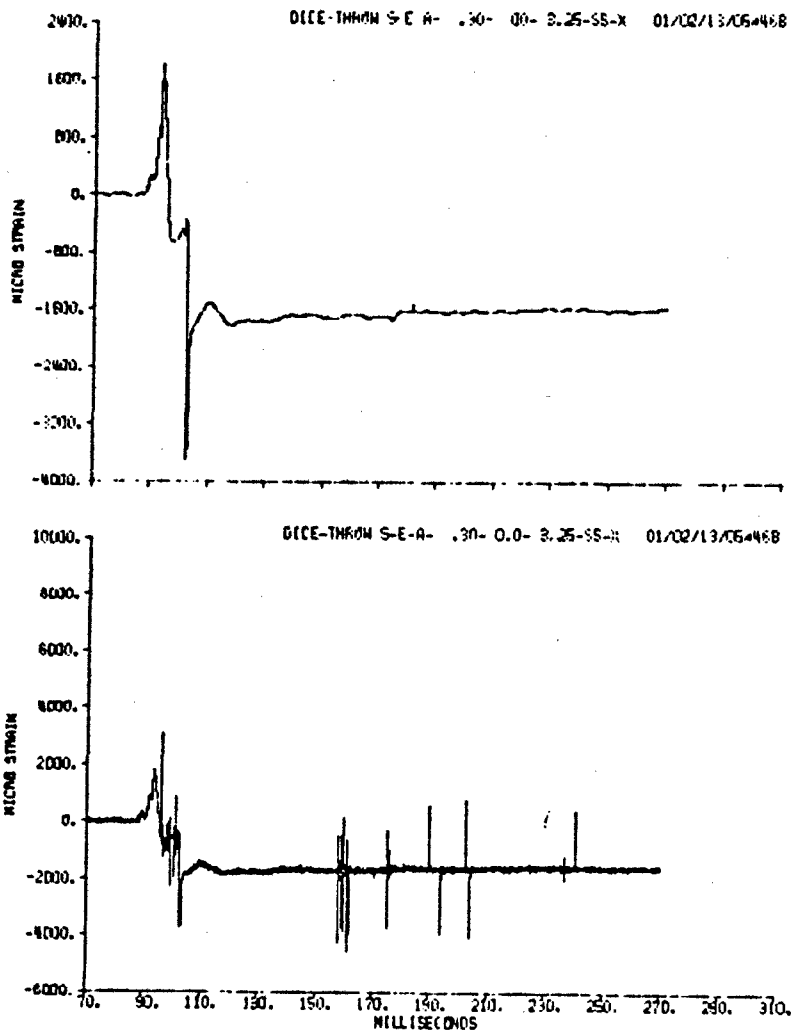

DICE-THROW S-E-A 0.0- 1.45 2.48-SS-Y 01/02/12/04=463
MICRO STRAIN
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
-3000.
DICE-THROW S-E-A- 0.0 -1.45- 2.48-SS-Y 01/02/12/04=463
MICRO STRAIN
20000.
16000.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

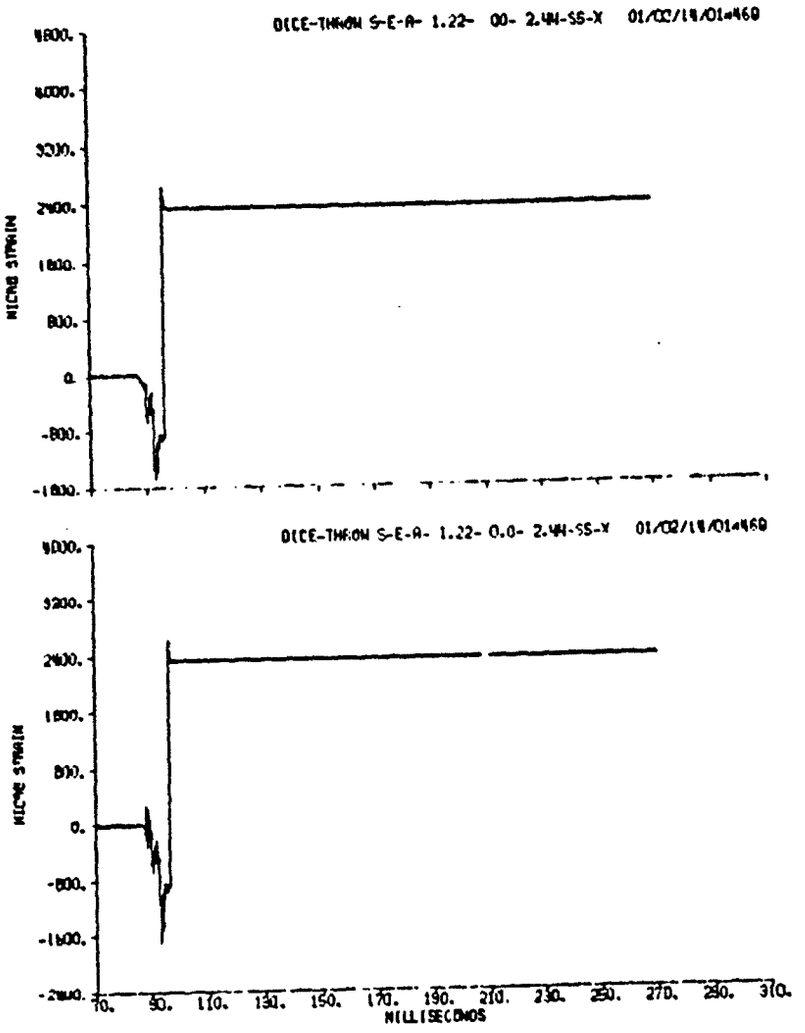

DICE-THROW S-E-A- 0.0- 1.45- 3.25-SS-Y 01/02/13/01+404
MICRO STRAIN
5600.
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
DICE-THROW S-E-A- 0.0 -1.45- 3.25-SS-Y 01/02/13/01+404
MICRO STRAIN
6000.
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

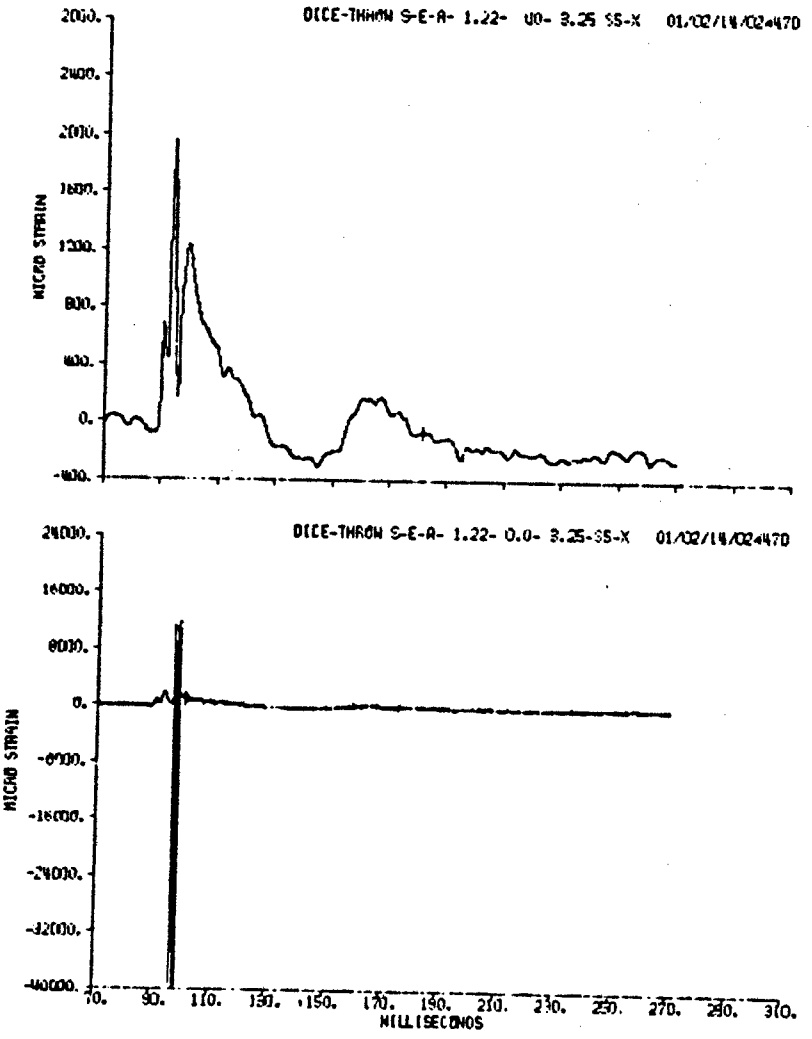

DICE-THAW S-E-A- 0.0- .38- 2.44-SS-Y 01/02/13/02=465
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
-2000
MICRO STRAIN
DICE-THAW S-E-A- 0.0 -.38 - 2.44-SS-Y 01/02/13/02=465
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
-2000.
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

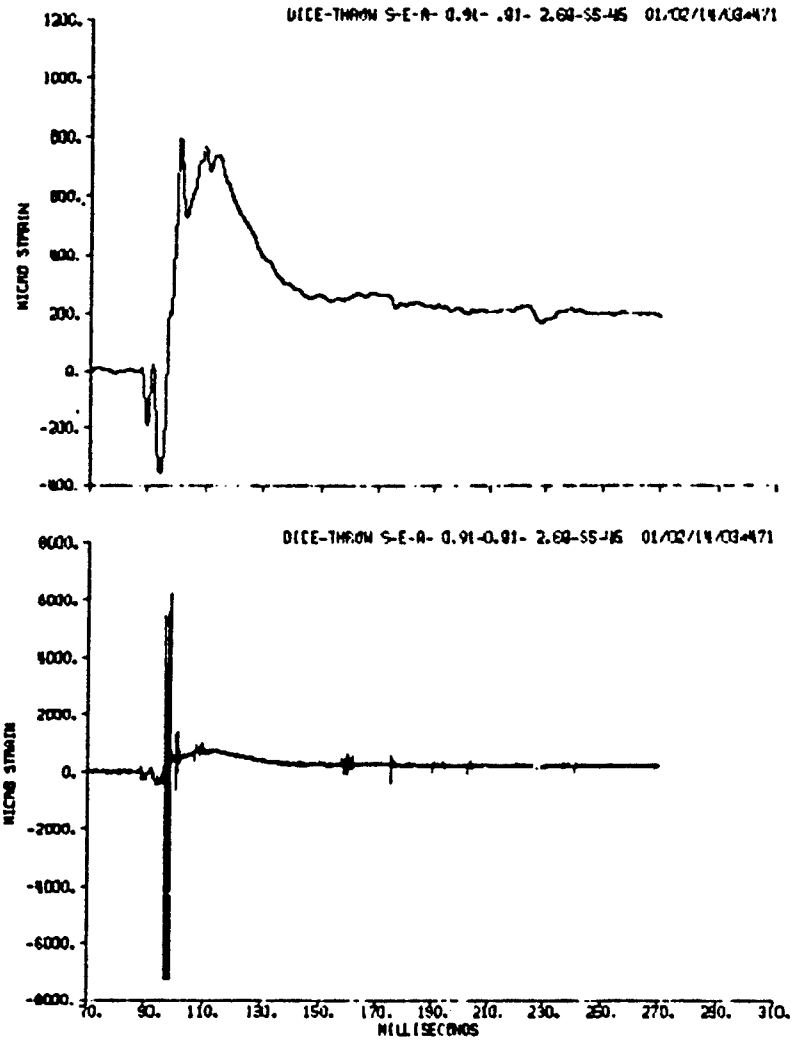

DEEP-THROW S-E-A- 0.0- .3- 3.25-15-1
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200
DEEP-THROW S-E-A- 0.0 - .3 - 3.25-15-1
MICRO STRAIN
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

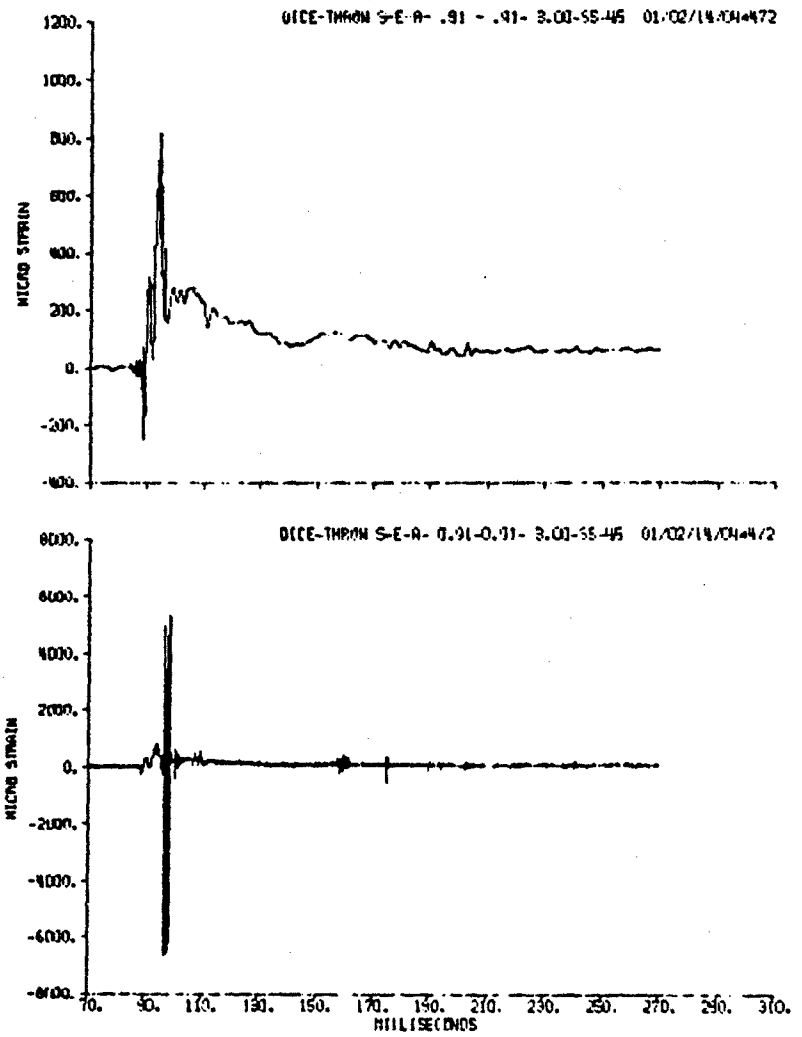

DEEE-THROW S-E-A- .30- 0.0- 2.44-SS-R 01/02/13/034467
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
-4000.
-4800.
MICRO STRAIN
DEEE-THROW S-E-A- .30- 0.0- 2.44-SS-R 01/02/13/034467
800.
0.
-800.
-1600.
-2400.
-3200.
-4000.
-4800.
-5600.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

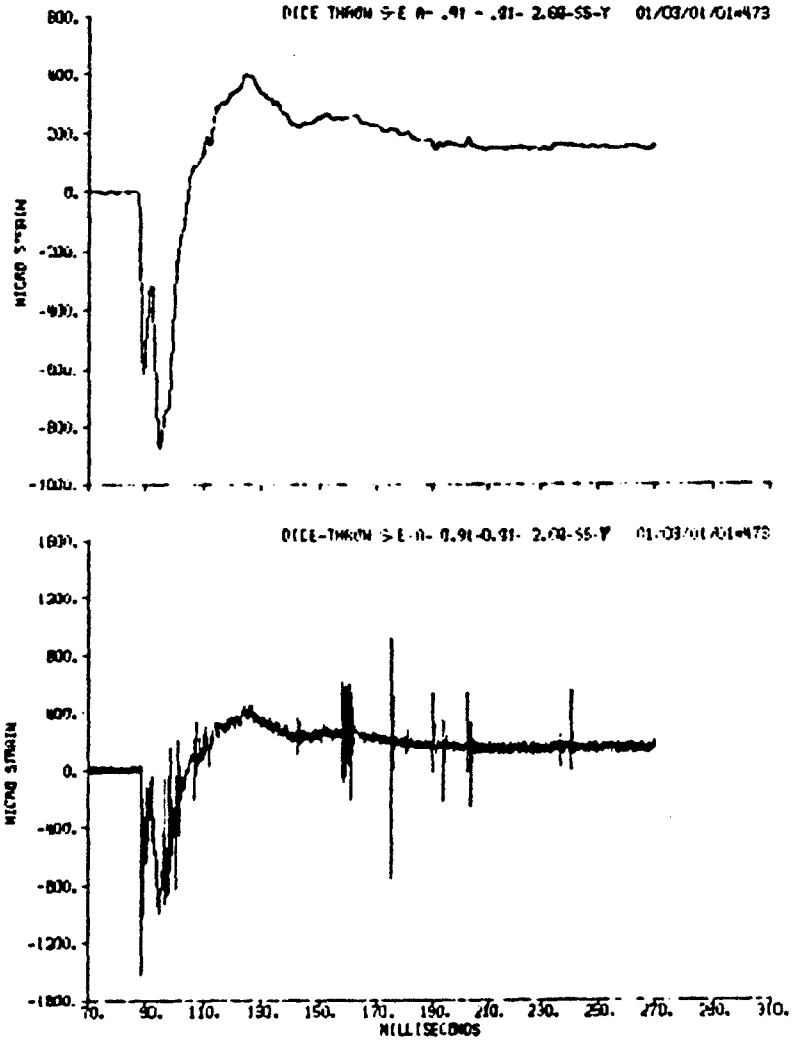

DICE-THROW S-E A- .30- 00- 8.25-SS-X 01/02/13/06+46B
2400.
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
-4000.
MICRO STRAIN
DICE-THROW S-E-A- .30- 0.0- 8.25-SS-X 01/02/13/06+46B
10000.
8000.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

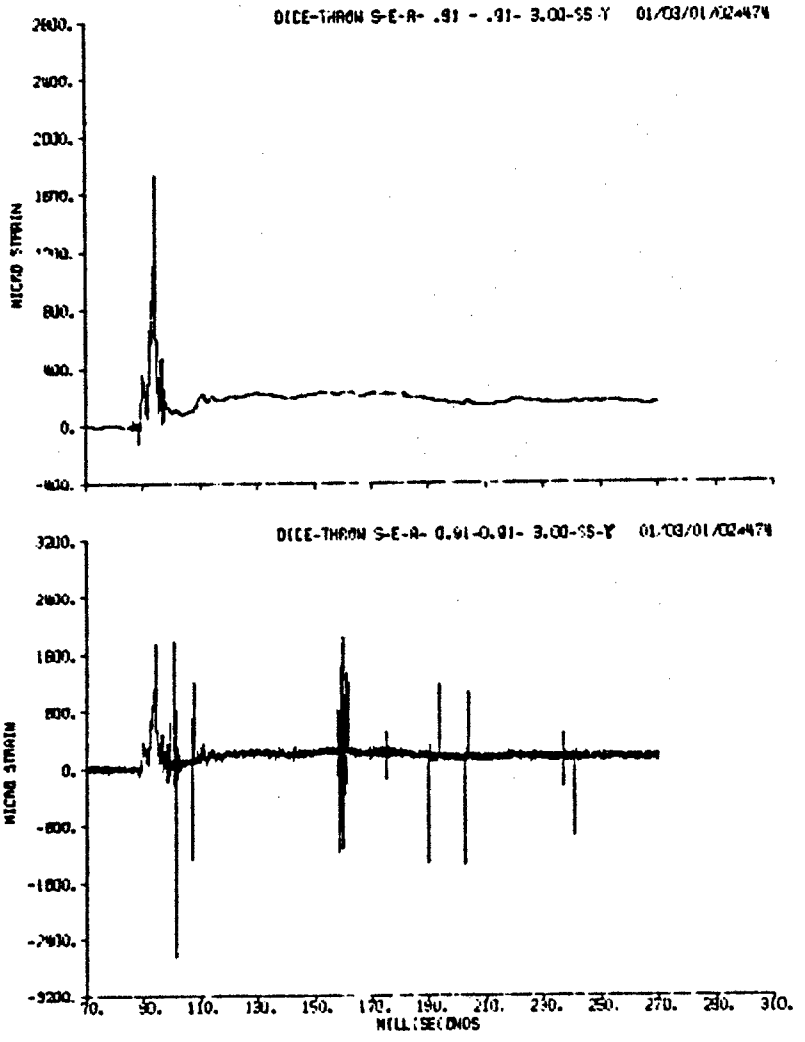

DICE-THROW S-E-A- 1.22- 00- 2.4N-SS-X 01/02/18/01=469
MICRO STRAIN
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
DICE-THROW S-E-A- 1.22- 0.0- 2.4N-SS-X 01/02/18/01=469
MICRO STRAIN
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
10. 30. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

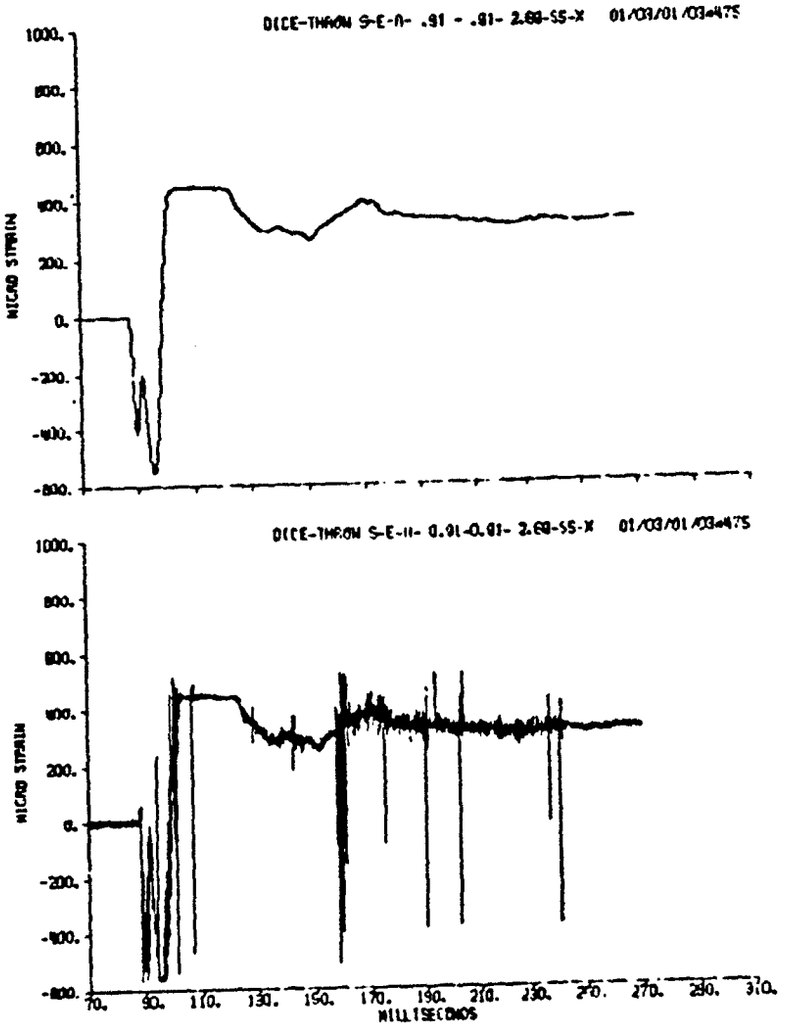

DICE-THROW S-E-A- 1.22- 00- 3.25 SS-X 01/02/14/024470
MICRO STRAIN
2000.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
DICE-THROW S-E-A- 1.22- 0.0- 3.25-SS-X 01/02/14/024470
MICRO STRAIN
24000.
16000.
8000.
0.
-8000.
-16000.
-24000.
-32000.
-40000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

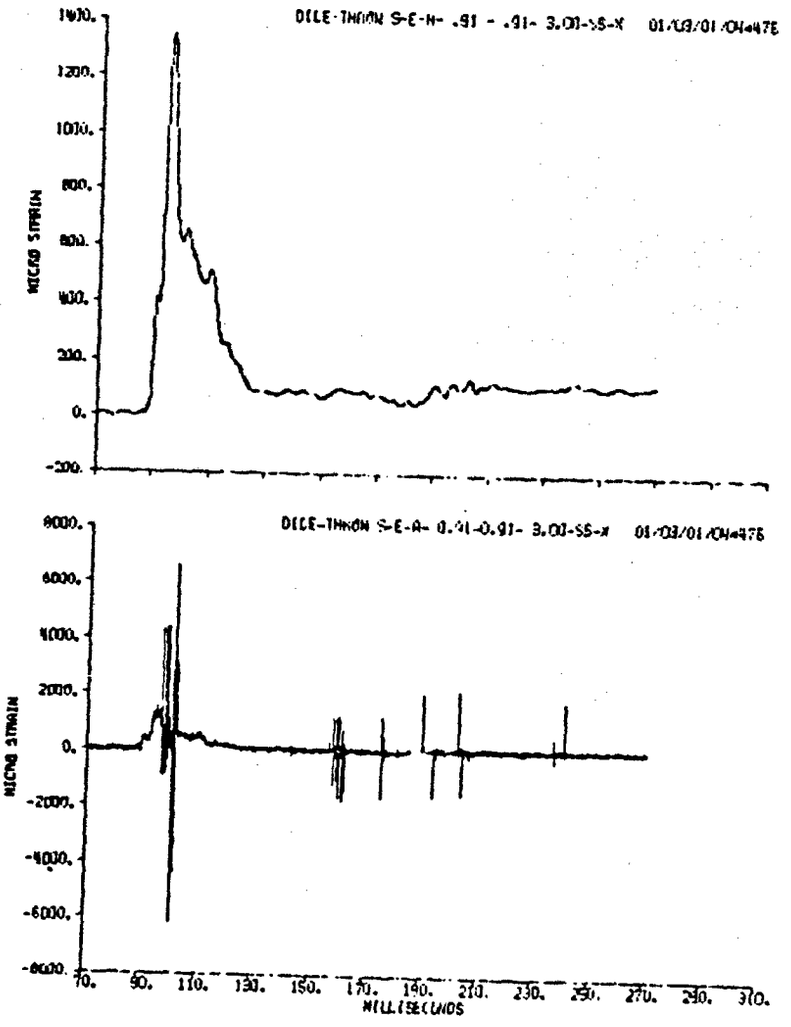

DICE-THROW S-E-A- 0.91- .01- 2.68-SS-45 01/02/14/03=471
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
MICRO STRAIN
DICE-THROW S-E-A- 0.91-0.01- 2.68-SS-45 01/02/14/03=471
8000.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
-8000.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

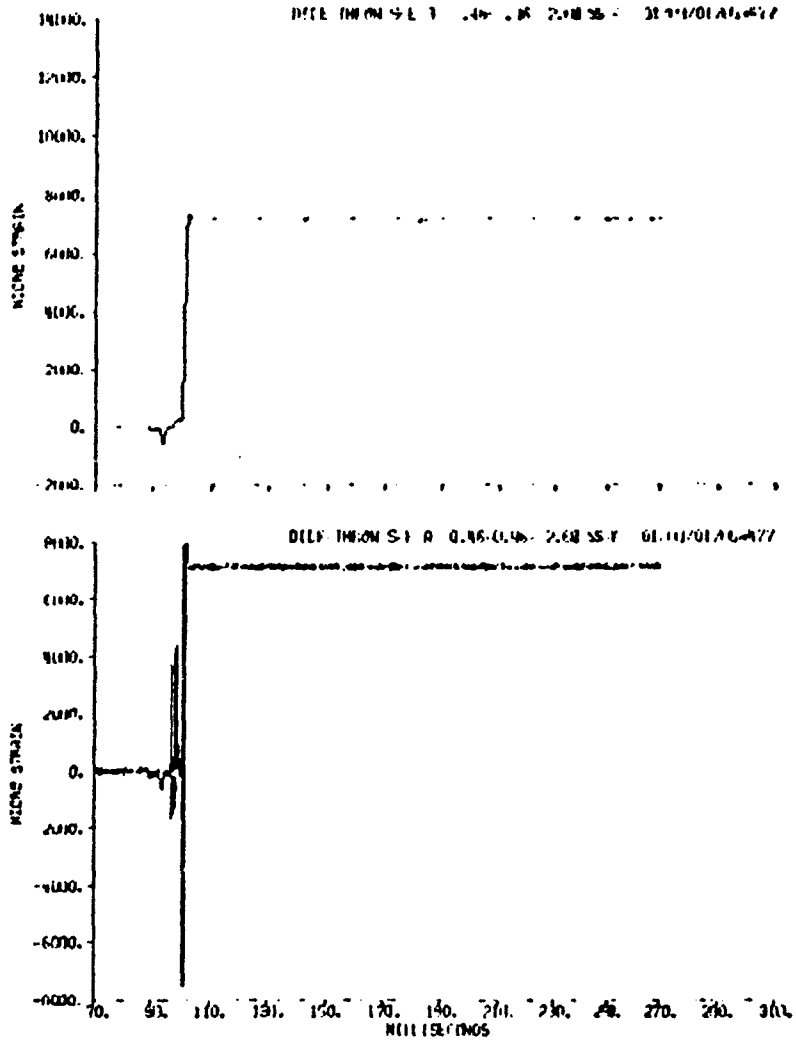

DICE-THROW S-E-A- .91 - .91- 3.00-55-45 01/02/14/04472
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
MICRO STRAIN
DICE-THROW S-E-A- 0.91-0.01- 3.00-55-45 01/02/14/04472
8000.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
-8000.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

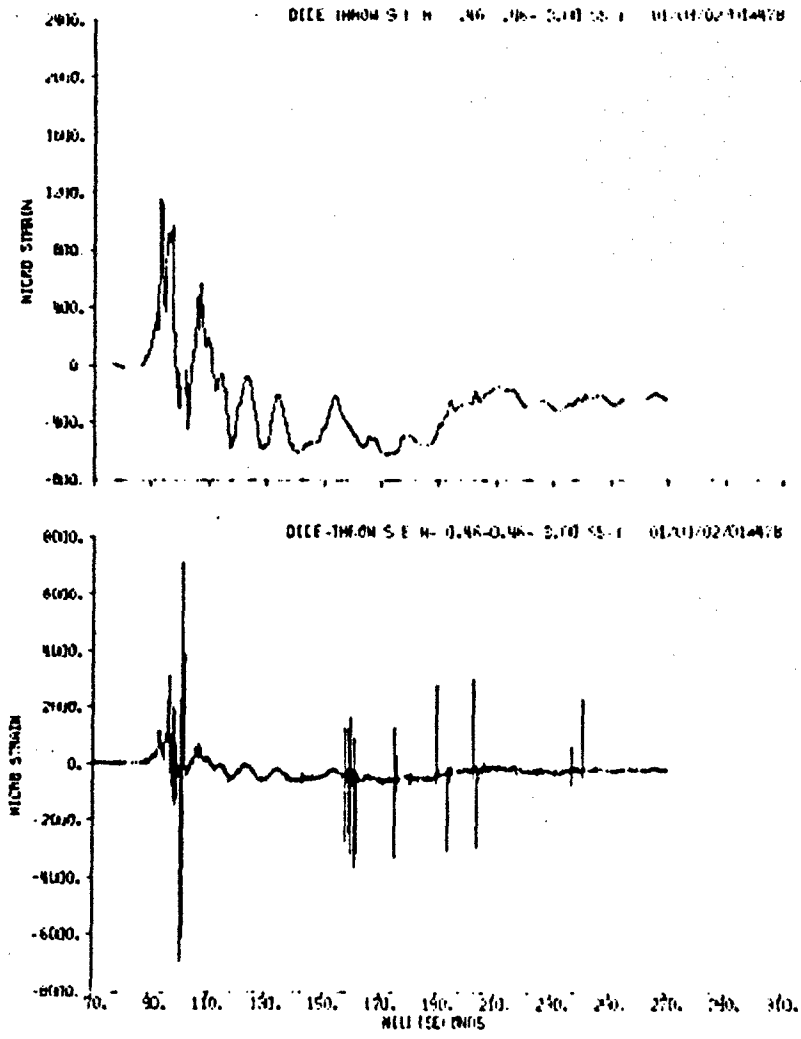

DICE THROW 5-E A- .91 - .91- 2.68-SS-Y 01/03/01/01=473
MICRO STRAIN
800.
600.
200.
0.
-200.
-400.
-600.
-800.
-1000.
DICE-THROW 5-E-A- 0.91-0.91- 2.68-SS-Y 01/03/01/01=473
MICRO STRAIN
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

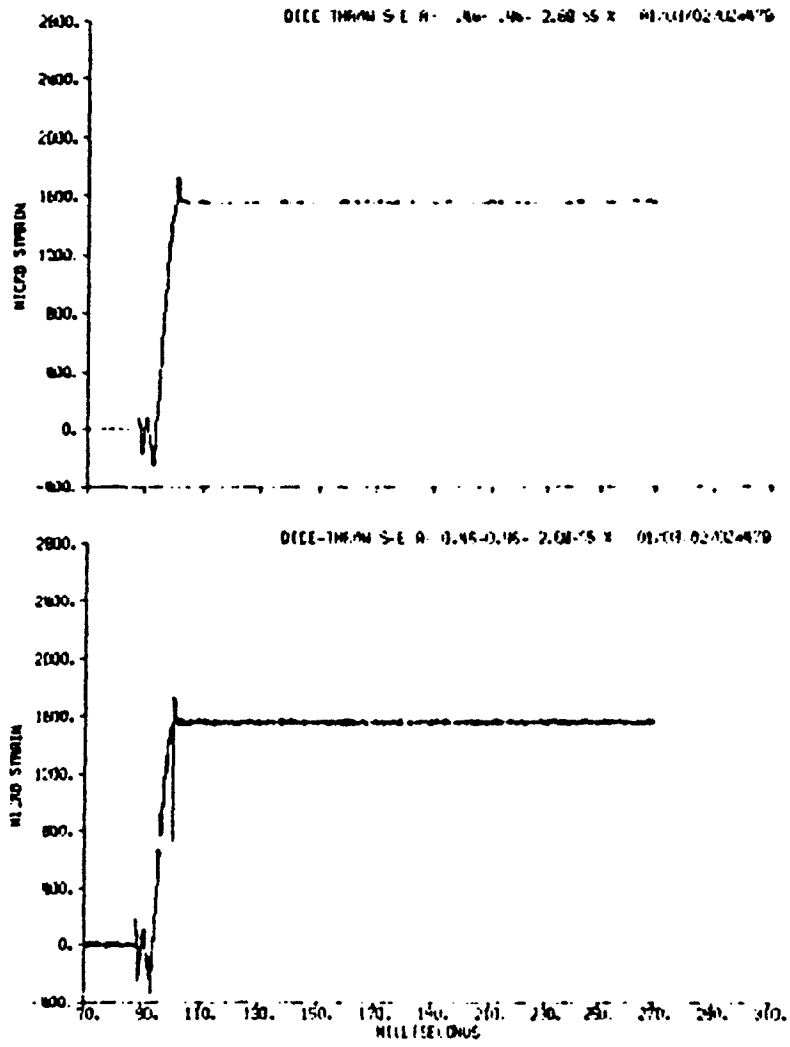

DICE-THROW S-E-R- .91 - .91- 3.00-SS-Y 01/03/01/02=47%
2400.
2000.
1600.
800.
0.
MICRO STRAIN
DICE-THROW S-E-R- 0.91-0.91- 3.00-SS-Y 01/03/01/02=47%
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

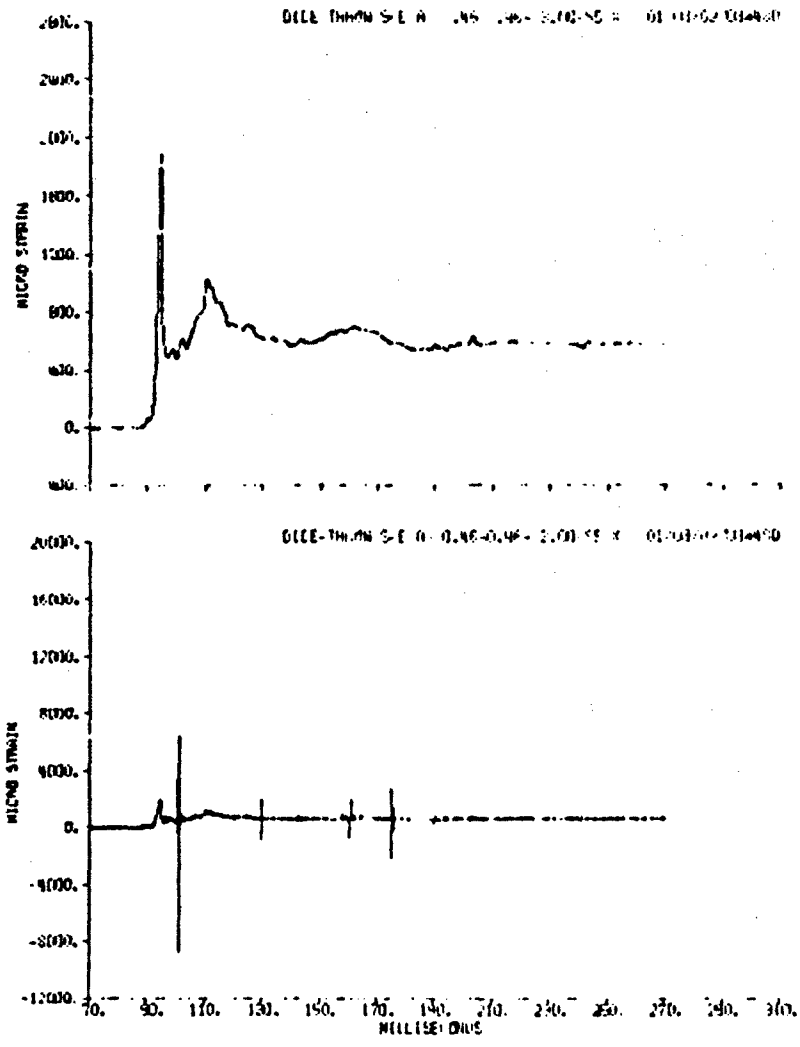

DICE-THROW S-E-A- .91 - .81- 2.68-SS-X 01/03/01/03=475
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
MICRO STRAIN
DICE-THROW S-E-H- 0.91-0.81- 2.68-SS-X 01/03/01/03=475
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

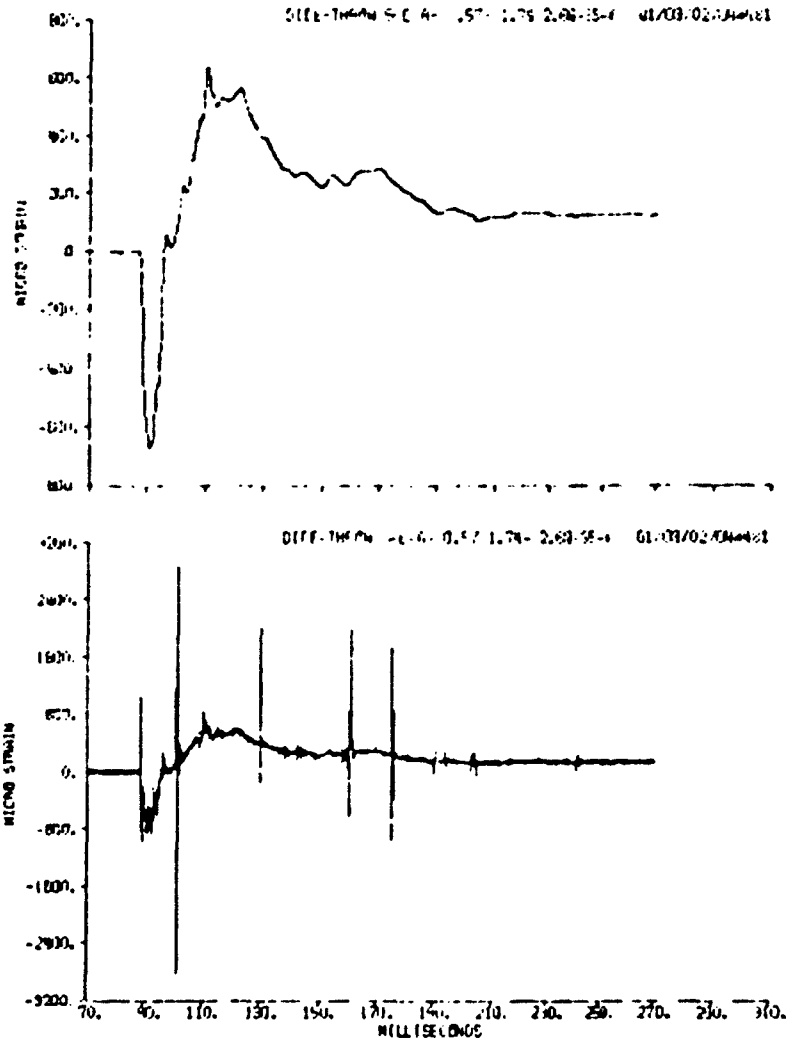

DICE-THROW S-E-H- .91 - .91- 3.00-SS-X 01/03/01/0H=47E
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 0.91-0.91- 3.00-SS-X 01/03/01/0H=47E
MICRO STRAIN
8000.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
-8000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

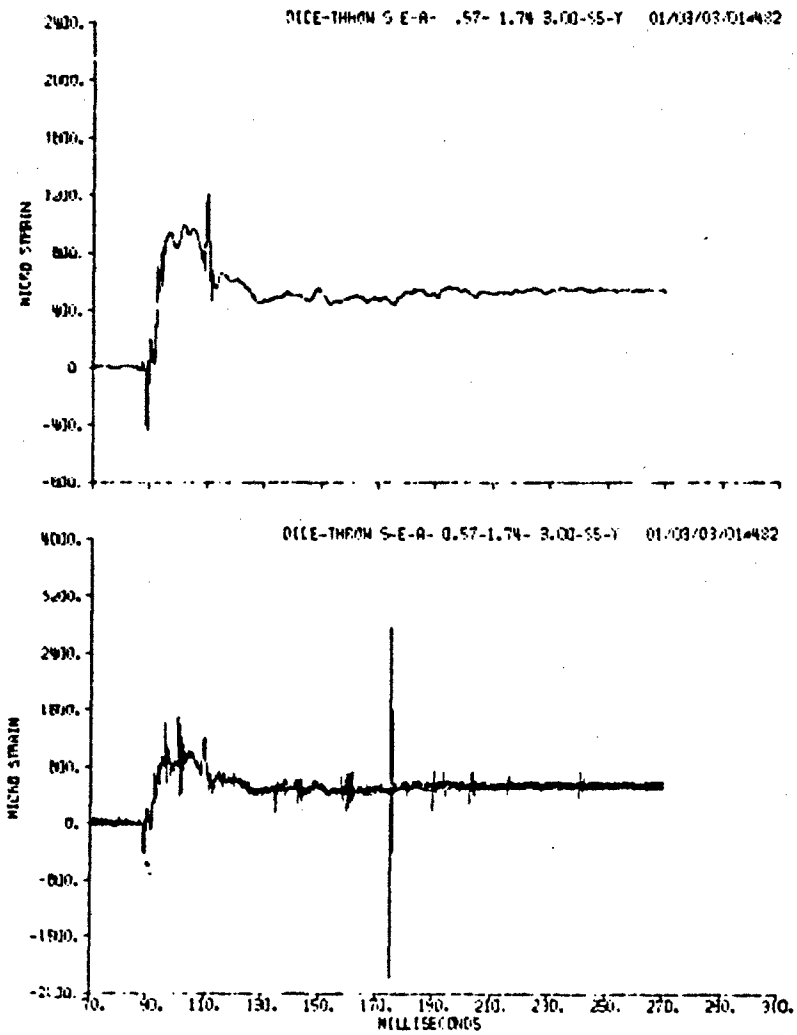

MICRO STRAIN
MICRO STRAIN
MICROSECONDS

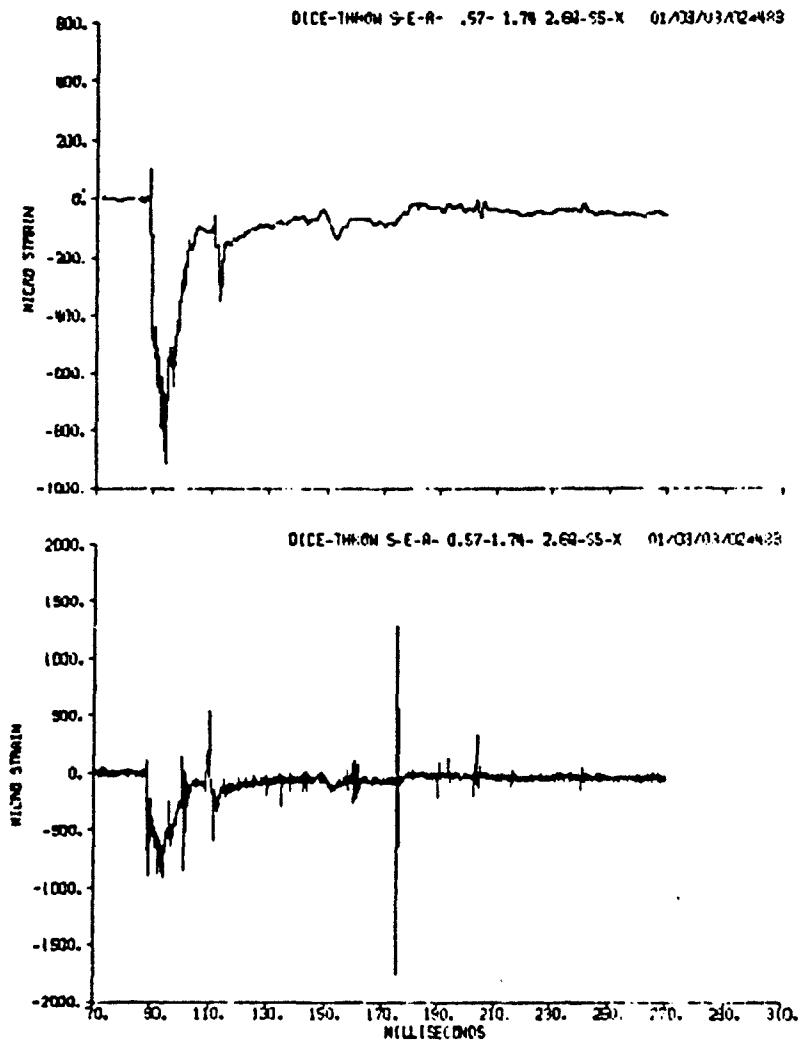

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

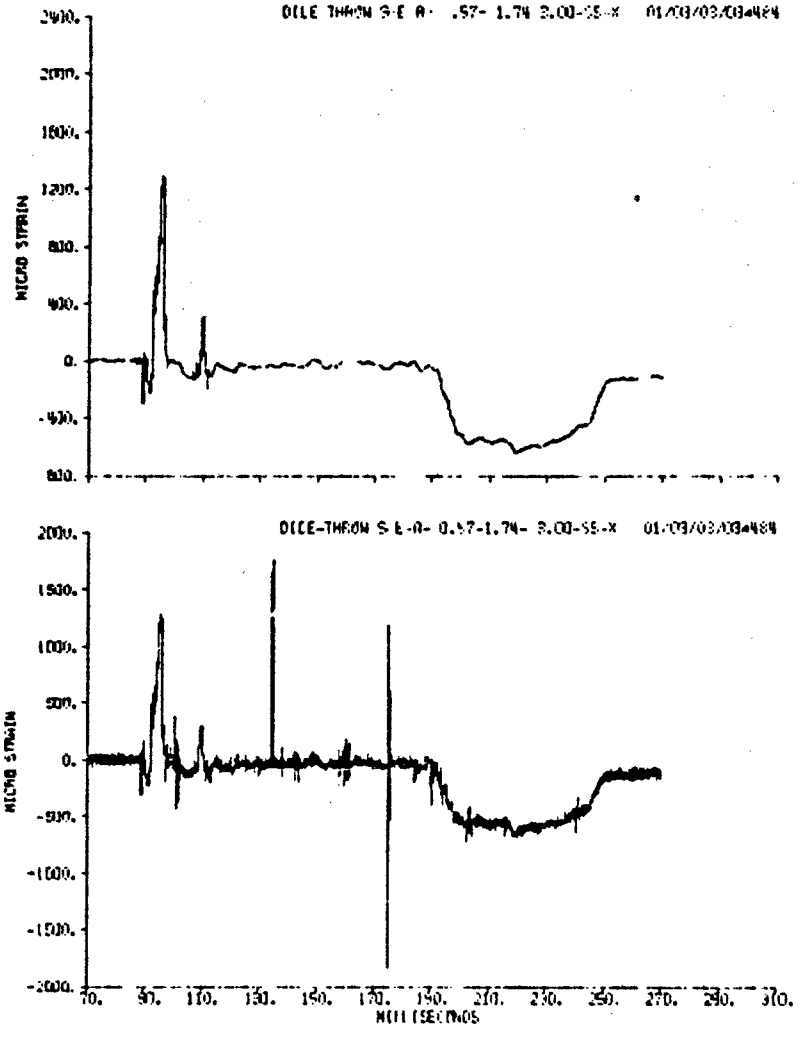

2600.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

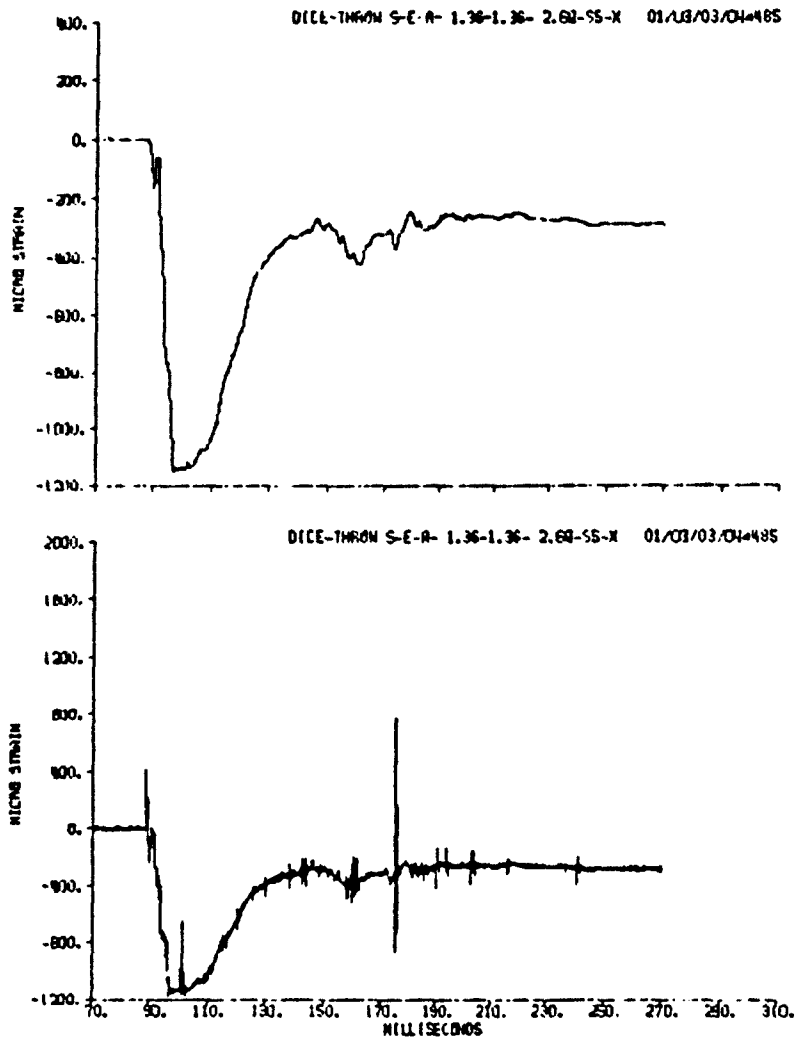

MICRO STRAIN
MILLISECONDS

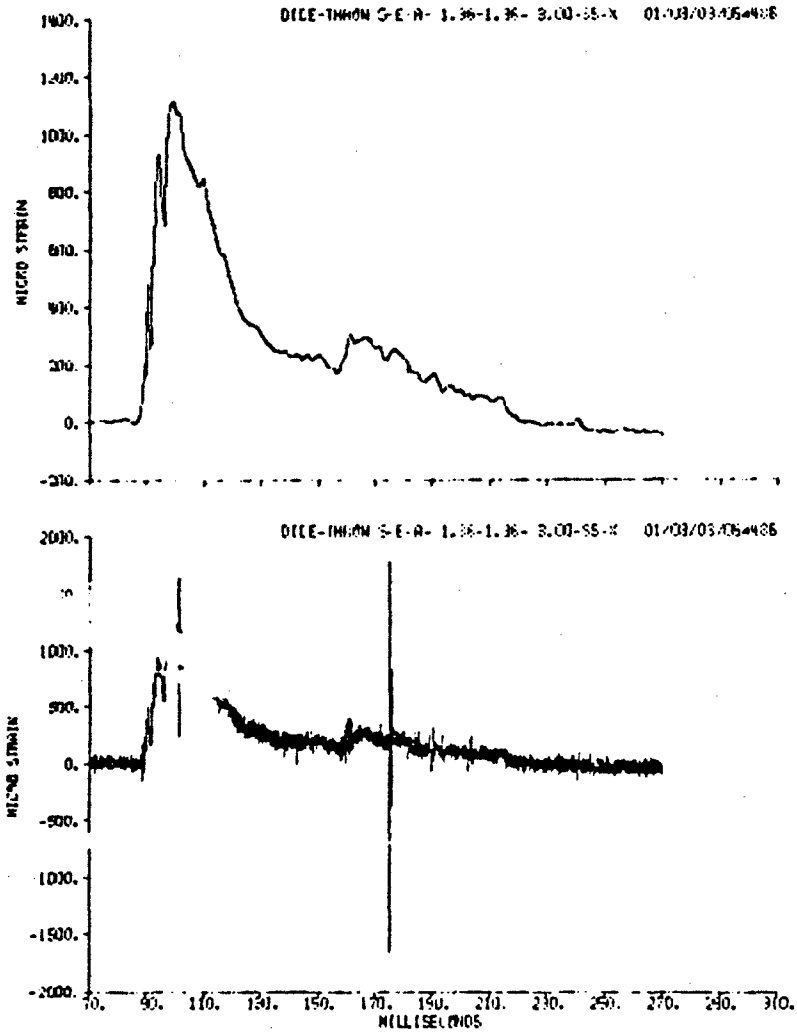

MICRO STRAIN
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

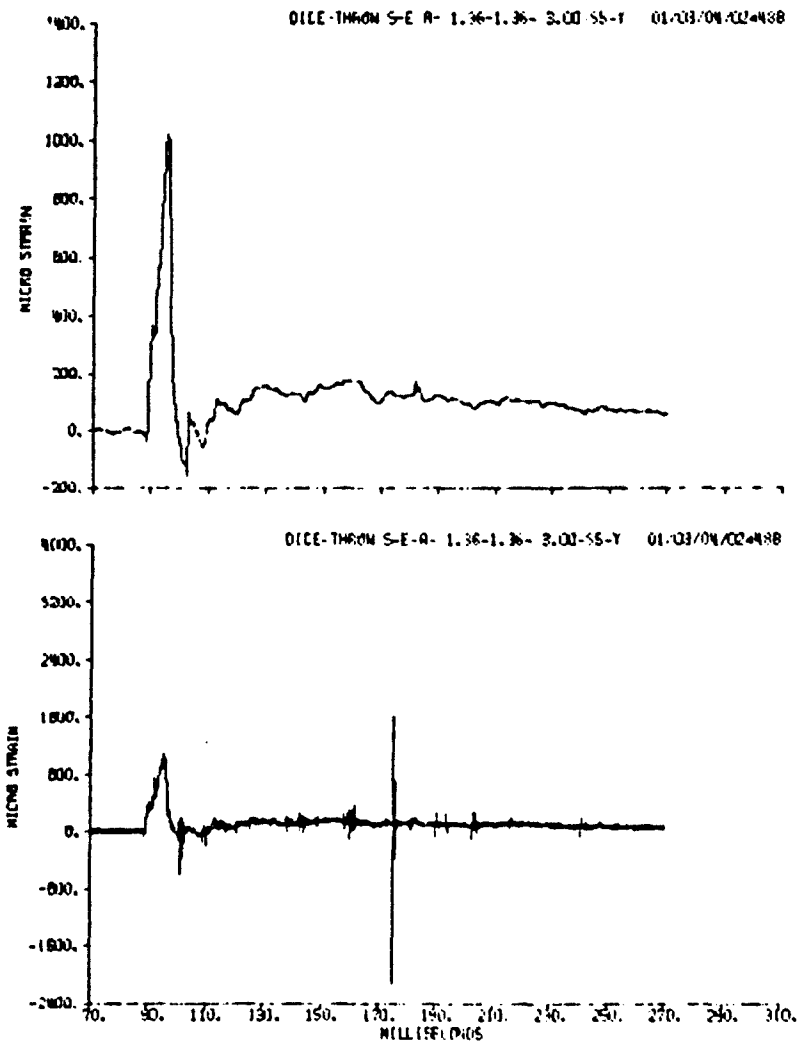

DICE-THROW S E-A- .57- 1.74 3.00-55-Y 01/08/03/014482
MICRO STRAIN
2000.
1000.
0
-1000.
DICE-THROW S-E-A- 0.57-1.74- 3.00-55-Y 01/08/03/014482
MICRO STRAIN
4000.
2000.
0.
-2000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

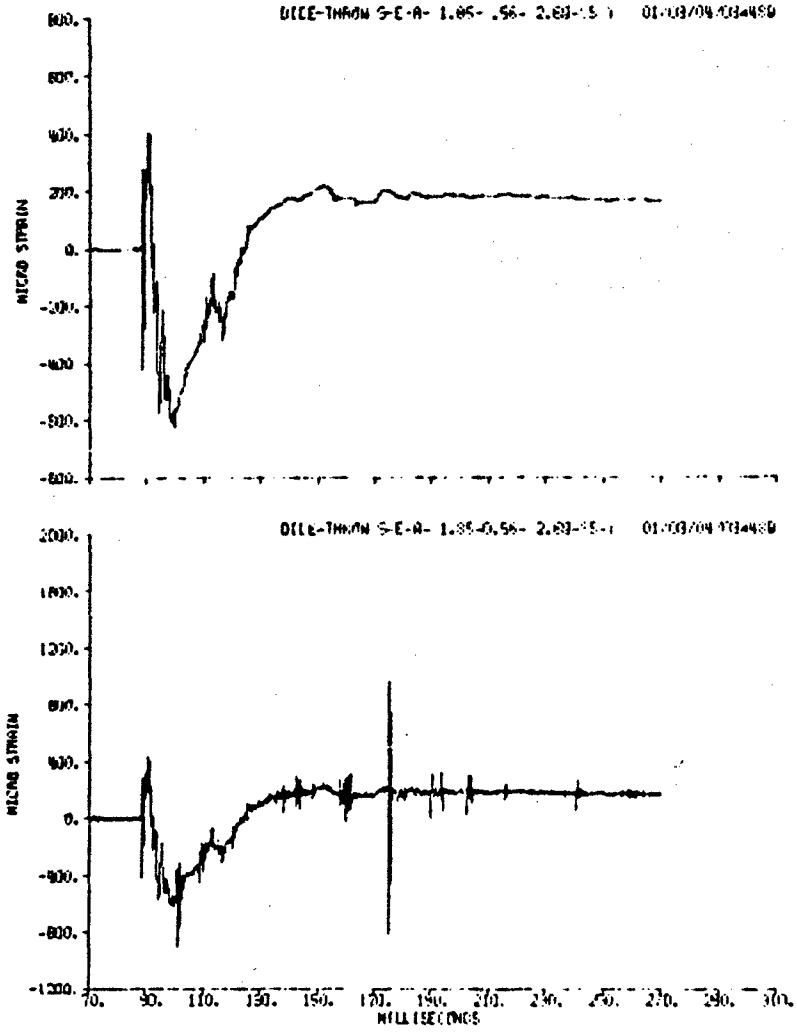

DICE-THROW S-E-A- .57- 1.79 2.69-SS-X
MICRO STRAIN
800.
600.
200.
0.
-200.
-400.
-600.
-1000.
DICE-THROW S-E-A- 0.57-1.79- 2.69-SS-X
MICRO STRAIN
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

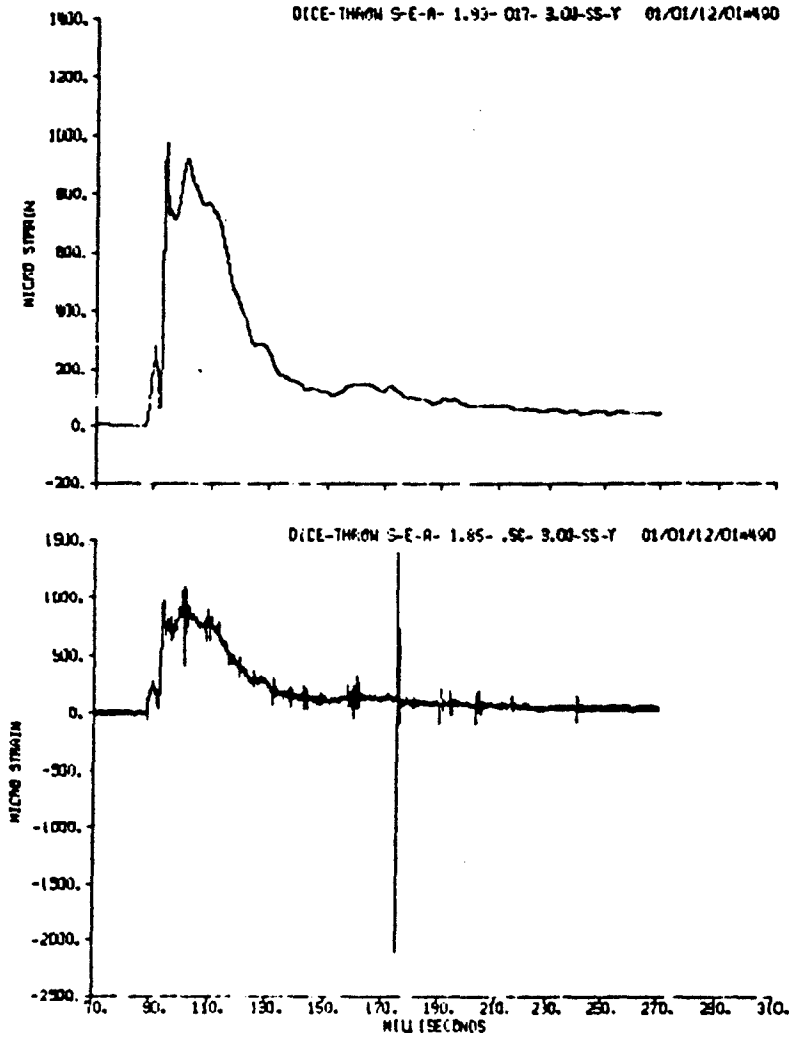

DICE THROW S-E A- .57- 1.74 3.00-SS-X 01/03/03/034484
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
MICRO STRAIN
DICE-THROW S-E-A- 0.57-1.74- 3.00-SS-X 01/03/03/034484
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
MICRO STRAIN
10. 30. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

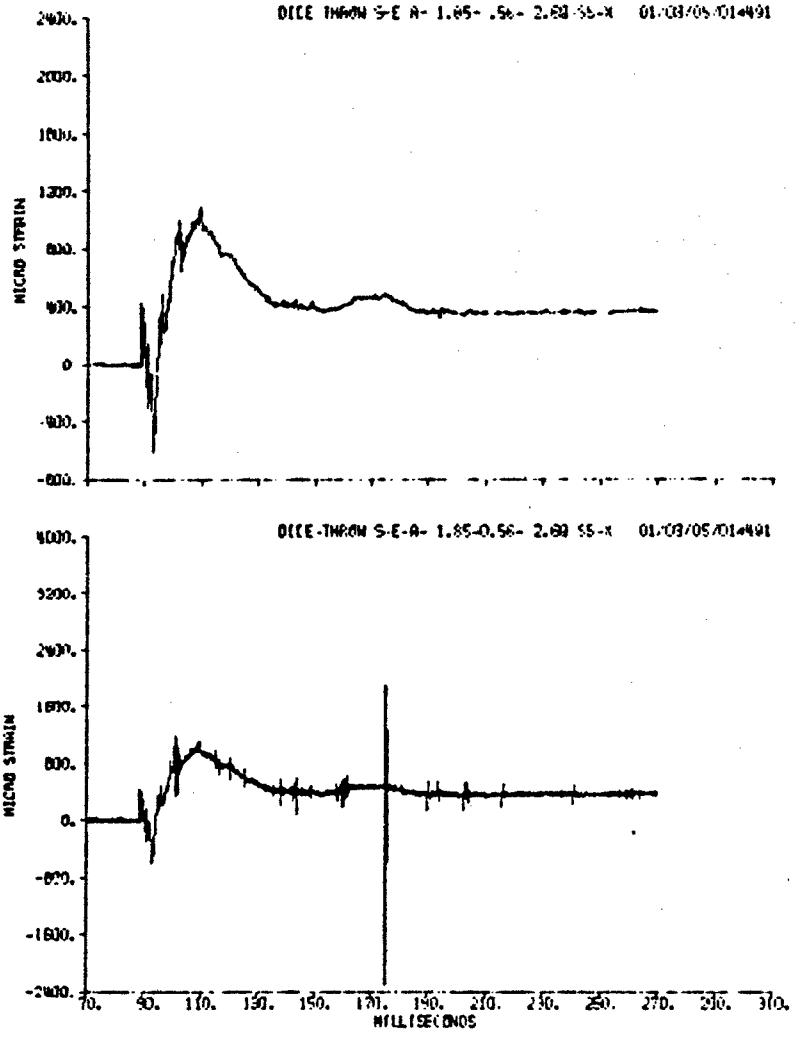

DICE-THROW S-E-A- 1.36-1.36- 2.68-SS-X 01/03/03/04=485
MICRO STRAIN
200.
0.
-200.
-400.
-600.
-800.
-1000.
-1200.
DICE-THROW S-E-A- 1.36-1.36- 2.68-SS-X 01/03/03/04=485
MICRO STRAIN
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

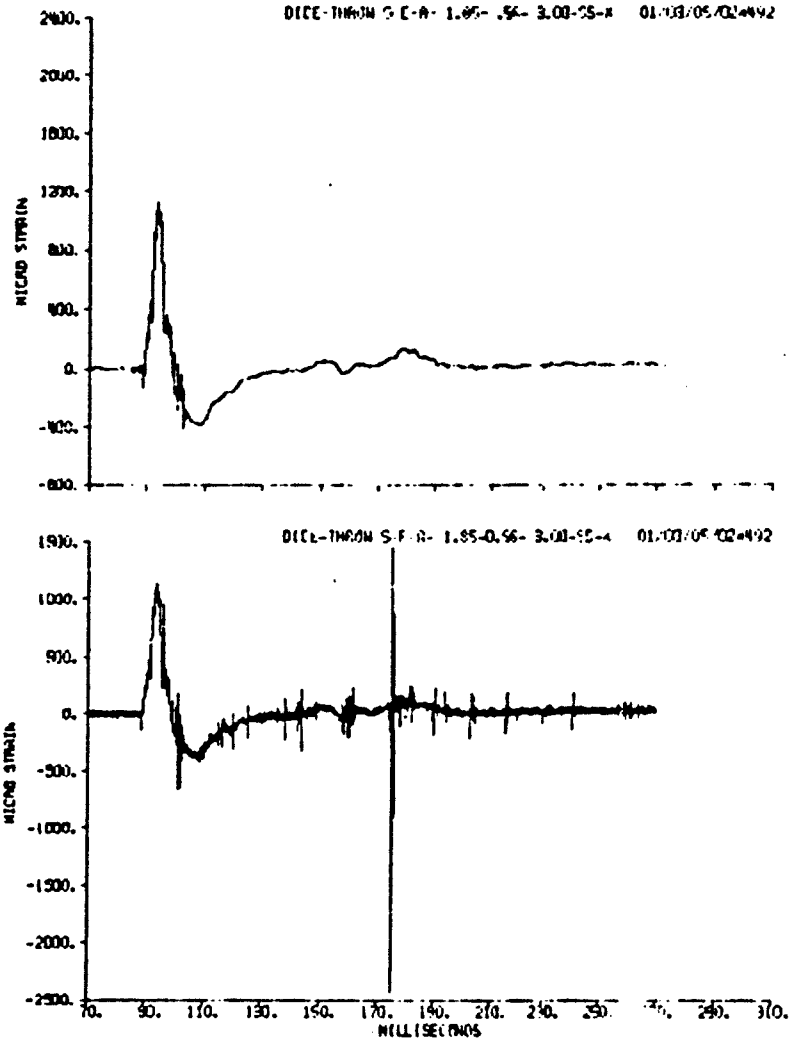

DICE-THRON S-E-A- 1.36-1.36- 3.00-SS-X
MICRO STRAIN
1400.
1000.
600.
200.
0.
-200.
DICE-THRON S-E-A- 1.36-1.36- 3.00-SS-X
MICRO STRAIN
2000.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

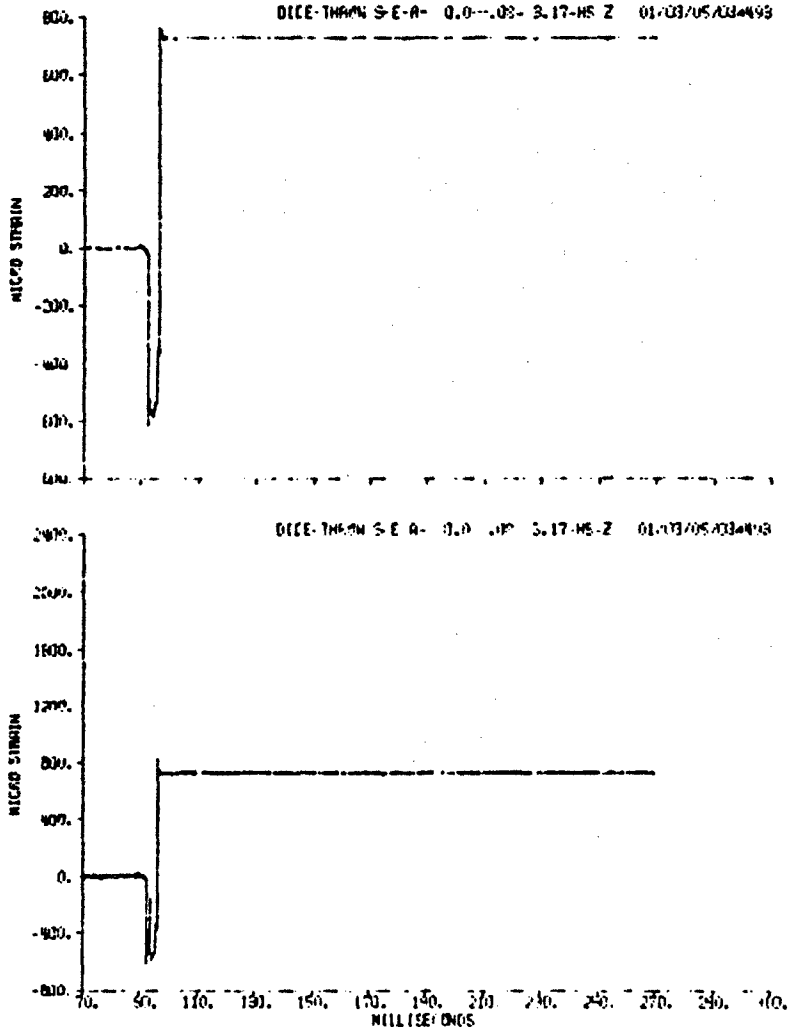

DICE-THROW S-E A- 1.36-1.36- 3.00 SS-Y 01/03/04/02=488
MICRO STRAIN
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 1.36-1.36- 3.00-SS-Y 01/03/04/02=488
MICRO STRAIN
5200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

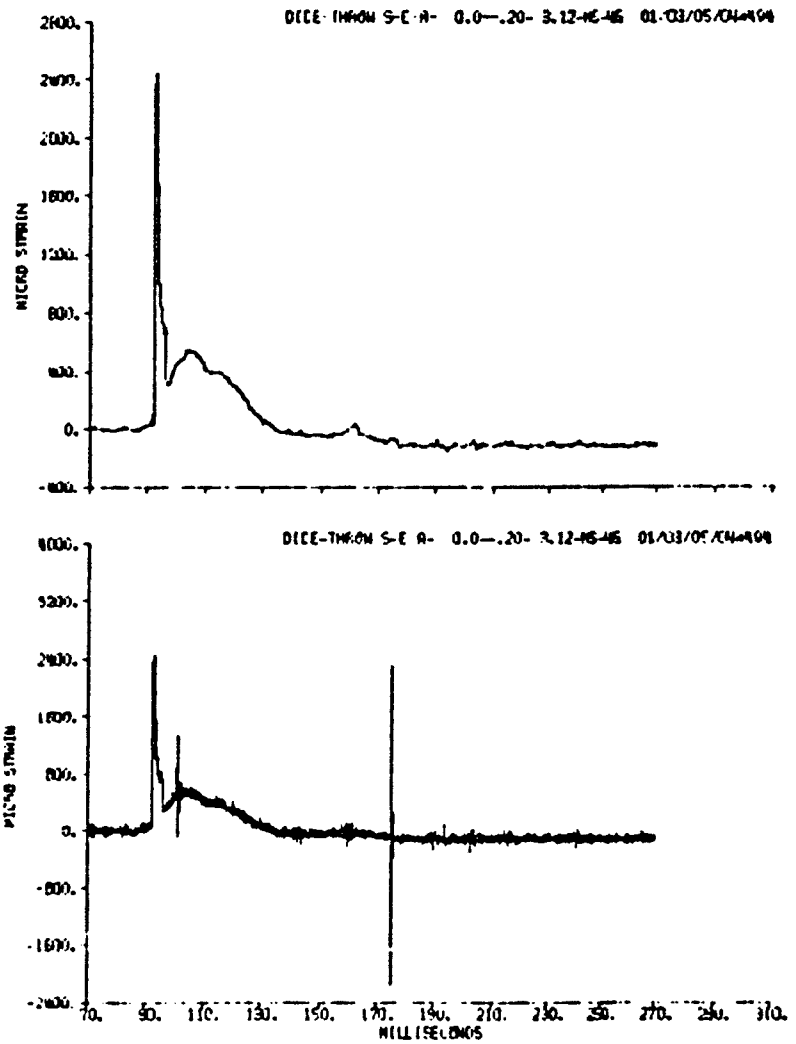

DICE-THROW S-E-A- 1.85- .56- 2.83-15 1 01/03/04/034459
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
DICE-THROW S-E-A- 1.85-0.56- 2.83-15-1 01/03/04/034459
MICRO STRAIN
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

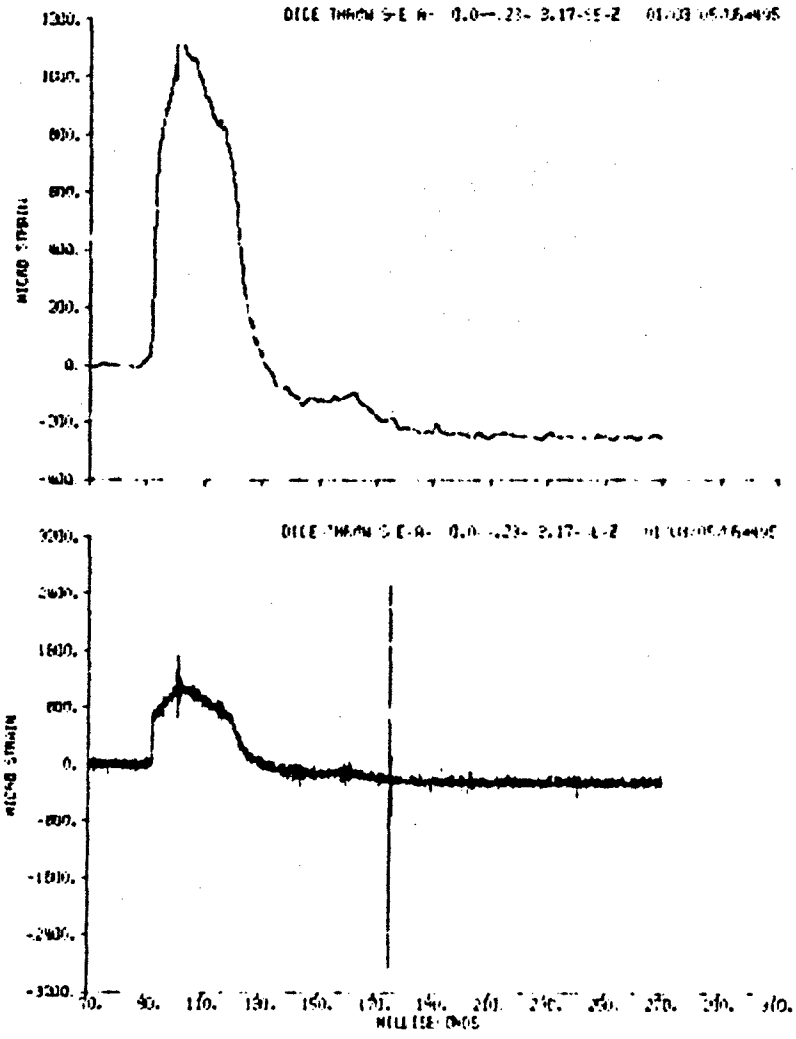

DICE-THROW S-E-A- 1.93- 017- 3.00-SS-Y 01/01/12/01=490
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 1.65- .56- 3.00-SS-Y 01/01/12/01=490
MICRO STRAIN
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
-2500.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

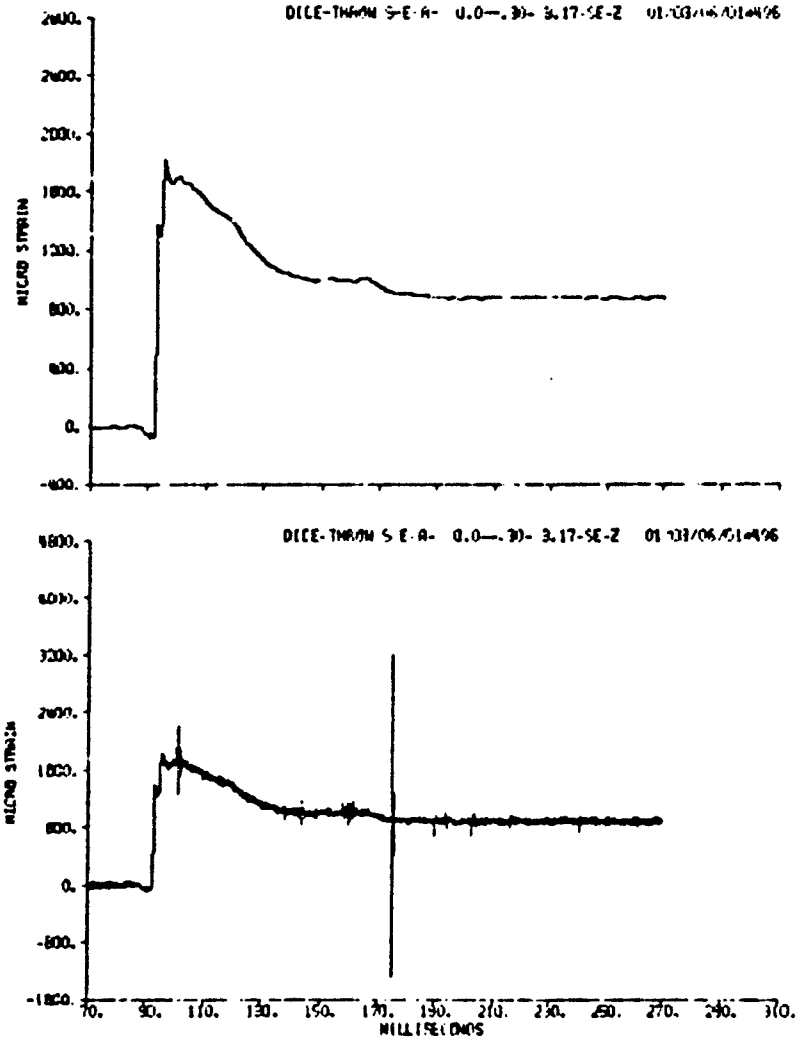

DICE THROW S-E A- 1.85- .56- 2.80 SS-X 01/08/05/014491
MICRO STRAIN
2400.
2000.
1600.
1200.
800.
400.
0
-400.
-800.
DICE-THROW S-E-A- 1.85-0.56- 2.80 SS-X 01/08/05/014491
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
-2000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

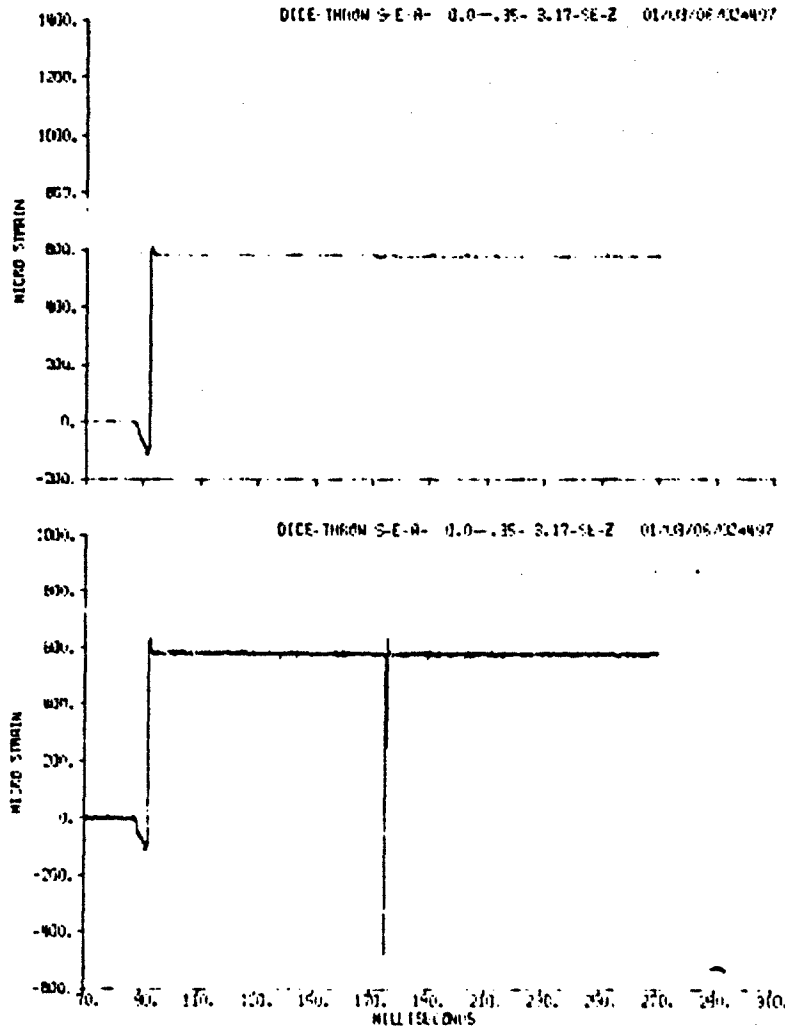

2000.
1000.
0.
-1000.
-2000.
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

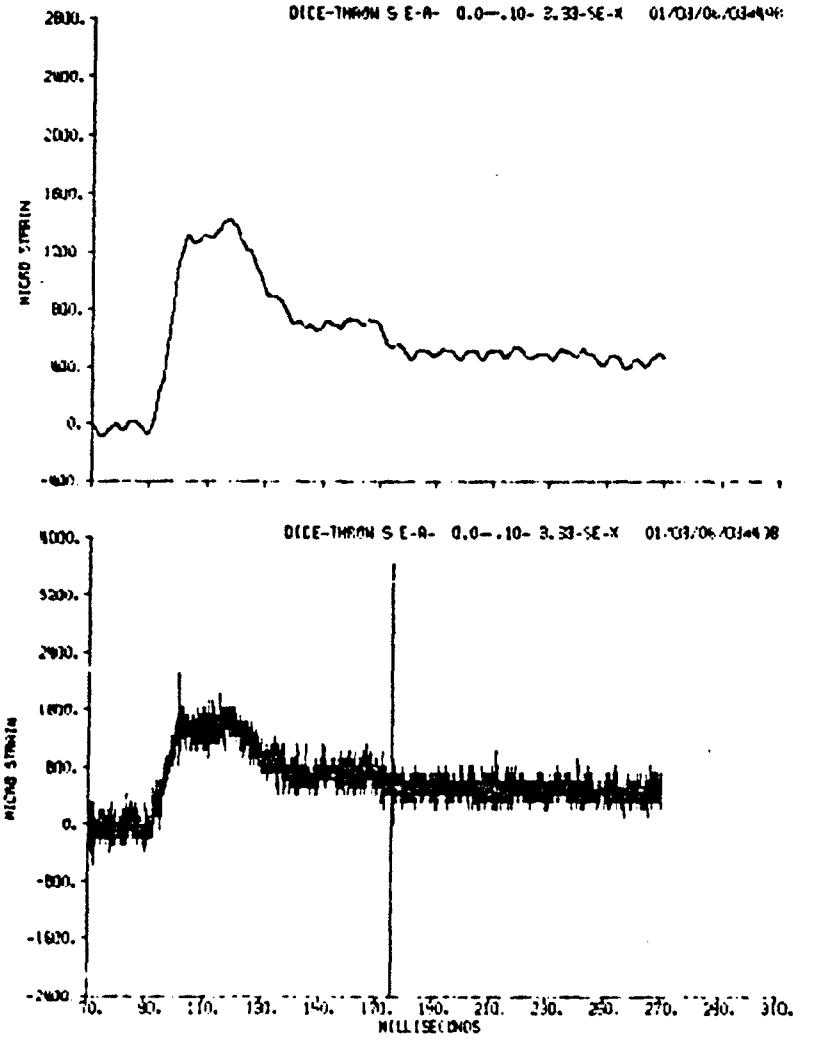

DICE-THRAN S-E-A- 0.0---.03- 3.17-HS Z 01/03/05/033a493
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
DICE-THRAN S-E-A- 0.0 .03 3.17-HS-Z 01/03/05/033a493
MICRO STRAIN
2000.
1800.
1600.
1400.
800.
400.
0.
-400.
-800.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

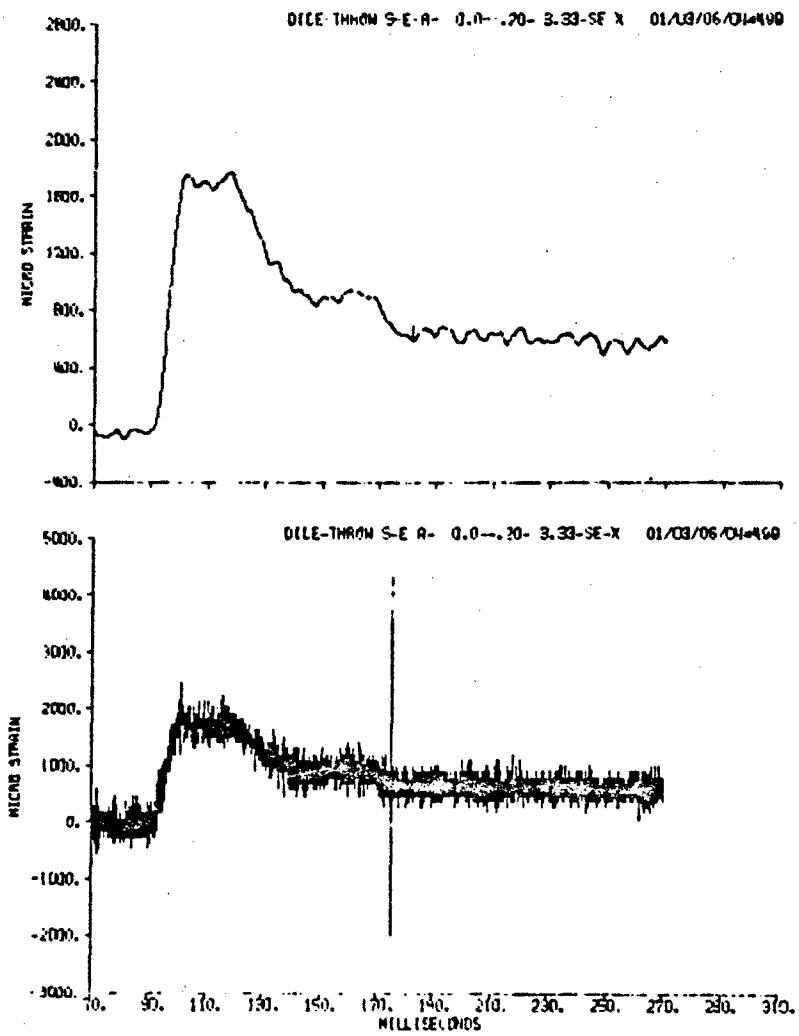

DICE-THROW S-E A- 0.0—.20- 3.12-MS-MS 01/03/05/CH=KSN
MICRO STRAIN
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
DICE-THROW S-E A- 0.0—.20- 3.12-MS-MS 01/03/05/CH=KSN
MICRO STRAIN
6000.
5200.
4400.
3600.
2800.
2000.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
-2000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

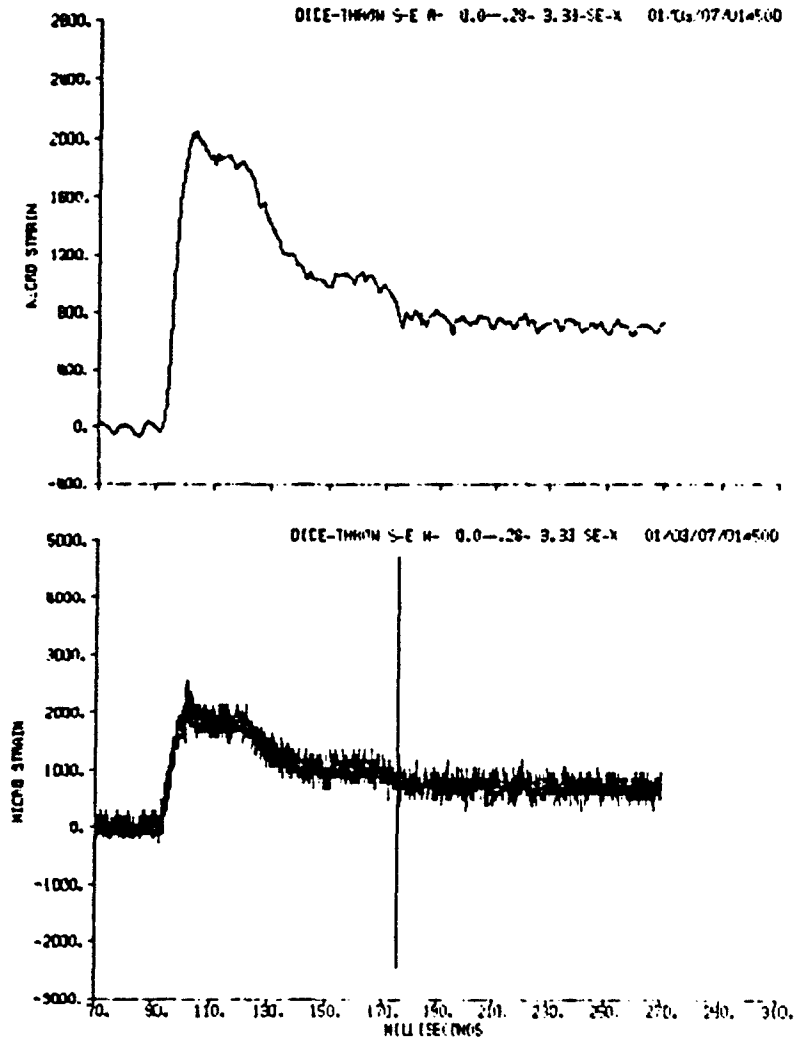

1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
MICRO STRAIN
3000.
2400.
1800.
1200.
600.
0.
-600.
-1200.
-1800.
-2400.
-3000.
MICRO STRAIN
0.
90.
180.
270.
360.

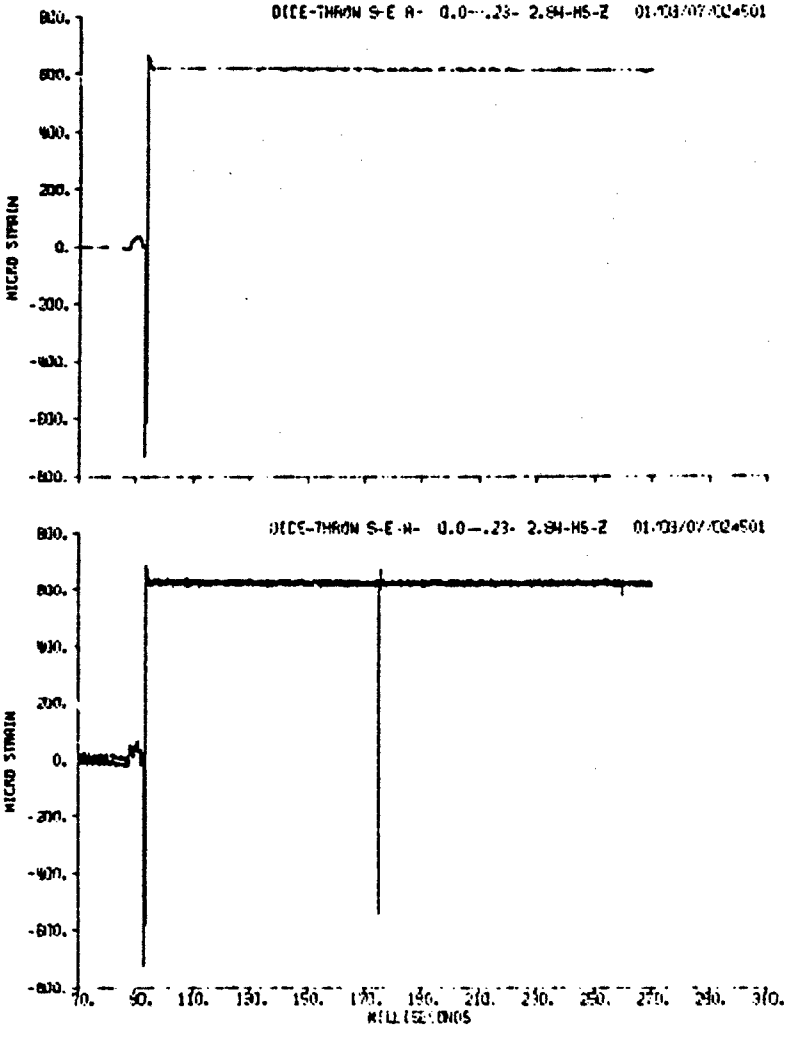

DICE-THROW S-E-A- 0.0—.30- 3.17-SE-Z
MICRO STRAIN
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
DICE-THROW S E-A- 0.0—.30- 3.17-SE-Z
MICRO STRAIN
3200.
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

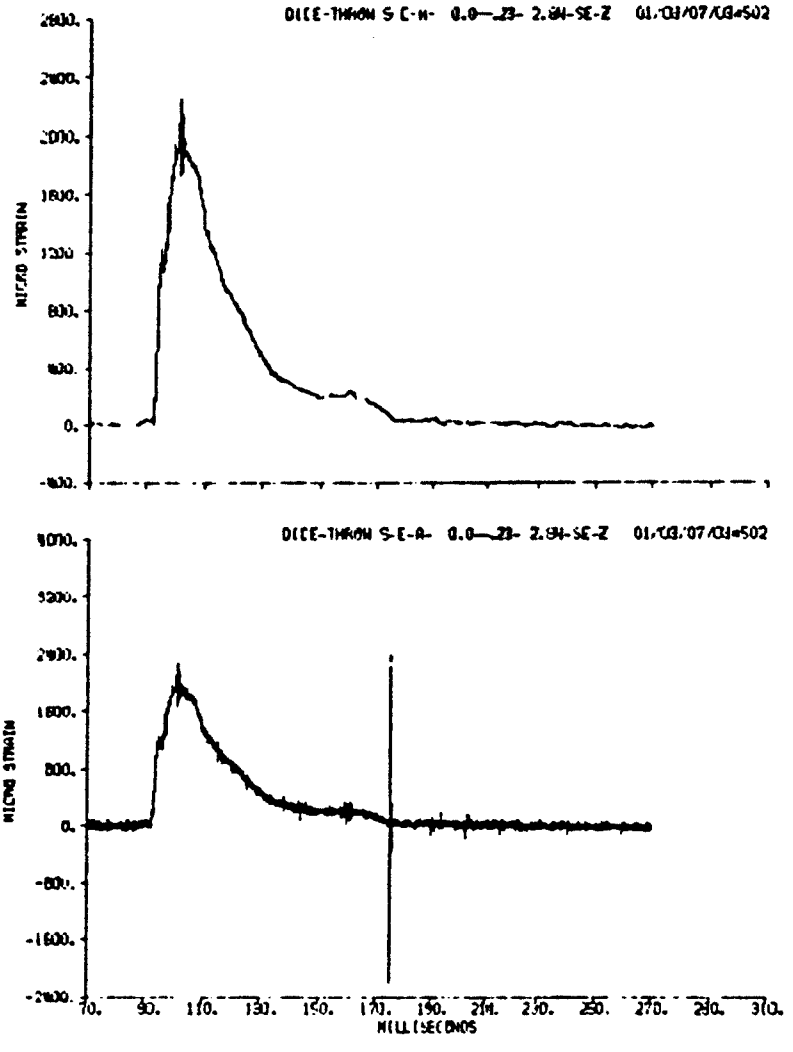

DICE-THROW S-E-A- 0.0—.35- 3.17-SE-Z
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 0.0—.35- 3.17-SE-Z
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
MILLISECONDS

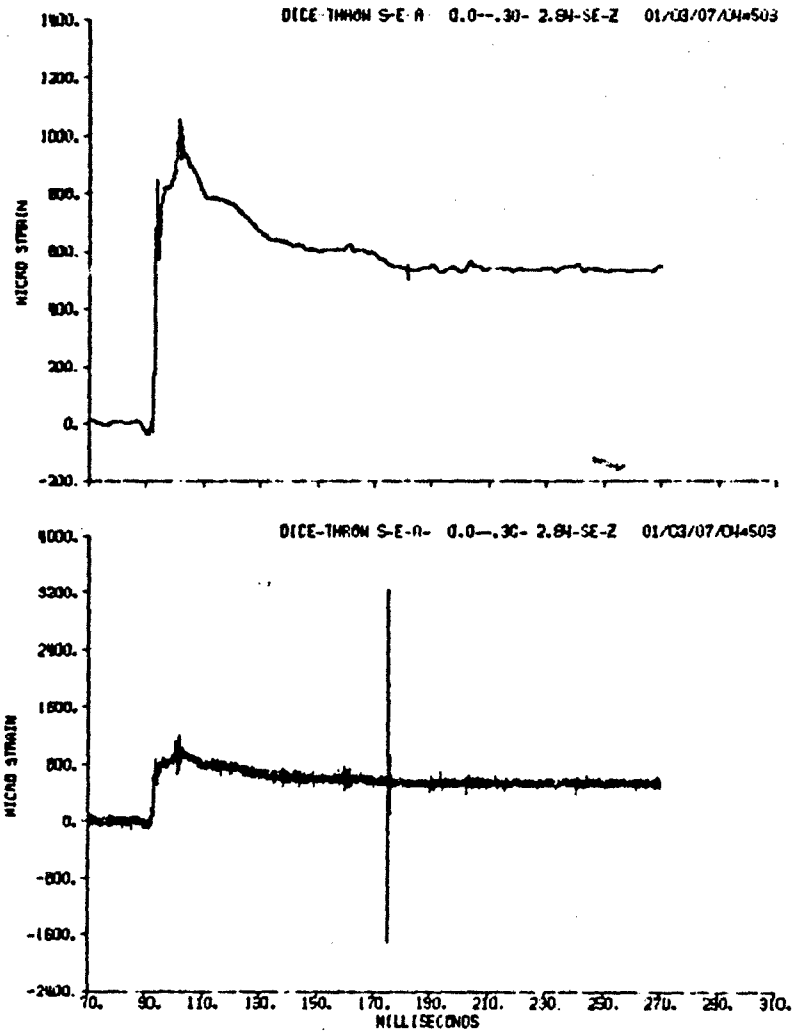

DICE-THROW S E-A- 0.0—.10- 3.33-SE-X
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
MICRO STRAIN
DICE-THROW S E-A- 0.0—.10- 3.33-SE-X
5200.
2800.
1600.
800.
0.
-800.
-1600.
-2400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

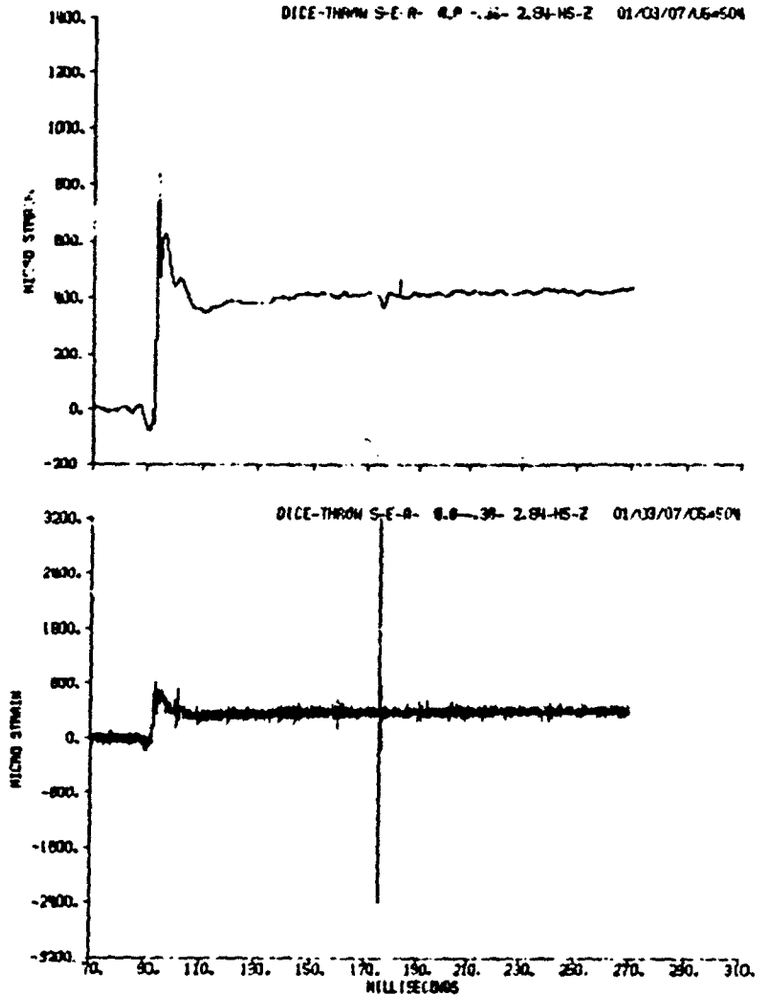

DILE THROW S-E-A- 0.0--.20- 3.33-SE X 01/03/06/04=490
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
MICRO STRAIN
DILE-THROW S-E A- 0.0--.20- 3.33-SE-X 01/03/06/04=490
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
-3000.
MICRO STRAIN
10.
90.
170.
250.
330.
MILLISECONDS

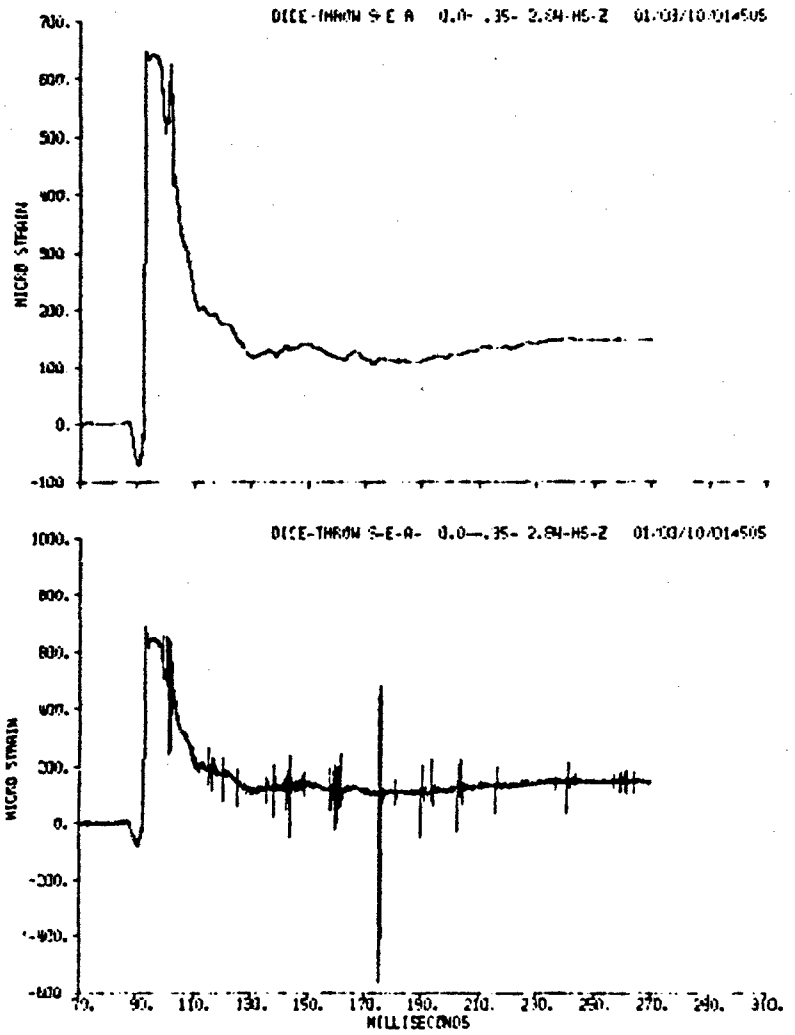

DICE-THROW S-E #- 0.0—.28- 3.33-SE-X
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
A.CRO STRAIN
DICE-THROW S-E #- 0.0—.28- 3.33 SE-X
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
-3000.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

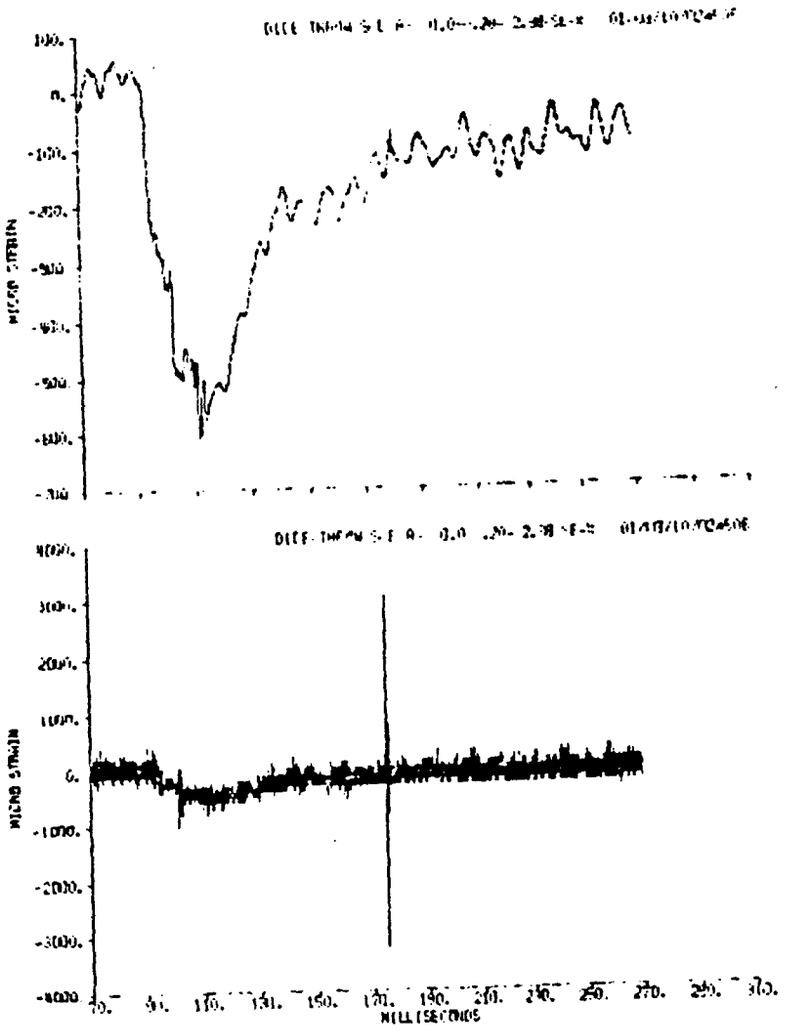

DICE-THROW S-E A- 0.0—.23- 2.84-HS-Z
MICRO STRAIN
DICE-THROW S-E-A- 0.0—.23- 2.84-HS-Z
MICRO STRAIN

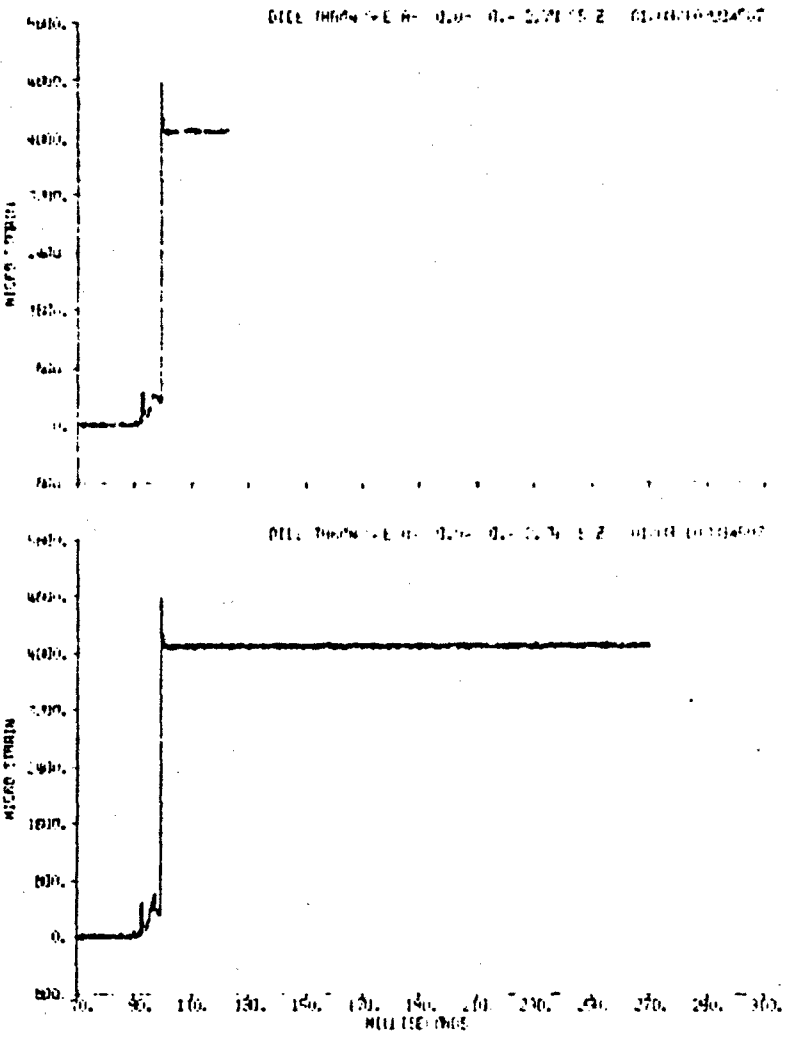

DICE-THROW S C-H- 0.0—.23- 2.6H-SE-Z
MICRO STRAIN
DICE-THROW S-E-A- 0.0—.23- 2.6H-SE-Z
MICRO STRAIN
MILLISECONDS

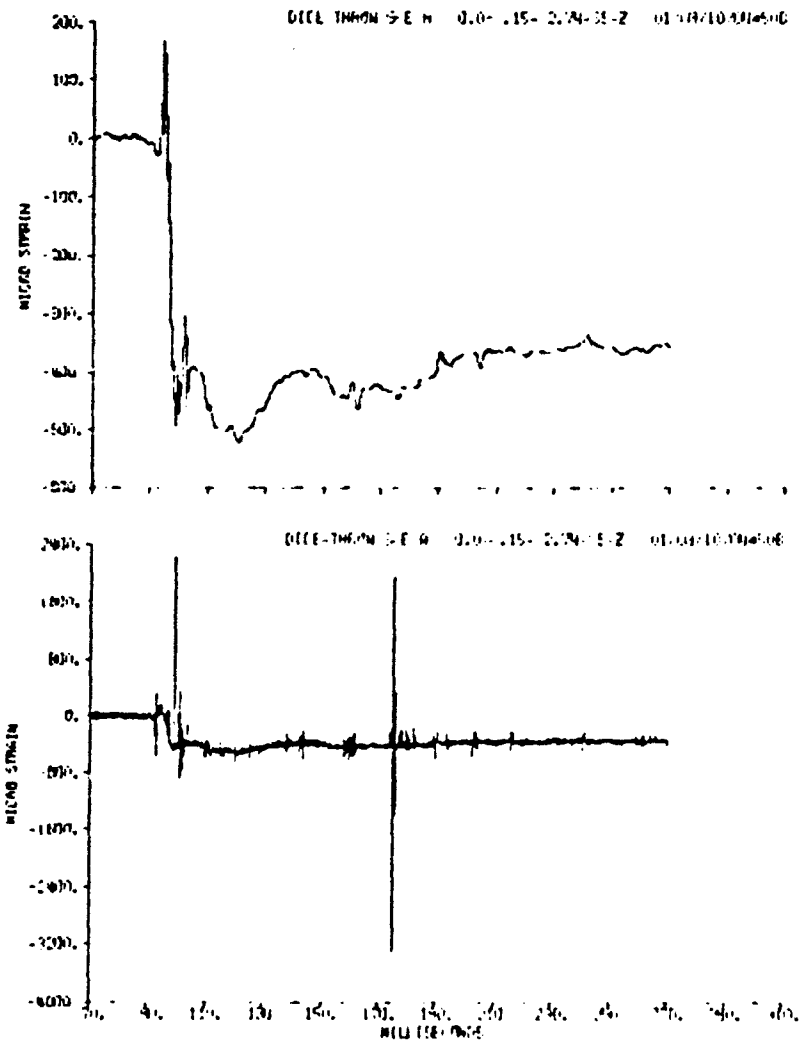

DICE-THROW S-E-A 0.0--.30- 2.8H-SE-Z 01/03/07/OH=503
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 0.0—.3C- 2.8H-SE-Z 01/03/07/OH=503
MICRO STRAIN
3200.
2800.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

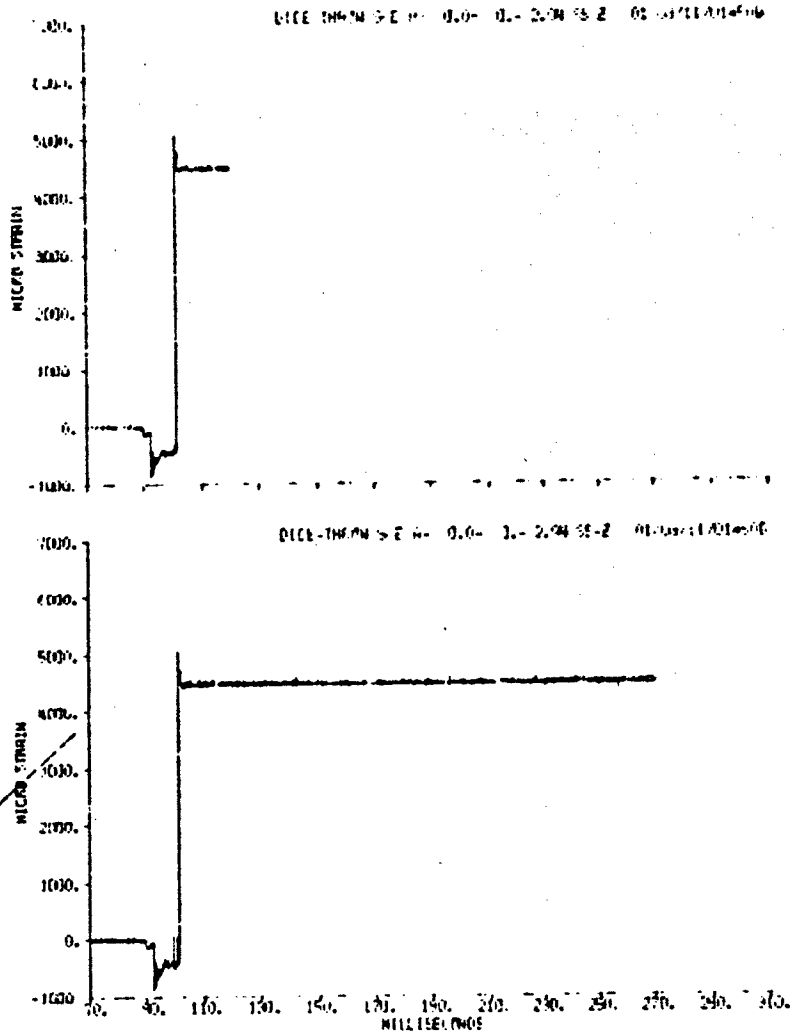

DICE-THROW S-E-A- 0.0 -.38- 2.5M-HS-Z 01/03/07/05=50M
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200
MICRO STRAIN
DICE-THROW S-E-A- 0.0—.38- 2.5M-HS-Z 01/03/07/05=50M
3200.
2600.
1800.
800.
0.
-800.
-1600.
-2400.
-3200.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

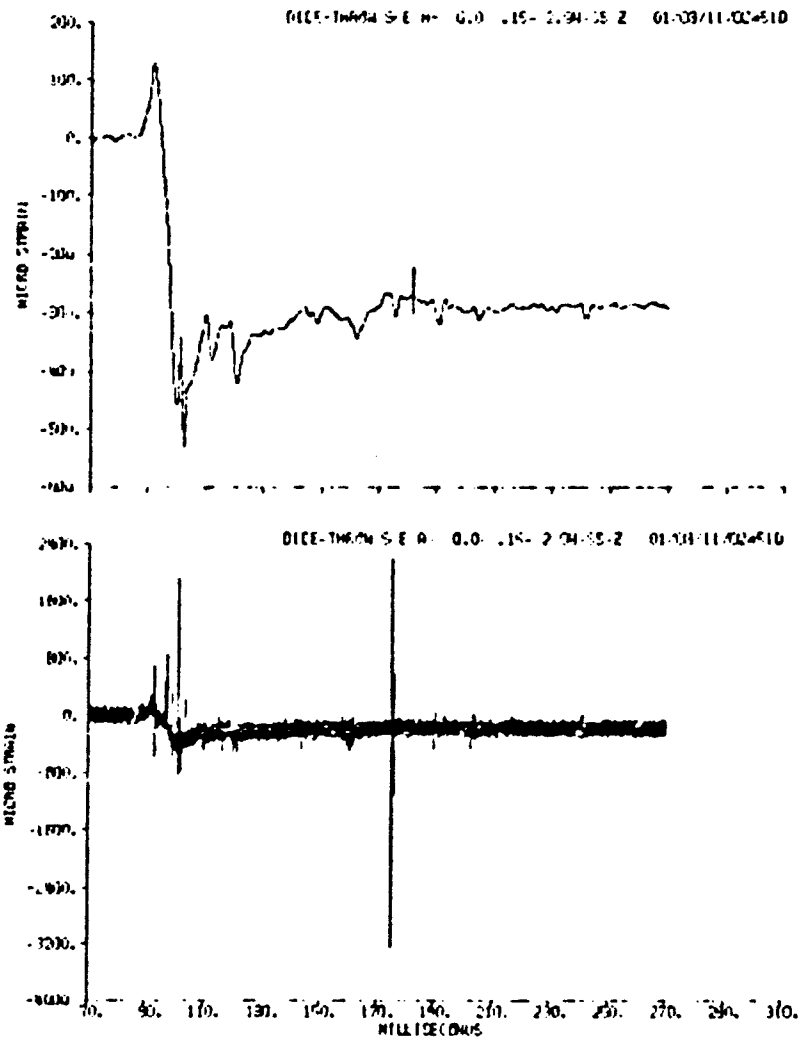

DICE-THROW S-E A 0.0- .35- 2.84-HS-Z
MICRO STRAIN
700.
600.
500.
400.
300.
200.
100.
0.
-100
DICE-THROW S-E-A- 0.0—.35- 2.84-HS-Z
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

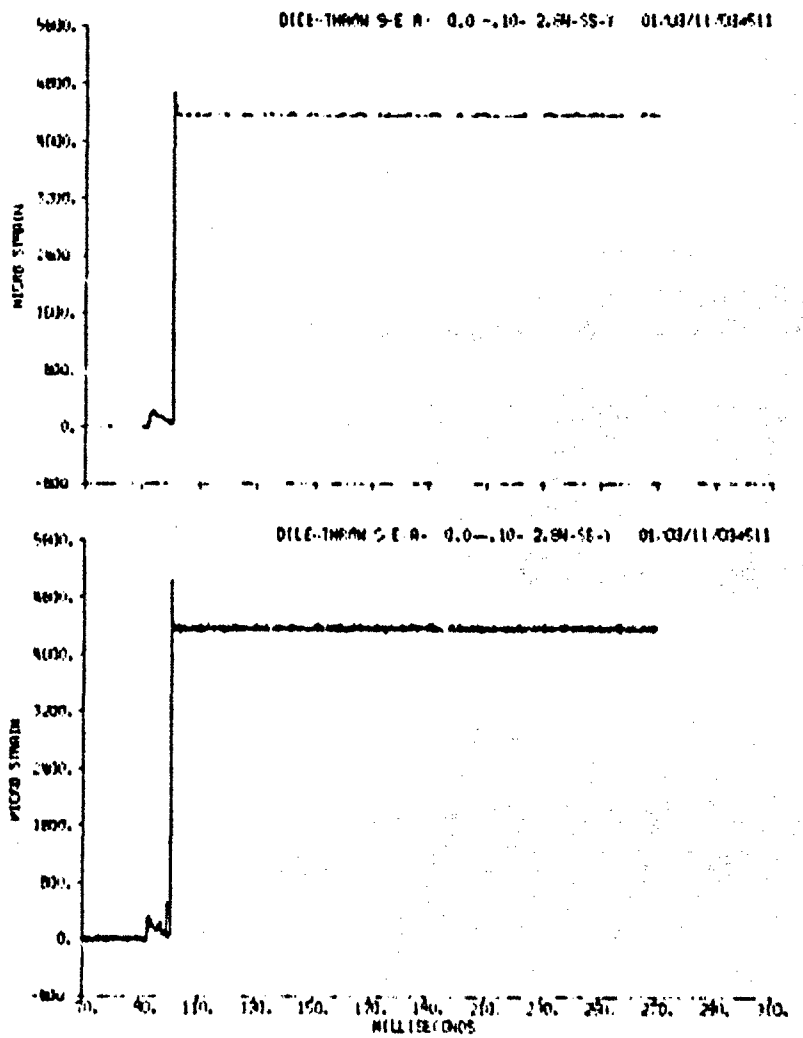

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

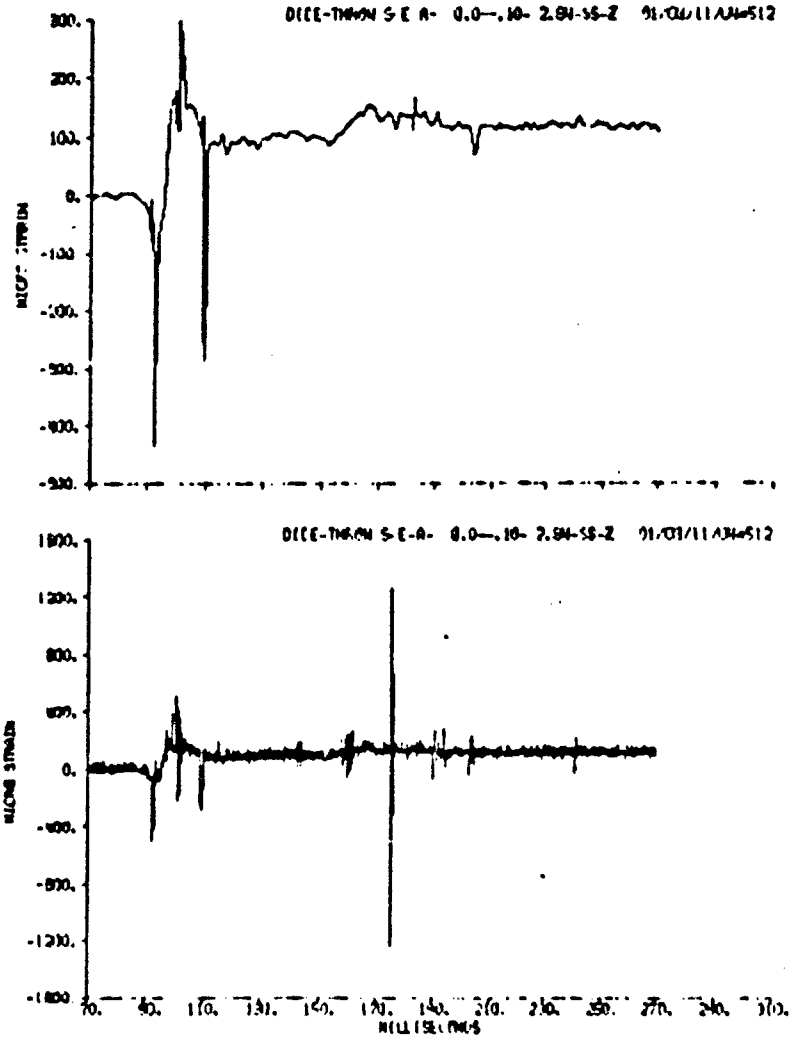


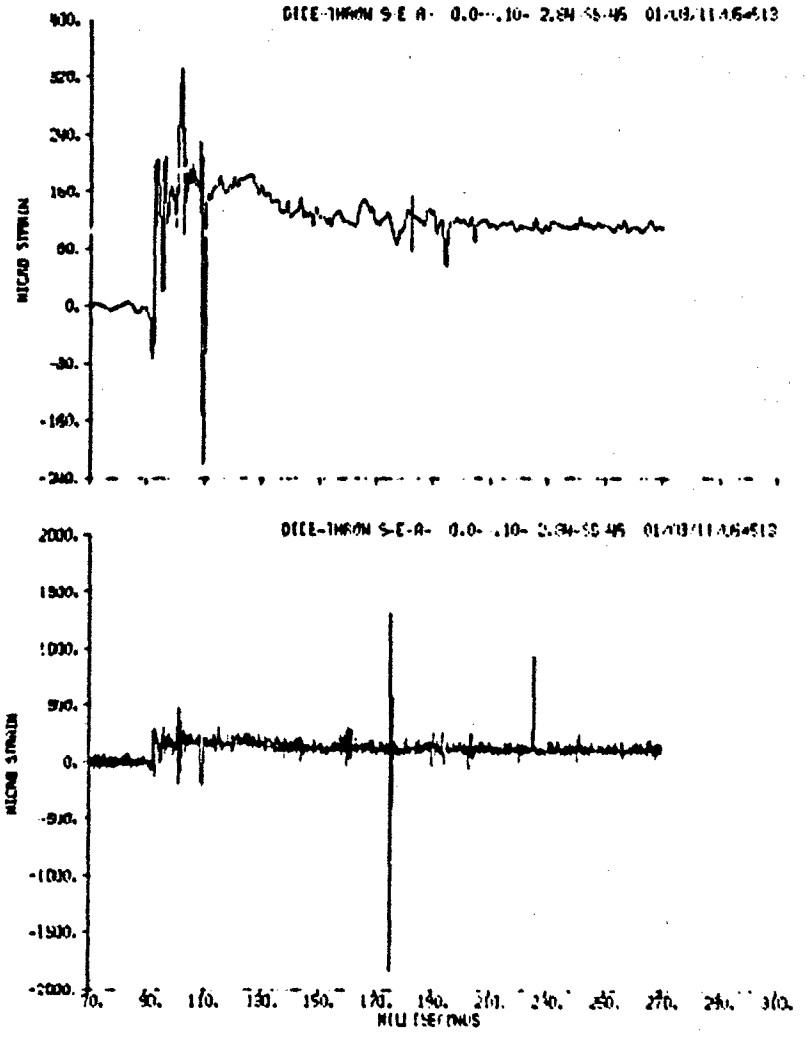

MICRO STRAIN
MICRO STRAIN

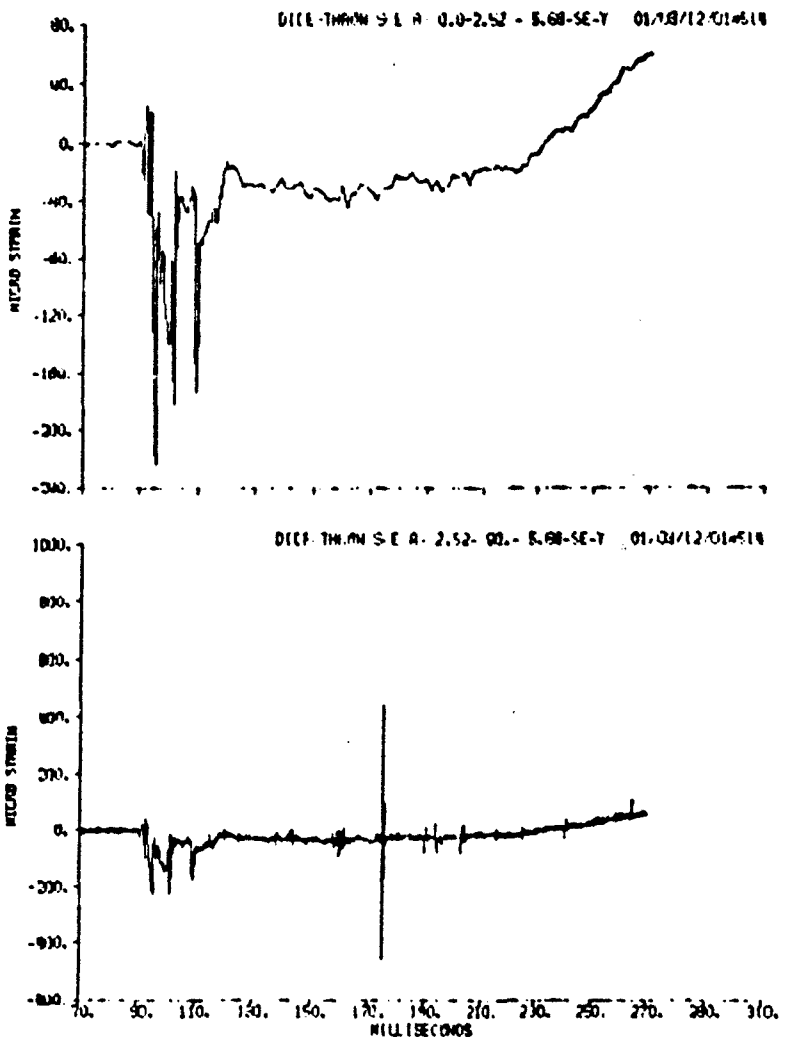

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

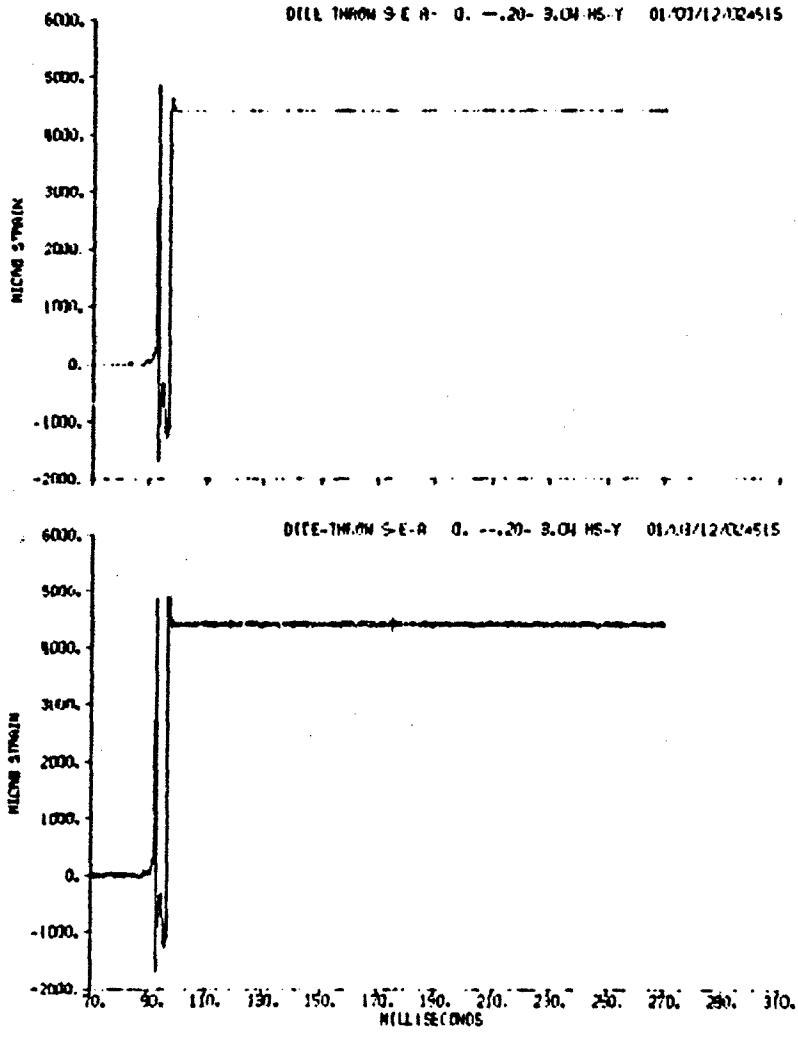

MICRO STRAIN
MILLISECONDS

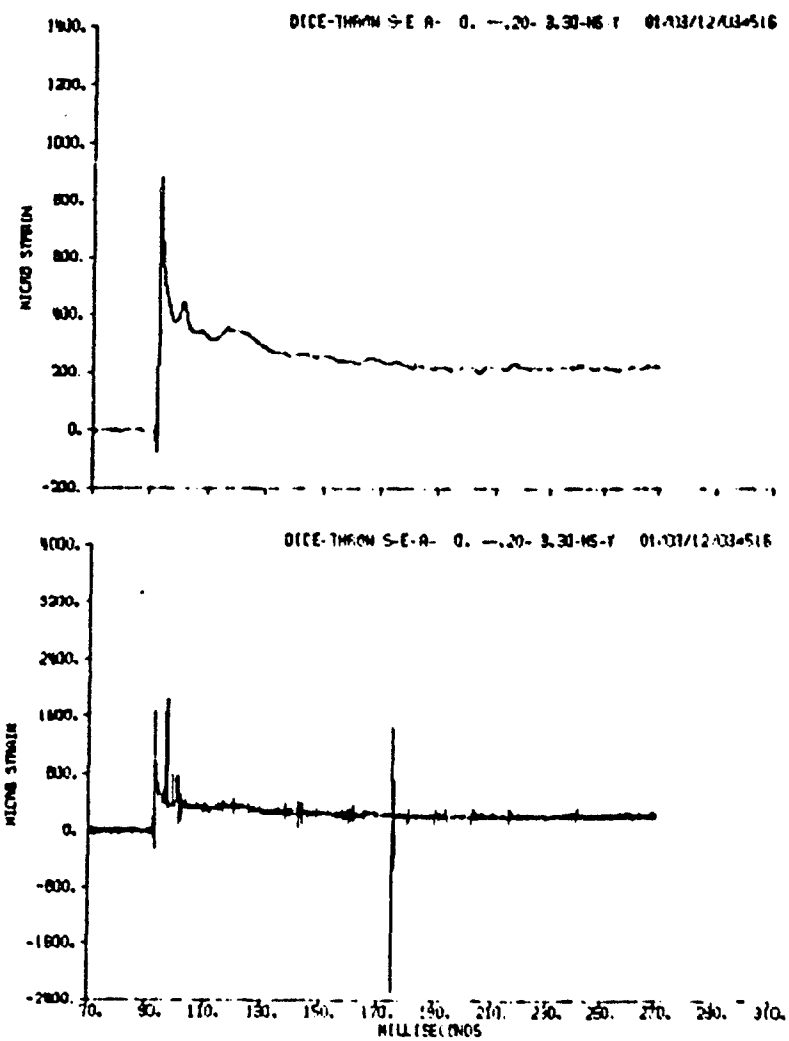

DICE-THRW S-E A- 0.0 -.10- 2.84-SS-1 01/03/11/03+511
MICRO STRAIN
DICE-THRW S-E A- 0.0—.10- 2.84-SS-1 01/03/11/03+511
MICRO STRAIN
MILLISECONDS

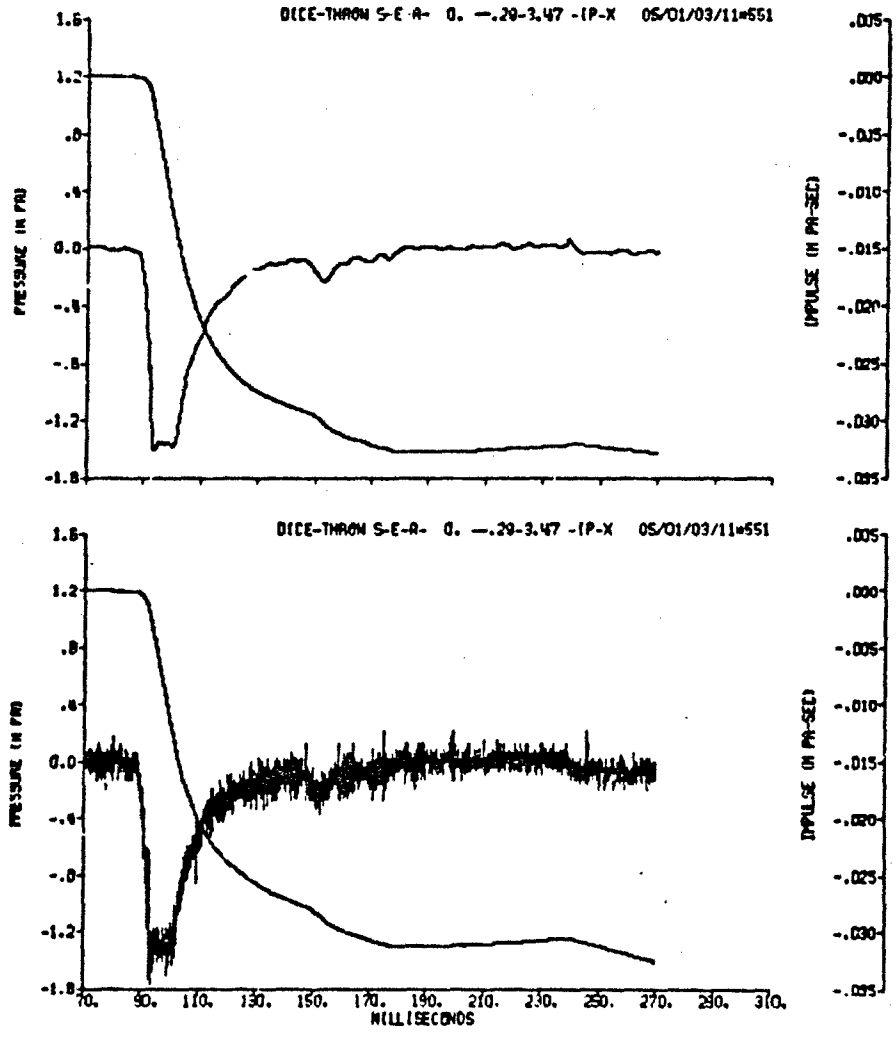

DICE-THROW S E A- 0.0—.10- 2.5M-SS-Z
MICRO STRAIN
DICE-THROW S-E-A- 0.0—.10- 2.5M-SS-Z
MICRO STRAIN

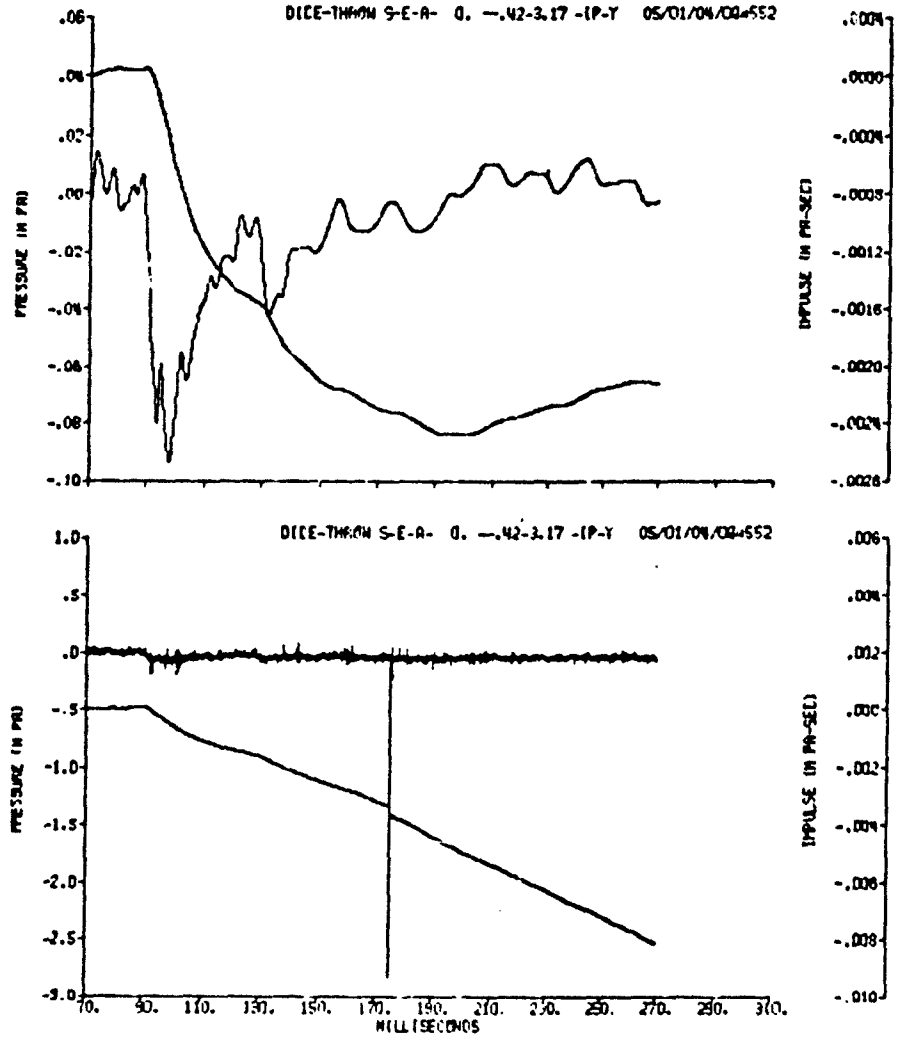

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

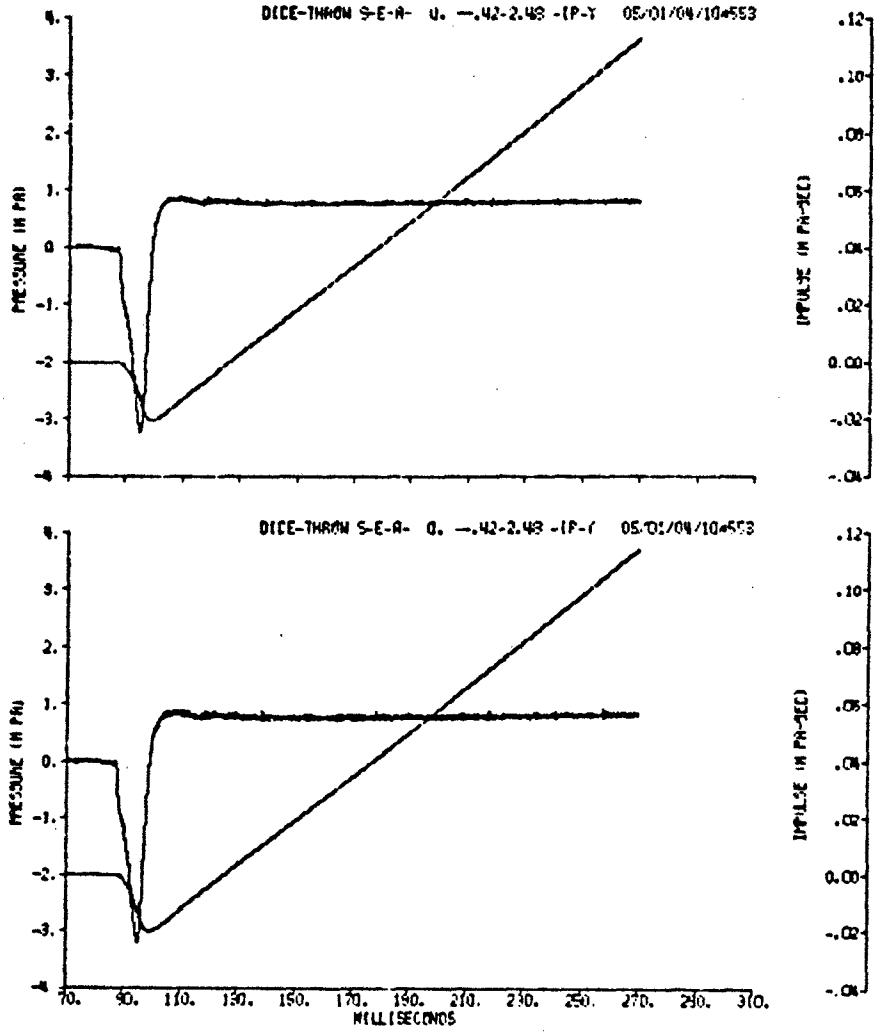

DEEP THIAN S E A 0.0-2.52 - 5.68-SE-Y
MICRO STRAIN
80.
0.
-40.
-80.
-120.
-160.
-200.
-240.
DEEP THIAN S E A 2.52- 00.- 5.68-SE-Y
MICRO STRAIN
1000.
800.
600.
200.
0.
-200.
-400.
-600.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS


6000.
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS


DICE-THROW S-E A- 0. -.20- 3.30-NS Y
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-A- 0. -.20- 3.30-NS-Y
MICRO STRAIN
3200.
2800.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS


DICE-THROW S-E A- 0. —.29-3.47 -IP-X 05/01/03/11=551
PRESSURE IN PSI
IMPULSE IN PA-SEC
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
.005
.000
-.005
-.010
-.015
-.020
-.025
-.030
-.035
DICE-THROW S-E-A- 0. —.29-3.47 -IP-X 05/01/03/11=551
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS


DICE-THROW S-E-A- 0. —.42-3.17 -(P-Y 05/01/04/02+552
PRESSURE (N PSI)
IMPULSE (N PA-SEC)
.06
.04
.02
.00
-.02
-.04
-.06
-.08
-.10
.0004
.0000
-.0004
-.0008
-.0012
-.0016
-.0020
-.0024
-.0028
DICE-THROW S-E-A- 0. —.42-3.17 -(P-Y 05/01/04/02+552
PRESSURE (N PSI)
IMPULSE (N PA-SEC)
1.0
.5
.0
-.5
-1.0
-1.5
-2.0
-2.5
-3.0
.006
.004
.002
.000
-.002
-.004
-.006
-.008
-.010
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS


DICE-THROW S-E-A- U. —.42-2.48 -(P-Y 05/01/04/10=553
PRESSURE (N PA)
IMPULSE (N PA-SEC)
DICE-THROW S-E-A- U. —.42-2.48 -(P-Y 05/01/04/10=553
PRESSURE (N PA)
IMPULSE (N PA-SEC)
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

APPENDIX E

AIRCRAFT SHELTER "B" DATA PRESENTATION

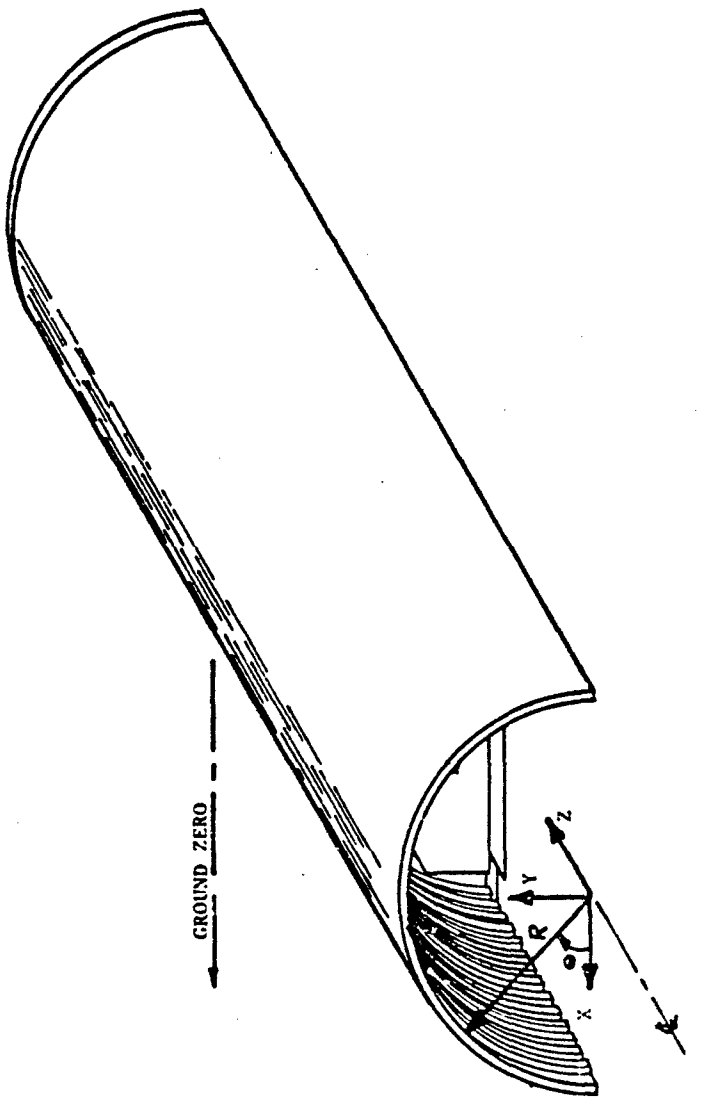


Figure E-1 Aircraft Shelter "B" Coordinate System

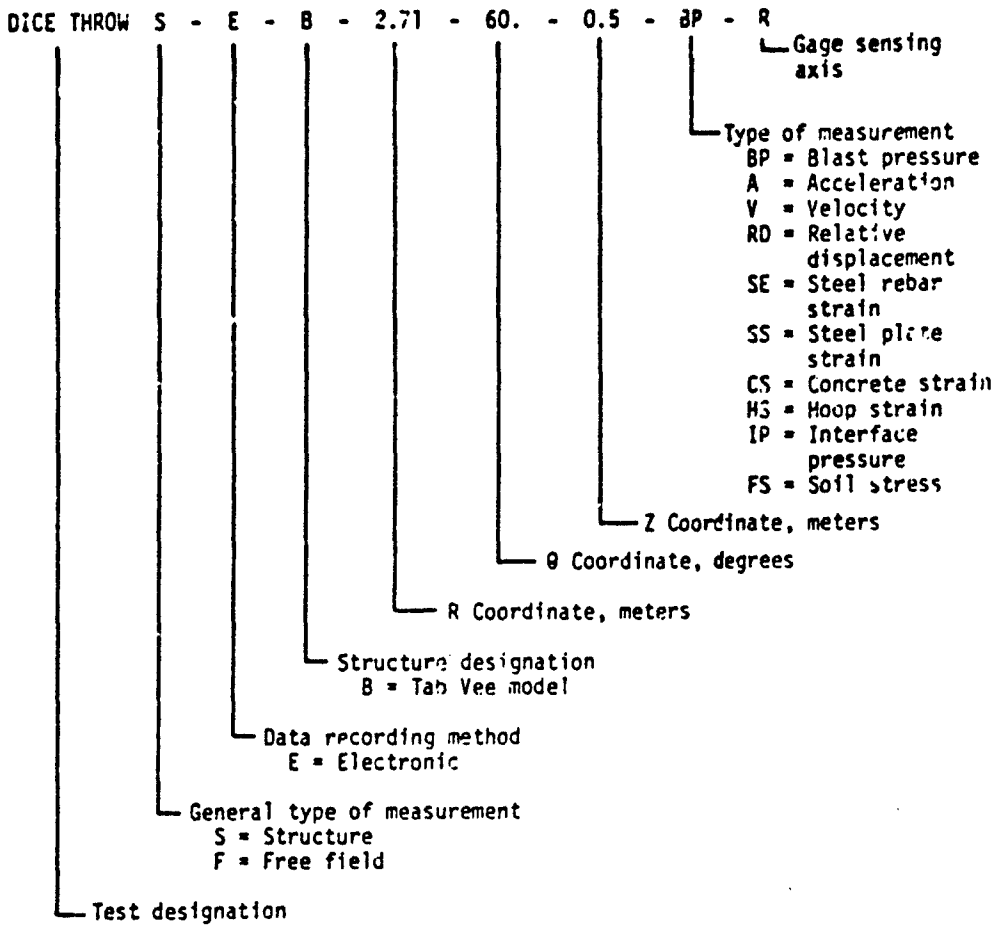


Figure 82. Measurement Designation System

DATA CORRECTIONS

DSP - points have been despiked.

SMT - a modified Hanning smooth has been performed.

FIL - a frequency cut-off or a band reject digital filter has been made.

BLC - the data has been baseline corrected.

INV - the polarity has been reversed.

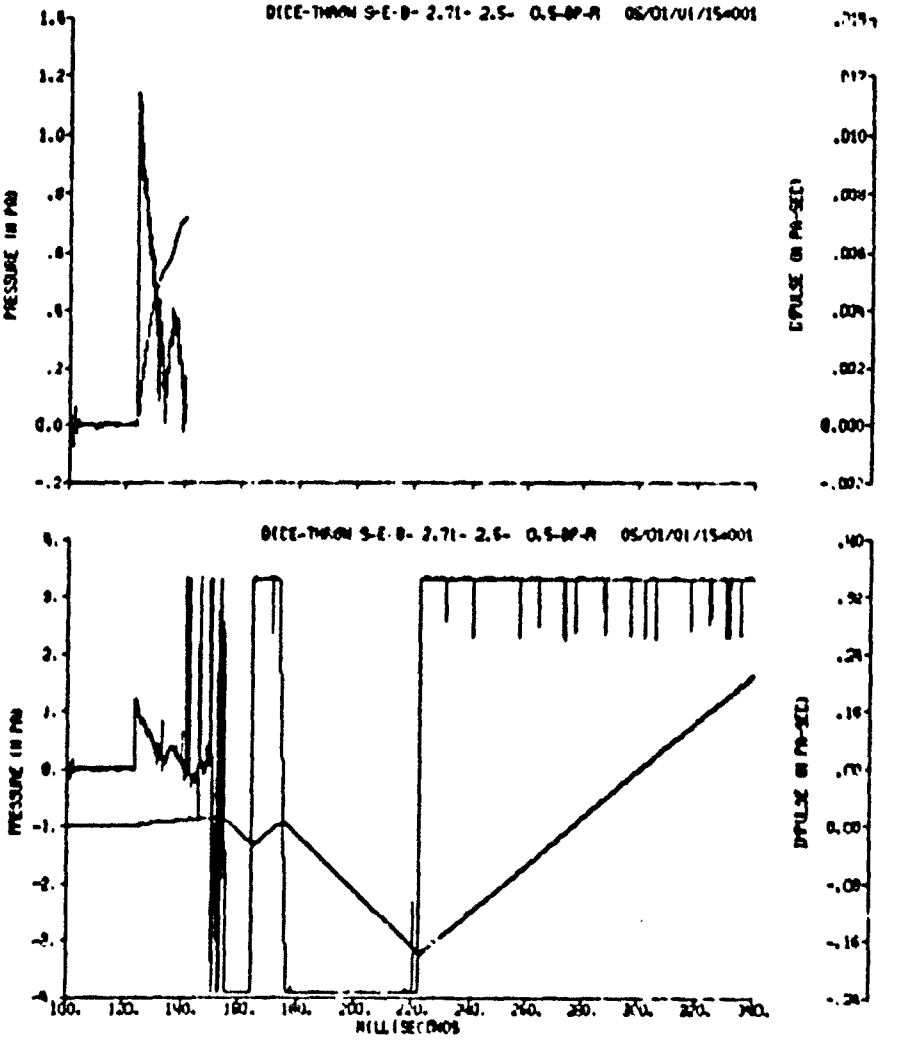
On each page, the corrected plot is at the top and the uncorrected plot is at the bottom. Each acceleration plot is followed by its integral.

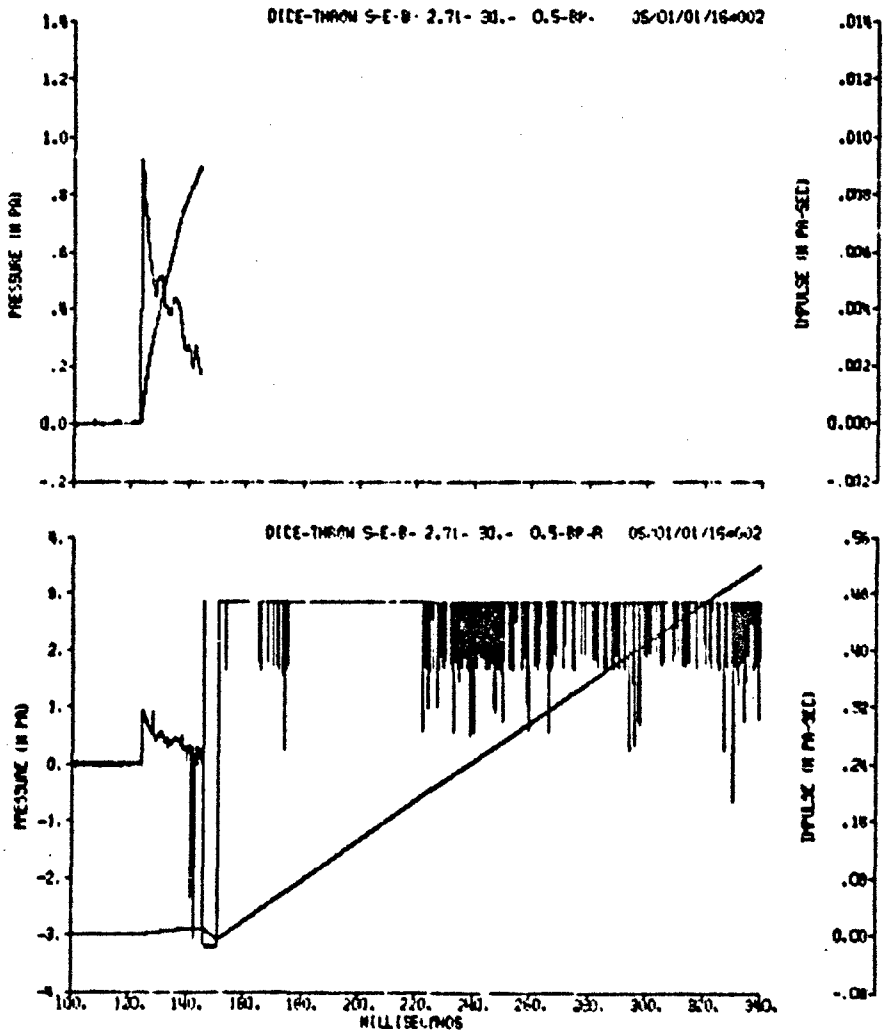
DICE THROW, SHELTER B DATA CORRECTIONS

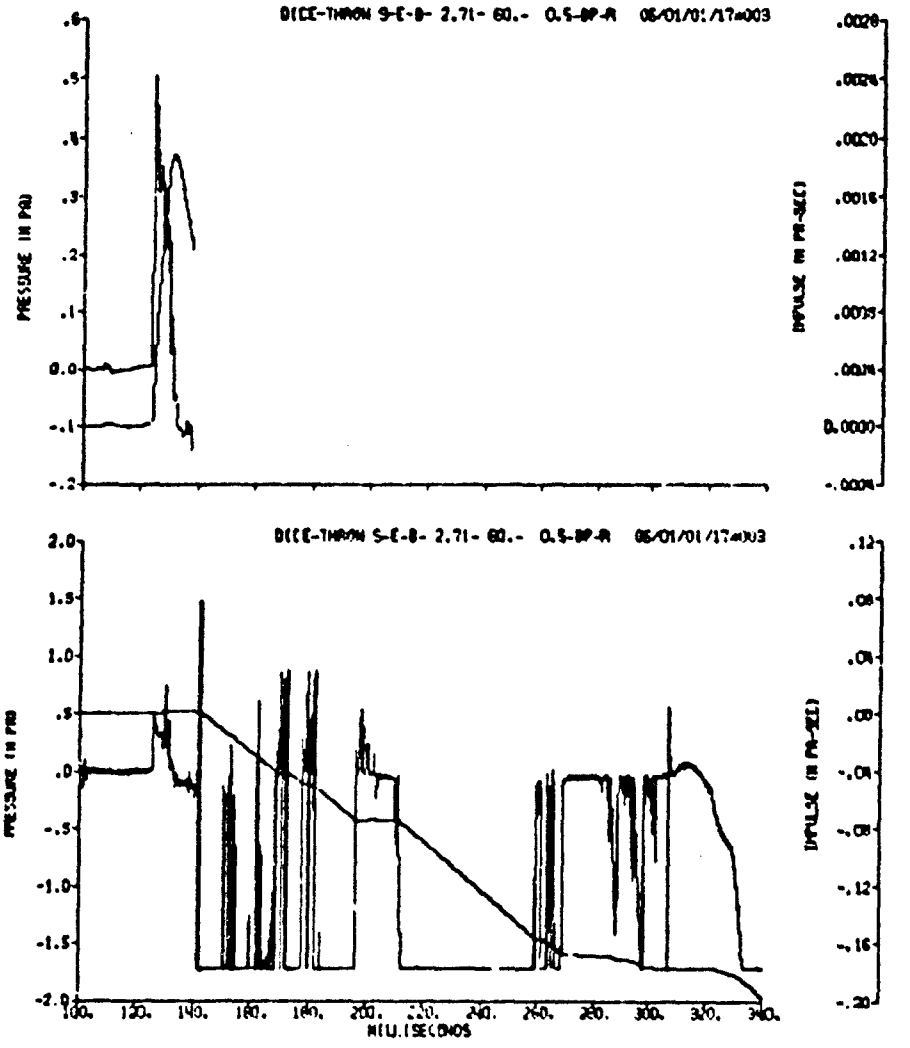
MEAS. NO.	COORDINATES R METERS	θ DEGREES	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
001	2.71	2.5	0.50	BP	R	DSP,SMT	Outer Surf of Struc
002	2.71	30	0.50	BP	R	DSP,SMT	Outer Surf of Struc
003	2.71	60	0.50	BP	R	DSP,SMT,BLC	Outer Surf of Struc
004	2.71	90	0.50	BP	R	DSP,SMT	Outer Surf of Struc
005	2.71	120	0.50	BP	R	DSP,SMT	Outer Surf of Struc
006	2.71	150	0.50	BP	R	DSP,SMT,BLC	Outer Surf of Struc
007	2.71	177.5	0.50	BP	R	DSP,SMT	Outer Surf of Struc
008	2.71	2.5	6.88	BP	R	DSP,SMT	Outer Surf/Middle of Struc
009	2.71	30	6.58	BP	R	DSP,SMT	Outer Surf/Middle of Struc
010	2.71	60	6.58	BP	R	DSP,SMT	Outer Surf/Middle of Struc
011	2.71	90	6.88	BP	R	DSP,SMT	Outer Surf/Middle of Struc
012	2.71	120	6.88	BP	R	DSP,SMT	Outer Surf/Middle of Struc
013	2.71	150	6.58	BP	R	DSP,SMT	Outer Surf/Middle of Struc
014	2.71	177.5	6.88	BP	R	DSP,SMT,BLC	Outer Surf/Middle of Struc
105	2.44	45	6.58	A	X	DSP,SMT	Inner Surf/Middle of Struc
106	2.44	45	6.58	A	Y	DSP,SMT,FIL	Inner Surf/Middle of Struc
107	2.44	90	6.58	A	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
108	2.44	90	6.58	A	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
201	2.44	45	3.5	V	X	DSP,SMT,BLC	Inner Surf of Struc
202	2.44	45	3.5	V	Y	DSP,SMT,BLC	Inner Surf of Struc
203	2.44	90	3.5	V	X	DSP,SMT,BLC	Inner Surf of Struc
204	2.44	90	3.5	V	Y	DSP,SMT,BLC	Inner Surf of Struc
205	2.44	135	3.5	V	X	DSP,SMT,BLC	Inner Surf of Struc
206	2.44	135	3.5	V	Y	SMT	Inner Surf of Struc
207	2.44	45	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
208	2.44	45	6.58	V	Y	DSP,SMT	Inner Surf/Middle of Struc
209	2.44	90	6.58	V	X	DSP,SMT	Inner Surf/Middle of Struc
210	2.44	90	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc

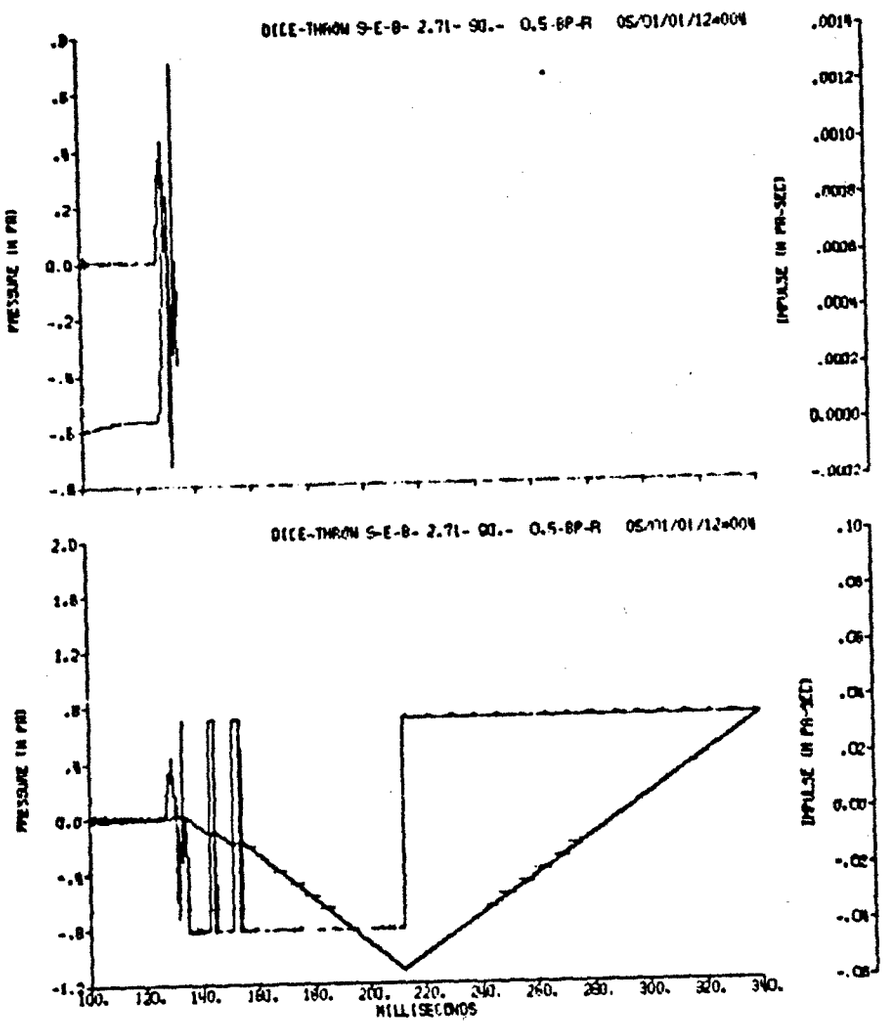
DICE THROW, SHELTER B DATA CORRECTIONS (cont'd)

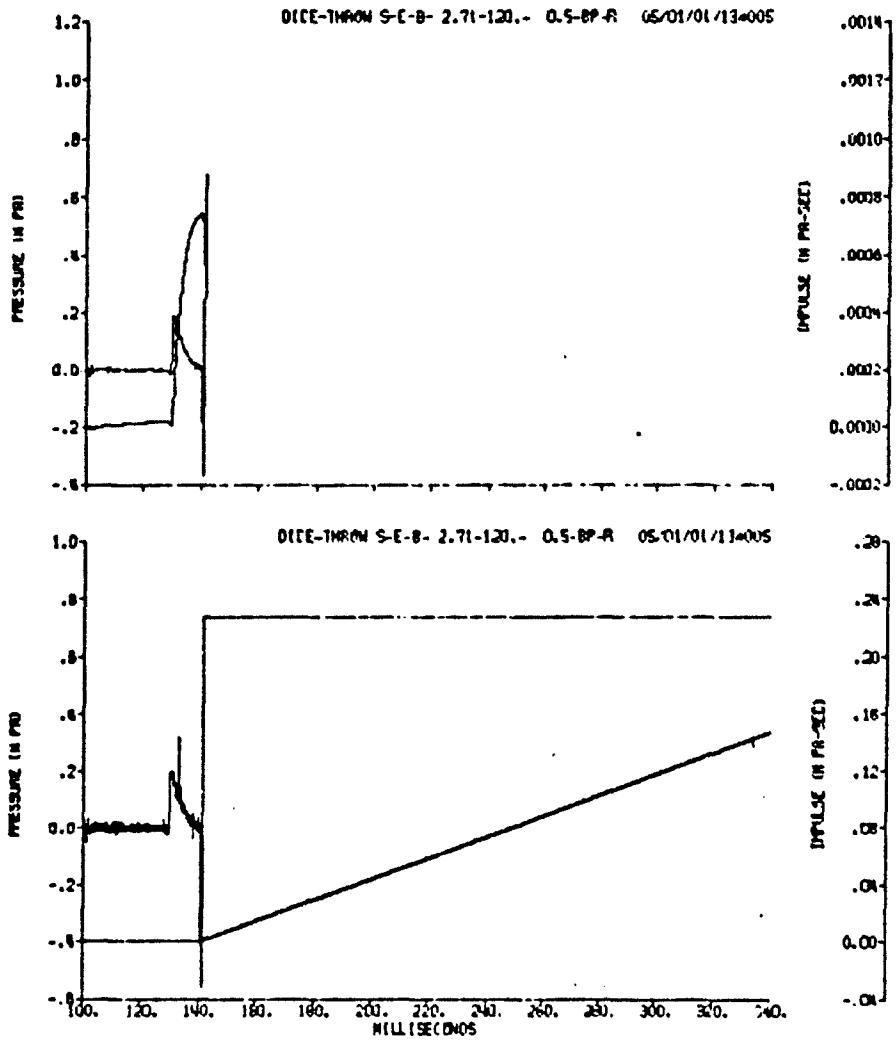
MEAS. NO.	COORDINATES R METERS	θ DEGREES	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
211	2.44	135	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
212	2.44	135	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
232	2.44	2.5	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
233	2.44	2.5	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
234	2.44	177.5	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
235	2.44	177.5	6.58	V	Y	DSP, SMT	Inner Surf/Middle of Struc
401	2.68	30	3.5	SE	R	Scratched	Inner Reinf of Super Struc
402	2.68	60	3.5	SE	R	DSP,SMT,FIL	Inner Reinf of Super Struc
403	2.68	90	3.5	SE	R	DSP,SMT,FIL	Inner Reinf of Super Struc
404	2.68	120	3.5	SE	R	DSP,SMT	Inner Reinf of Super Struc
405	2.68	150	3.5	SE	R	Scratched	Inner Reinf of Super Struc
406	2.46	30	3.5	SE	R	Scratched	Outer Reinf of Super Struc
407	2.46	60	3.5	SE	R	DSP,SMT	Outer Reinf of Super Struc
408	2.46	90	3.5	SE	R	DSP,SMT	Outer Reinf of Super Struc
409	2.46	120	3.5	SE	R	DSP,SMT	Outer Reinf of Super Struc
410	2.46	150	3.5	SE	R	DSP,SMT	Outer Reinf of Super Struc
411	2.68	30	6.58	SE	R	DSP,SMT	Inner Surf/Middle of Struc
412	2.58	60	6.58	SE	R	DSP,SMT	Inner Surf/Middle of Struc
413	2.68	90	6.58	SE	R	DSP,SMT	Inner Surf/Middle of Struc
414	2.68	120	6.58	SE	R	DSP,SMT	Inner Surf/Middle of Struc
415	2.68	150	6.58	SE	R	DSP,SMT	Inner Surf/Middle of Struc
416	2.46	30	6.58	SE	R	DSP	Outer Surf/Middle of Struc
417	2.46	60	6.58	SE	R	DSP,SMT	Outer Surf/Middle of Struc
418	2.46	90	6.58	SE	R	DSP,SMT	Outer Surf/Middle of Struc
419	2.46	120	6.58	SE	R	DSP,SMT	Outer Surf/Middle of Struc
420	2.46	150	6.58	SE	R	DSP,SMT	Outer Surf/Middle of Struc

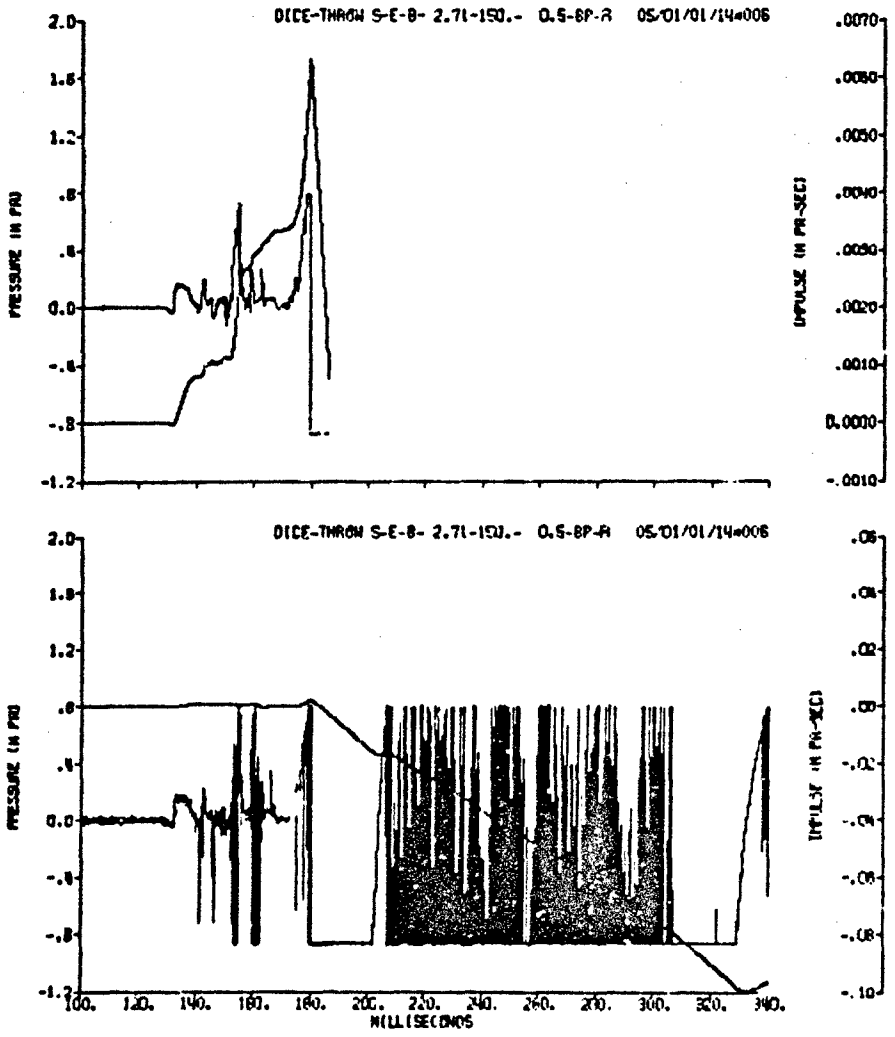

DICE-THROW S-E-B- 2.71- 2.5- 0.5-BP-R 05/01/01/15=001
PRESSURE (10 PSI)
IMPULSE (10 PSI-SEC)
DICE-THROW S-E-B- 2.71- 2.5- 0.5-BP-R 05/01/01/15=001
PRESSURE (10 PSI)
IMPULSE (10 PSI-SEC)
MILLISECONDS

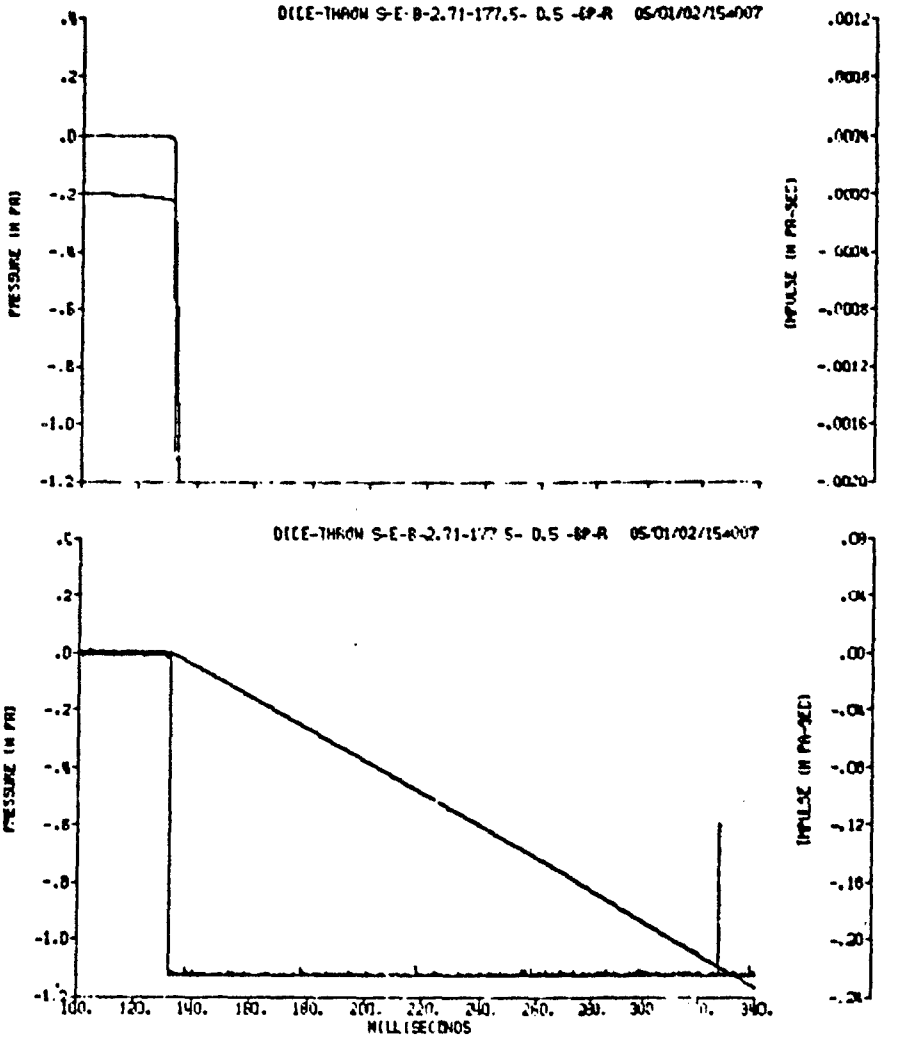

DICE-THROW S-E-8- 2.71- 30.- 0.5-8P- 05/01/01/16+002
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
DICE-THROW S-E-8- 2.71- 30.- 0.5-8P-R 05/01/01/16+002
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
MILLISECONDS

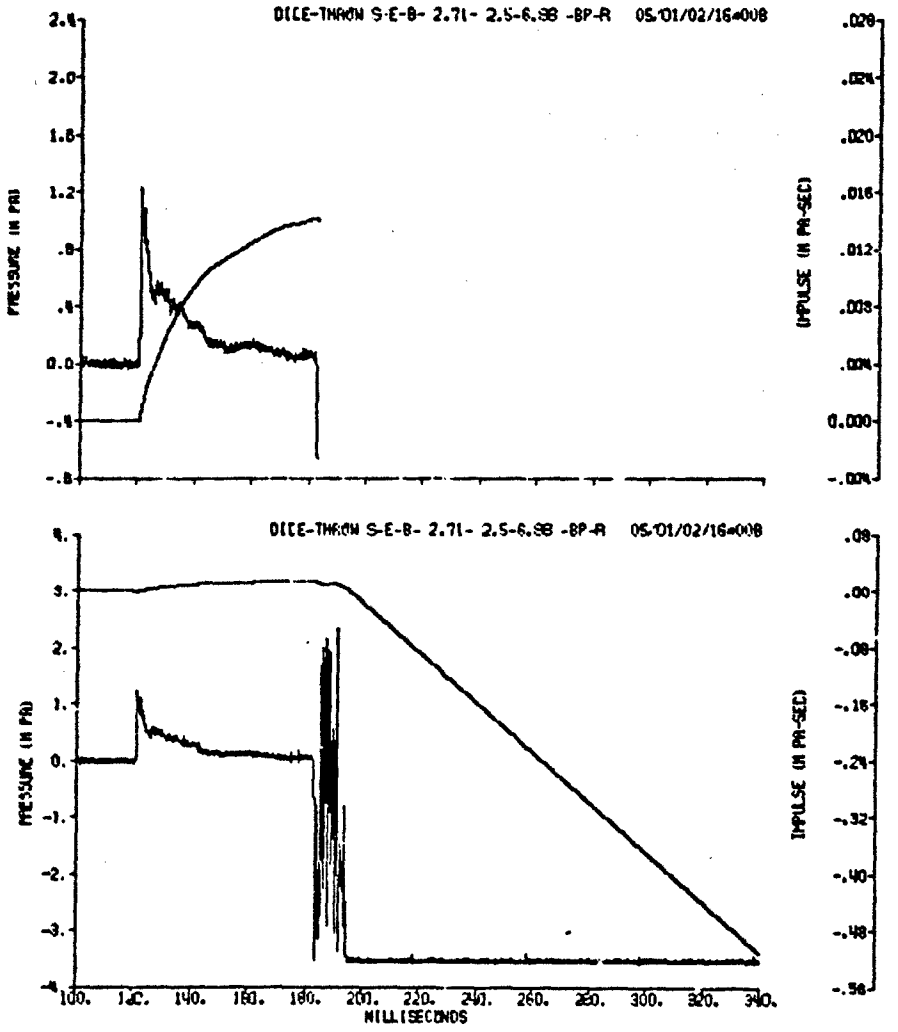

DICE-THROW S-E-8- 2.71- 60.- 0.5-BP-R 05/01/01/17=003
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-8- 2.71- 60.- 0.5-BP-R 05/01/01/17=003
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

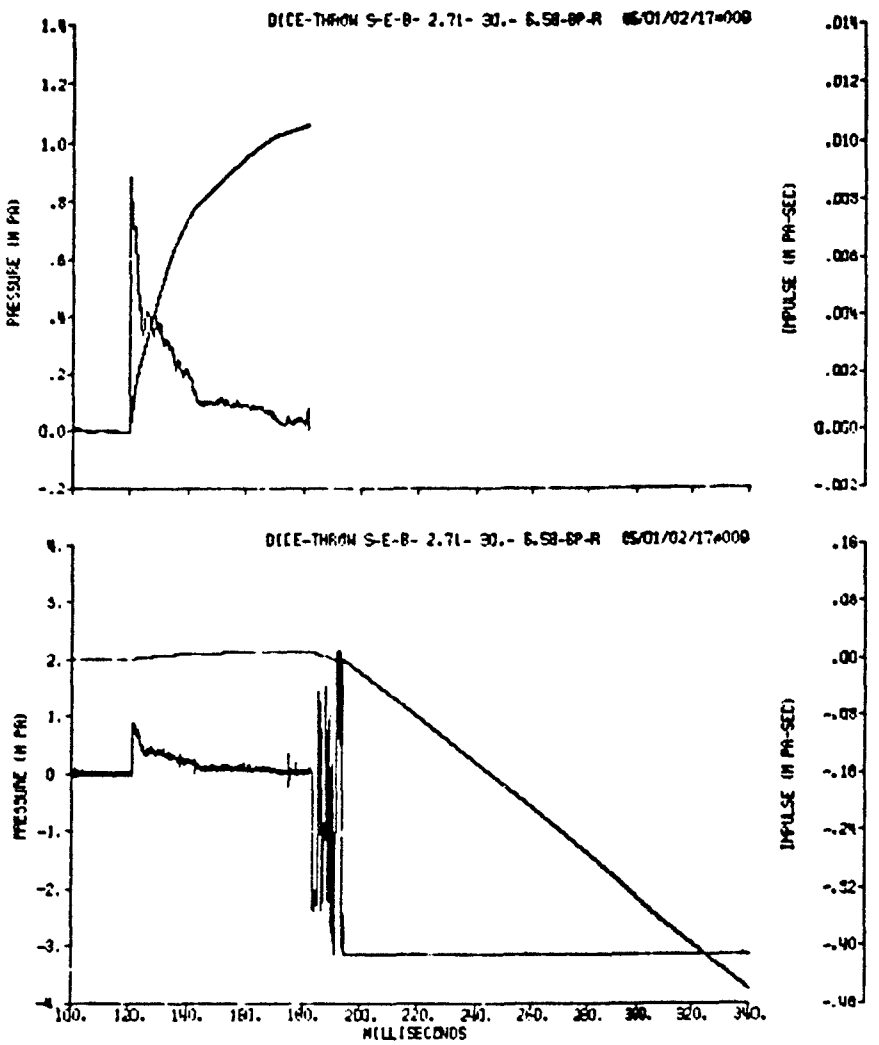

DICE-THROW S-E-B- 2.7I- 90.- 0.5-BP-R 05/01/01/12=00%
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-B- 2.7I- 90.- 0.5-BP-R 05/01/01/12=00%
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

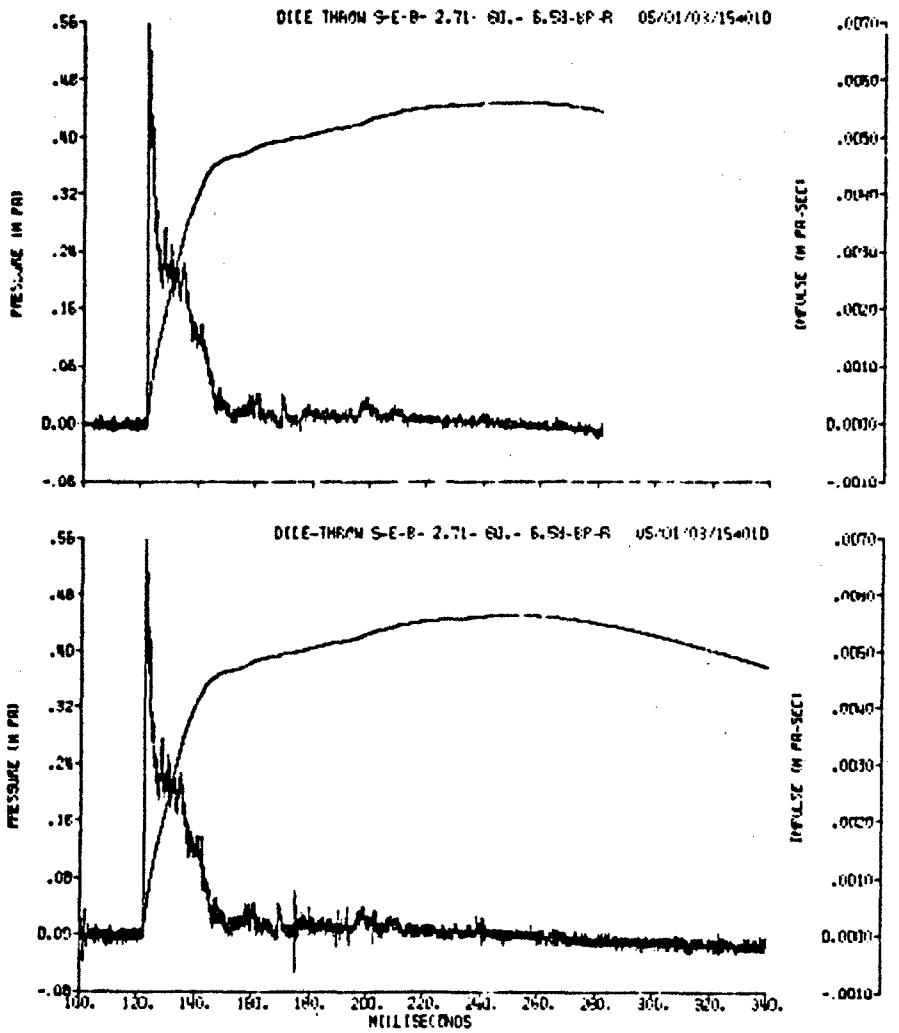

DICE-THROW S-E-8- 2.71-120.- 0.5-BP-R 05/01/01/13=005
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
1.2
1.0
.8
.6
.4
.2
0.0
-.2
-.4
.0014
.0012
.0010
.0008
.0006
.0004
.0002
0.0000
-.0002
DICE-THROW S-E-8- 2.71-120.- 0.5-BP-R 05/01/01/13=005
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
1.0
.8
.6
.4
.2
0.0
-.2
-.4
.20
.16
.12
.08
.04
0.00
-.04
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

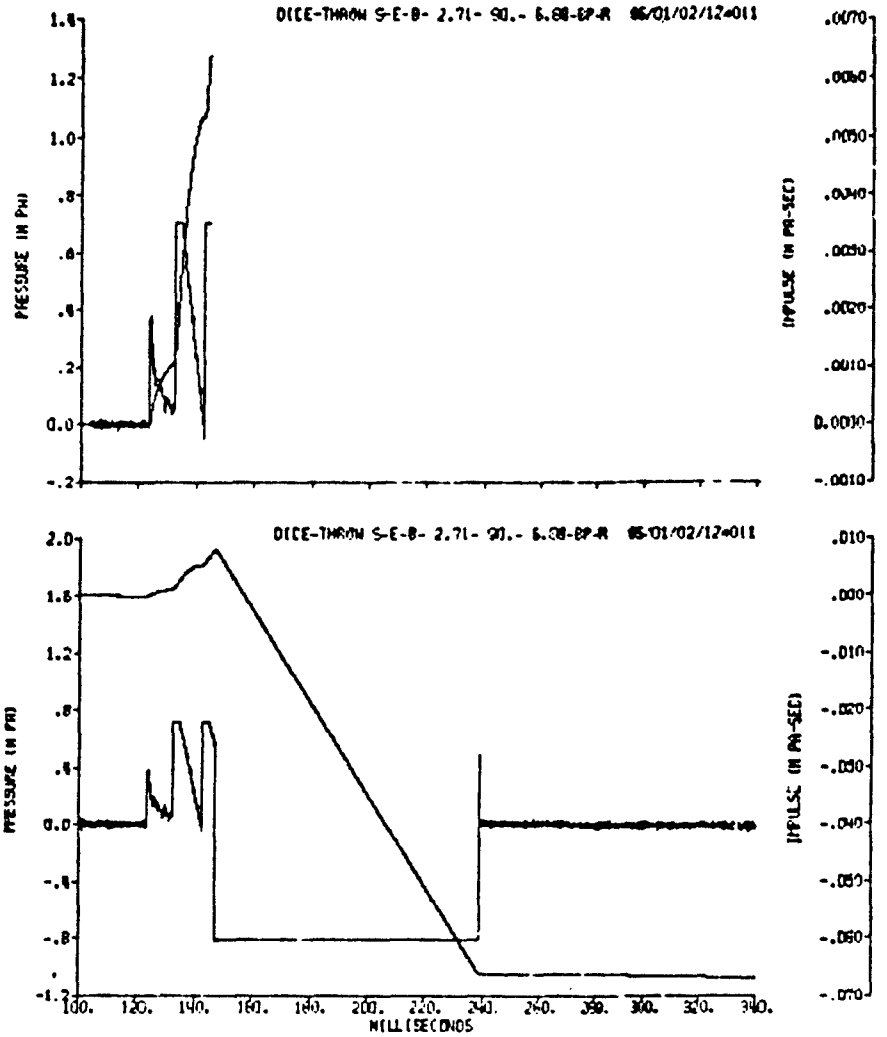

DICE-THROW S-E-8- 2.71-150.- 0.5-8P-R 05/01/01/14=006
PRESSURE IN PSI
IMPULSE IN PSI-SEC
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
.0070
.0060
.0050
.0040
.0030
.0020
.0010
0.0000
-.0010
DICE-THROW S-E-8- 2.71-150.- 0.5-8P-R 05/01/01/14=006
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.06
.04
.02
.00
-.02
-.04
-.06
-.08
-.10
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

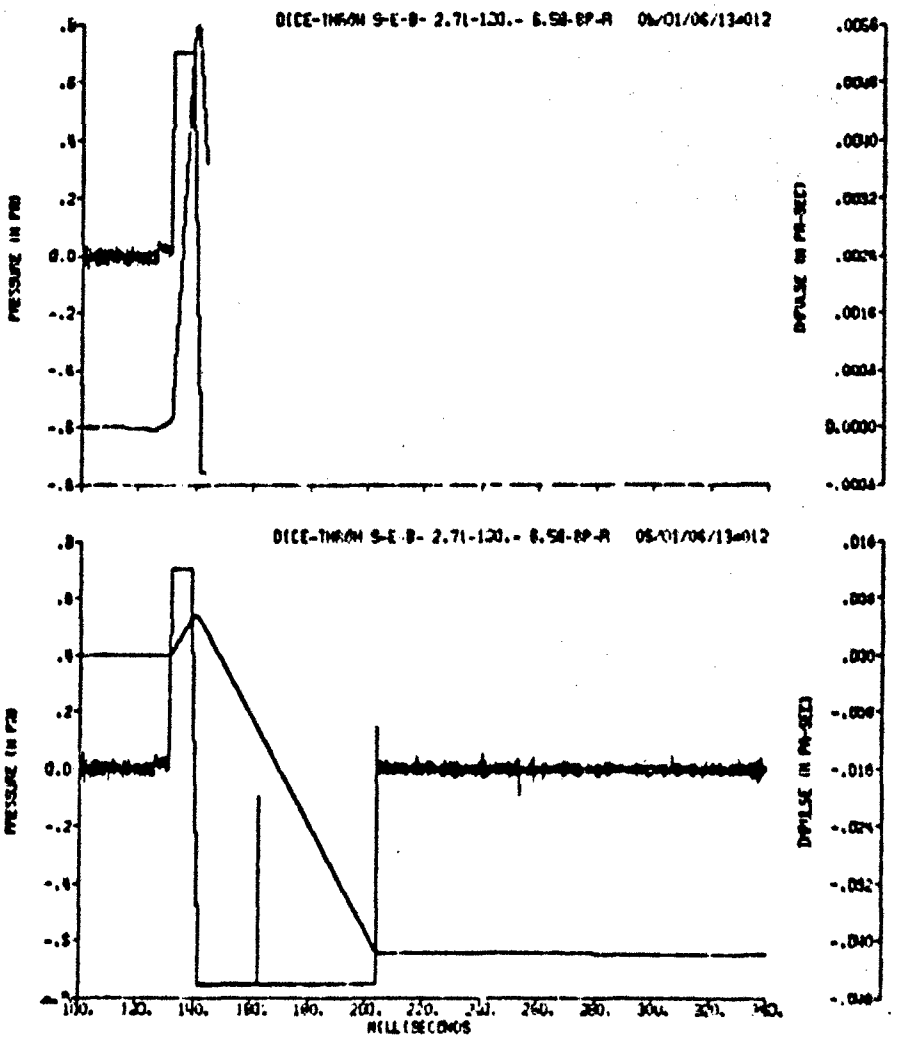

DICE-THROW S-E-B-2.71-177.5- 0.5 -6P-R 05/01/02/15+007
PRESSURE (IN PSI)
IMPULSE (IN PA-SEC)
.2
.0
-.2
-.4
-.6
-.8
-1.0
-1.2
.0012
.0008
.0004
.0000
-.0004
-.0008
-.0012
-.0016
-.0020
DICE-THROW S-E-B-2.71-177.5- 0.5 -6P-R 05/01/02/15+007
.2
.0
-.2
-.4
-.6
-.8
-1.0
-1.2
.08
.04
.00
-.04
-.08
-.12
-.16
-.20
-.24
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 0. 340.
MILLISECONDS

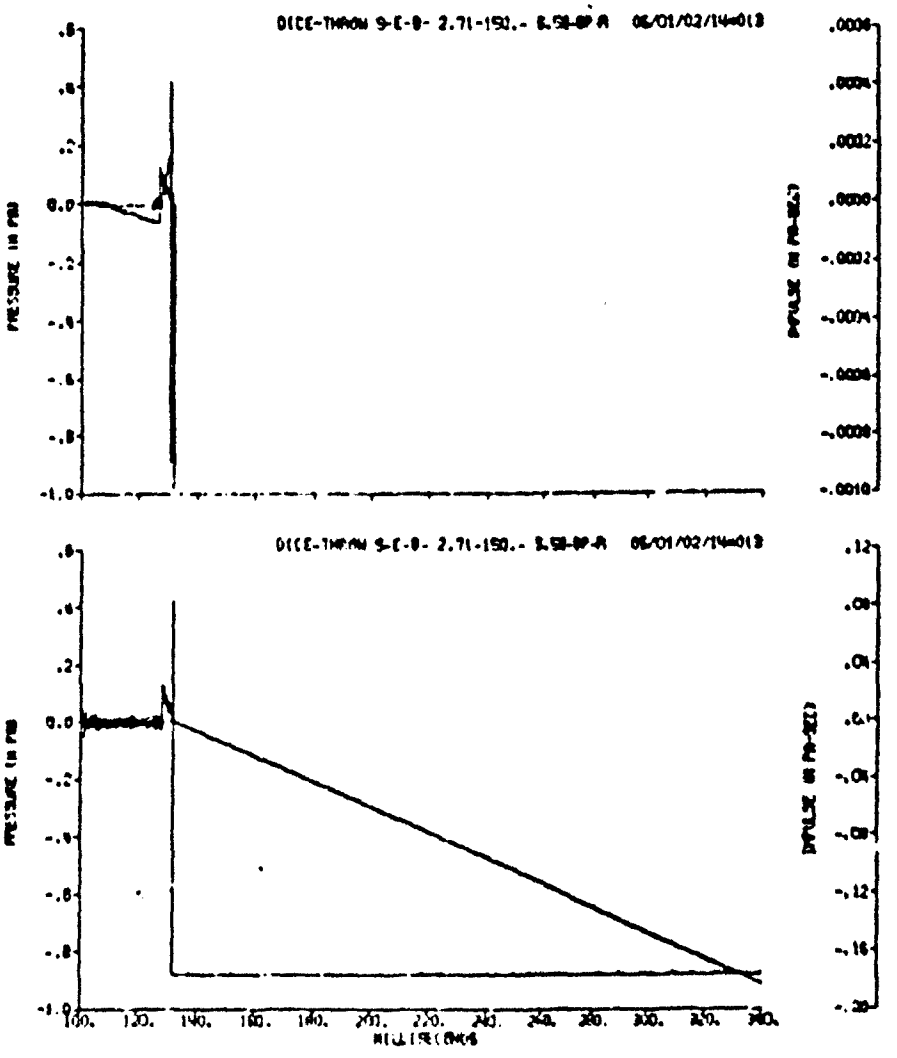

DICE-THROW S-E-B- 2.7I- 2.5-6.9B -BP-R 05/01/02/16+008
PRESSURE (IN PSI)
IMPULSE (IN PA-SEC)
DICE-THROW S-E-B- 2.7I- 2.5-6.9B -BP-R 05/01/02/16+008
PRESSURE (IN PA)
IMPULSE (IN PA-SEC)
MILLISECONDS

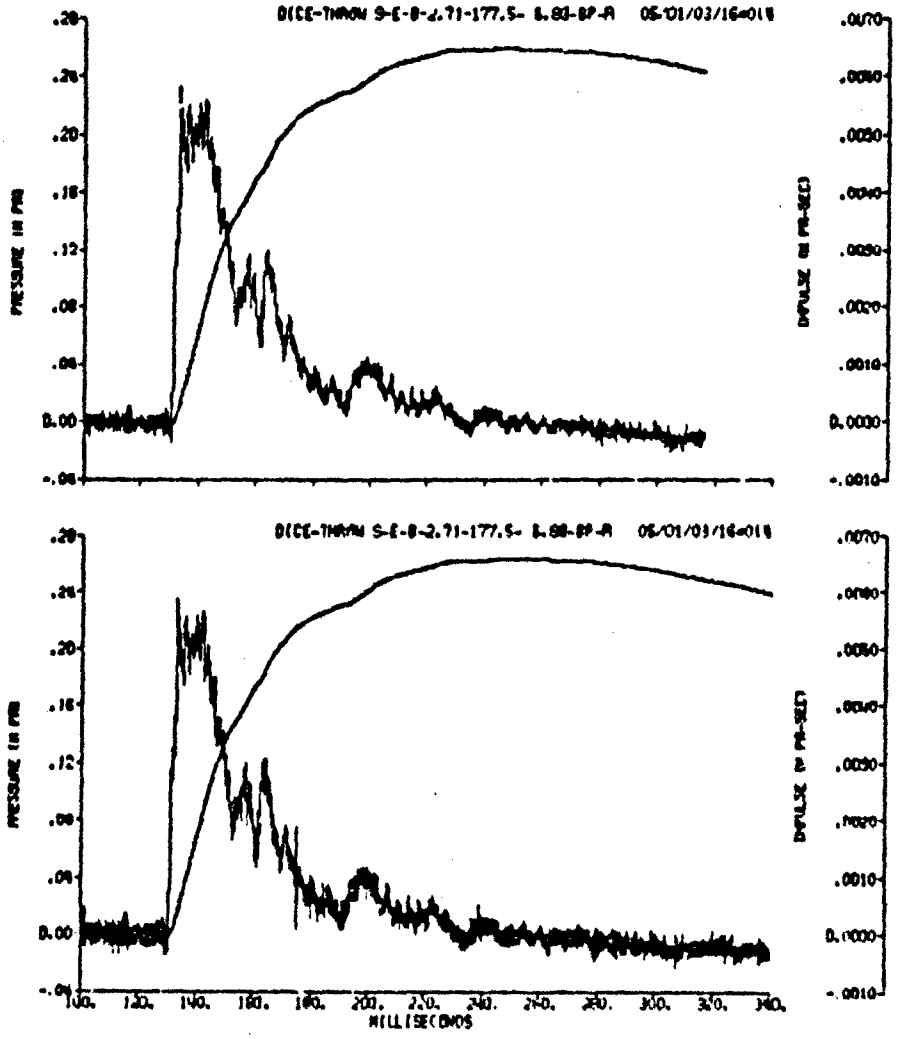

DICE-THROW S-E-B- 2.71- 30.- 6.58-BP-R 05/01/02/17=009
PRESSURE (N PA)
IMPULSE (N PA-SEC)
1.4
1.2
1.0
.8
.6
.4
.2
0.0
-.2
.014
.012
.010
.008
.006
.004
.002
0.000
-.002
DICE-THROW S-E-B- 2.71- 30.- 6.58-BP-R 05/01/02/17=009
PRESSURE (N PA)
IMPULSE (N PA-SEC)
4.
3.
2.
1.
0
-1.
-2.
-3.
-4
.16
.08
.00
-.08
-.16
-.24
-.32
-.40
-.48
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

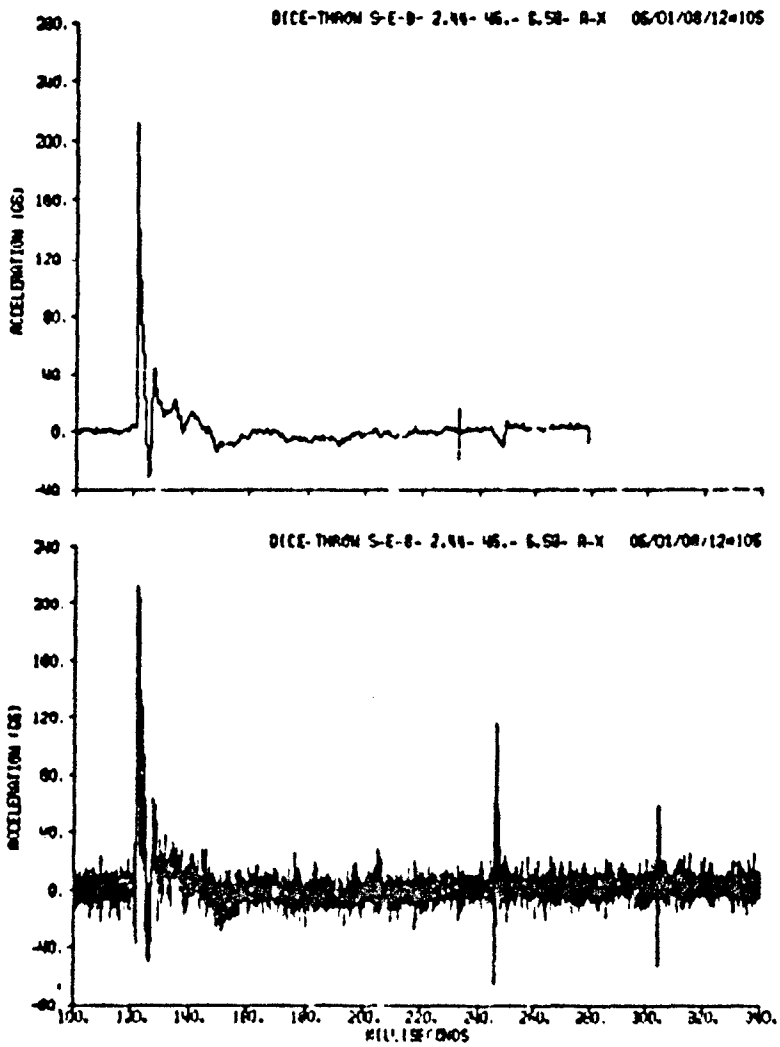

DICE THROW S-E-B- 2.71- 60.- 6.53-BP-R 05/01/03/15+01D
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.56
.48
.40
.32
.24
.16
.08
0.00
-.08
.0070
.0060
.0050
.0040
.0030
.0020
.0010
0.0000
-.0010
DICE-THROW S-E-B- 2.71- 60.- 6.53-BP-R 05/01/03/15+01D
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

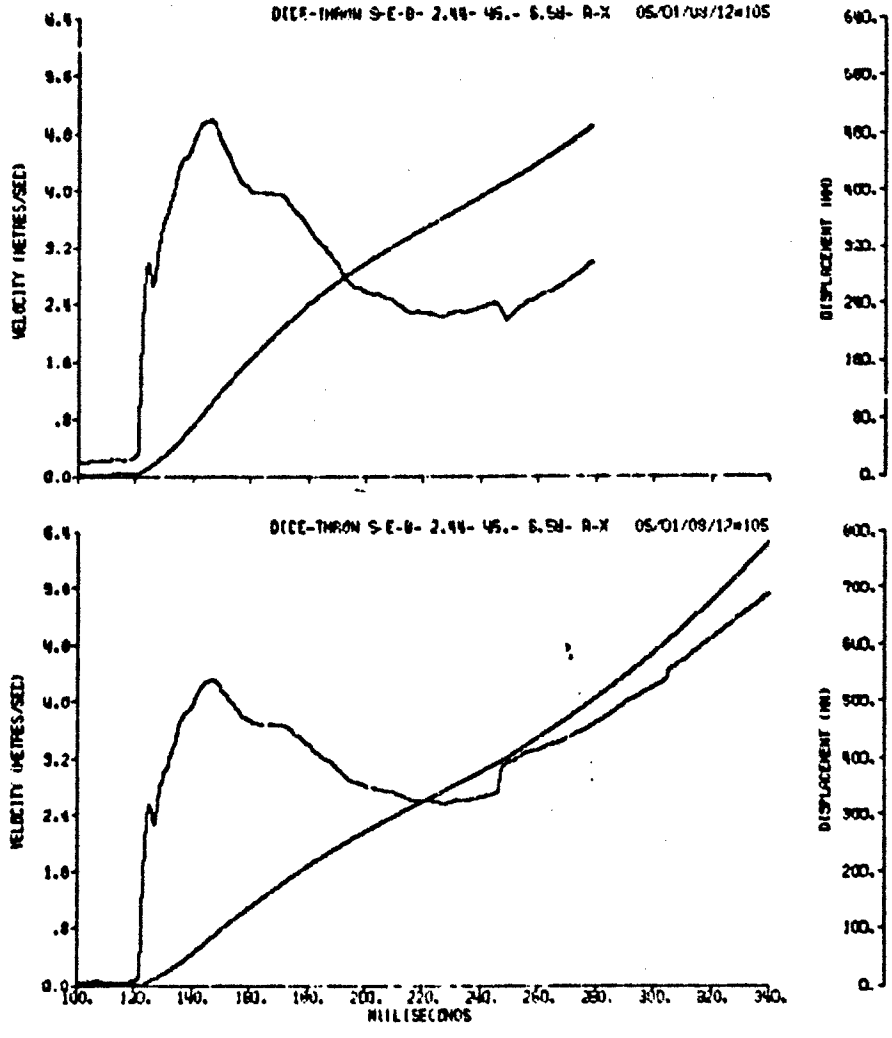

DICE-THROW S-E-B- 2.71- 90.- 6.08-BP-R 85/01/02/12+011
PRESSURE IN PSI
IMPULSE IN PSI-SEC
1.6
1.2
1.0
.8
.6
.4
.2
0.0
-.2
.0070
.0060
.0050
.0040
.0030
.0020
.0010
0.0000
-.0010
DICE-THROW S-E-B- 2.71- 90.- 6.08-BP-R 85/01/02/12+011
PRESSURE IN PSI
IMPULSE IN PSI-SEC
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
.010
.000
-.010
-.020
-.030
-.040
-.050
-.060
-.070
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

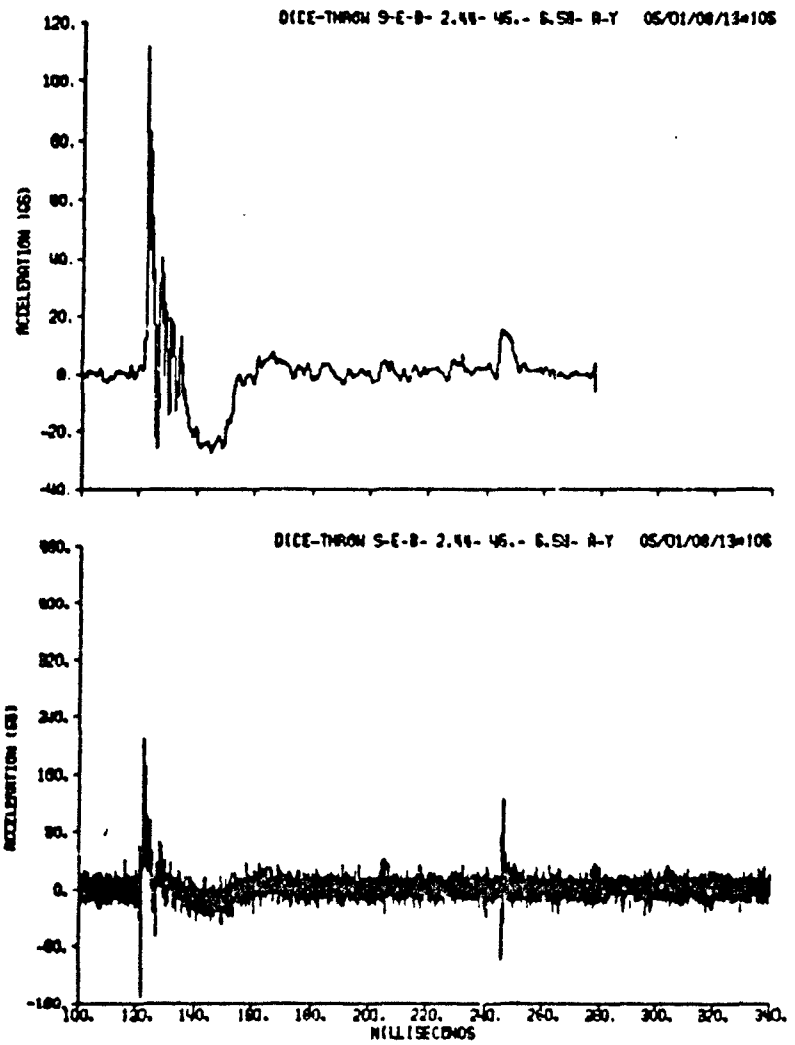

DICE-THROW S-E-B- 2.71-120.- 8.58-BP-R 06/01/06/13=012
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-B- 2.71-120.- 8.58-BP-R 06/01/06/13=012
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

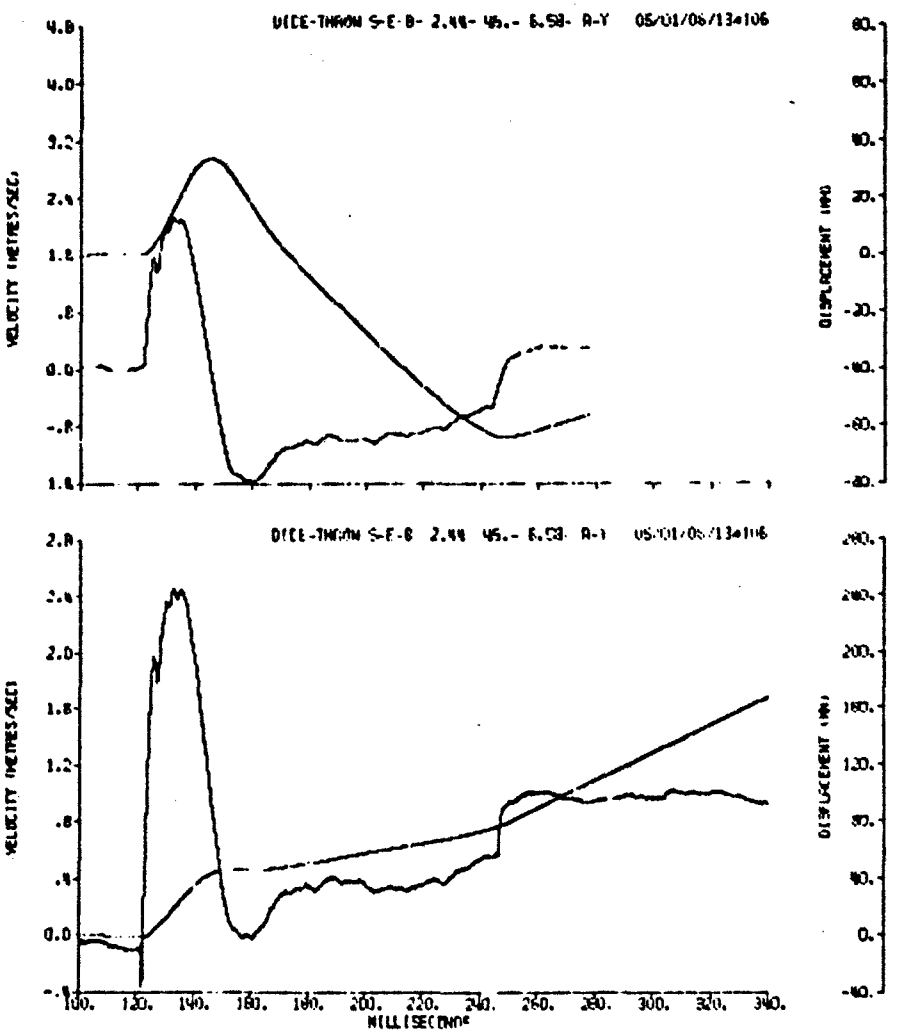

DICE-THROW 9-E-0- 2.71-150.- 8.58-0P-R 06/01/02/14=013
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW 9-E-0- 2.71-150.- 8.58-0P-R 06/01/02/14=013
PRESSURE IN PSI
IMPULSE IN PSI-SEC
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.

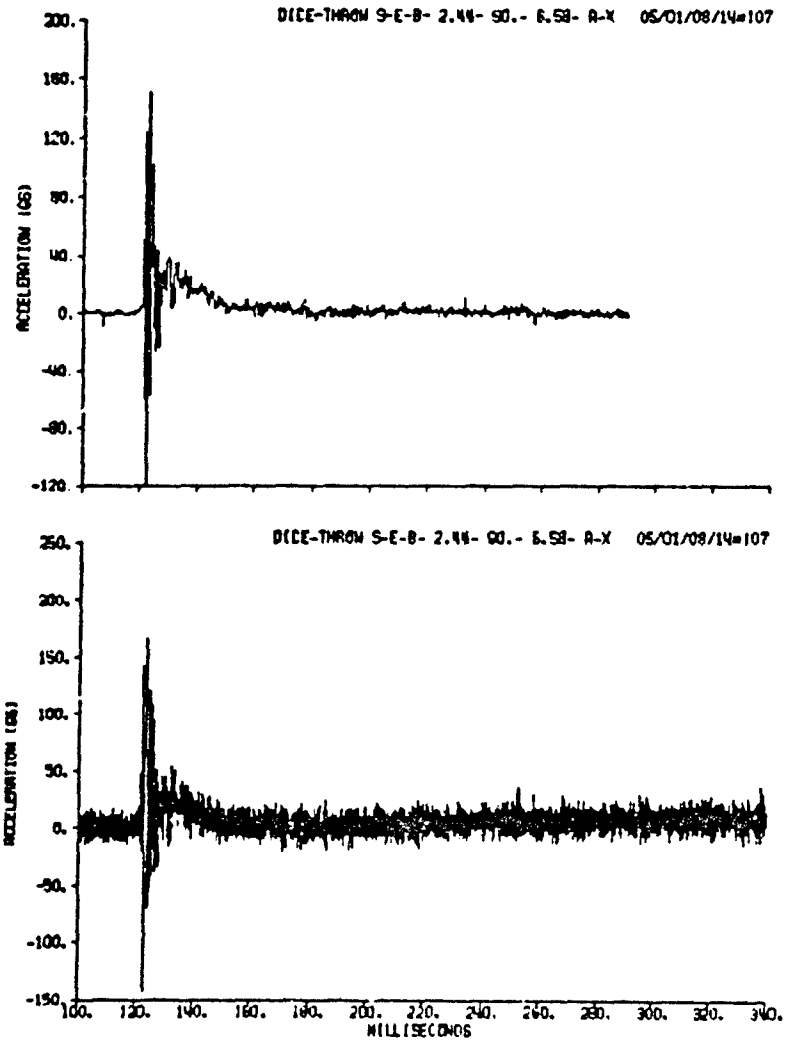

DICE-THROW S-E-8-2.71-177.5- 8.88-BP-R 05/01/03/16=018
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.20
.16
.12
.08
.04
0.00
-.04
.0070
.0060
.0050
.0040
.0030
.0020
.0010
0.0000
-.0010
DICE-THROW S-E-8-2.71-177.5- 8.88-BP-R 05/01/03/16=018
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

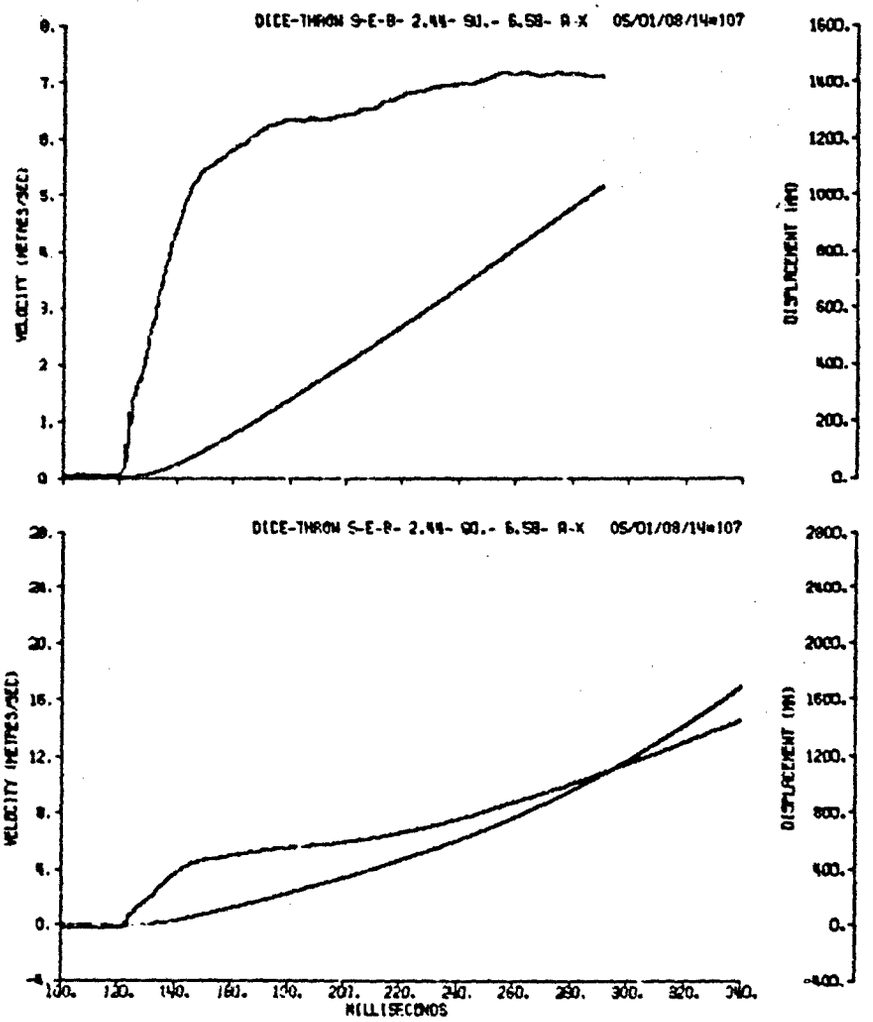

DICE-THROW S-E-B- 2.44- 46.- 8.58- A-X 06/01/08/12=10S
ACCELERATION (GS)
200.
160.
120.
80.
40.
0.
-40.
DICE-THROW S-E-B- 2.44- 46.- 8.58- A-X 06/01/08/12=10S
ACCELERATION (GS)
200.
160.
120.
80.
40.
0.
-40.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

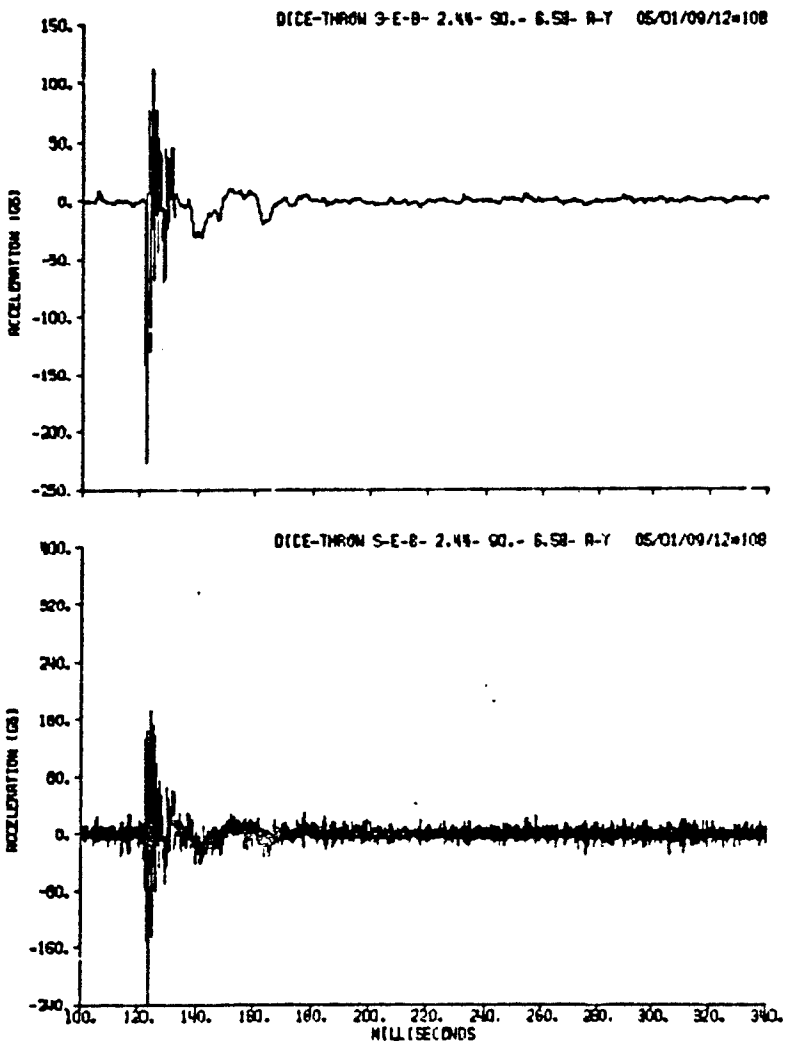

VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.

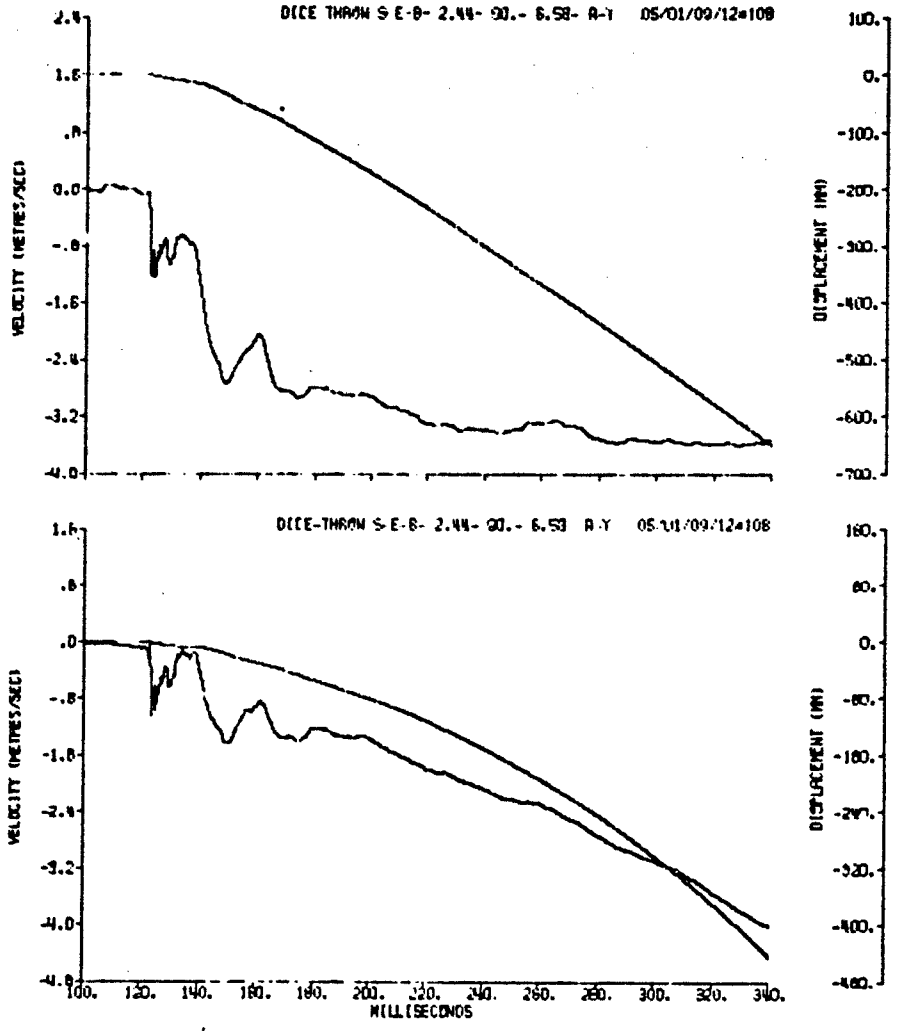

DICE-THROW 9-E-B- 2.44- 45.- 6.58- R-Y 05/01/08/13=108
ACCELERATION (GS)
120.
100.
80.
60.
40.
20.
0.
-20.
-40.
DICE-THROW 9-E-B- 2.44- 45.- 6.58- R-Y 05/01/08/13=108
ACCELERATION (GS)
280.
240.
200.
160.
120.
80.
40.
0.
-40.
-80.
-120.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

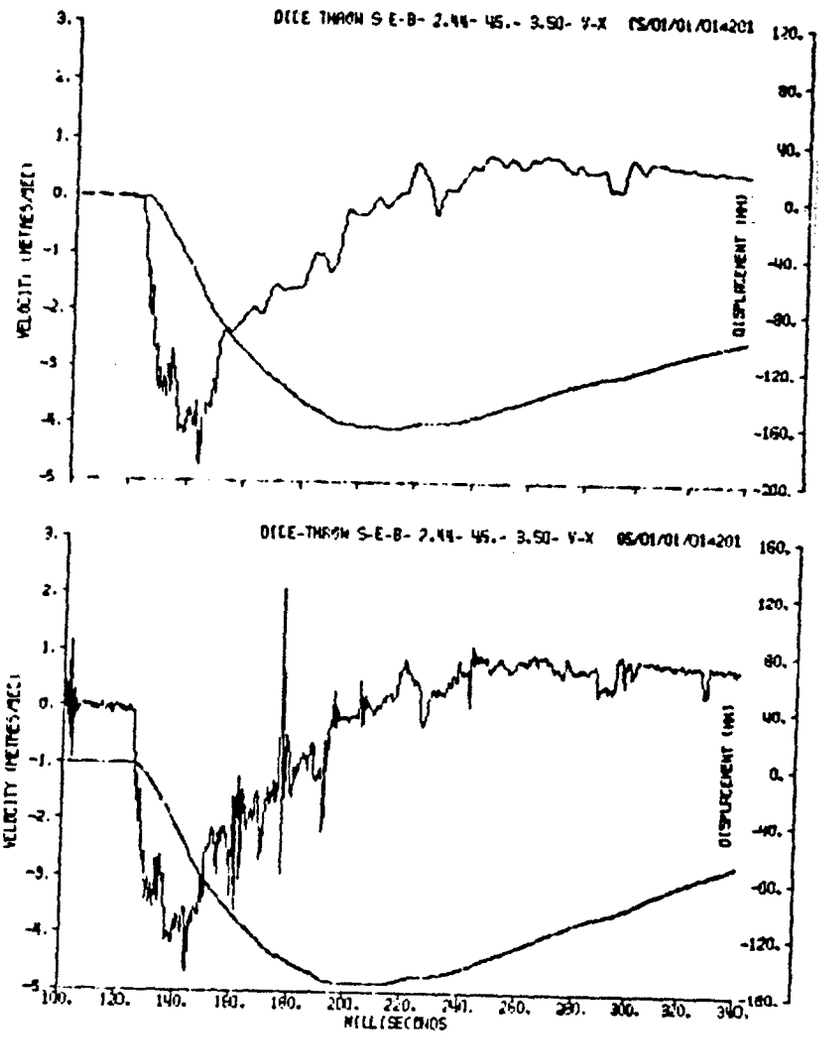

DICE-THROW S-E-B- 2.4ft- 45.- 6.5ft- R-Y 05/01/06/13+106
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
4.8
4.0
2.4
1.6
.8
0.0
-.8
-1.6
80.
60.
40.
20.
0.
-20.
-40.
-60.
-80.
DICE-THROW S-E-B 2.4ft 45.- 6.5ft R-Y 05/01/06/13+106
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
280.
240.
200.
160.
120.
80.
40.
0.
-40.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

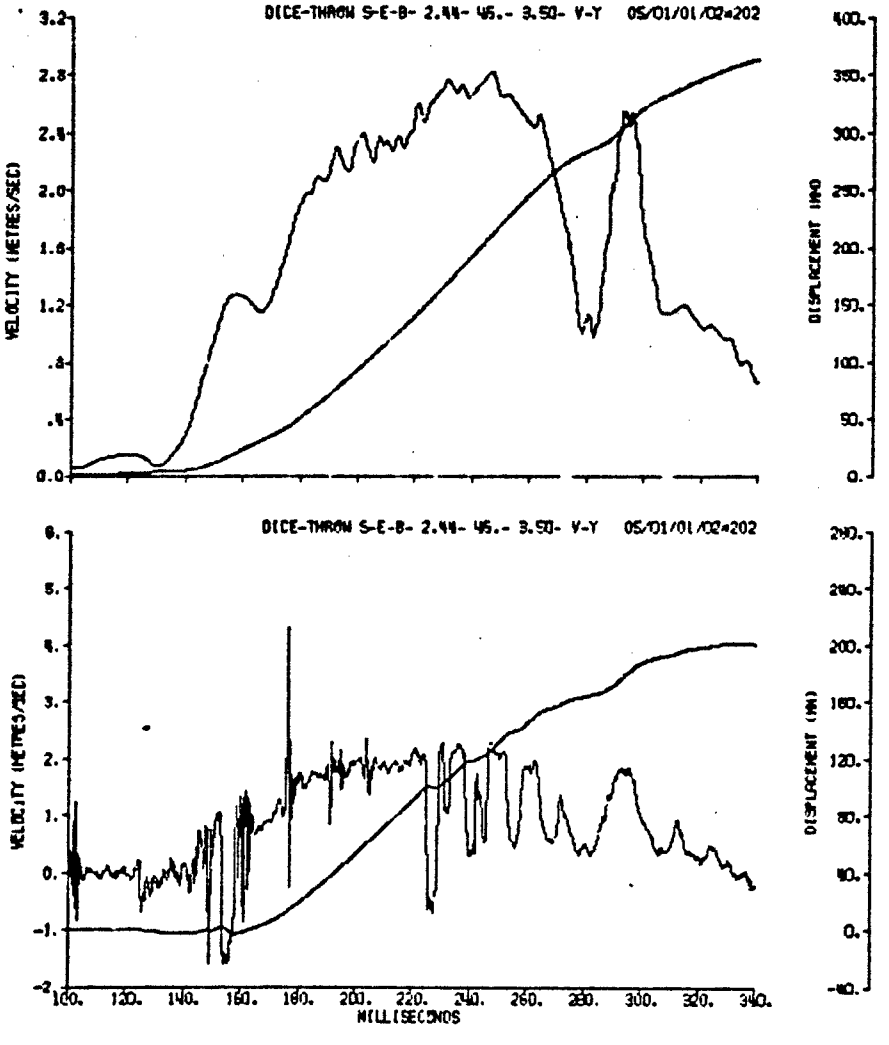

DICE-THROW S-E-B- 2.44- 90.- 6.58- A-X 05/01/08/14=107
ACCELERATION (GS)
200.
160.
120.
80.
40.
0.
-40.
-80.
-120.
DICE-THROW S-E-B- 2.44- 90.- 6.58- A-X 05/01/08/14=107
ACCELERATION (GS)
250.
200.
150.
100.
50.
0.
-50.
-100.
-150.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

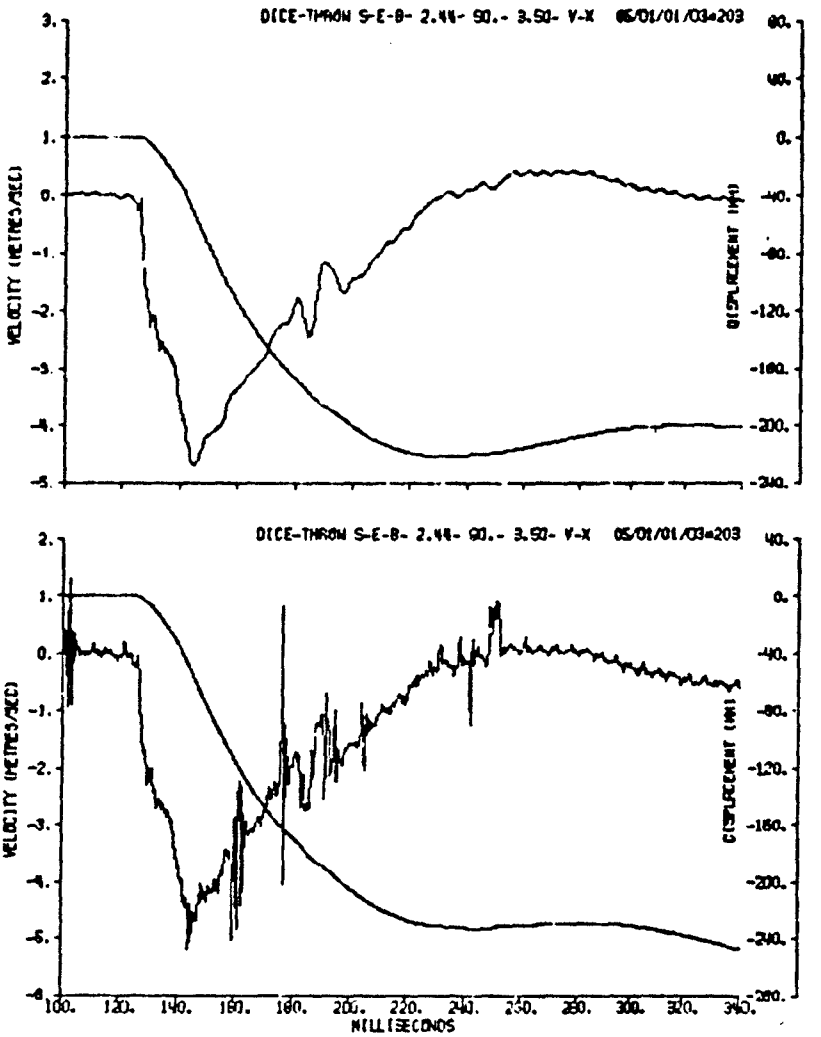

DICE-THROW S-E-B- 2.4%- 90.- 6.5B- A-X 05/01/08/14=107
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
0.
7.
6.
5.
4.
3.
2.
1.
0
1600.
1400.
1200.
1000.
800.
600.
400.
200.
0.
DICE-THROW S-E-B- 2.4%- 90.- 6.5B- A-X 05/01/08/14=107
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
24.
20.
16.
12.
8.
4.
0.
-4.
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
100. 120. 140. 160. 180. 201. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

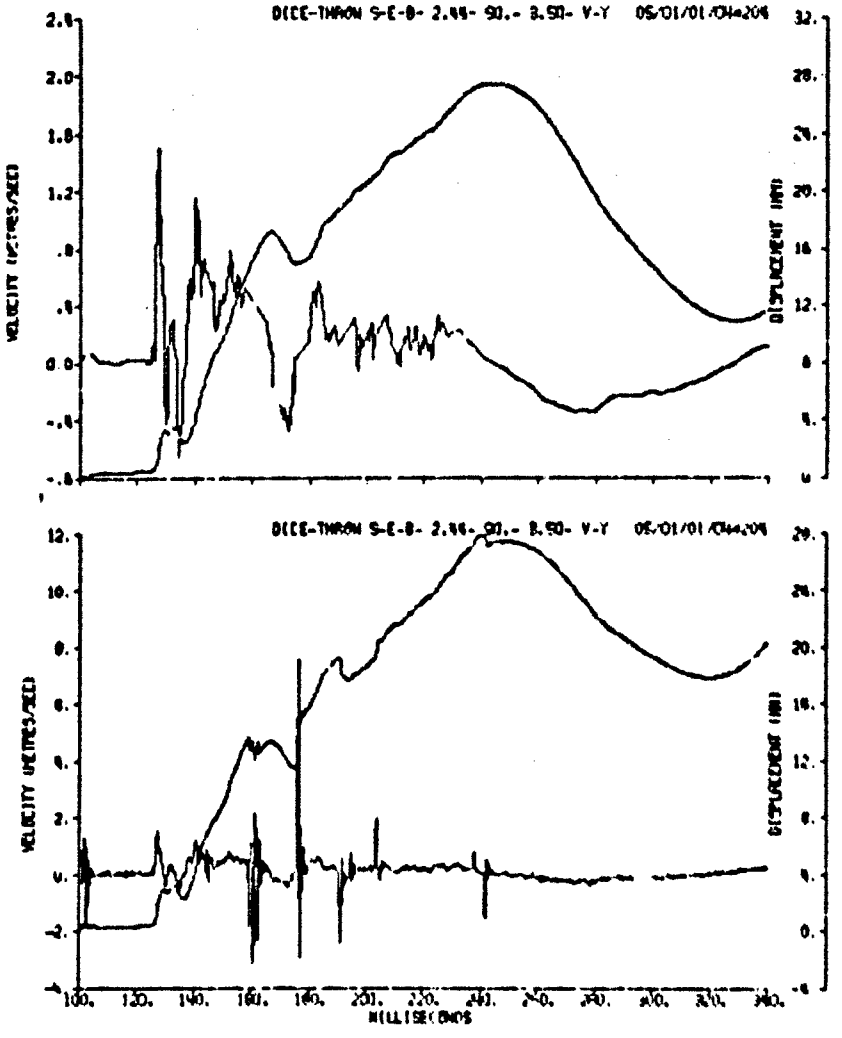

DICE-THROW 3-E-8- 2.4#- 90.- 6.5#- A-Y 05/01/09/12=108
ACCELERATION (G'S)
150.
100.
50.
0.
-50.
-100.
-150.
-200.
-250.
DICE-THROW 3-E-8- 2.4#- 90.- 6.5#- A-Y 05/01/09/12=108
ACCELERATION (G'S)
280.
220.
240.
180.
60.
0.
-60.
-160.
-240.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

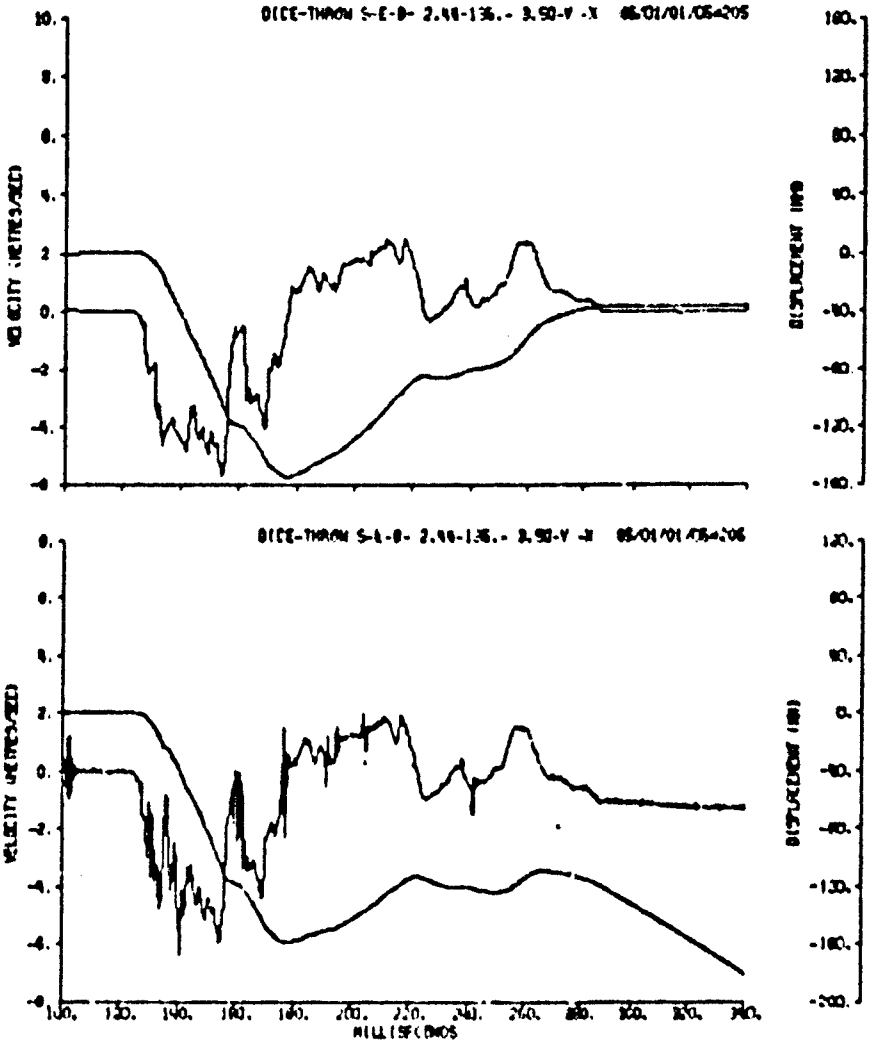

DICE THROW S E-B- 2.4M- 90.- 6.5B- A-1 05/01/09/12+108
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.4M- 90.- 6.5B A-Y 05/01/09/12+108
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

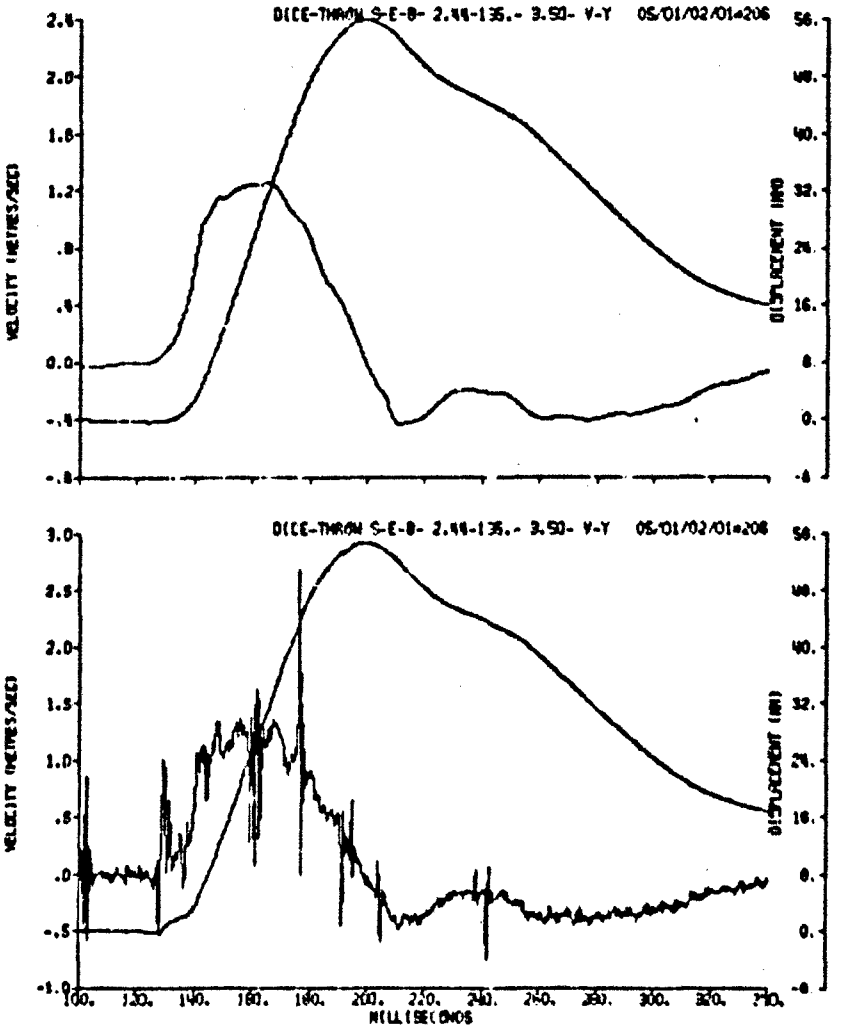

DICE THROW S E-B- 2.44- 45.- 3.50- V-X 05/01/01/01+201
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.44- 45.- 3.50- V-X 05/01/01/01+201
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

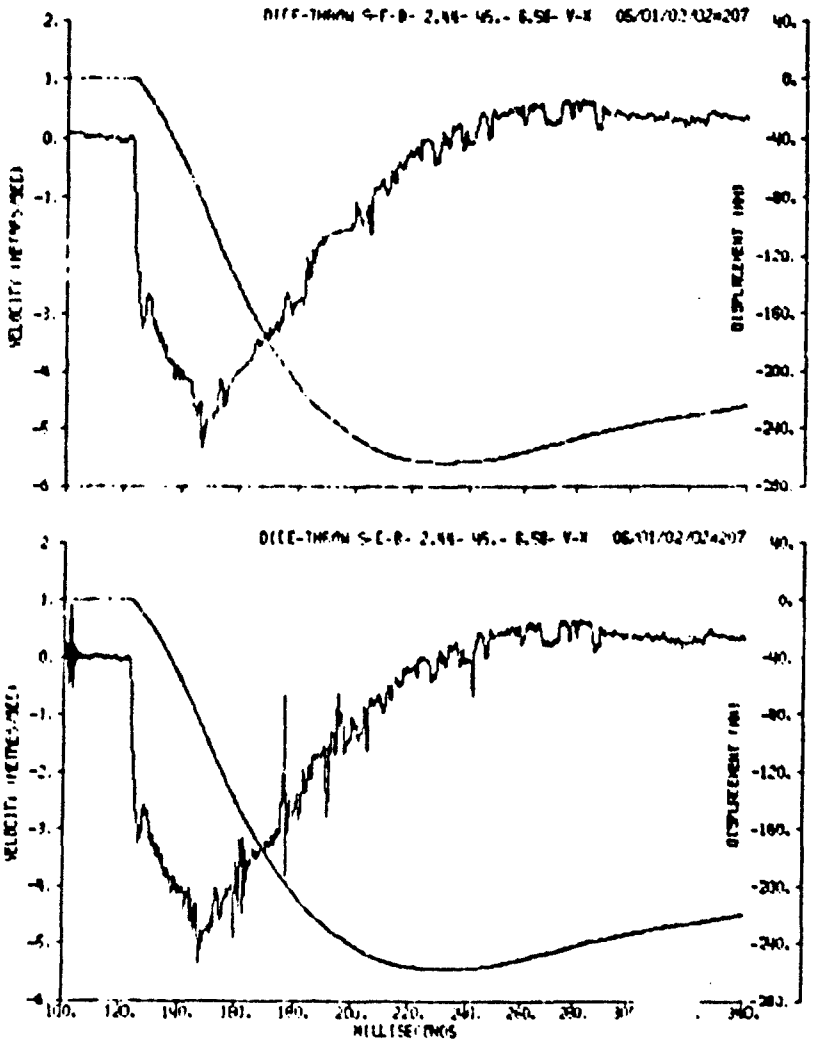

DICE-THROW S-E-B- 2.4%- 45.- 3.50- V-Y 05/01/01/02=202
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.4%- 45.- 3.50- V-Y 05/01/01/02=202
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

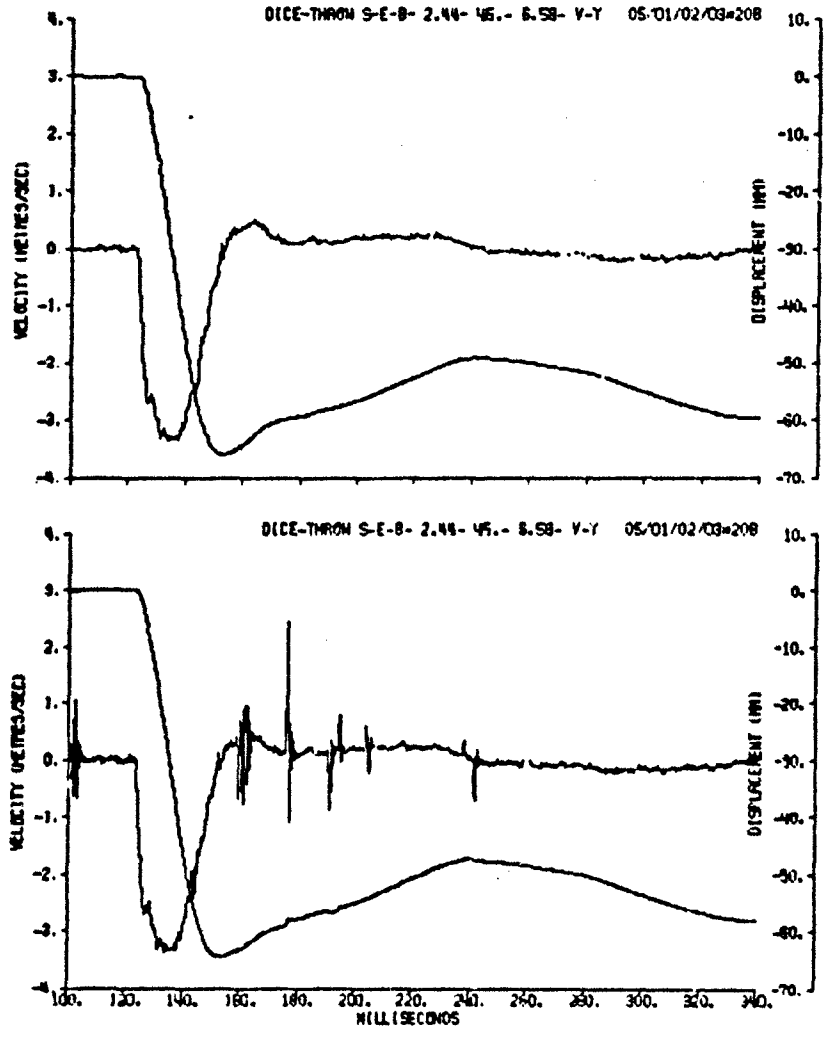

DICE-THROW S-E-B- 2.44- 90.- 3.50- V-X 05/01/01/03=203
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.44- 90.- 3.50- V-X 05/01/01/03=203
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

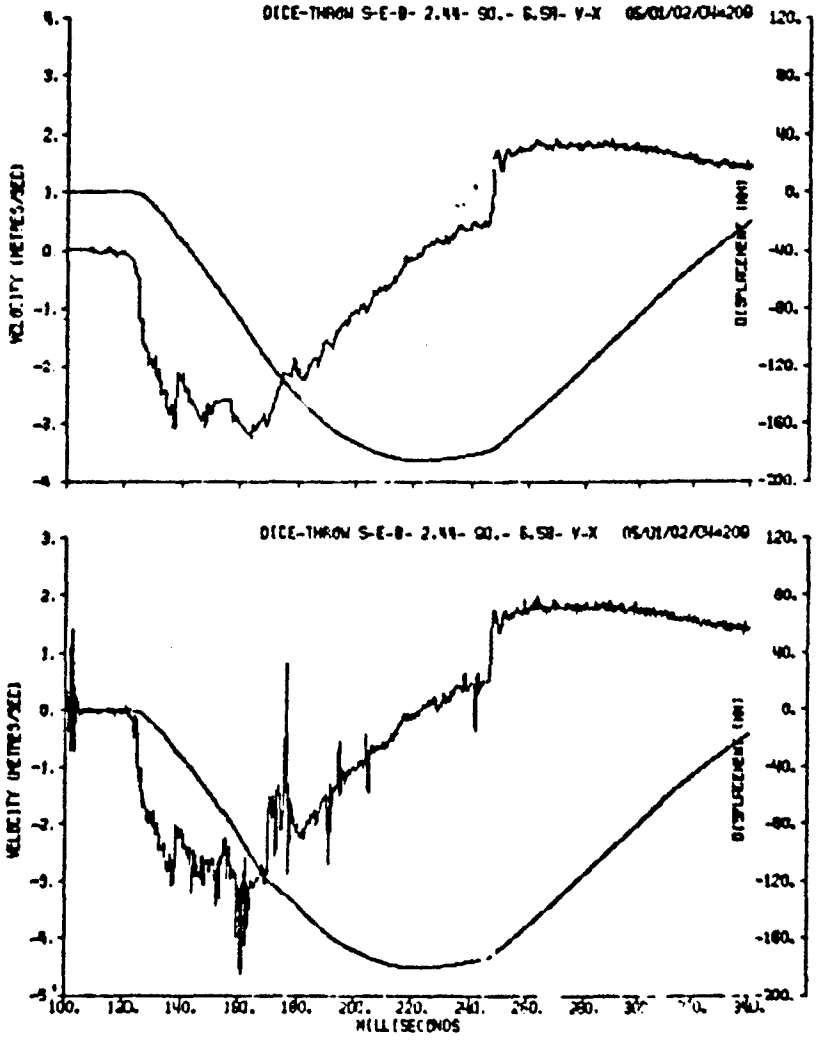

DICE-THRON S-E-B- 2.4%- 90.- 8.50- V-Y 05/01/01/0
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THRON S-E-B- 2.4%- 90.- 8.50- V-Y 05/01/01/0
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

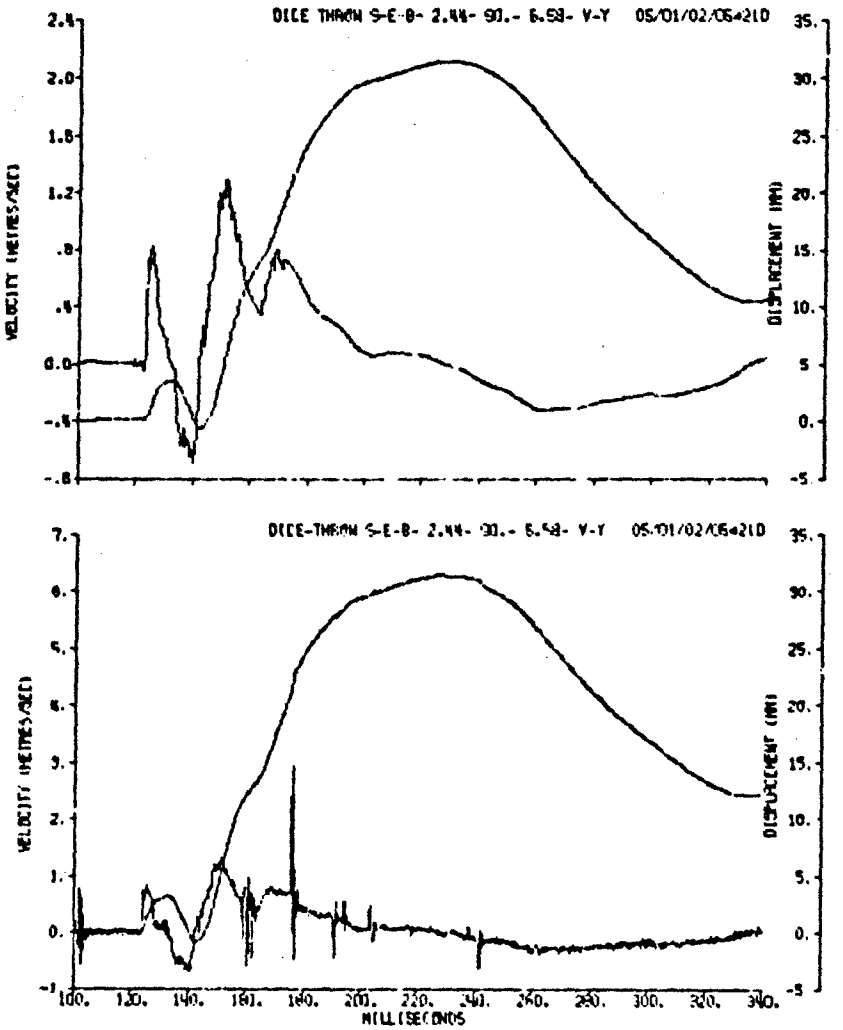


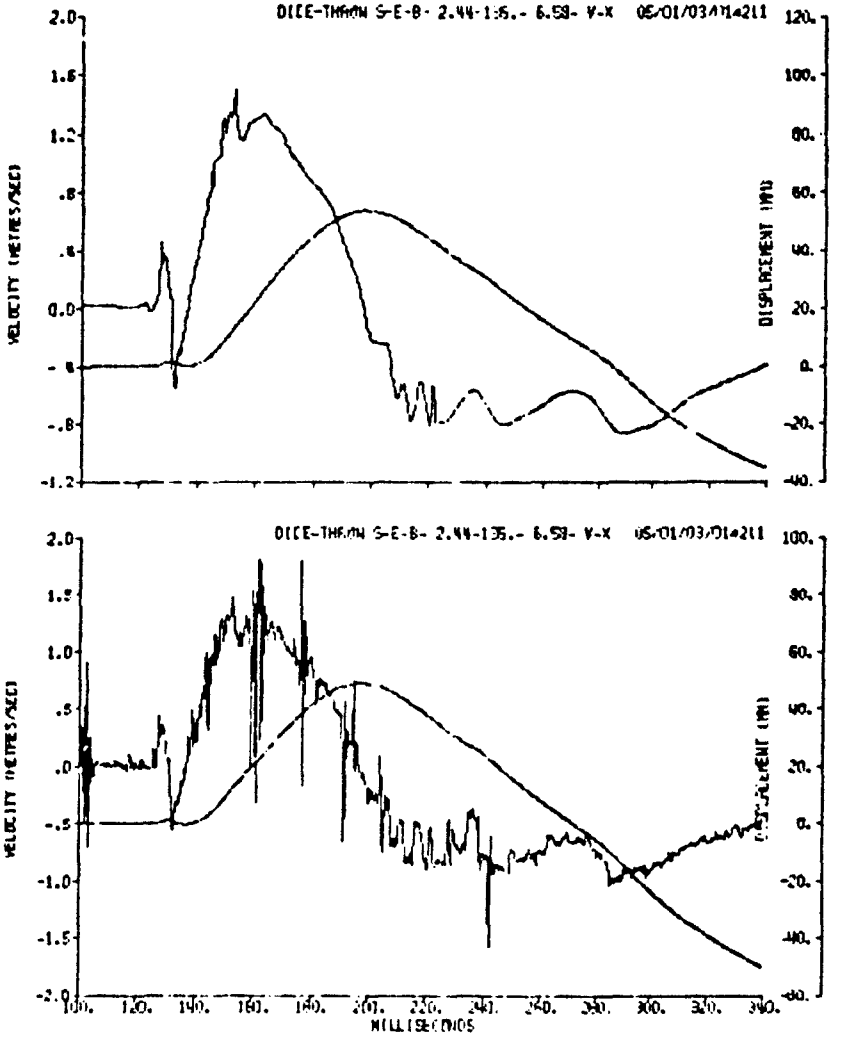

DICE-THROW S-E-8- 2.44-135.- 3.50- V-Y 05/01/02/01=206
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-8- 2.44-135.- 3.50- V-Y 05/01/02/01=206
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

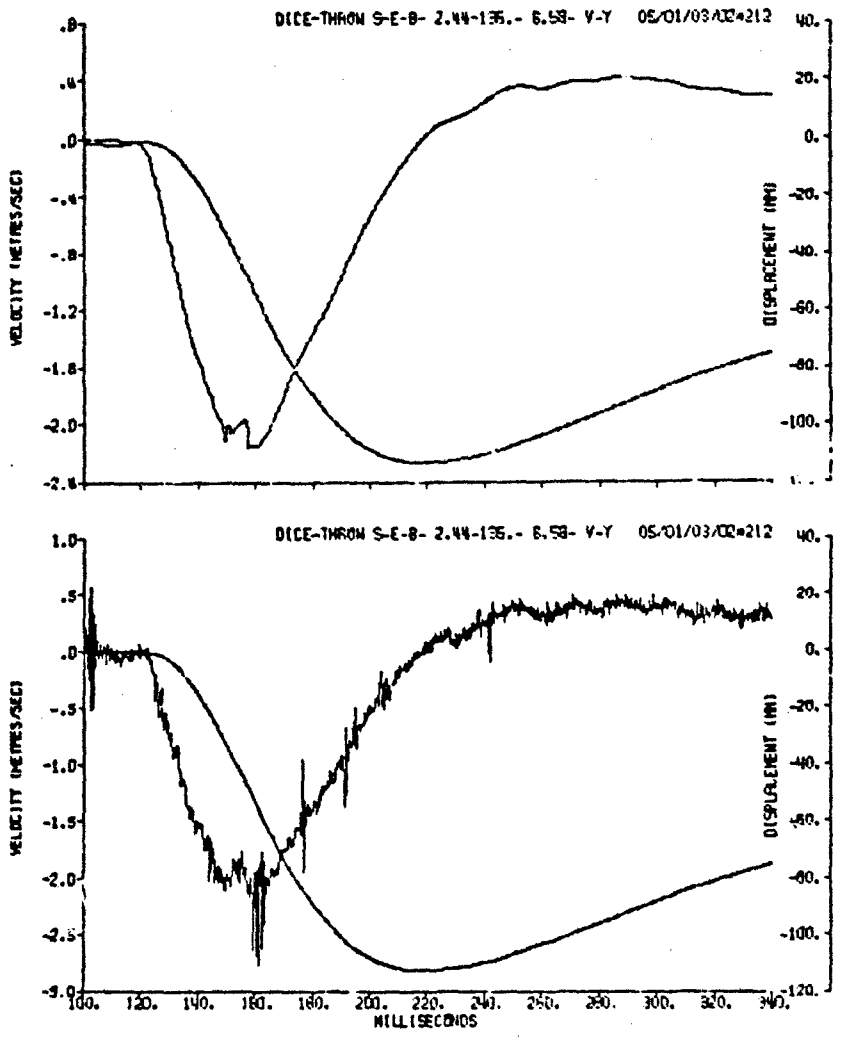


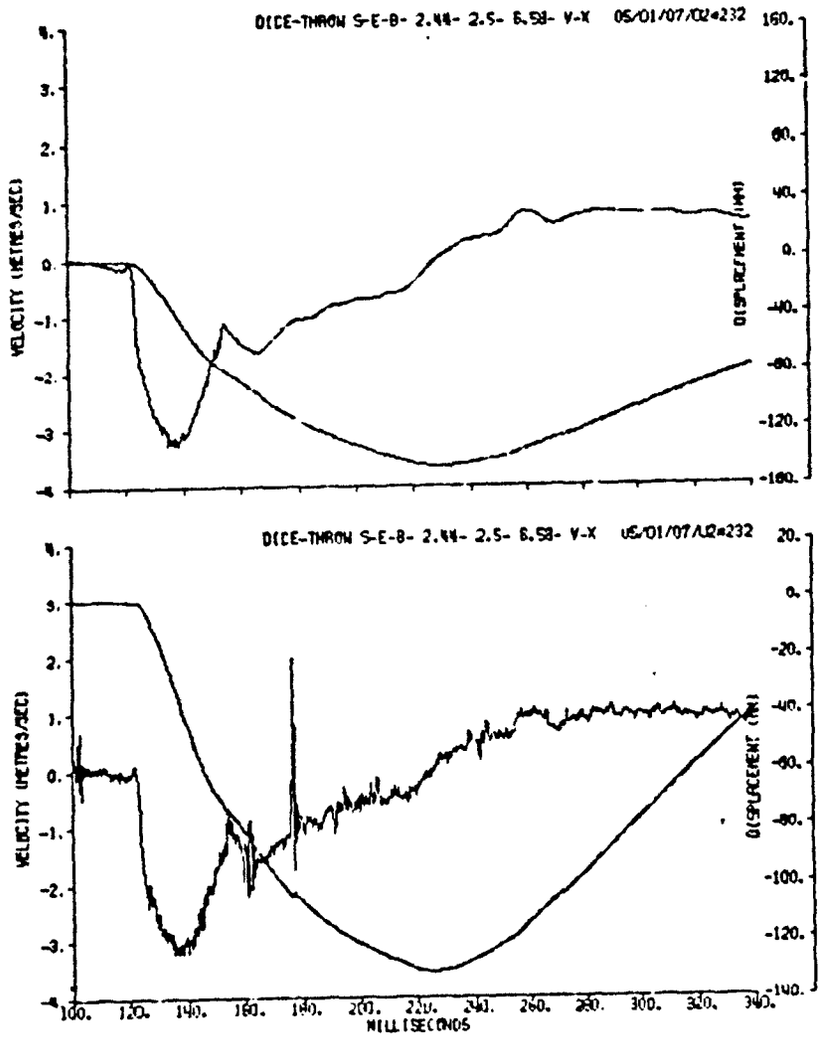

DICE-THROW S-E-8- 2.44- 45.- 8.58- V-Y 05/01/02/03=208
VELOCITY (INCHES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-8- 2.44- 45.- 8.58- V-Y 05/01/02/03=208
VELOCITY (INCHES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

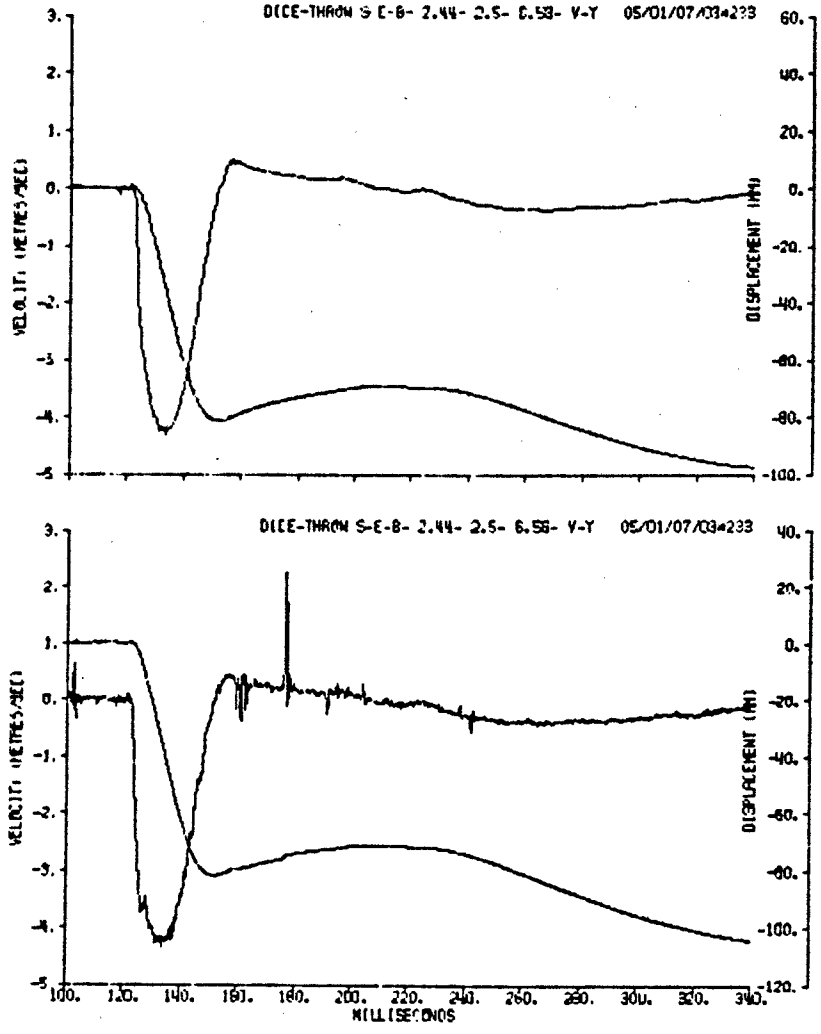

DICE-THROW S-E-B- 2.4$- 90.- 6.5$- V-X 05/01/02/04+200
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.4$- 90.- 6.5$- V-X 05/01/02/04+200
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

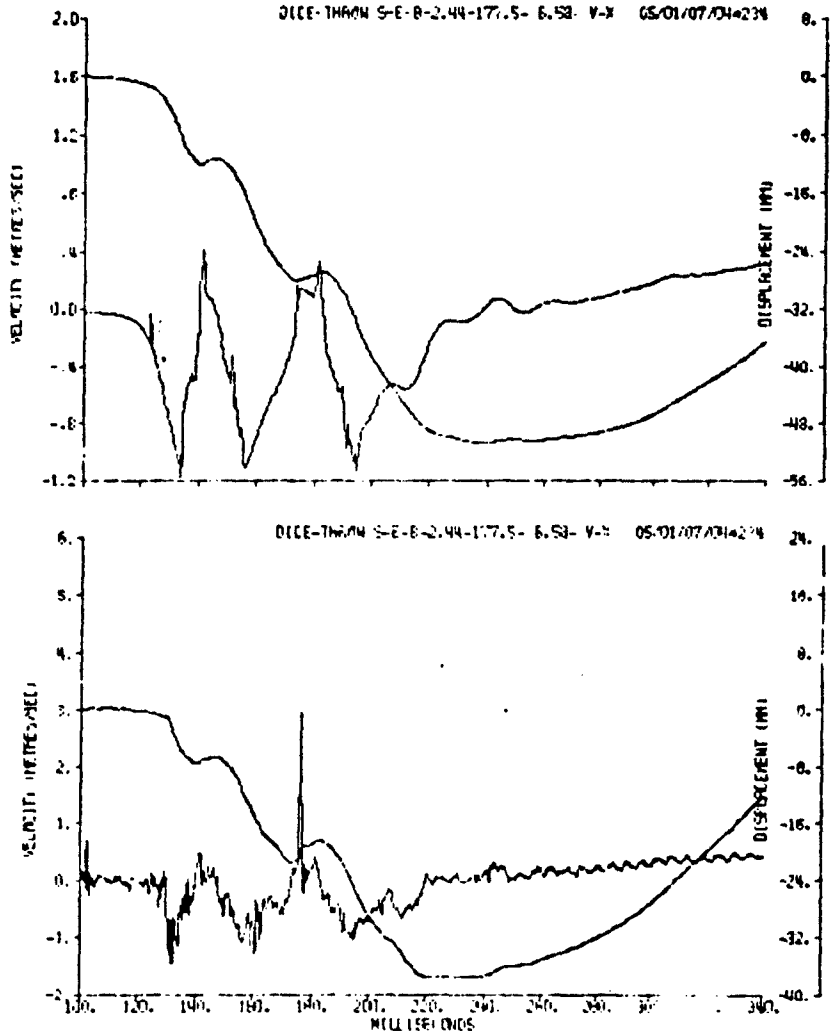

DICE THROW S-E-B- 2.44- 90.- 6.58- V-Y 05/01/02/06+210
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.44- 90.- 6.58- V-Y 05/01/02/06+210
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

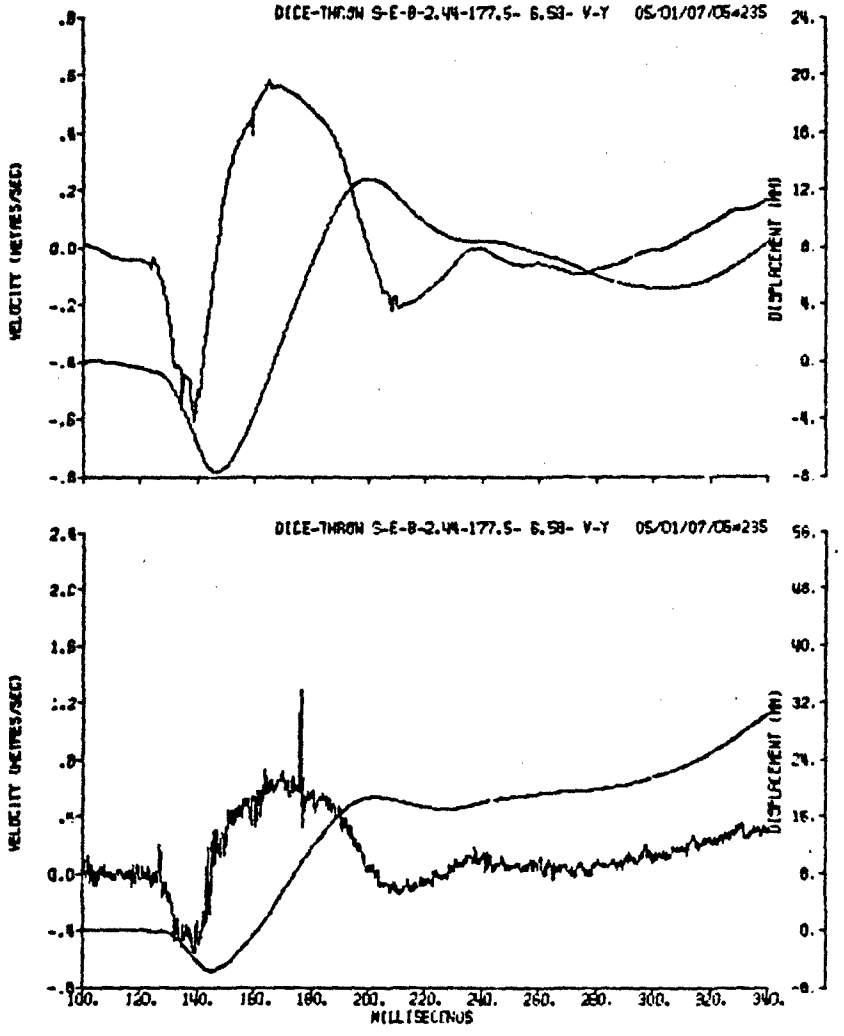

DICE-THROW S-E-B- 2.44-135.- 6.58- V-X 05/01/03/01+211
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
120.
100.
80.
60.
40.
20.
0.
-20.
-40.
DICE-THROW S-E-B- 2.44-135.- 6.58- V-X 05/01/03/01+211
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.0
1.5
1.0
.5
0.0
-.5
-1.0
-1.5
-2.0
100.
80.
60.
40.
20.
0.
-20.
-40.
-60.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

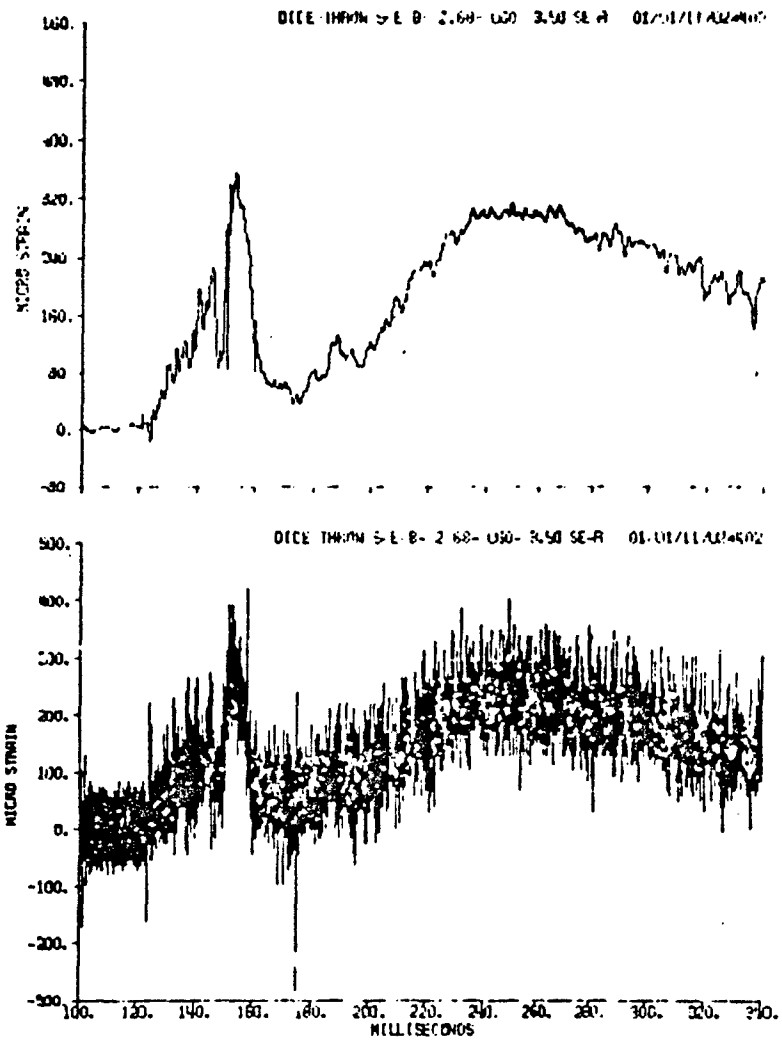

DICE-THROW S-E-B- 2.44-135.- 6.58- V-Y 05/01/03/02=212
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-B- 2.44-135.- 6.58- V-Y 05/01/03/02=212
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

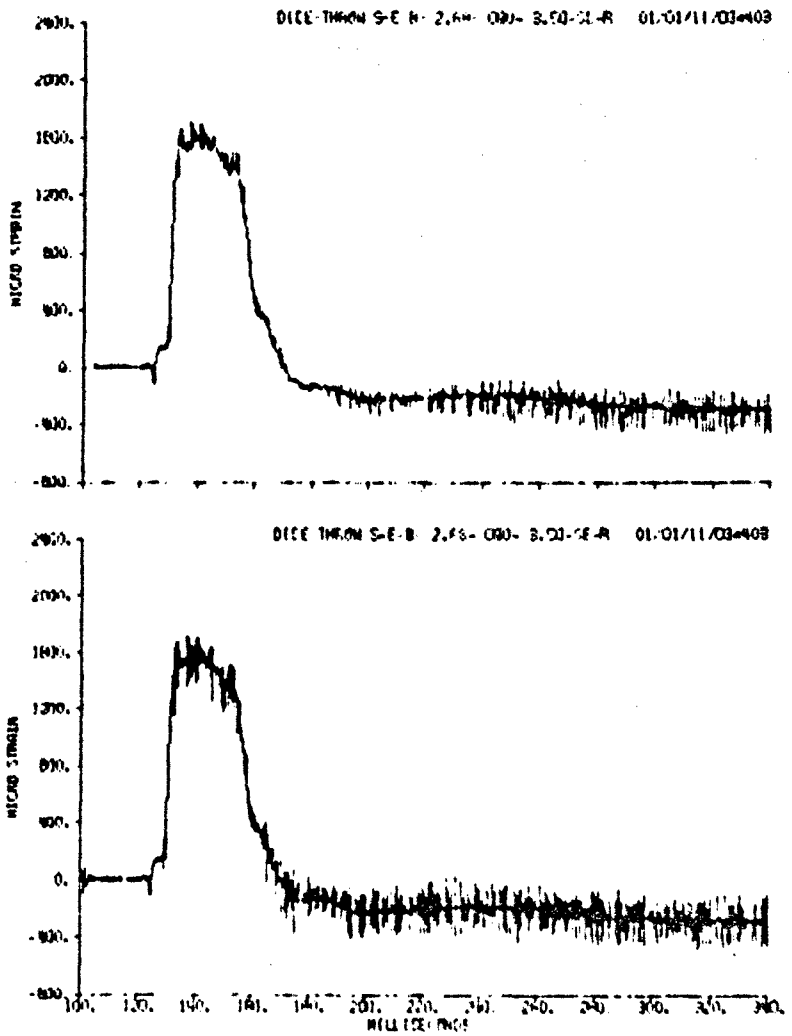

DICE-THROW S-E-8- 2.44- 2.5- 6.58- V-X 05/01/07/02=232
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-8- 2.44- 2.5- 6.58- V-X 05/01/07/02=232
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

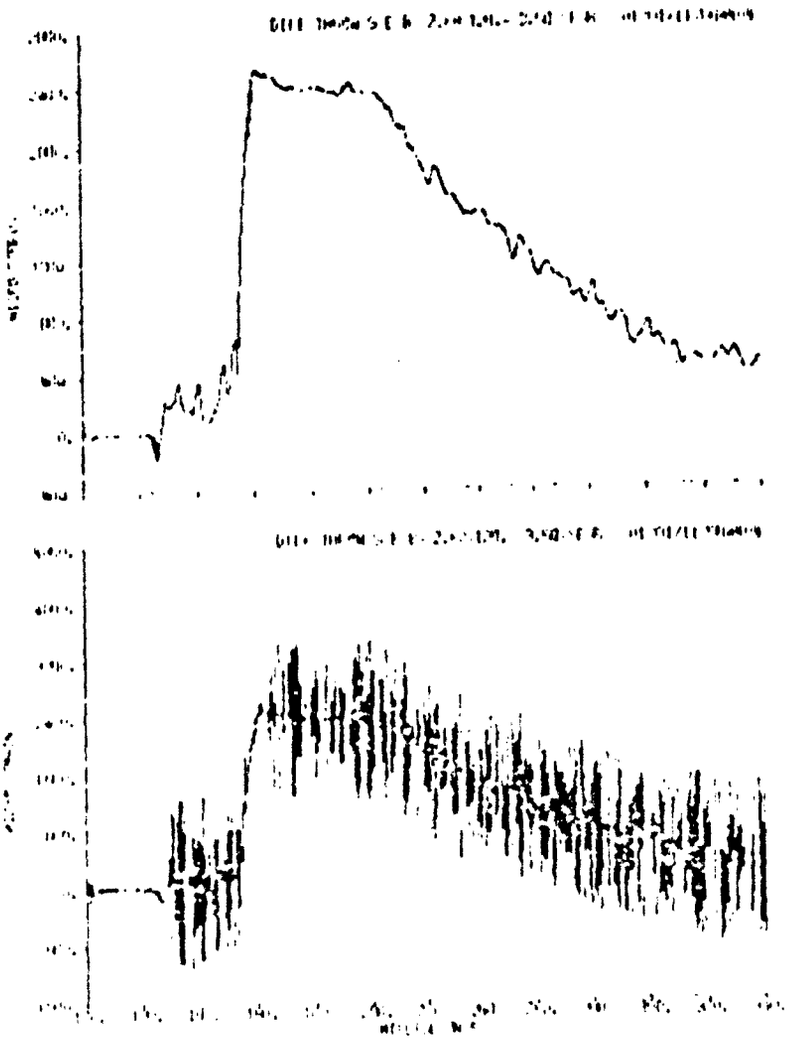

DICE-THROW S E-B- 2.44- 2.5- 6.58- V-Y 05/01/07/03+233
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
3.
2.
1.
0.
-1.
-2.
-3.
-4.
-5
60.
40.
20.
0.
-20.
-40.
-60.
-80.
-100.
DICE-THROW S-E-B- 2.44- 2.5- 6.58- V-Y 05/01/07/03+233
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
3.
2.
1.
0.
-1.
-2.
-3.
-4.
-5
40.
20.
0.
-20.
-40.
-60.
-100.
-120.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

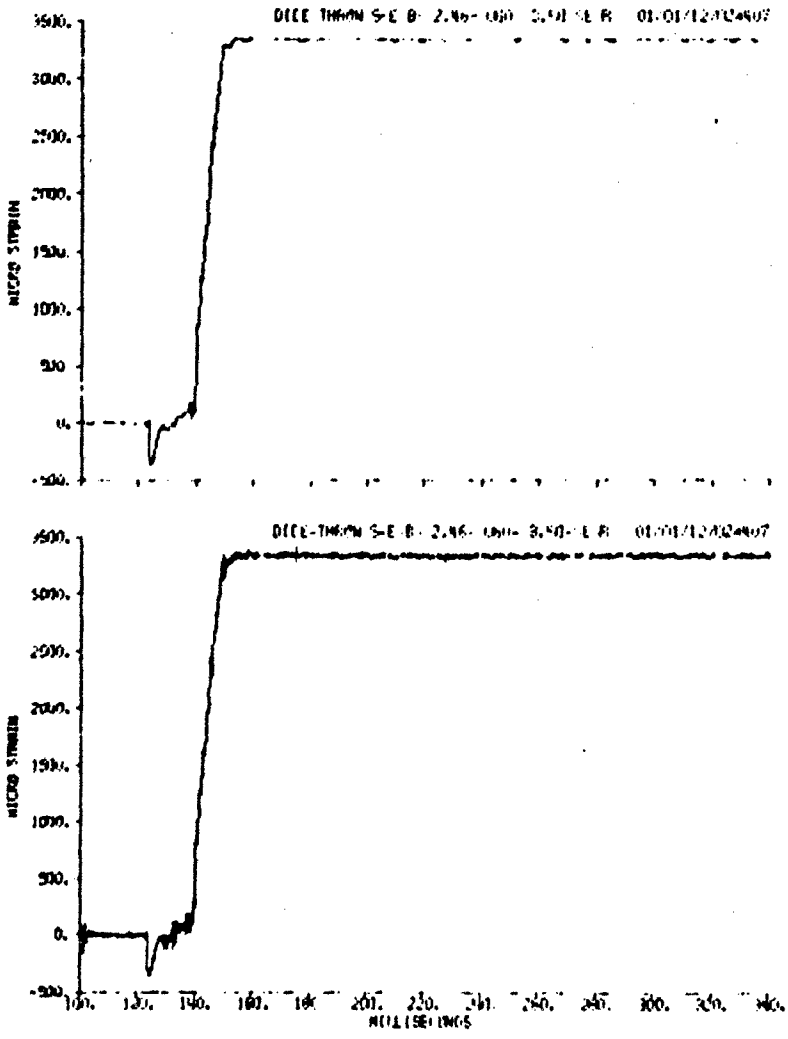

DICE-THROW S-E-8-2.44-177.5- 6.58- V-X 05/01/07/034+23%
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
8.
0.
-8.
-16.
-24.
-32.
-40.
-48.
-56.
DICE-THROW S-E-8-2.44-177.5- 6.58- V-X 05/01/07/034+23%
6.
5.
4.
3.
2.
1.
0.
-1.
-2.
24.
16.
8.
0.
-8.
-16.
-24.
-32.
-40.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

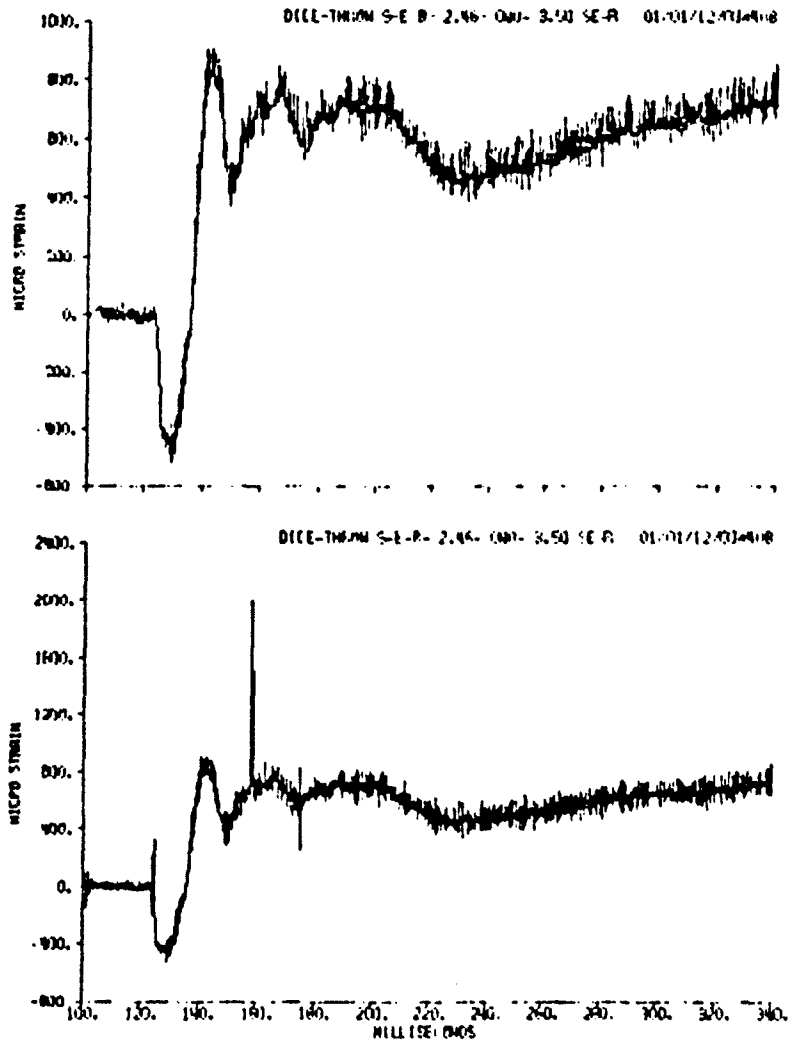

DICE-THROW S-E-B-2.W4-177.5- 6.53- V-Y 05/01/07/05=235
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.8
.6
.4
.2
0.0
-.2
-.4
-.6
-.8
24.
20.
16.
12.
8.
4.
0.
-4.
-8.
DICE-THROW S-E-B-2.W4-177.5- 6.58- V-Y 05/01/07/05=235
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
56.
48.
40.
32.
24.
16.
8.
0.
-8.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

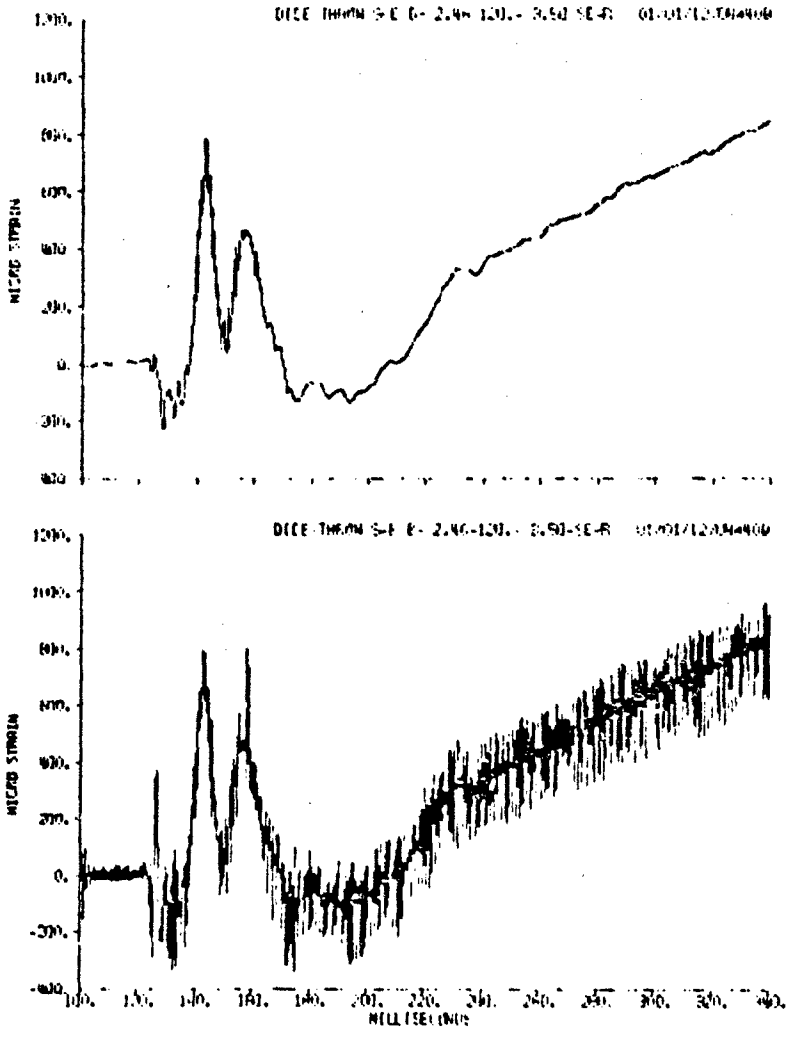

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

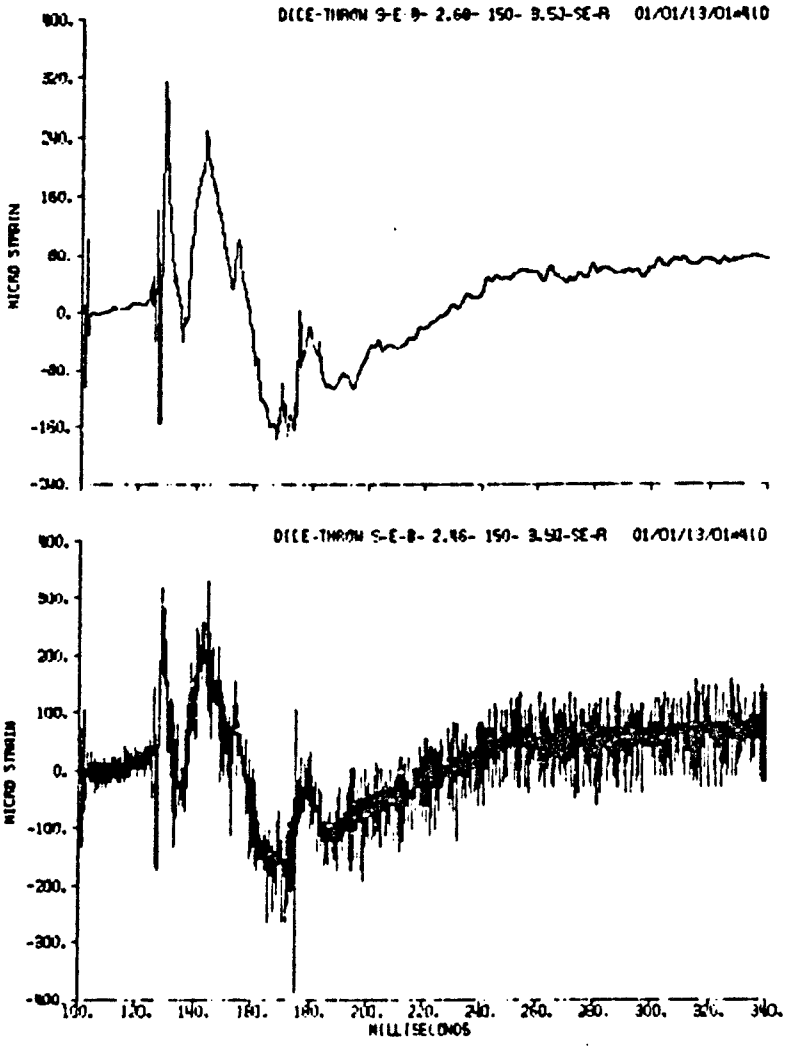

DICE-THROW S-E A- 2.4M- 090- 8.00-SL-R 01/01/11/03=403
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
DICE THROW S-E-B 2.4M- 090- 8.00-SL-R 01/01/11/03=403
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
100.
120.
140.
160.
180.
200.
220.
240.
260.
280.
300.
320.
340.

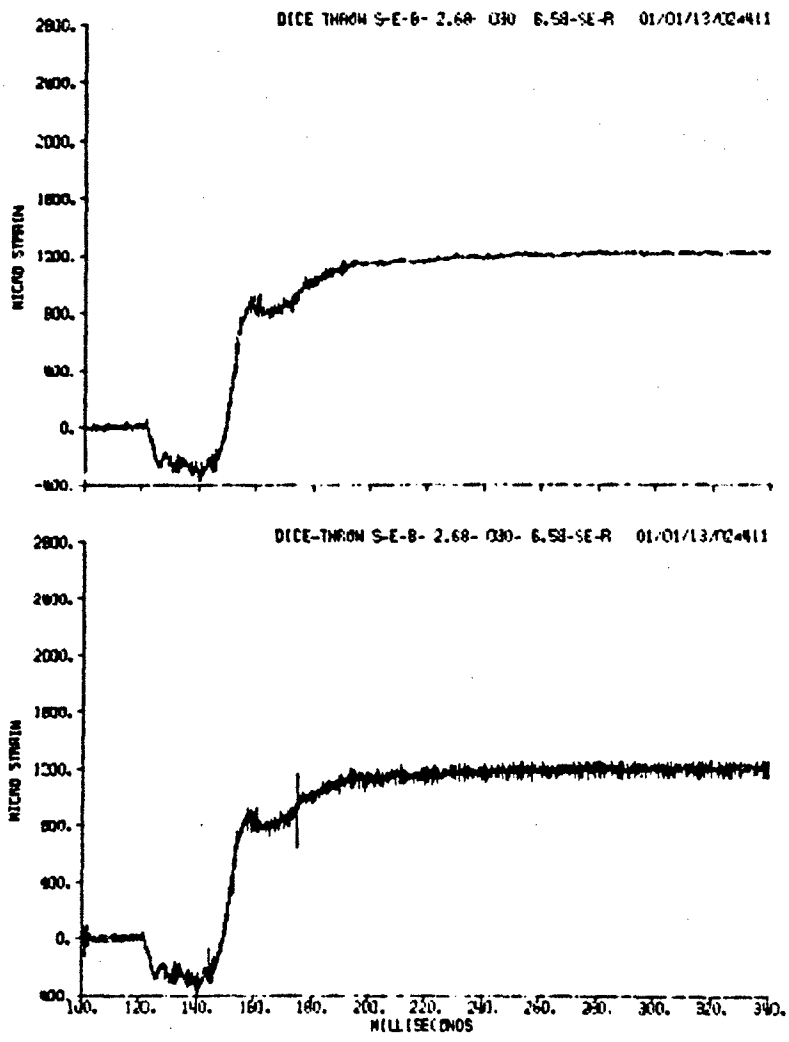


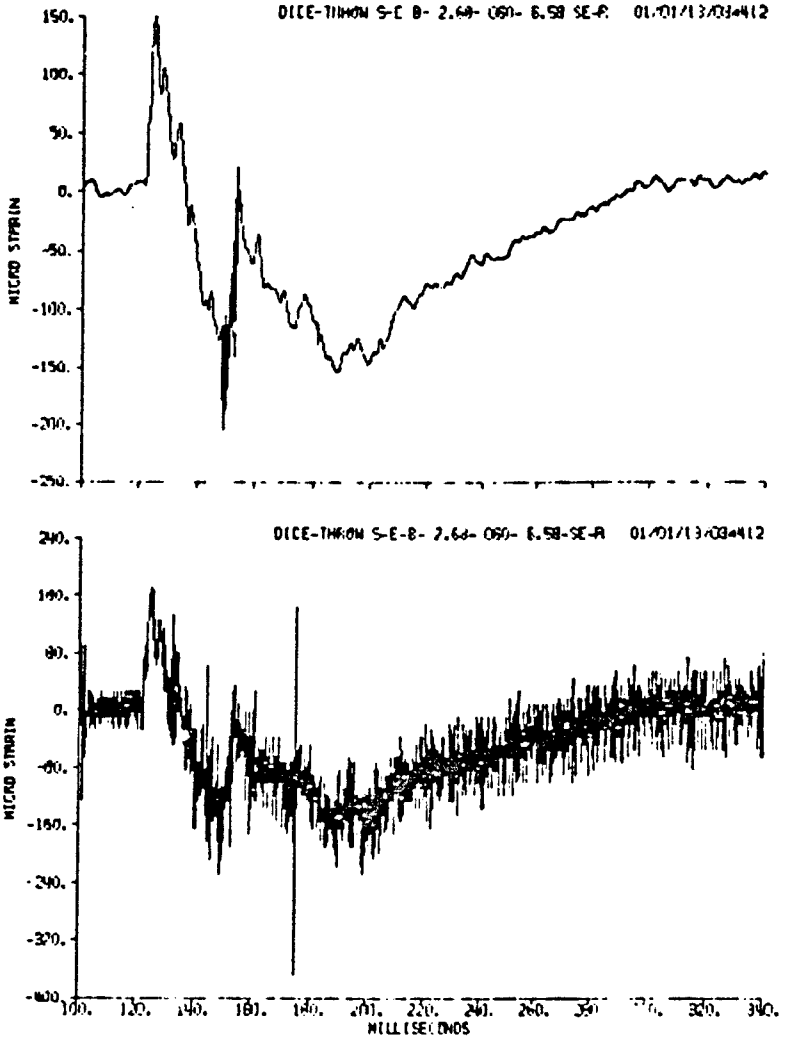

MICRO STRAIN
MICRO STRAIN

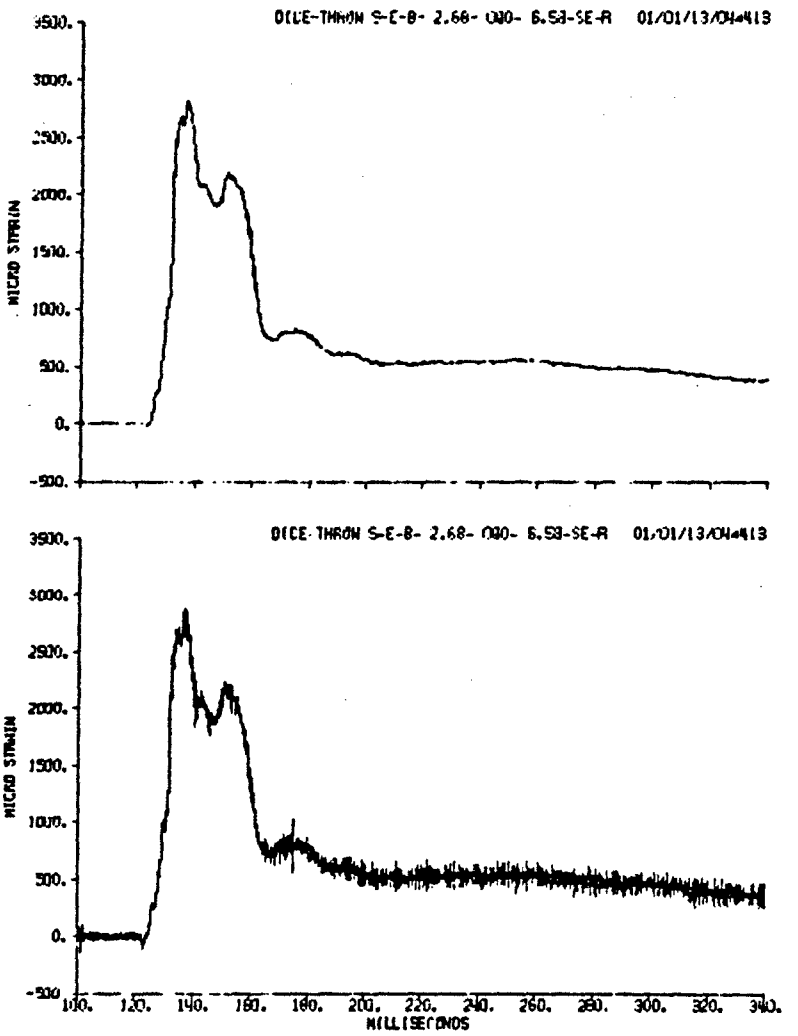

1000.
800.
600.
400.
200.
0.
-200.
-400.
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
MICRO STRAIN
100.
120.
140.
160.
180.
200.
220.
240.
260.
280.
300.
320.
340.
MILLISECONDS

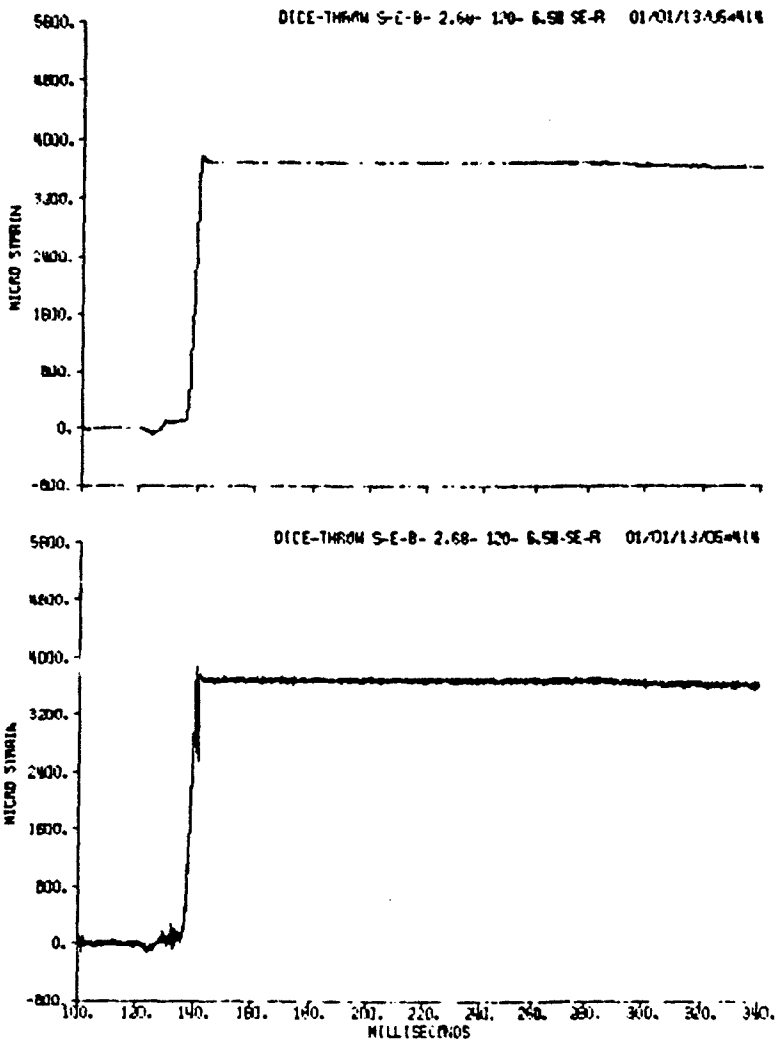

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

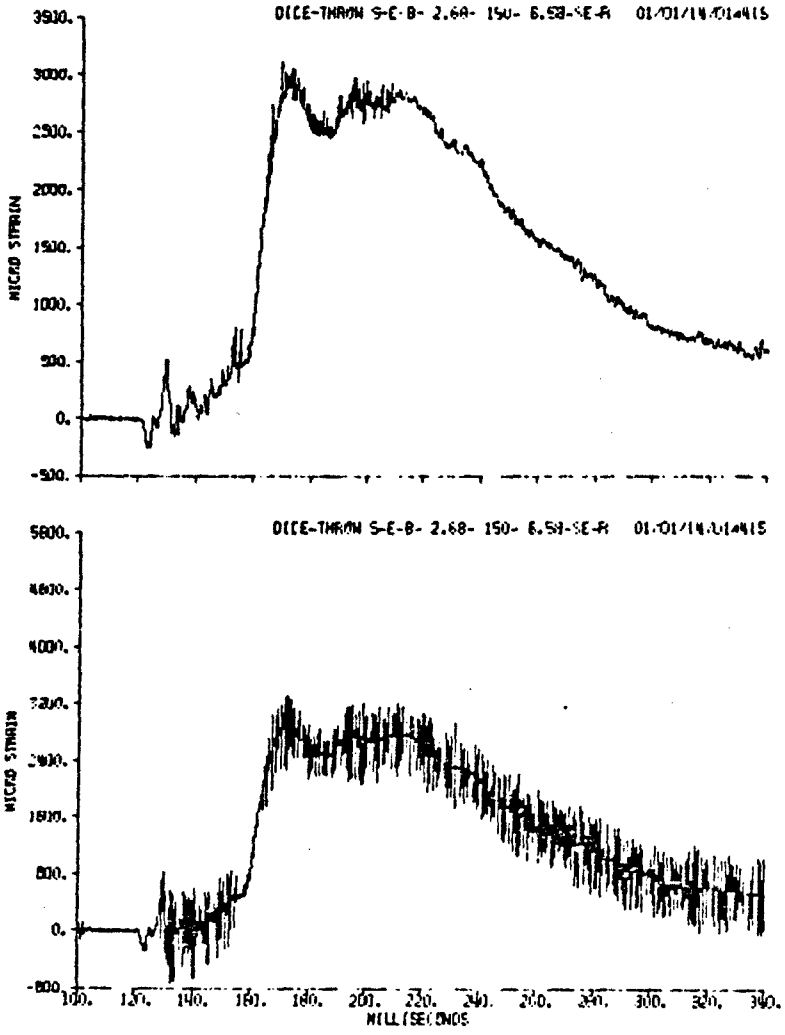

DICE-THROW 9-E 9- 2.60- 150- 9.50-SE-R 01/01/13/01=410
MICRO STRAIN
800.
400.
240.
160.
80.
0.
-80.
-160.
-240.
DICE-THROW 9-E-8- 2.96- 150- 8.50-SE-R 01/01/13/01=410
MICRO STRAIN
800.
500.
200.
100.
0.
-100.
-200.
-300.
-400.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

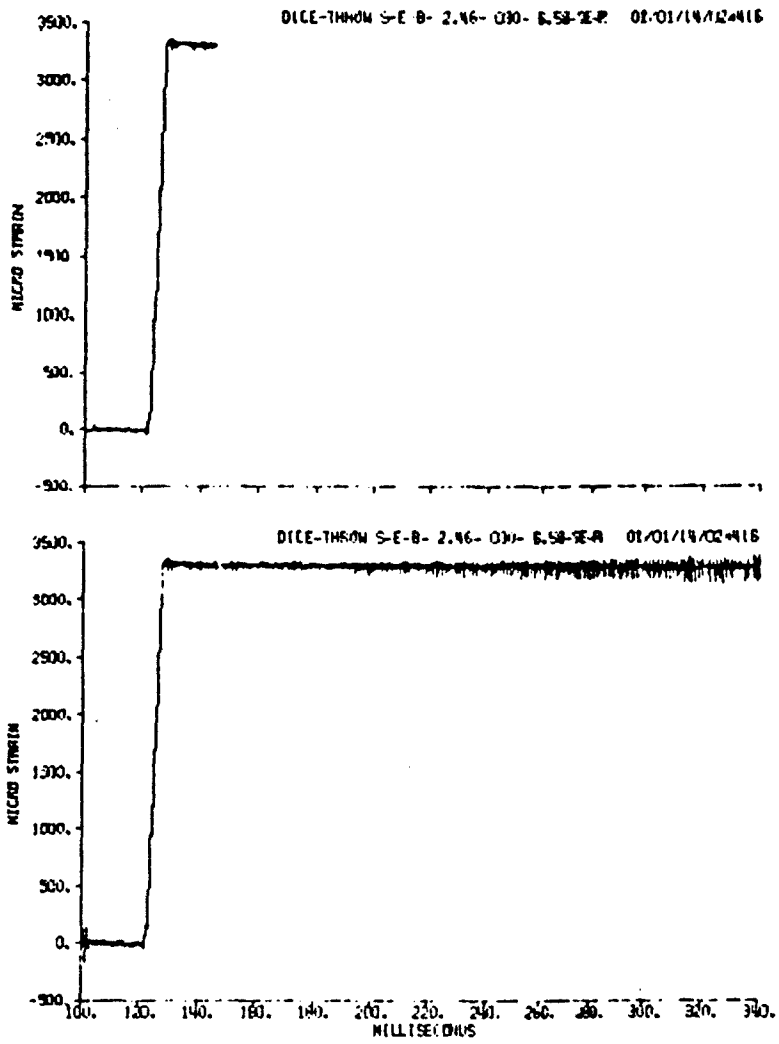

DICE THROW S-E-B- 2.68- 030 6.58-SE-R 01/01/13/02:411
MICRO STRAIN
2800.
2600.
2000.
1800.
1200.
800.
400.
0.
-400.
DICE-THROW S-E-B- 2.68- 030- 6.58-SE-R 01/01/13/02:411
MICRO STRAIN
2800.
2600.
2000.
1800.
1200.
800.
400.
0.
-400.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

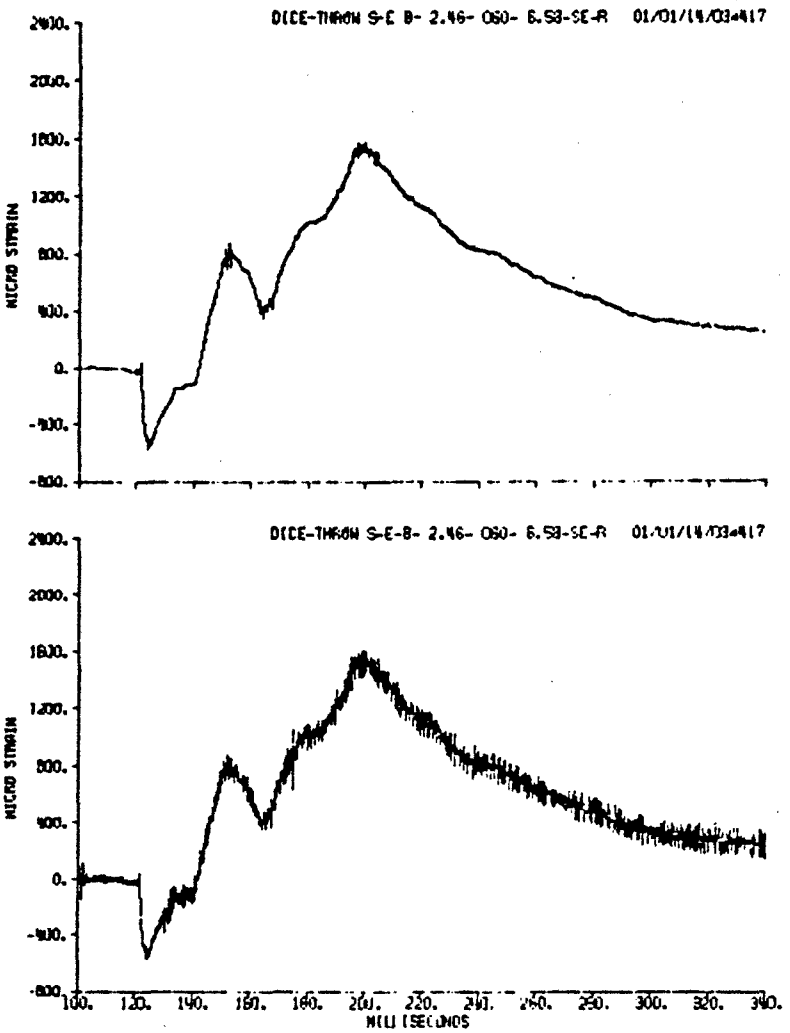

DICE-THROW S-E B- 2.64- 090- 8.58 SE-R 01/01/13/03+412
MICRO STRAIN
150.
100.
50.
0.
-50.
-100.
-150.
-200.
-250.
DICE-THROW S-E-B- 2.64- 090- 8.58-SE-R 01/01/13/03+412
MICRO STRAIN
240.
160.
80.
0.
-80.
-160.
-240.
-320.
100.
120.
140.
160.
180.
200.
220.
240.
260.
280.
300.
320.
340.
MILLISECONDS

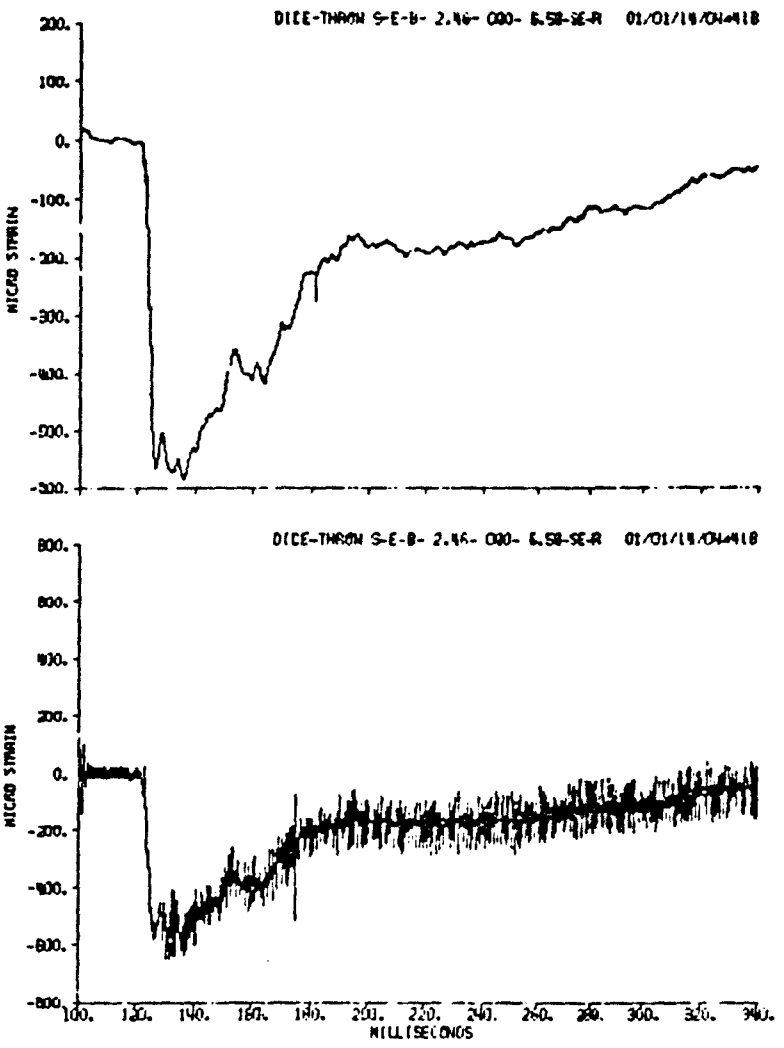

DICE-THROW S-E-8- 2.68- 000- 6.53-SE-R 01/01/13/04=413
MICRO STRAIN
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
DICE-THROW S-E-8- 2.68- 000- 6.53-SE-R 01/01/13/04=413
MICRO STRAIN
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

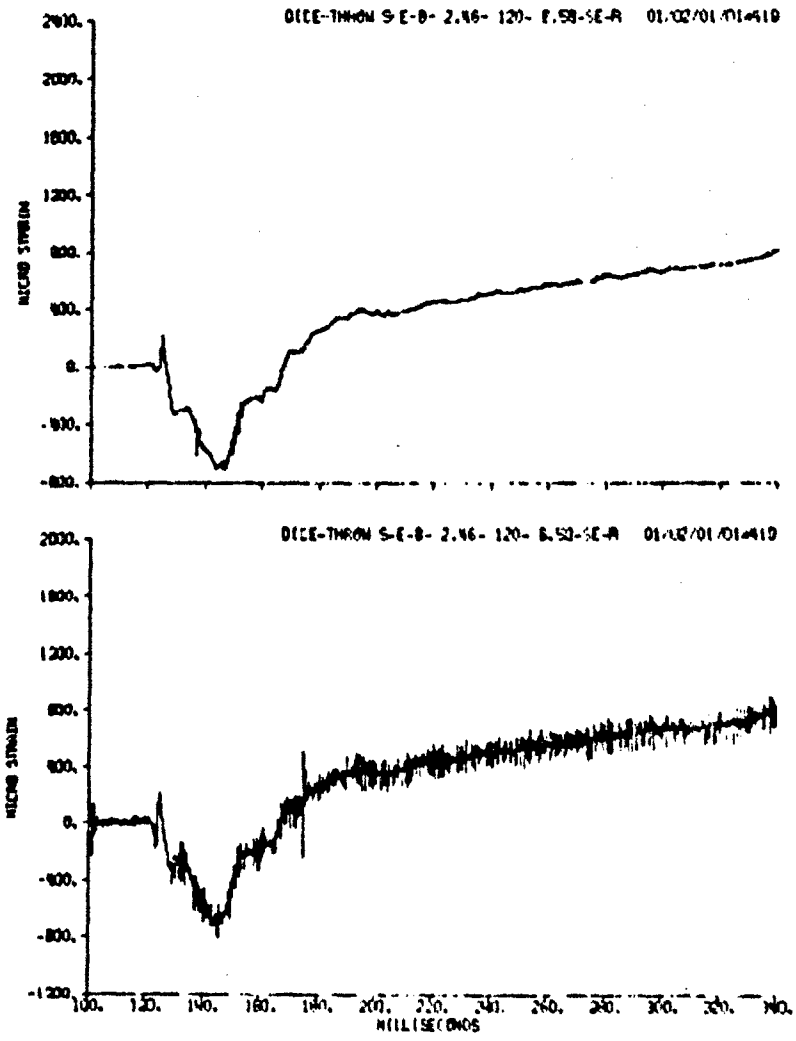

DICE-THROW S-E-B- 2.6#- 120- 6.5# SE-R 01/01/13/06=41%
5600.
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
MICRO STRAIN
DICE-THROW S-E-B- 2.68- 120- 6.5#-SE-R 01/01/13/05=41%
5600.
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
MICRO STRAIN
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS

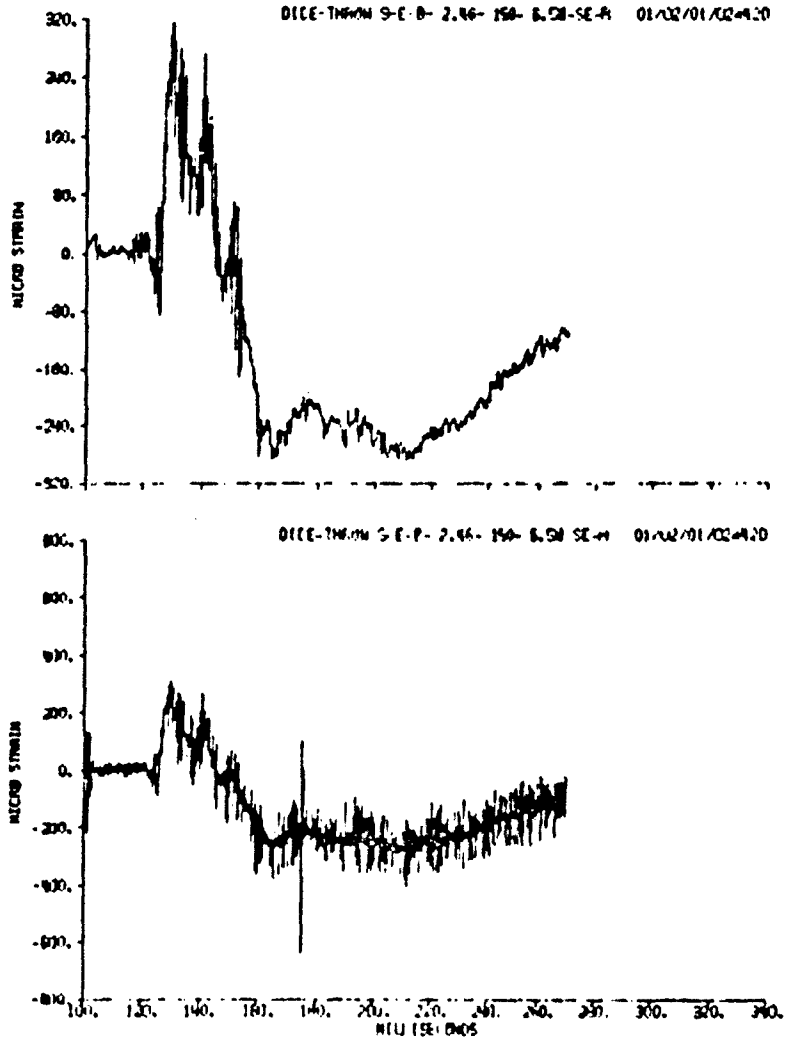

DICE-THROW S-E-B- 2.68- 150- 6.58-SE-R 01/01/14/014415
MICRO STRAIN
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
DICE-THROW S-E-B- 2.68- 150- 6.58-SE-R 01/01/14/014415
MICRO STRAIN
5000.
4000.
800.
0.
-800.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS


DICE-THROW S-E B- 2.46- 030- 6.58-SE-R 01/01/19/12+416
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
MICRO STRAIN
DICE-THROW S-E-B- 2.46- 030- 6.58-SE-R 01/01/19/02+416
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
MICRO STRAIN
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS


DICE-THROW S-E B- 2.46- 050- 6.58-SE-R 01/01/14/033+417
MICRO STRAIN
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
DICE-THROW S-E-B- 2.46- 050- 6.58-SE-R 01/01/14/033+417
MICRO STRAIN
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS


DICE-THROW S-E-B- 2.46- 000- 6.58-SE-R 01/01/19/CH=418
MICRO STRAIN
200.
100.
0.
-100.
-200.
-300.
-400.
-500.
-600.
DICE-THROW S-E-B- 2.46- 000- 6.58-SE-R 01/01/19/CH=418
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
100.
120.
140.
160.
180.
200.
220.
240.
260.
280.
300.
320.
340.
MILLISECONDS


DICE-THROW S-E-8- 2.46- 120- 8.58-SE-R 01/02/01/01=410
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
MICRO STRAIN
DICE-THROW S-E-8- 2.46- 120- 8.58-SE-R 01/02/01/01=410
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
100. 120. 140. 160. 180. 200. 220. 240. 260. 280. 300. 320. 340.
MILLISECONDS


320.
240.
160.
80.
0.
-80.
-160.
-240.
-320.
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
100.
120.
140.
160.
180.
200.
220.
240.
260.
280.
300.
320.
340.

APPENDIX F

AIRCRAFT SHELTER "C" DATA PRESENTATION

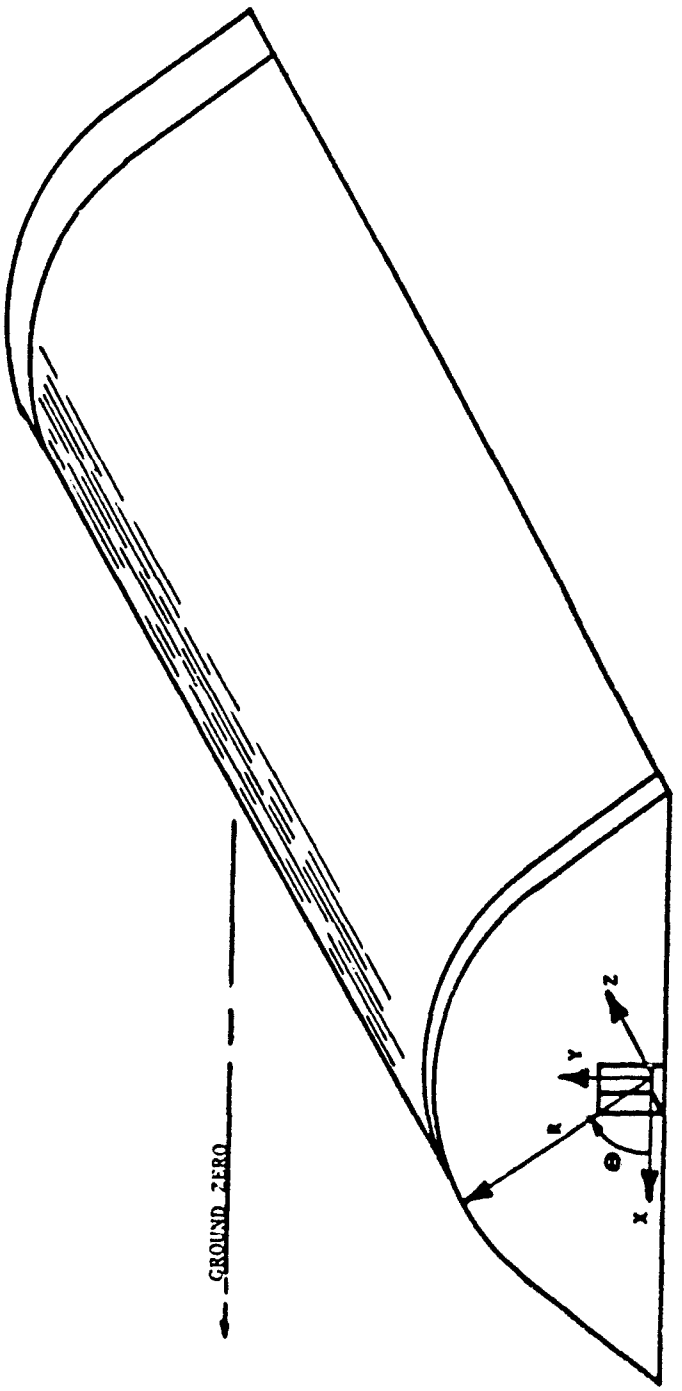


Figure F-1 Aircraft Shelter "C" Coordinate System

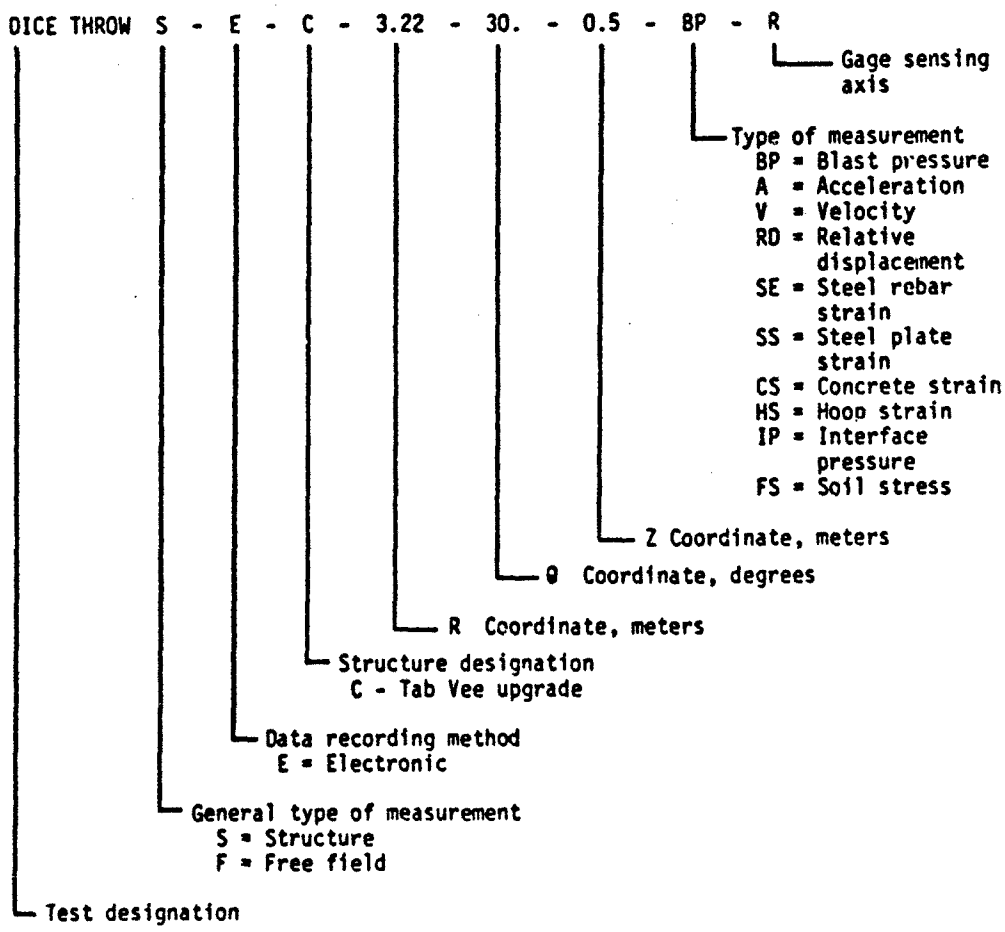


Figure F2. Measurement Designation System

DATA CORRECTIONS

DSP - points have been despiked.

SMT - a modified Hanning smooth has been performed.

FIL - a frequency cut-off or a band reject digital filter has been made.

BLC - the data has been baseline corrected.

INV - the polarity has been reversed.

On each page, the corrected plot is at the top and the uncorrected plot is at the bottom. Each acceleration plot is followed by its integral.

DICE THROW, SHELTER C DATA CORRECTIONS

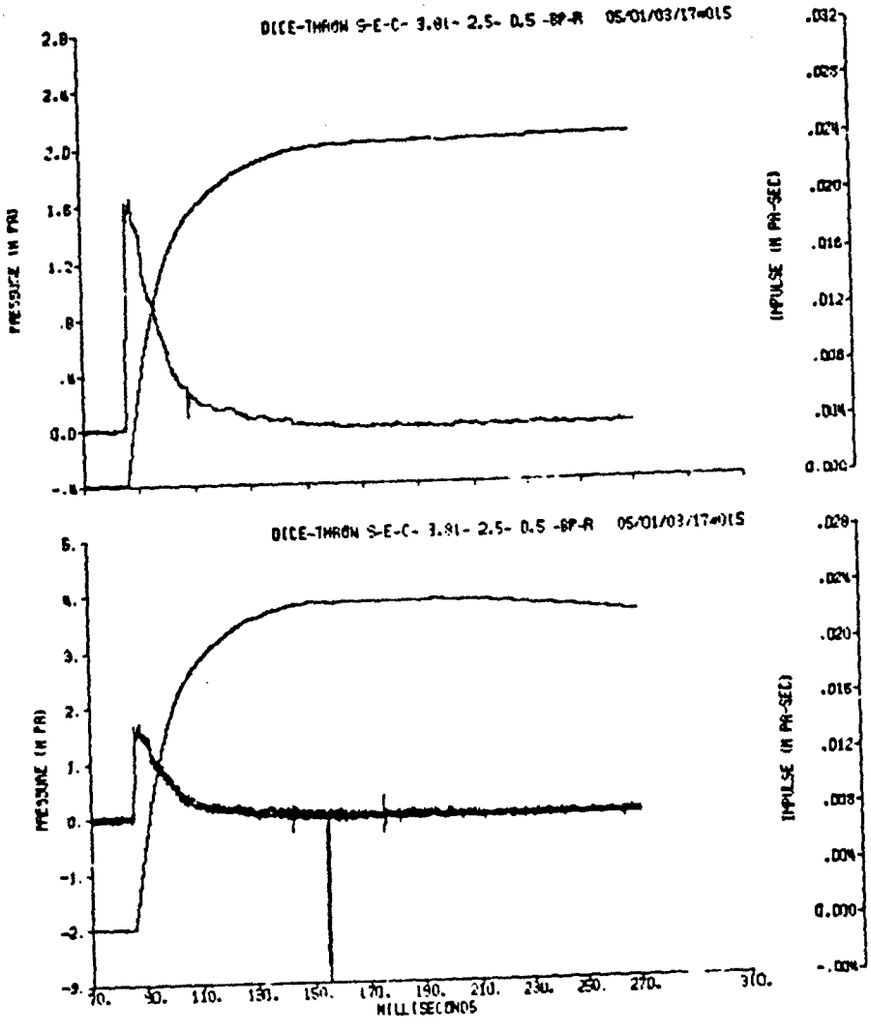
MEAS. NO.	COORDINATES R METERS	θ DEGREES	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
015	3.81	2.5	0.5	BP	R	DSP,SMT,BLC	Outer Surf/Outer Edge
016	3.22	30	0.5	BP	R	DSP,SMT	Outer Surf/Outer Edge
017	3.21	60	0.5	BP	R	DSP,SMT,BLC	Outer Surf/Outer Edge
018	3.21	90	0.5	BP	R	DSP,SMT,BLC	Outer Surf/Outer Edge
019	3.21	120	0.5	BP	R	DSP,SMT,FIL,BLC	Outer Surf/Outer Edge
020	3.22	150	0.5	BP	R	DSP,BLC	Outer Surf/Outer Edge
021	3.81	177.5	0.5	BP	R	DSP,SMT	Outer Surf/Outer Edge
022	3.81	2.5	6.88	BP	R	DSP,SMT,BLC	Outer Surf/Middle of Struc
023	3.22	30	6.58	BP	R	DSP,SMT	Outer Surf/Middle of Struc
024	3.21	60	6.58	BP	R	DSP,SMT	Outer Surf/Middle of Struc
025	3.21	90	6.88	BP	R	DSP,SMT	Outer Surf/Middle of Struc
026	3.21	120	6.58	BP	R	DSP,SMT,BLC	Outer Surf/Middle of Struc
027	3.22	150	6.58	BP	R	DSP,SMT,BLC	Outer Surf/Middle of Struc
028	3.81	177.5	6.88	BP	R	DSP,SMT,BLC	Outer Surf/Middle of Struc
109	2.44	45	6.58	A	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
110	2.44	45	6.58	A	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
111	2.44	90	6.58	A	X	DSP,SMT	Inner Surf/Middle of Struc
112	2.44	90	6.58	A	Y	DSP,SMT,FIL,BLC	Inner Surf/Middle of Struc
213	2.44	45	3.50	V	X	DSP,SMT,BLC	Inner Surf/Near Super Struc
214	2.44	45	3.50	V	Y	DSP,SMT,BLC	Inner Surf/Near Super Struc
215	2.44	90	3.50	V	X	DSP,SMT	Inner Surf/Near Super Struc
216	2.44	90	3.50	V	Y	DSP,SMT,BLC	Inner Surf/Near Super Struc
217	2.44	135	3.50	V	X	DSP,SMT,BLC	Inner Surf/Near Super Struc
218	2.44	135	3.50	V	Y	DSP,SMT,BLC	Inner Surf/Near Super Struc
219	2.44	45	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
220	2.44	45	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
221	2.44	90	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
222	2.44	90	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc

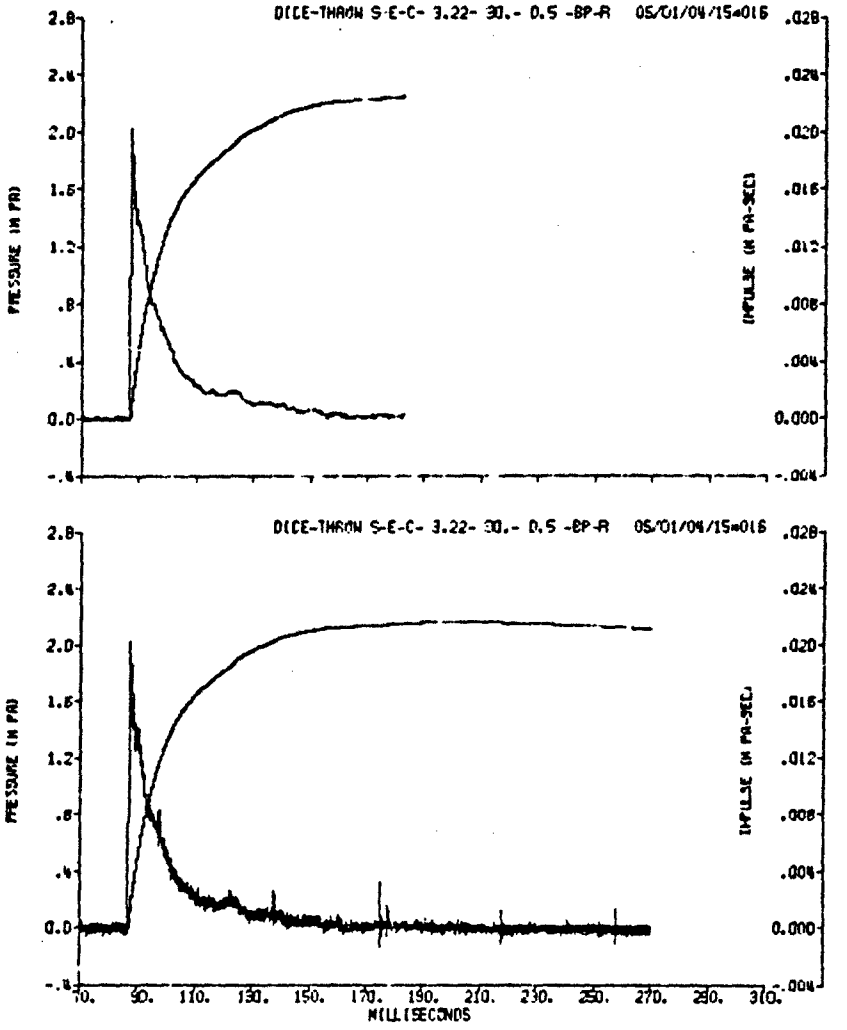
DICE THROW, SHELTER C DATA CORRECTIONS (cont'd)

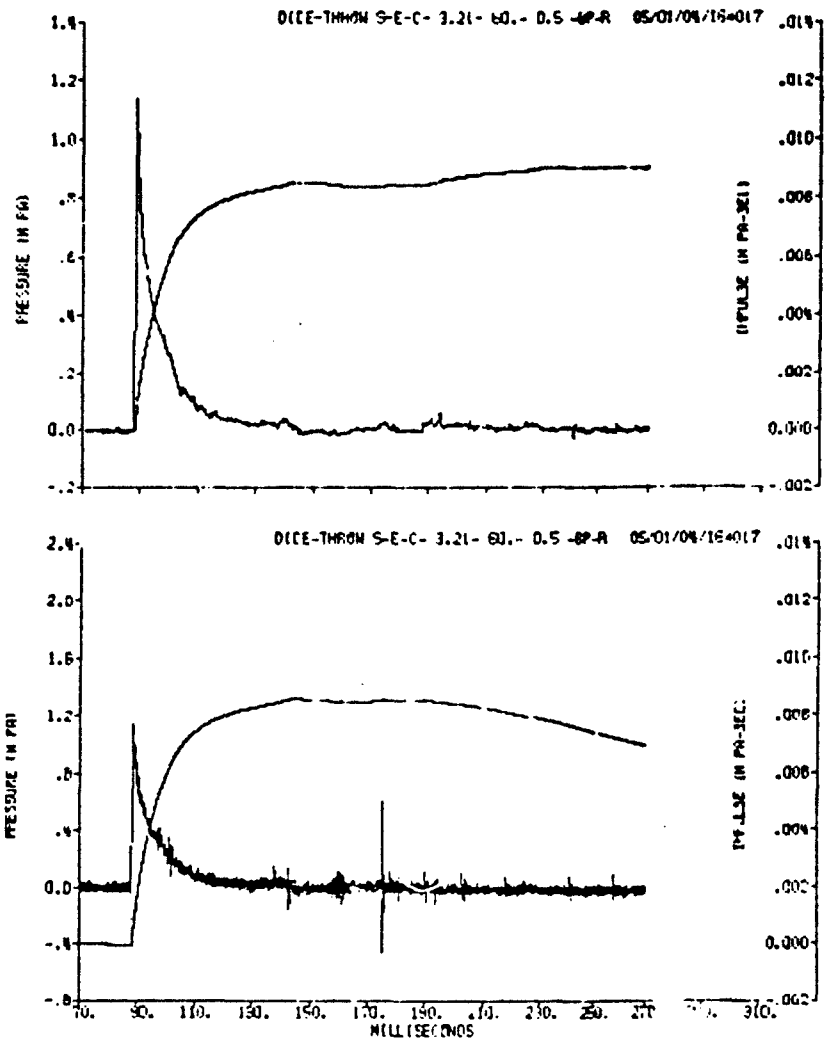
MEAS. NO.	COORDINATES R METERS	θ DEGREES	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
223	2.44	135	6.58	V	X	DSP,SMT	Inner Surf/Middle of Struc
224	2.44	135	6.58	V	Y	DSP,SMT	Inner Surf/Middle of Struc
236	2.44	2.5	6.58	V	X	DSP,SMT,BLC	Inner Surf/Middle of Struc
237	2.44	2.5	6.58	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
238	2.44	177.5	6.58	V	X	DSP,SMT	Inner Surf/Middle of Struc
239	2.44	177.5	6.53	V	Y	DSP,SMT,BLC	Inner Surf/Middle of Struc
421	2.68	30	3.50	SE	R	DSP,SMT	Inner Reinf/Near Super Struc
422	2.68	60	3.50	SE	R	DSP,SMT	Inner Renif/Near Super Struc
423	2.68	90	3.50	SE	R	DSP,SMT	Inner Reinf/Near Super Struc
424	2.58	120	3.50	SE	R	DSP	Inner Reinf/Near Super Struc
425	2.68	150	3.50	SE	R	DSP,SMT	Inner Reinf/Near Super Struc
426	2.46	30	3.50	SE	R	DSP	Outer Reinf/Near Super Struc
427	2.46	60	3.50	SE	R	DSP,SMT	Outer Reinf/Near Super Struc
428	2.46	90	3.50	SE	R	DSP,SMT	Outer Reinf/Near Super Struc
429	2.46	120	3.50	SE	R	DSP,SMT	Outer Reinf/Near Super Struc
430	2.46	150	3.50	SE	R	DSP,SMT,FIL	Outer Reinf/Near Super Struc
431	2.68	30	6.58	SE	R	DSP,SMT	Inner Reinf/Middle of Struc
432	2.68	60	6.58	SE	R	DSP,SMT	Inner Reinf/Middle of Struc
433	2.68	90	6.58	SE	R	DSP,SMT	Inner Reinf/Middle of Struc
434	2.68	120	6.58	SE	R	DSP,SMT	Inner Reinf/Middle of Struc
435	2.68	150	6.58	SE	R	DSP,SMT	Inner Reinf/Middle of Struc
436	2.46	30	6.58	SE	R	DSP,SMT	Outer Reinf/Middle of Struc
437	2.46	60	6.58	SE	R	DSP,SMT,FIL	Outer Reinf/Middle of Struc
438	2.46	90	6.58	SE	R	DSP,SMT	Outer Reinf/Middle of Struc
439	2.46	120	6.58	SE	R	DSP,SMT	Outer Reinf/Middle of Struc
440	2.46	150	6.58	SE	R	DSP,SMT	Outer Reinf/Middle of Struc
441	2.74	30	3.50	SE	R	DSP,SMT	Inner Reinf, Upgrade/Near Sup Str
442	2.74	60	3.50	SE	R	DSP	Inner Reinf, Upgrade/Near Sup Str

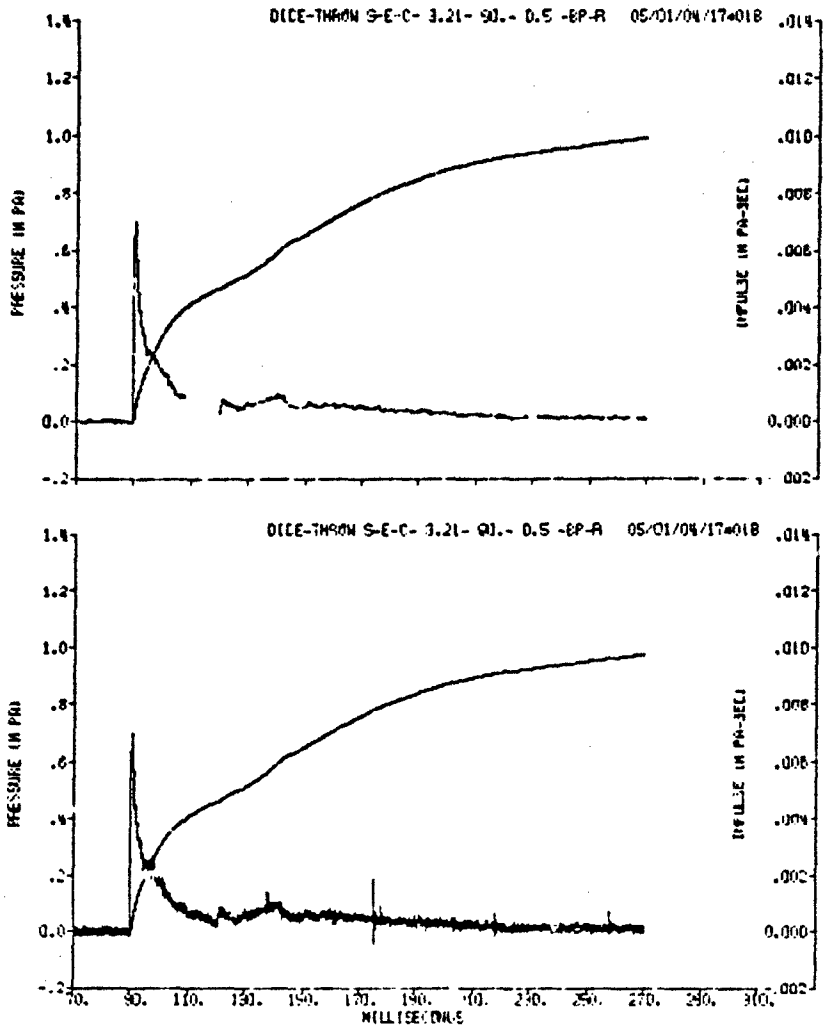
DICE THROW, SHELTER C DATA CORRECTIONS (cont'd)

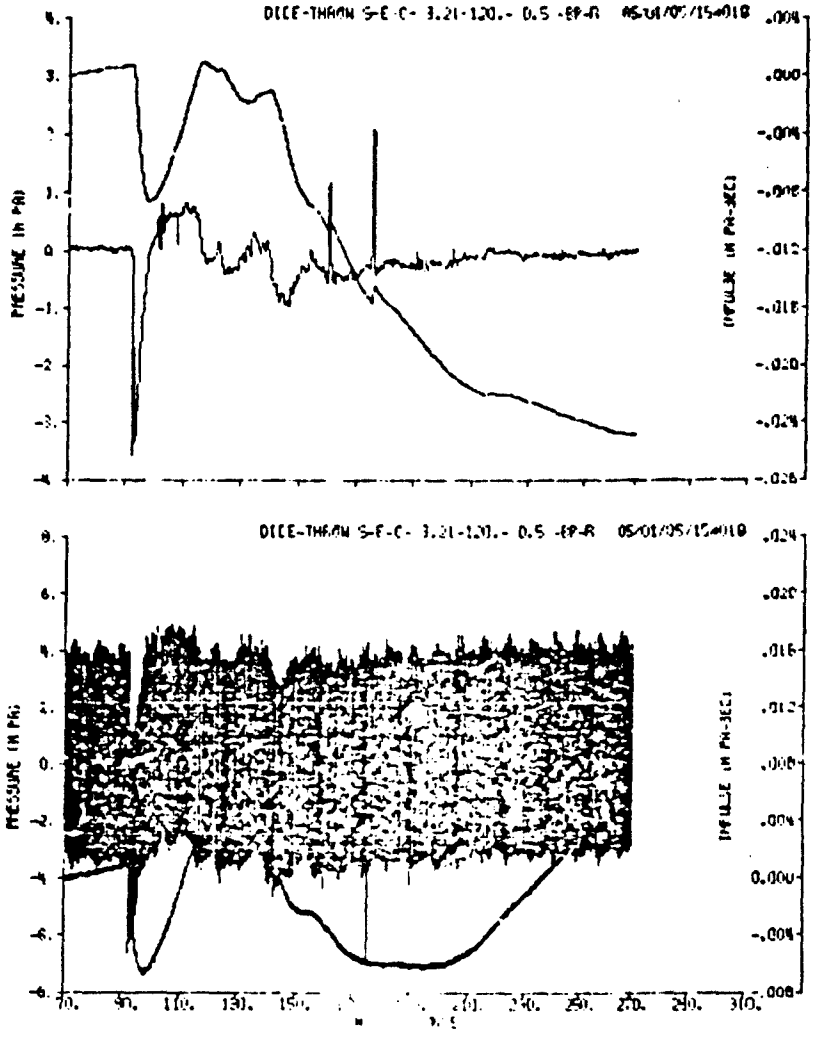
MEAS. NO.	COORDINATES R METERS	θ DEGREES	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
443	2.74	90	3.50	SE	R	DSP,SMT	Inner Reinf, Upgrade/Near Su
444	2.74	120	3.50	SE	R	DSP,SMT	Inner Reinf, Upgrade/Near Su
445	2.74	150	3.50	SE	R	DSP,SMT	Inner Reinf, Upgrade/Near Su
446	3.19	30	3.50	SE	R	DSP,SMT	Outer Reinf Upgrade/Near Sup
447	3.19	60	3.50	SE	R	DSP,SMT	Outer Reinf Upgrade/Near Sup
448	3.19	90	3.50	SE	R	DSP,SMT	Outer Reinf Upgrade/Near Sup
449	3.19	120	3.50	SE	R	DSP,SMT	Outer Reinf Upgrade/Near Sup
450	3.19	150	3.50	SE	R	DSP,SMT	Outer Reinf Upgrade/Near Sup
451	2.74	30	6.58	SE	R	DSP,SMT	Inner Reinf Upgrade/Middle o
452	2.74	60	6.58	SE	R	DSP,SMT	Inner Reinf Upgrade/Middle o
453	2.74	90	6.58	SE	R	DSP,SMT	Inner Reinf Upgrade/Middle o
454	2.74	120	6.58	SE	R	DSP,SMT	Inner Reinf Upgrade/Middle o
455	2.74	150	6.58	SE	R	DSP,SMT	Inner Reinf Upgrade/Middle o
456	3.19	30	6.58	SE	R	DSP,SMT	Outer Reinf Upgrade/Middle o
457	3.19	60	6.58	SE	R	DSP,SMT	Outer Reinf Upgrade/Middle o
458	3.19	90	6.58	SE	R	DSP,SMT	Outer Reinf Upgrade/Middle o
459	3.19	120	6.58	SE	R	DSP,SMT	Outer Reinf Upgrade/Middle o
460	3.19	150	6.58	SE	R	DSP,SMT	Outer Reinf Upgrade/Middle o

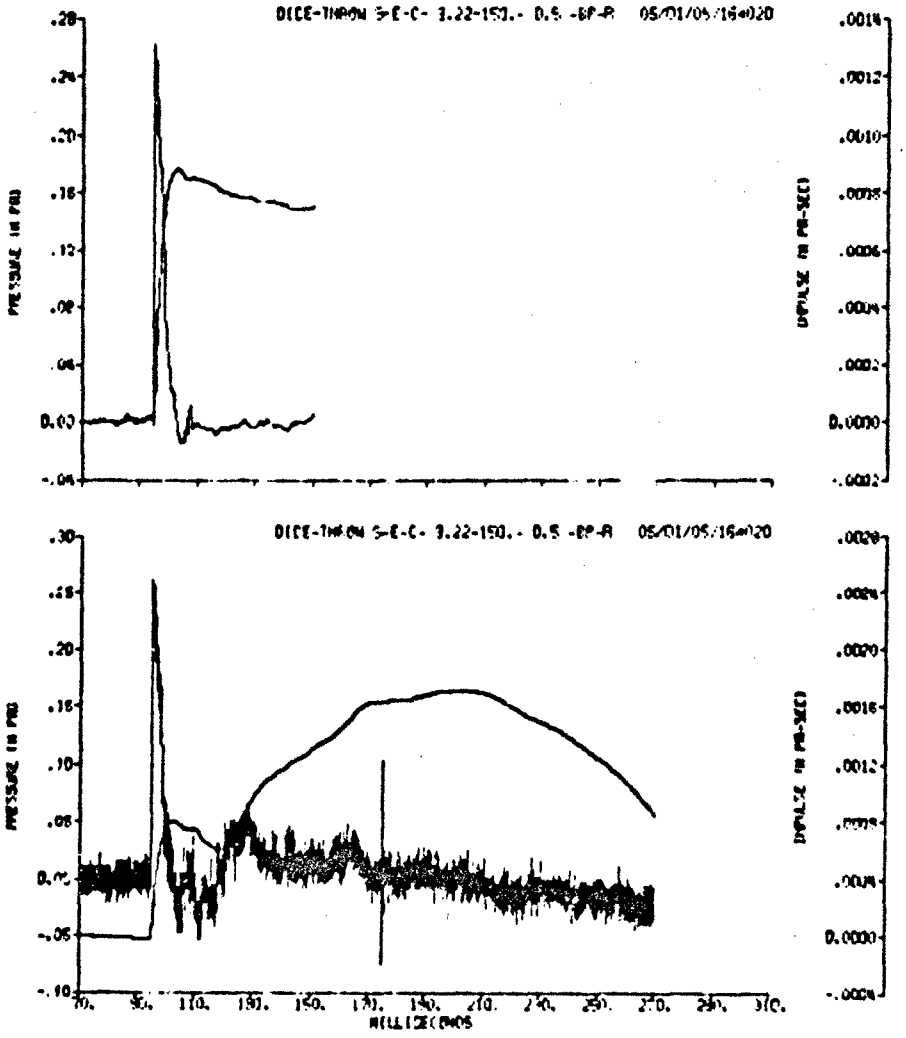

DICE-THROW S-E-C- 3.81- 2.5- 0.5 -BP-R 05/01/03/17=015
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-C- 3.81- 2.5- 0.5 -BP-R 05/01/03/17=015
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
MILLISECONDS

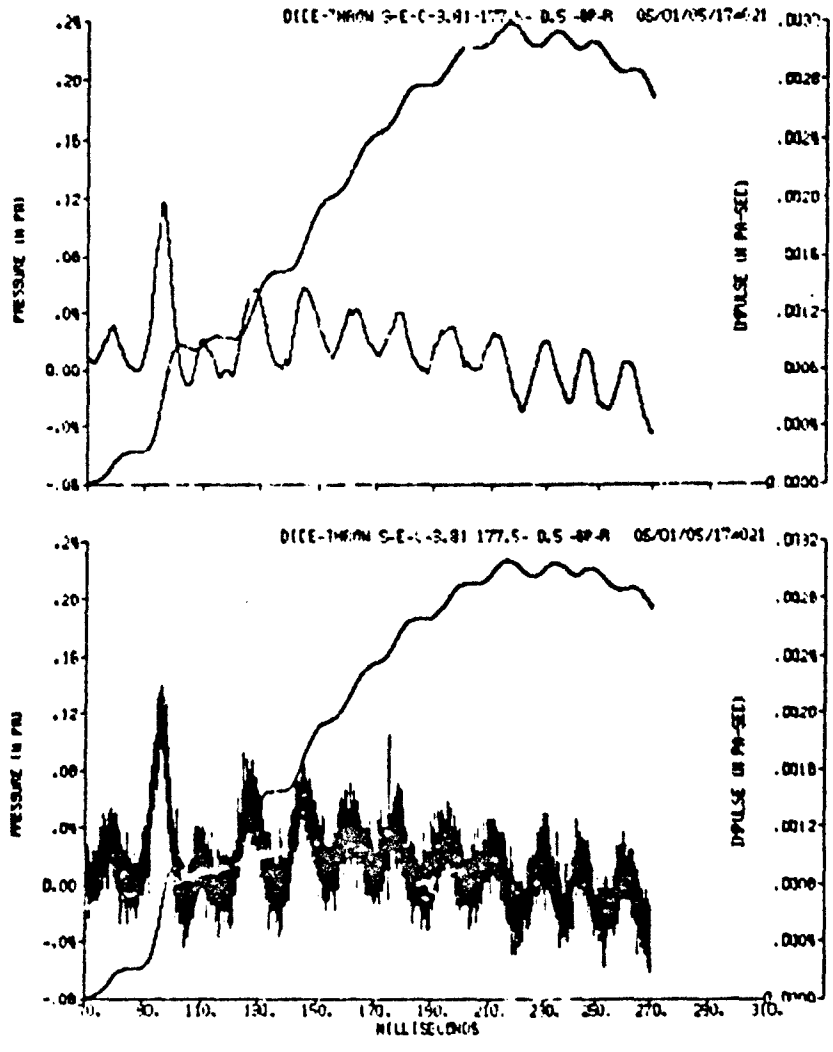

DICE-THROW S-E-C- 3.22- 30.- 0.5 -BP-R 05/01/04/15=016
PRESSURE (N PA)
IMPULSE (N PA-SEC)
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
.028
.024
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-C- 3.22- 30.- 0.5 -BP-R 05/01/04/15=016
PRESSURE (N PA)
IMPULSE (N PA-SEC)
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

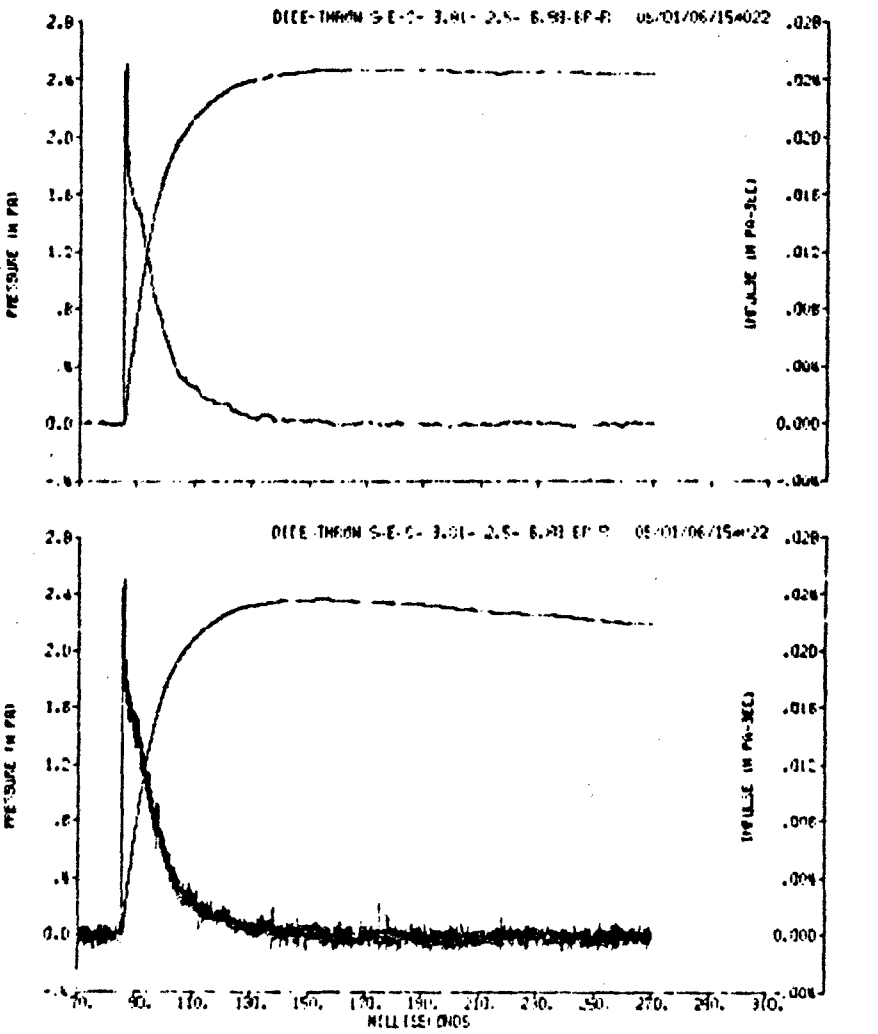

DICE-THROW S-E-C- 3.21- 60.- 0.5 -6P-R 05/01/06/16+017
PRESSURE IN PSI
IMPULSE IN PA-SEC
DICE-THROW S-E-C- 3.21- 60.- 0.5 -6P-R 05/01/06/16+017
PRESSURE IN PSI
IMPULSE IN PA-SEC
MILLISECONDS

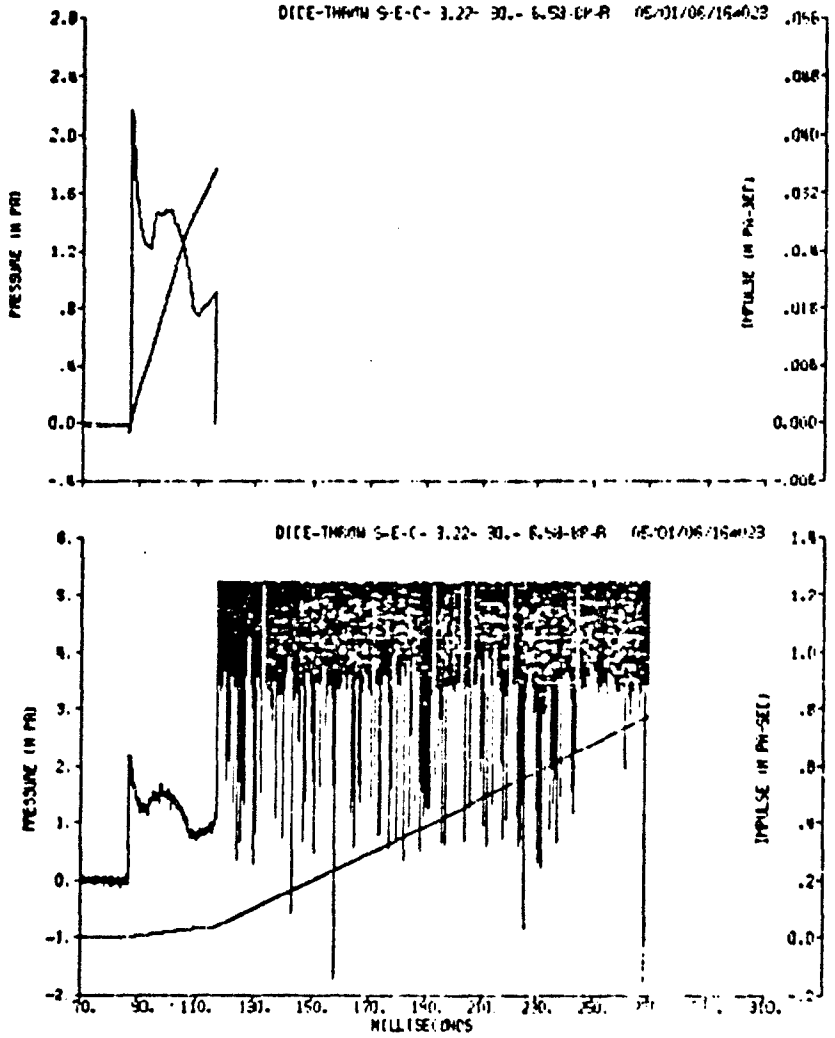

DICE-THROW S-E-C- 3.21- 90.- 0.5 -EP-A 05/01/04/17+018
PRESSURE IN PSI
IMPULSE IN PA-SEC
1.4
1.2
1.0
.8
.6
.4
.2
0.0
-.2
.014
.012
.010
.008
.006
.004
.002
0.000
.002
DICE-THROW S-E-C- 3.21- 90.- 0.5 -EP-A 05/01/04/17+018
PRESSURE IN PSI
IMPULSE IN PA-SEC
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
300.
MILLISECONDS

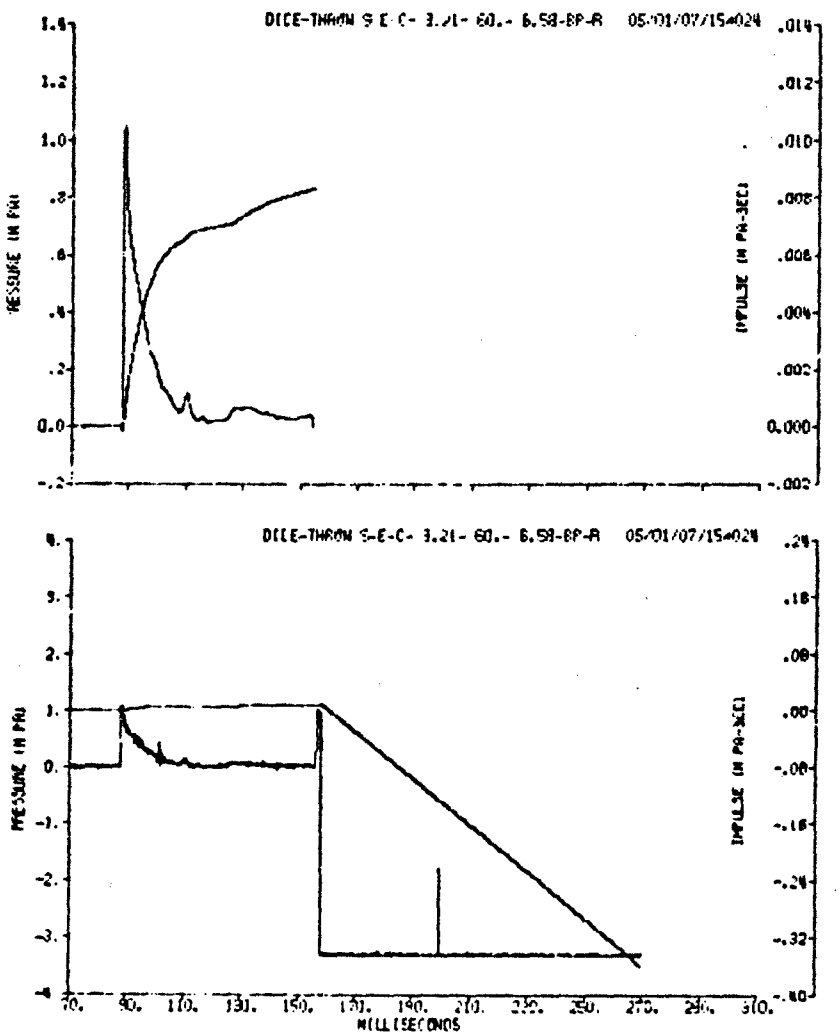

DICE-THROW S-E-C- 3.21-120.- 0.5 -EP-R
PRESSURE (in PSI)
IMPULSE (in PSI-SEC)
DICE-THROW S-E-C- 3.21-120.- 0.5 -EP-R
PRESSURE (in PSI)
IMPULSE (in PSI-SEC)

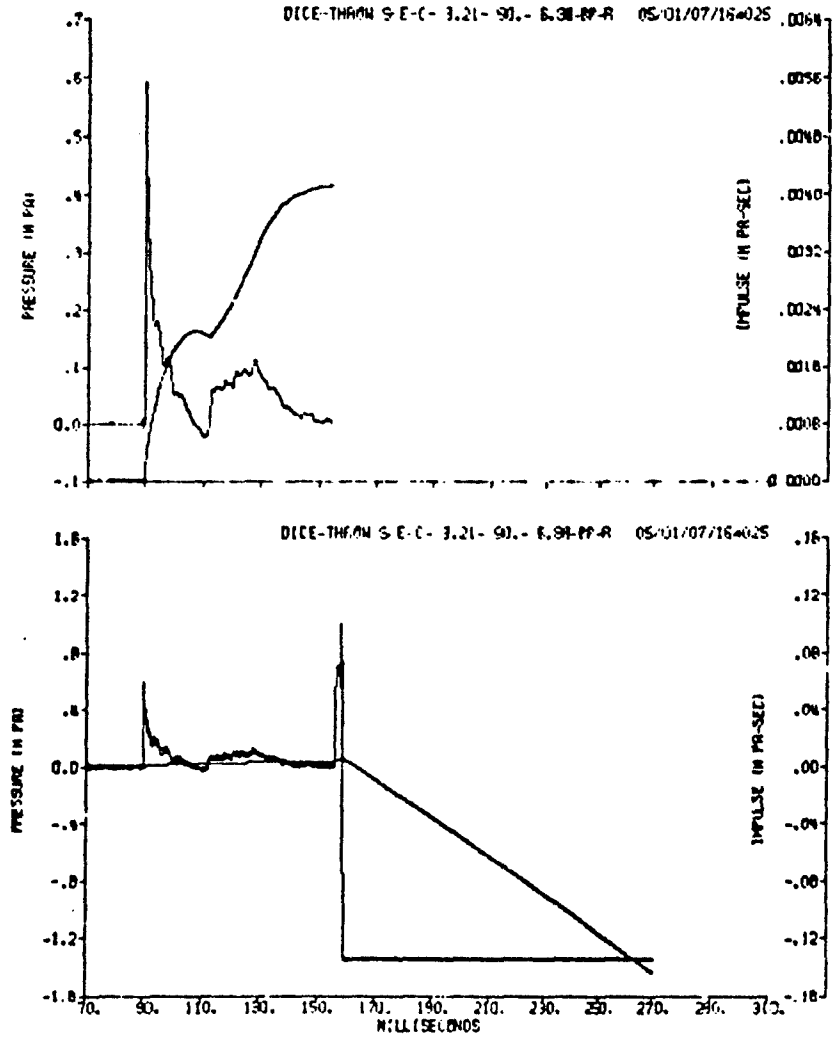

DICE-THROW S-E-C- 3.22-150.- 0.5 -BP-R 05/01/05/16+020
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.20
.16
.12
.08
.04
0.00
-.04
.0012
.0010
.0008
.0006
.0004
.0002
0.0000
-.0002
DICE-THROW S-E-C- 3.22-150.- 0.5 -BP-R 05/01/05/16+020
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.30
.25
.20
.15
.10
.05
0.00
-.05
-.10
.0020
.0016
.0012
.0008
.0004
0.0000
-.0004
50.
110.
150.
210.
250.
270.
310.

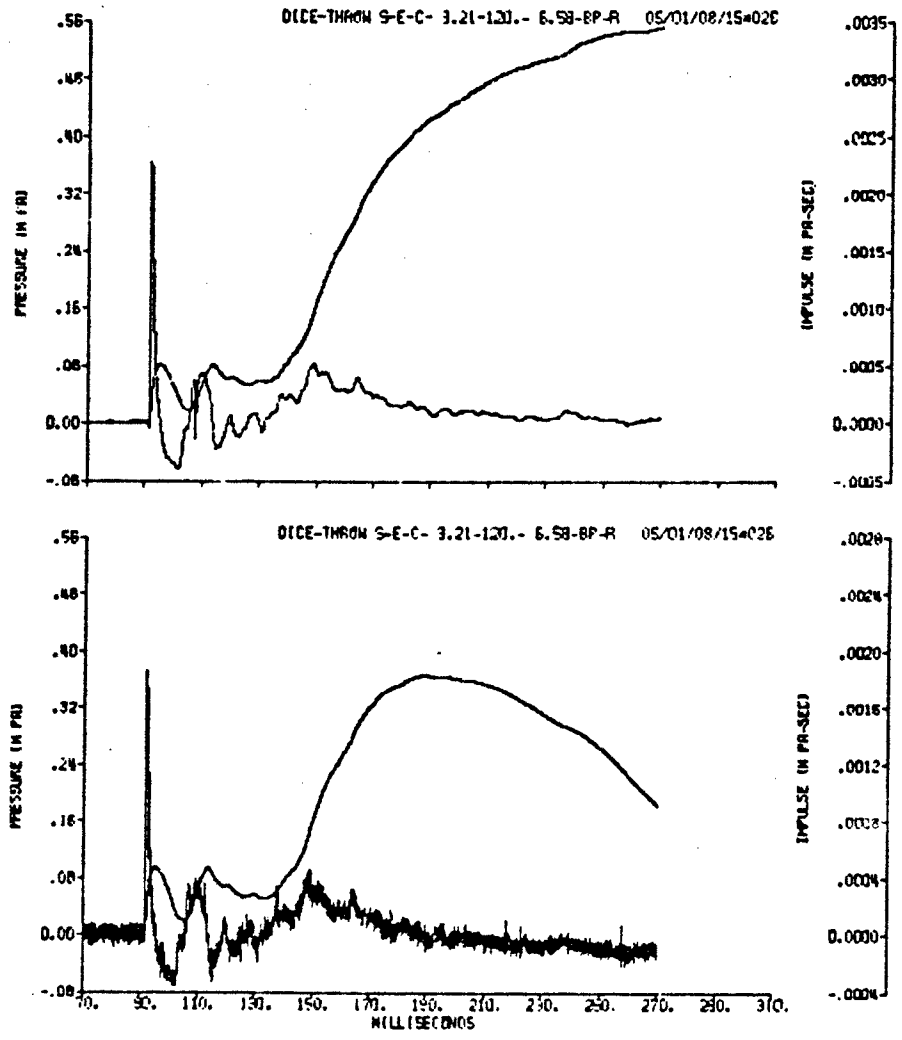

PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
MILLISECONDS

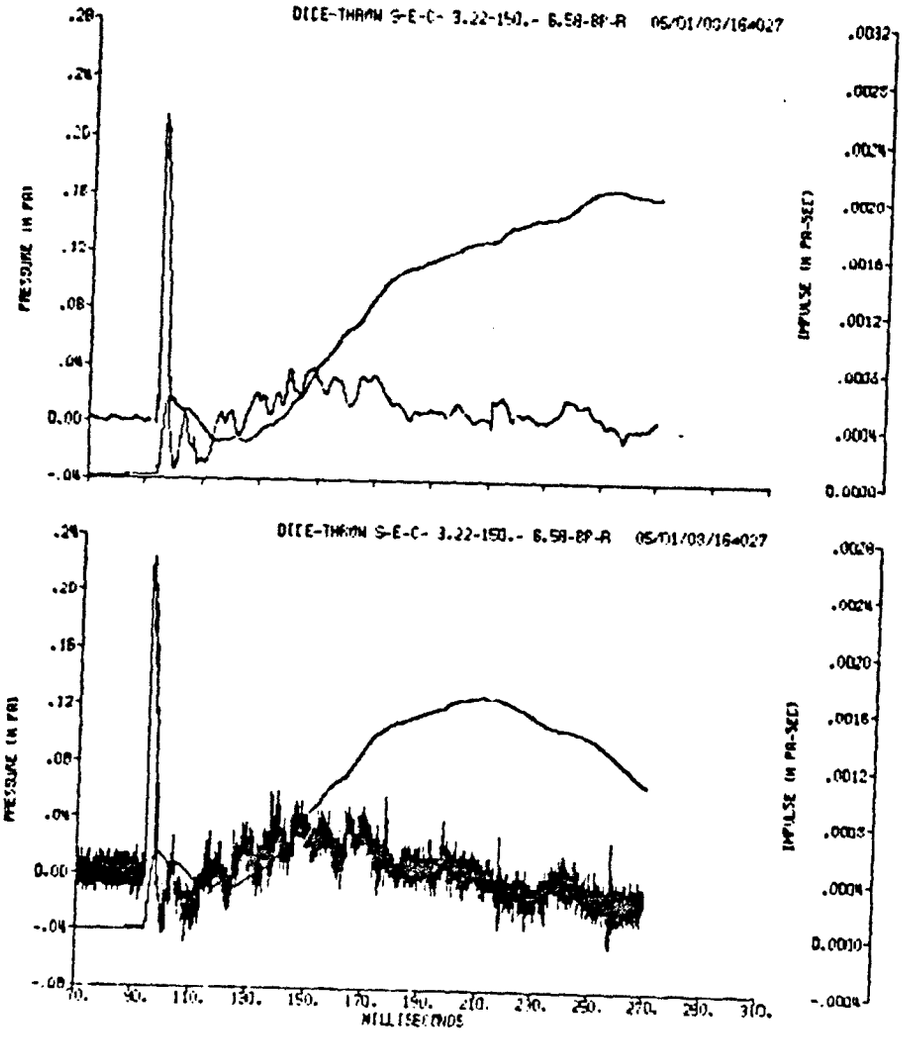

PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

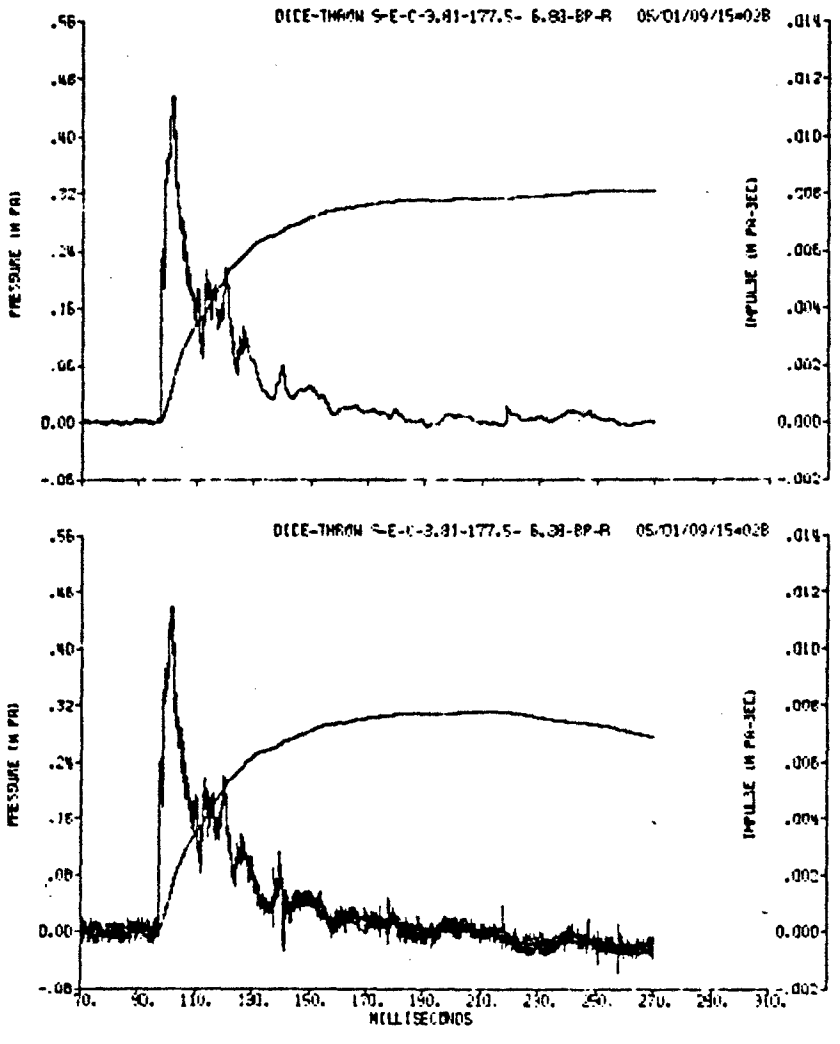

PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
MILLISECONDS

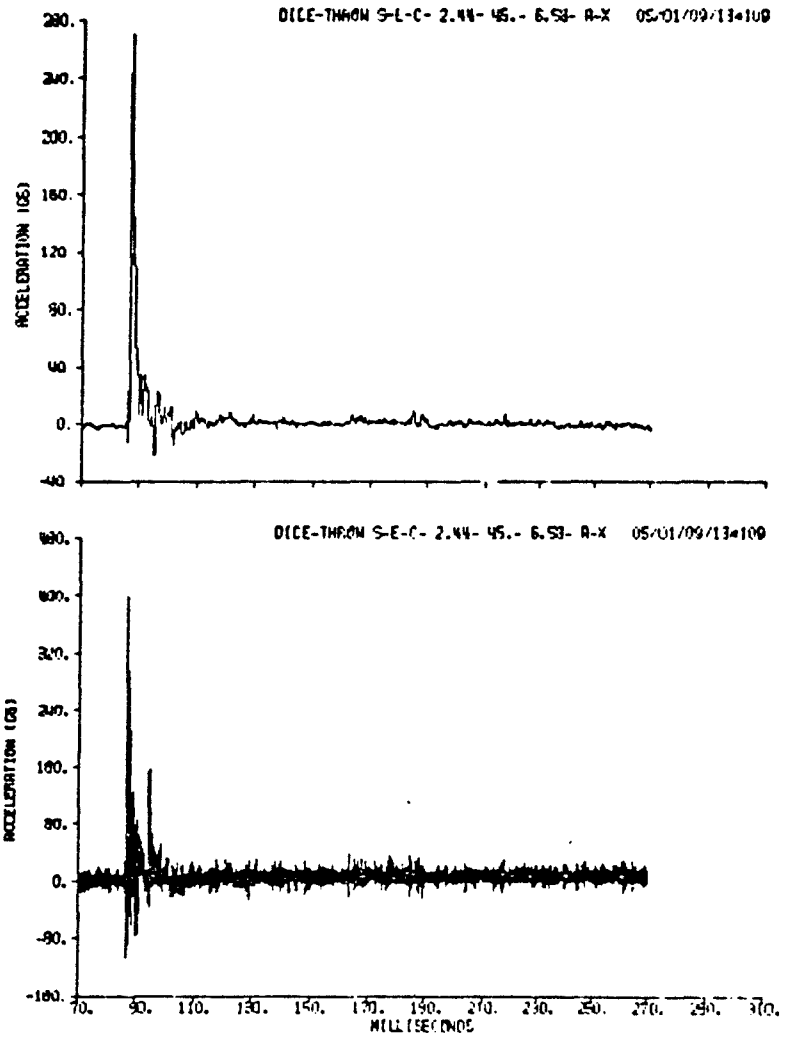

DICE-THROW S-E-C- 3.21- 60.- 6.58-BP-R 05/01/07/15+024
PRESSURE IN PSI
IMPULSE IN PSI-SEC
1.4
1.2
1.0
.8
.6
.4
.2
0.0
-.2
.014
.012
.010
.008
.006
.004
.002
0.000
-.002
DICE-THROW S-E-C- 3.21- 60.- 6.58-BP-R 05/01/07/15+024
PRESSURE IN PSI
IMPULSE IN PSI-SEC
4.
3.
2.
1.
0.
-1.
-2.
-3.
-4
.24
.16
.08
.00
-.08
-.16
-.24
-.32
-.40
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

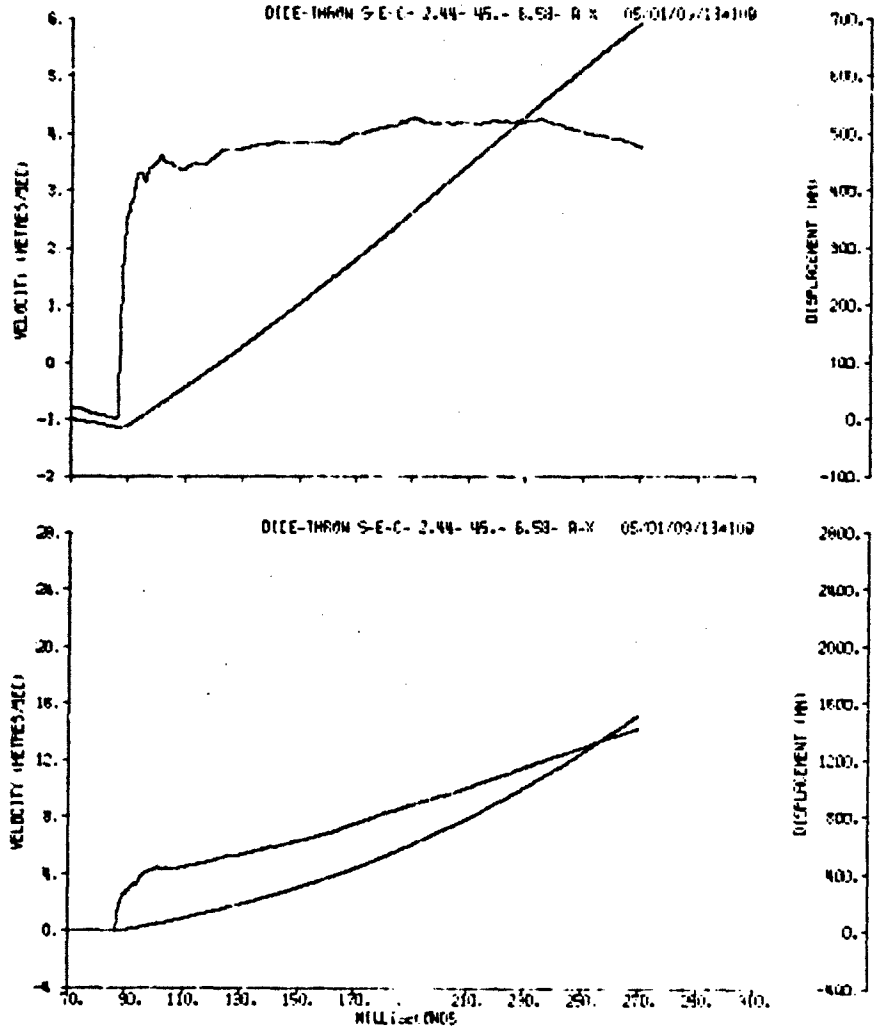

DICE-THROW S E-C- 3.21- 90.- 6.38-PP-R 05/01/07/16+025
PRESSURE IN PSI
IMPULSE IN PA-SEC
.7
.6
.5
.4
.3
.2
.1
0.0
-.1
.0064
.0056
.0048
.0040
.0032
.0024
.0016
.0008
0.0000
DICE-THROW S E-C- 3.21- 90.- 6.98-PP-R 05/01/07/16+025
PRESSURE IN PSI
IMPULSE IN PA-SEC
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
.16
.12
.08
.04
.00
-.04
-.08
-.12
-.16
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

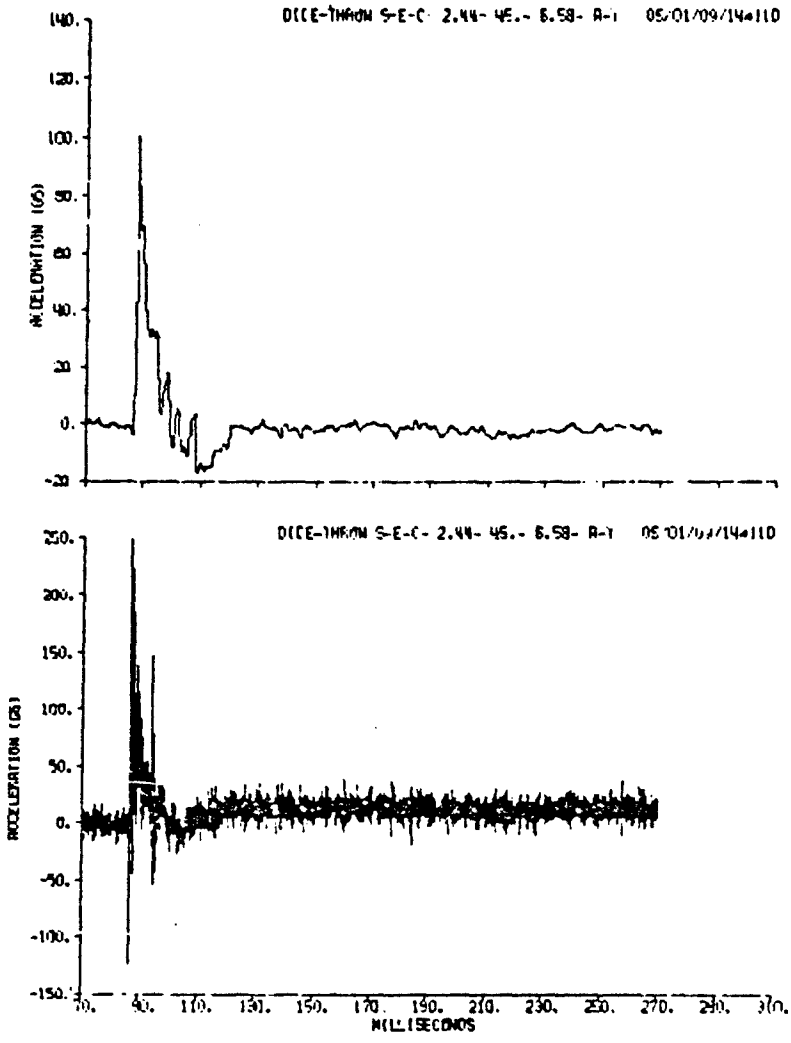

DICE-THROW S-E-C- 3.21-120.- 6.58-BP-R 05/01/08/15=026
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
.56
.48
.40
.32
.24
.16
.08
0.00
-.08
.0035
.0030
.0025
.0020
.0015
.0010
.0005
0.0000
-.0005
DICE-THROW S-E-C- 3.21-120.- 6.58-BP-R 05/01/08/15=026
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
.0028
.0024
.0020
.0016
.0012
.0008
.0004
0.0000
-.0004
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

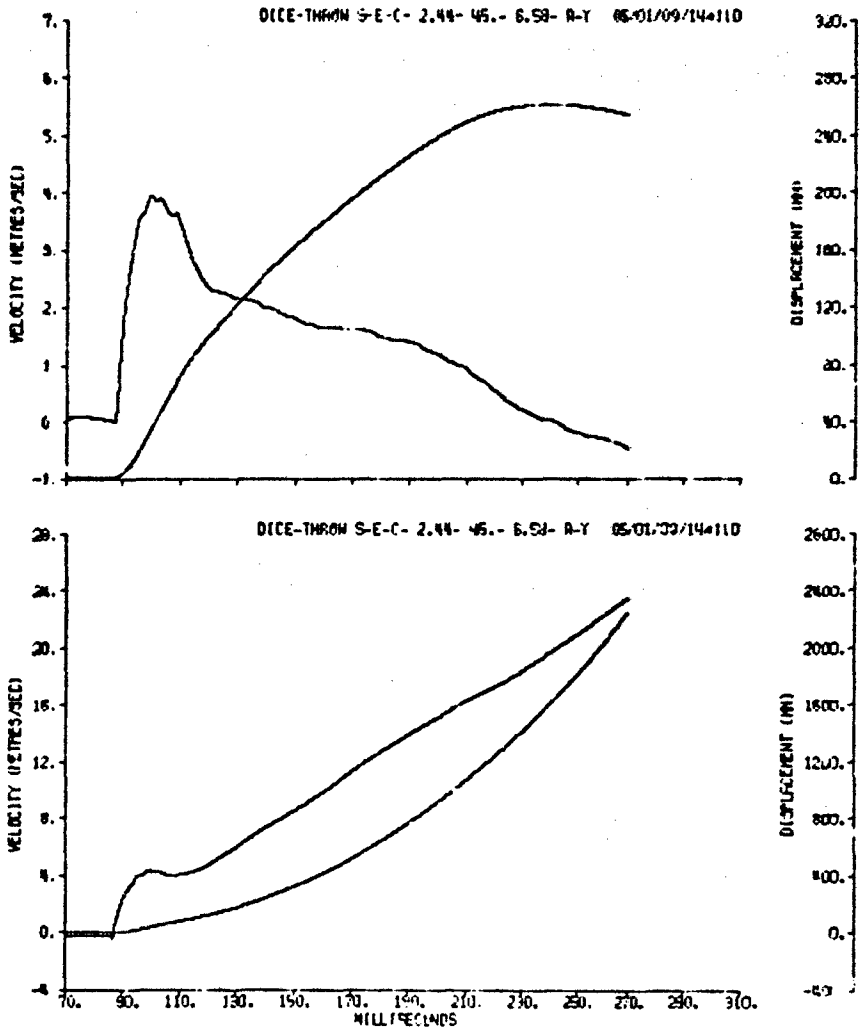

DICE-THROW S-E-C- 3.22-150.- 6.58-BP-R 05/01/03/16+027
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.20
.16
.12
.08
.04
0.00
-.04
.0032
.0028
.0024
.0020
.0016
.0012
.0008
.0004
0.0000
DICE-THROW S-E-C- 3.22-150.- 6.58-BP-R 05/01/03/16+027
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.24
.20
.16
.12
.08
.04
0.00
-.04
-.08
.0028
.0024
.0020
.0016
.0012
.0008
.0004
0.0000
-.0004
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

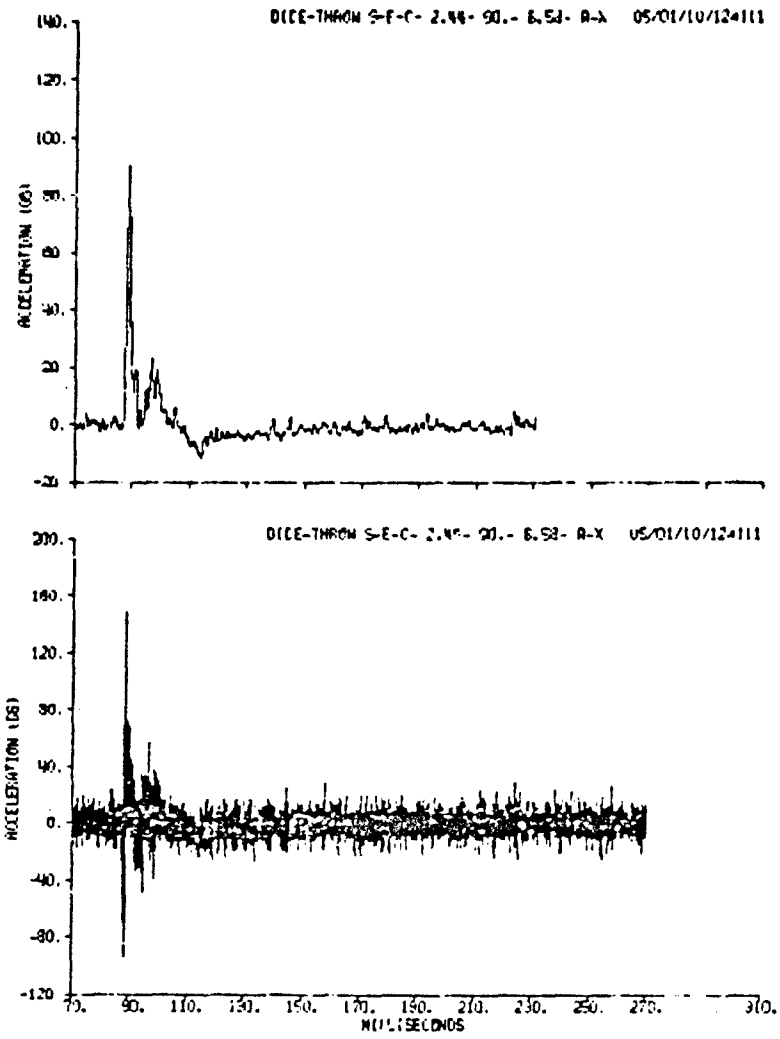

DICE-THROW S-E-C-3.81-177.5- 6.83-BP-R 05/01/09/15=02B
PRESSURE (IN PSI)
IMPULSE (IN PSI-SEC)
.56
.48
.40
.32
.24
.16
.08
0.00
-.08
.014
.012
.010
.008
.006
.004
.002
0.000
-.002
DICE-THROW S-E-C-3.81-177.5- 6.38-BP-R 05/01/09/15=02B
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

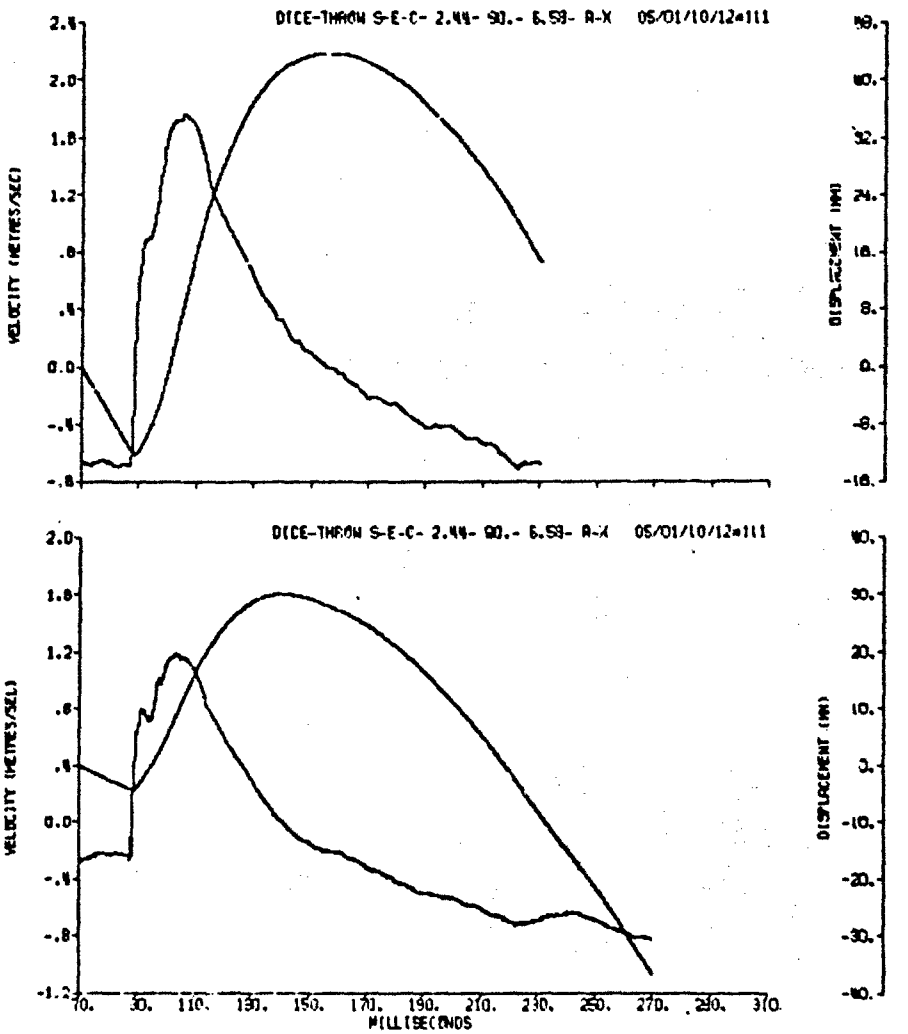

DICE-THROW S-L-C- 2.44- 45.- 6.53- A-X 05/01/09/13+109
ACCELERATION (GS)
280.
240.
200.
160.
120
80.
40
0.
-40
DICE-THROW S-E-C- 2.44- 45.- 6.53- A-X 05/01/09/13+109
ACCELERATION (GS)
400.
320.
240.
160.
80.
0.
-80.
-160.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

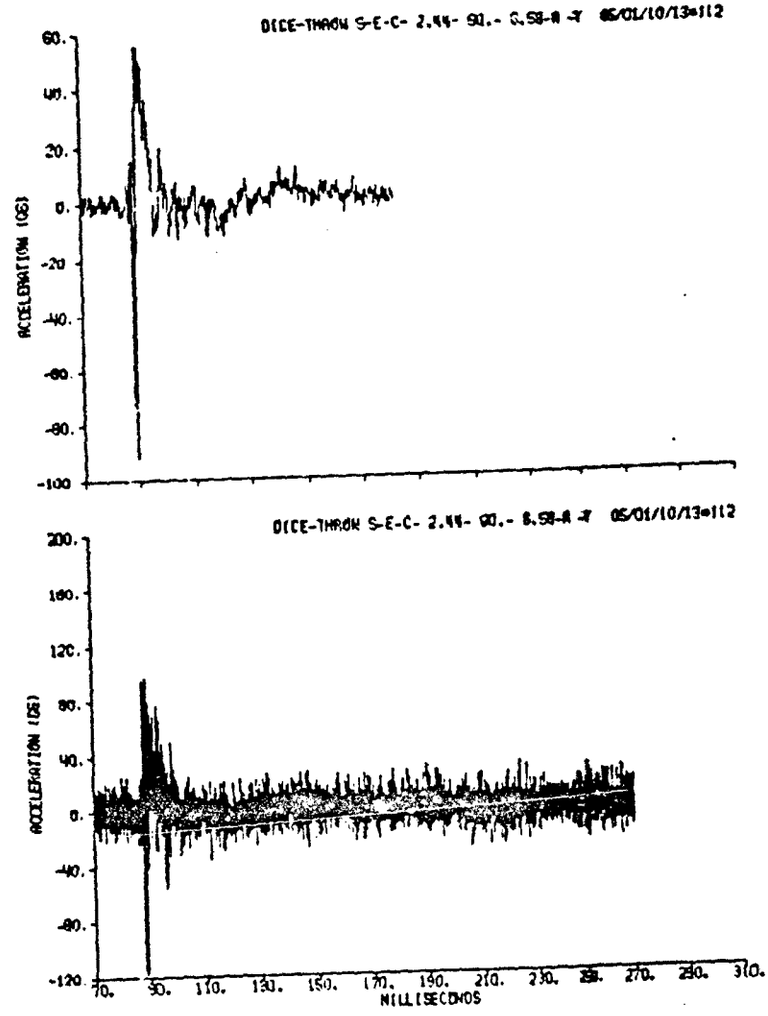

DICE-THROW S-E-C- 2.44- 45.- 6.58- R-X 05/01/09/13+109
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
6.
5.
4.
3.
2.
1.
0
-1.
-2
700.
600.
500.
400.
300.
200.
100.
0.
-100.
DICE-THROW S-E-C- 2.44- 45.- 6.58- R-X 05/01/09/13+109
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
20.
16.
12.
8.
4.
0.
-4
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
70.
90.
110.
130.
150.
170.
210.
230.
250.
270.
290.
310.

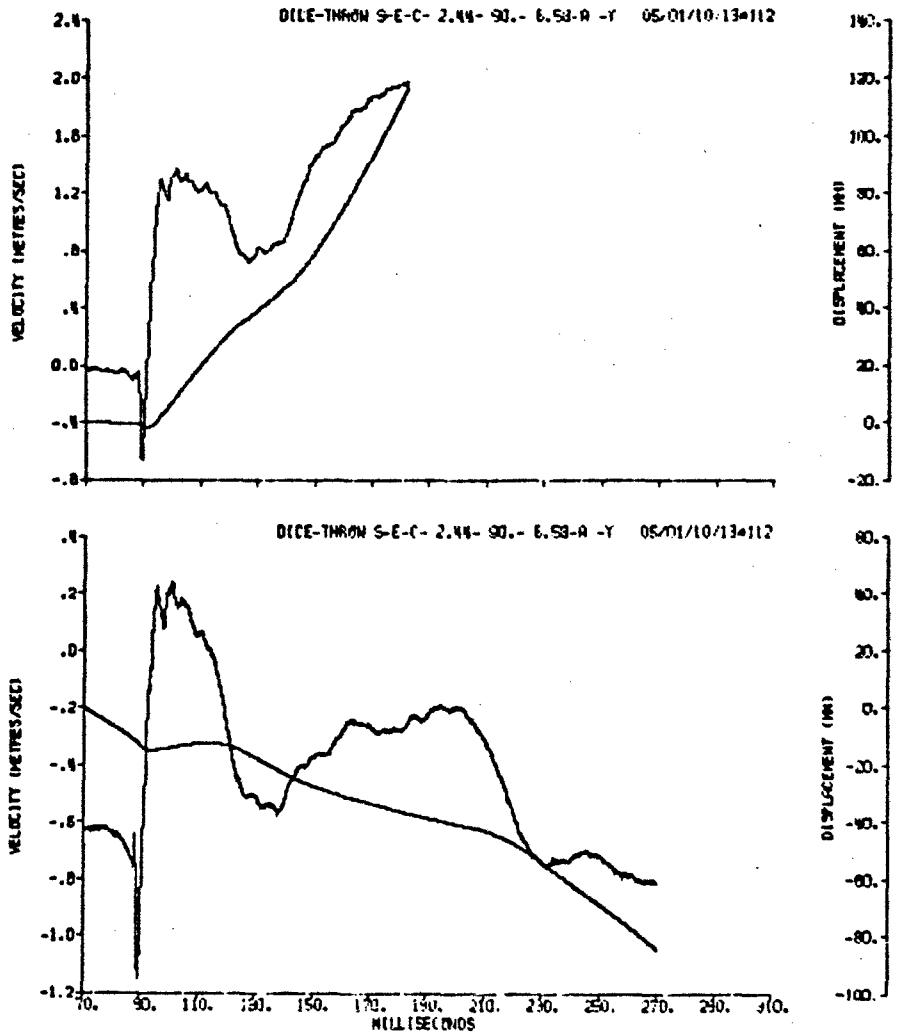

DICE-THROW S-E-C 2.44- 45.- 6.58- R-1 05/01/09/14+110
ACCELERATION (GS)
140.
120.
100.
80.
60.
40.
20.
0.
-20
DICE-THROW S-E-C- 2.44- 45.- 6.58- R-1 05/01/09/14+110
ACCELERATION (GS)
250.
200.
150.
100.
50.
0.
-50.
-100.
-150.
30.
50.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

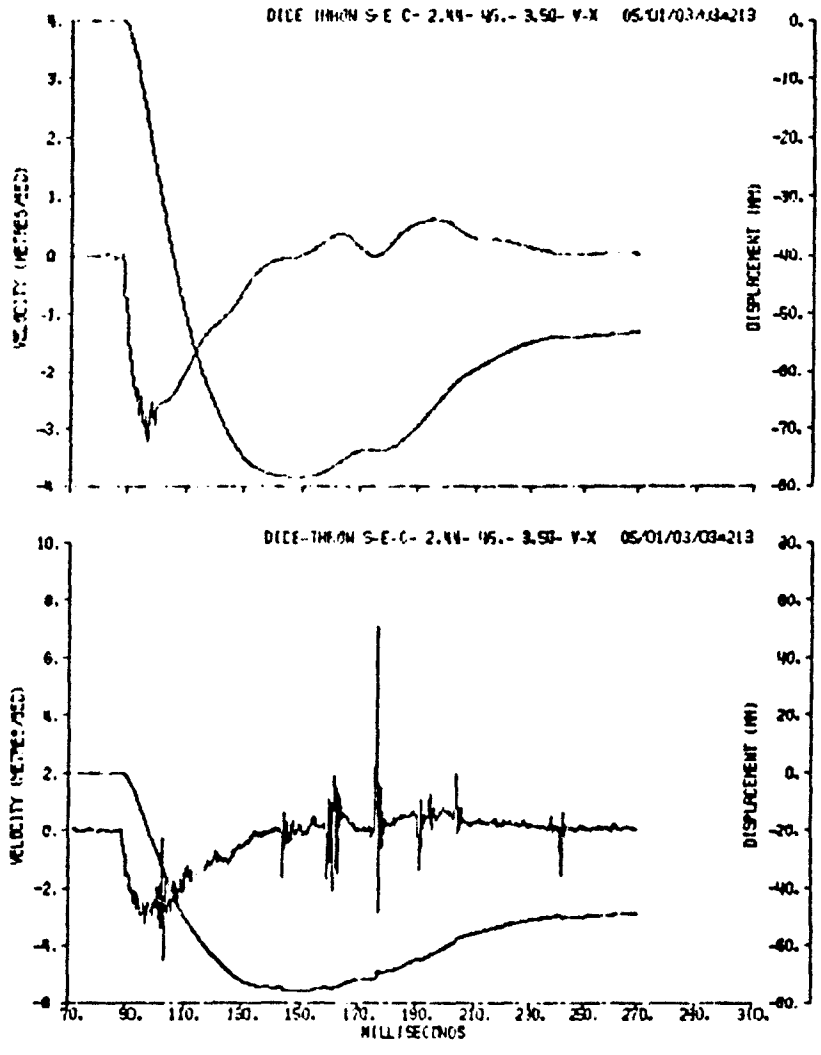

DICE-THROW S-E-C- 2.44- 45.- 6.58- A-Y 05/01/09/14+11.0
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44- 45.- 6.58- A-Y 05/01/09/14+11.0
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

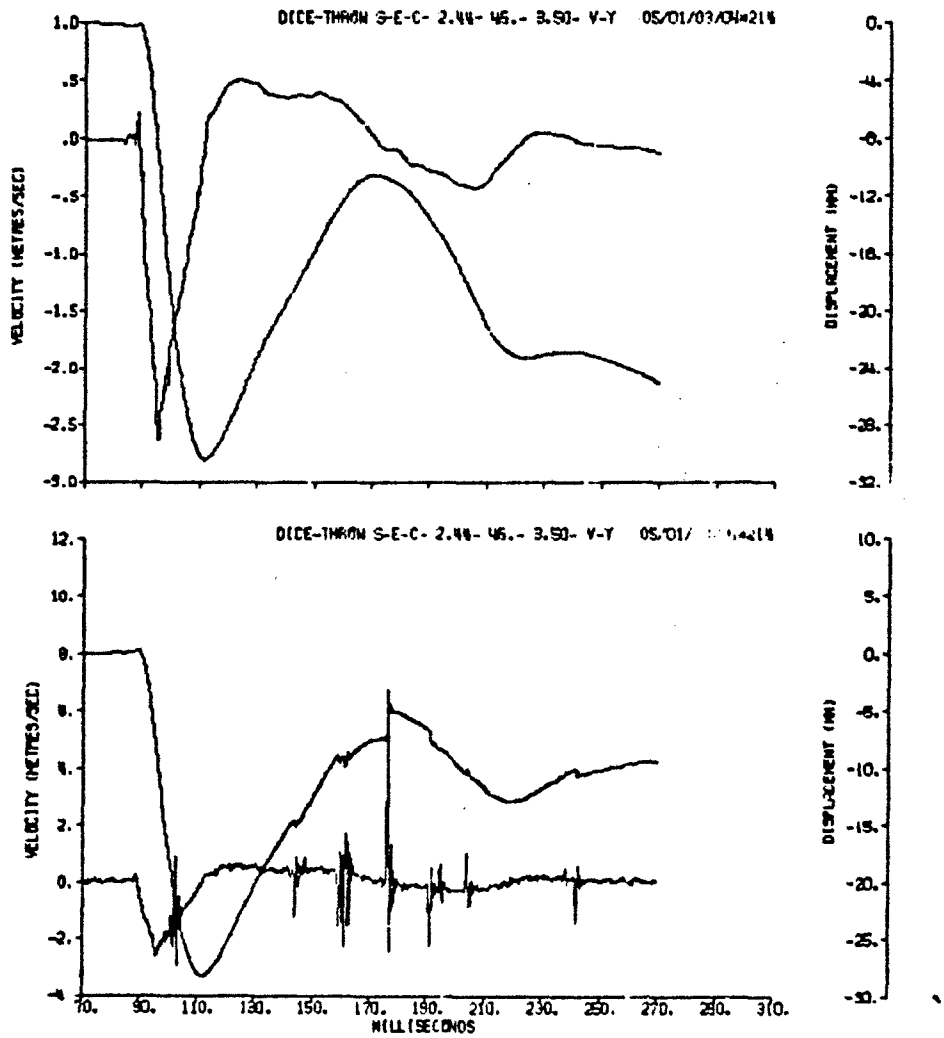

DICE-THROW S-E-C- 2.66- 90.- 6.5d- A-X 05/01/10/12+111
ACCELERATION (G)
140.
120.
100.
80.
60.
40.
20.
0.
-20
DICE-THROW S-E-C- 2.66- 90.- 6.5d- A-X 05/01/10/12+111
ACCELERATION (G)
200.
160.
120.
80.
40.
0.
-40.
-80.
-120
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
310.
MILLISECONDS

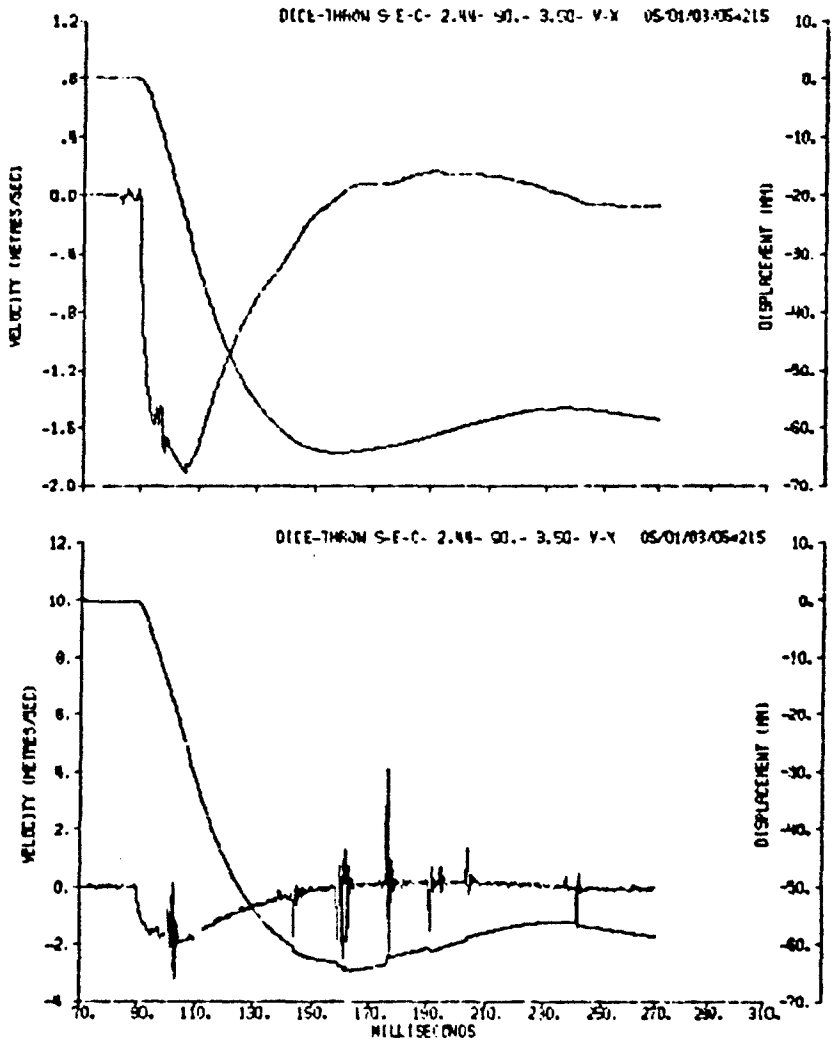

DICE-THROW S-E-C- 2.44- 90.- 6.58- A-X 05/01/10/12=111
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.4
2.0
1.8
1.2
.8
.4
0.0
-.4
-.8
48.
40.
32.
24.
16.
8.
0.
-8.
-16.
DICE-THROW S-E-C- 2.44- 90.- 6.58- A-X 05/01/10/12=111
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.0
1.8
1.2
.8
.4
0.0
-.4
-.8
-1.2
40.
30.
20.
10.
0.
-10.
-20.
-30.
-40.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

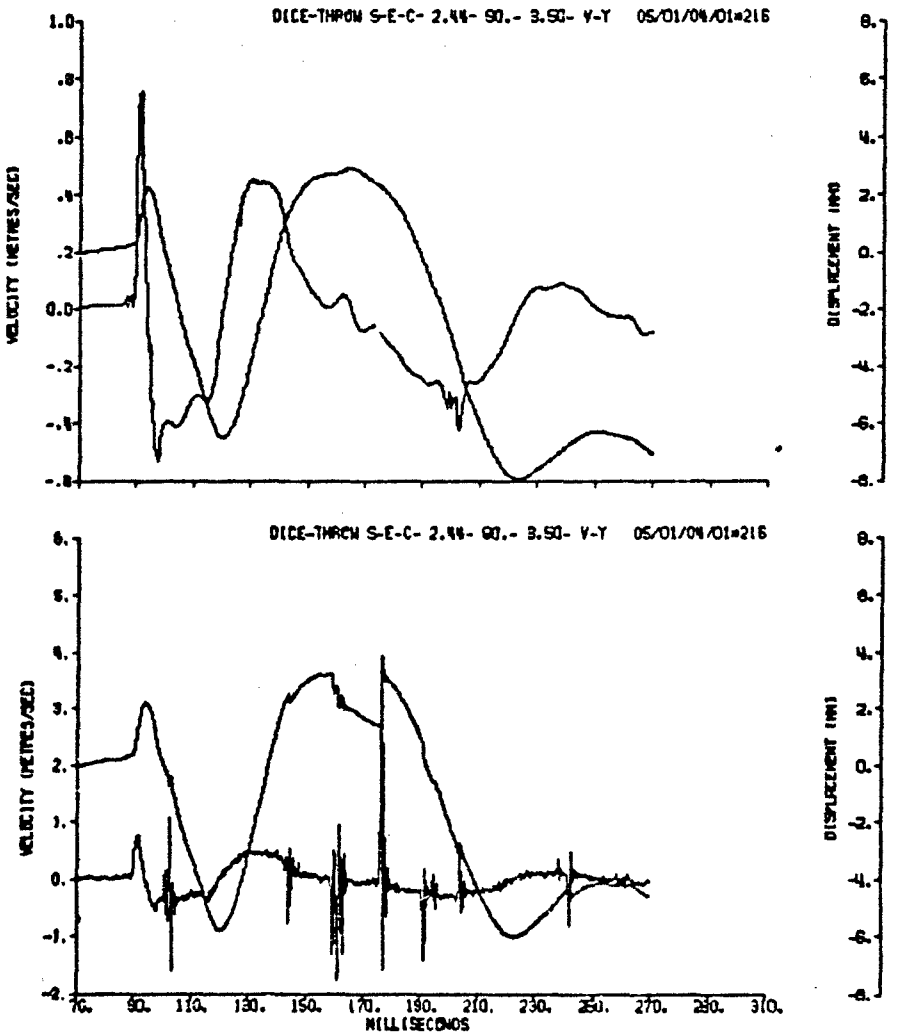

DICE-THROW S-E-C- 2.##- 90.- 8.58-A -Y 05/01/10/13=112
60.
40.
20.
0.
-20.
-40.
-60.
-80.
-100
ACCELERATION (GS)
DICE-THROW S-E-C- 2.##- 90.- 8.58-A -Y 05/01/10/13=112
200.
160.
120.
80.
40.
0.
-40.
-80.
-120.
ACCELERATION (GS)
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

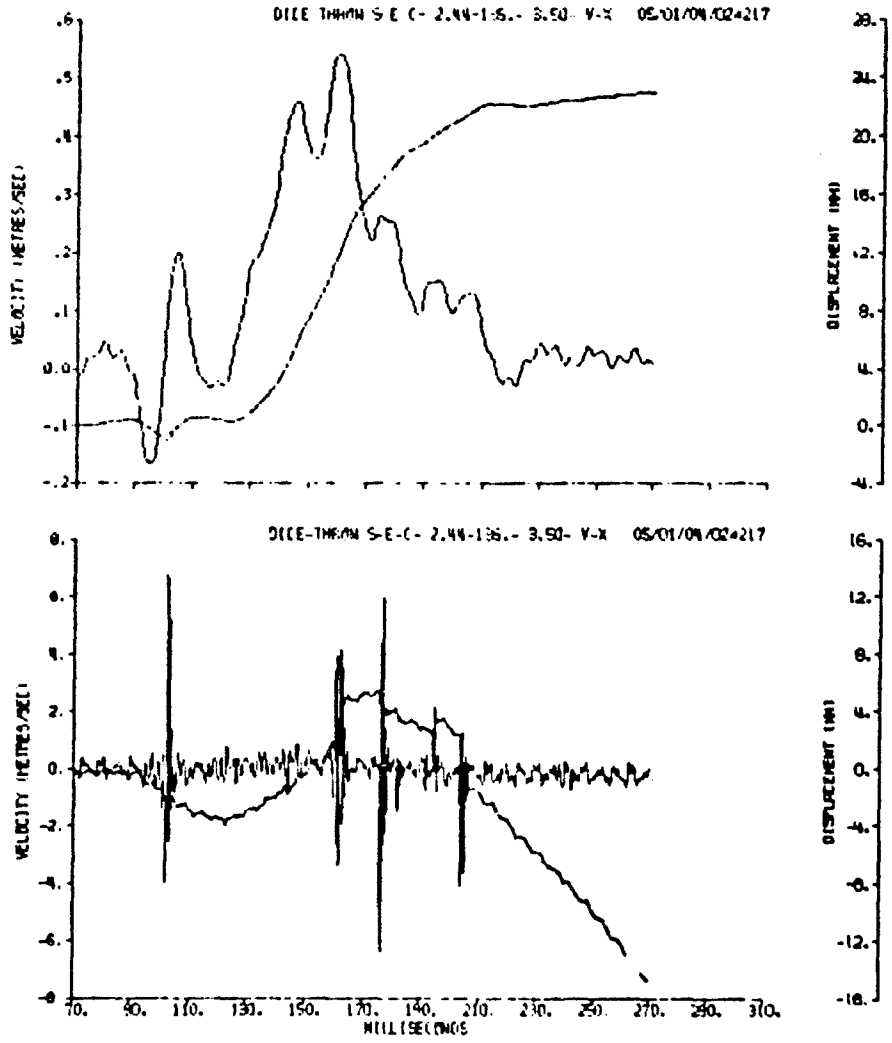

DICE-THROW S-E-C- 2.44- 90.- 6.58-A -Y 05/01/10/13+112
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
-.8
160.
120.
100.
80.
60.
40.
20.
0.
-20.
DICE-THROW S-E-C- 2.44- 90.- 6.58-A -Y 05/01/10/13+112
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.6
.4
.2
.0
-.2
-.4
-.6
-.8
-1.0
-1.2
80.
60.
40.
20.
0.
-20.
-40.
-60.
-80.
-100.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

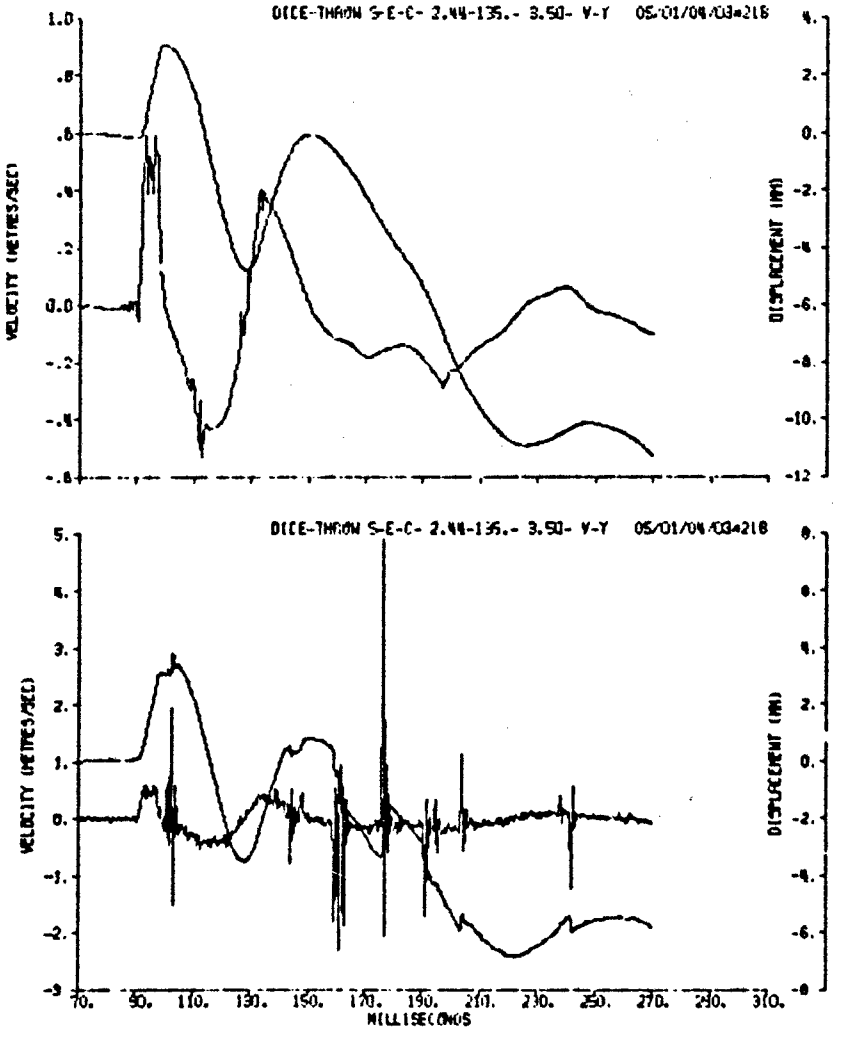

DISPLACEMENT (MM)
MILLISECONDS

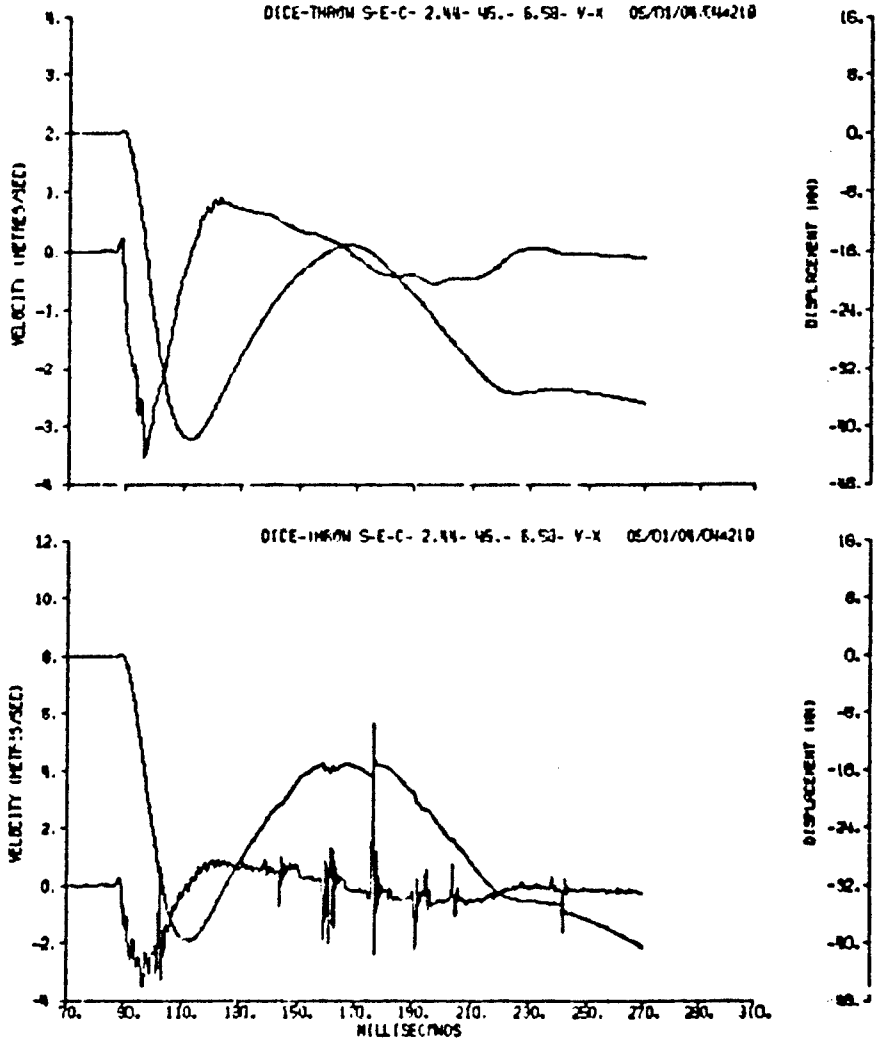

DICE-THROW S-E-C- 2.44- 45.- 3.50- V-Y 05/01/03/04=21%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.0
.5
.0
-.5
-1.0
-1.5
-2.0
-2.5
-3.0
0.
-4.
-8.
-12.
-16.
-20.
-24.
-28.
-32.
DICE-THROW S-E-C- 2.44- 45.- 3.50- V-Y 05/01/
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
12.
10.
8.
6.
4.
2.
0.
-2.
-4.
10.
5.
0.
-5.
-10.
-15.
-20.
-25.
-30.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

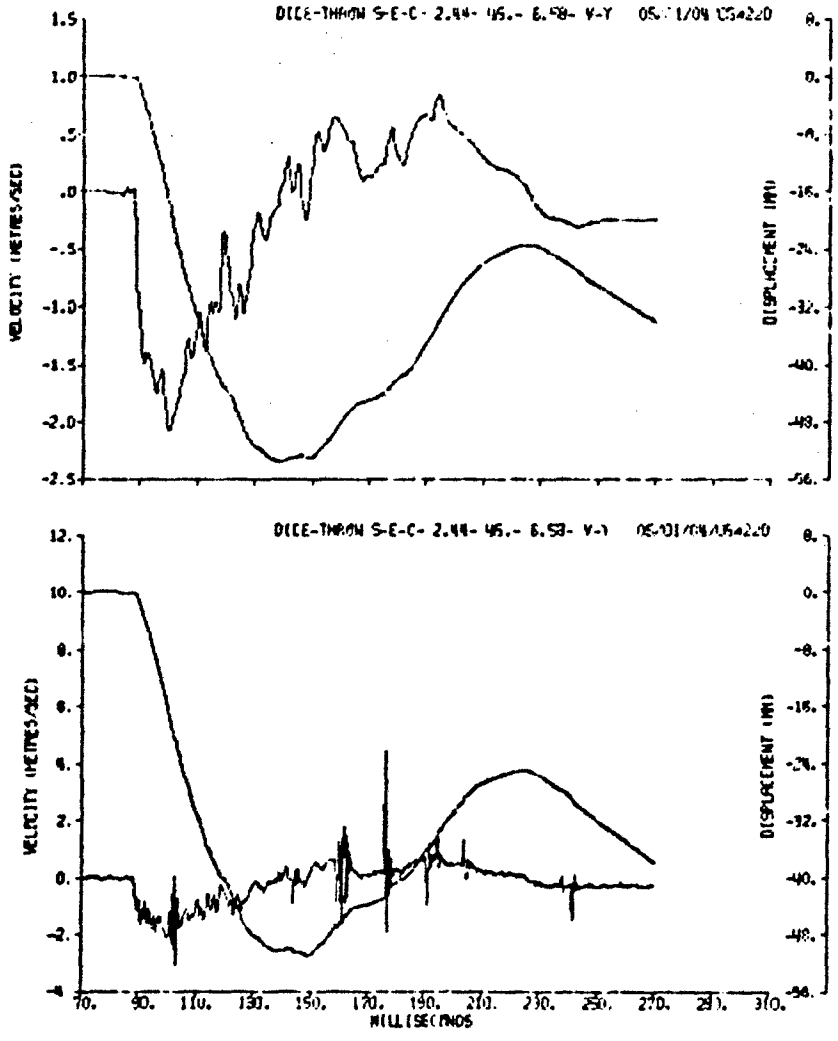

DIXIE-THROW S-E-C- 2.44- 90.- 3.50- V-X 05/01/03/05+215
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
-2.0
10.
0.
-10.
-20.
-30.
-40.
-50.
-60.
-70.
DIXIE-THROW S-E-C- 2.44- 90.- 3.50- V-X 05/01/03/05+215
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
12.
10.
8.
6.
4.
2.
0.
-2.
-4
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

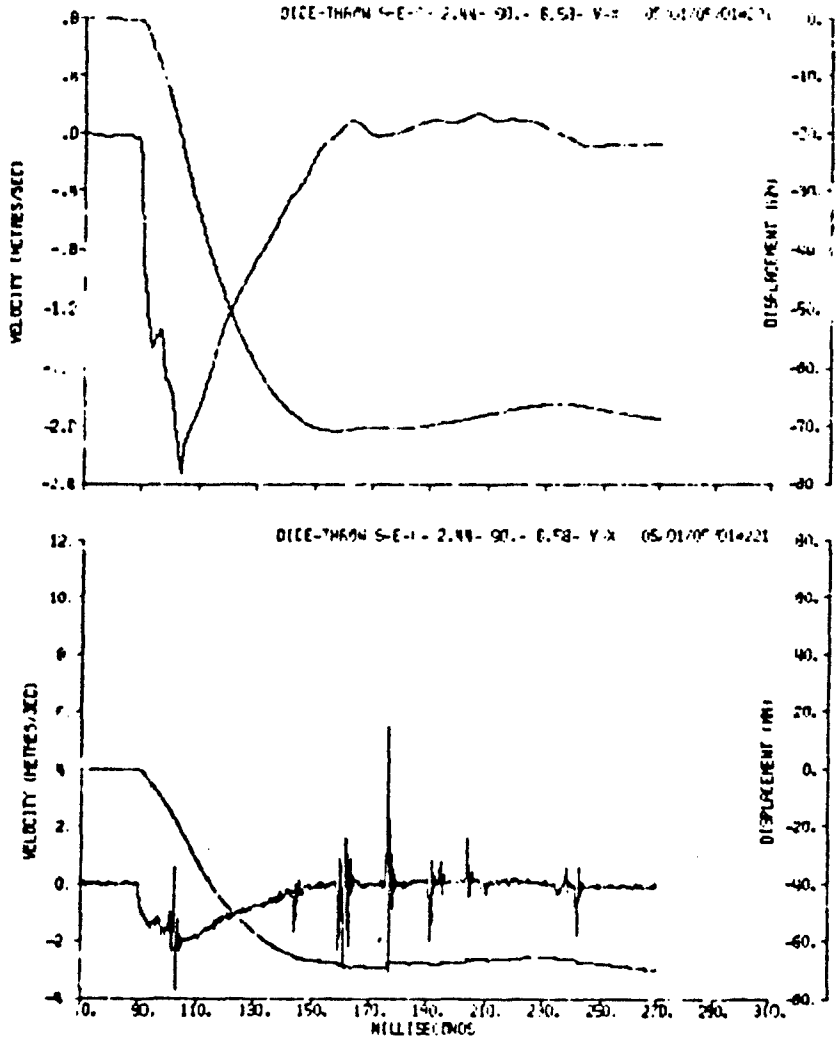

DICE-THROW S-E-C- 2.4%- 90.- 3.5Ω- V-Y 05/01/0%/01=216
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.0
.8
.6
.4
.2
0.0
-.2
-.4
-.6
-.8
8.
6.
4.
2.
0.
-2.
-4.
-6.
-8.
DICE-THROW S-E-C- 2.4%- 90.- 3.5Ω- V-Y 05/01/0%/01=216
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
6.
5.
4.
3.
2.
1.
0.
-1.
-2.
8.
6.
4.
2.
0.
-2.
-4.
-6.
-8.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

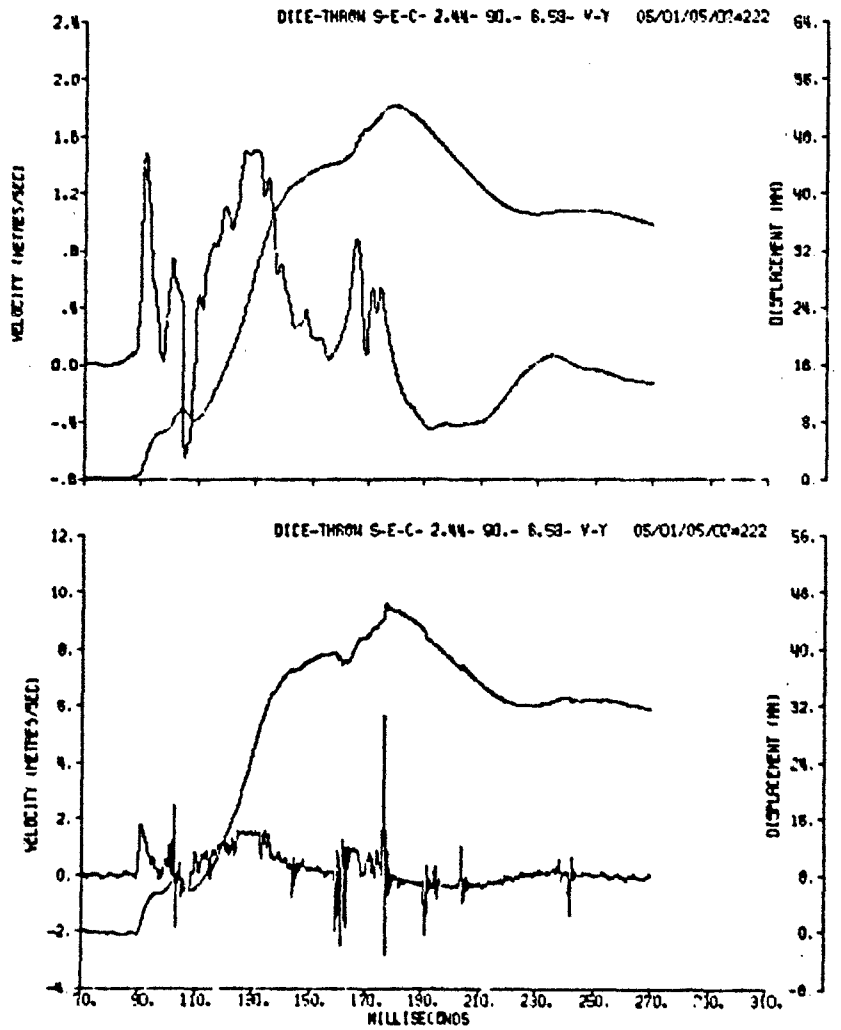

DICE THROW S-E (- 2.44-135.- 3.50- V-X 05/01/09/02+217
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-(- 2.44-135.- 3.50- V-X 05/01/09/02+217
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

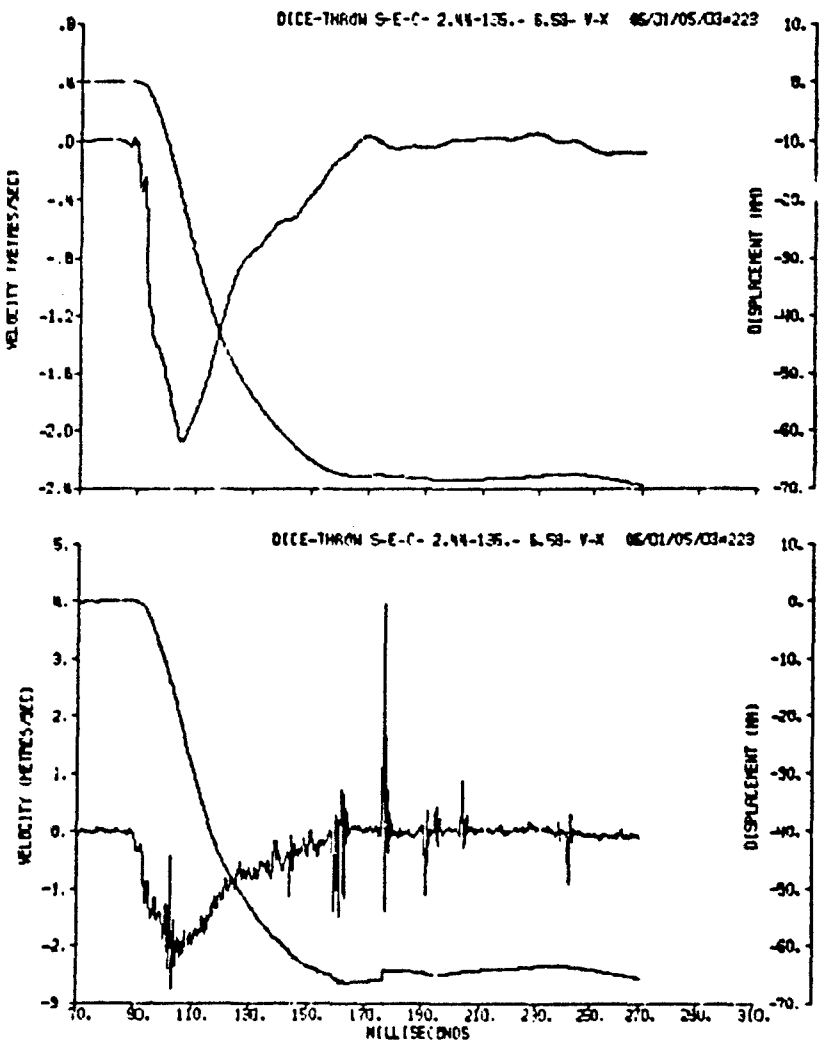

DICE-THROW S-E-C- 2.44-135.- 3.50- V-Y 05/01/04/03=218
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.0
.8
.6
.4
.2
0.0
-.2
-.4
-.6
4.
2.
0.
-2.
-4.
-6.
-8.
-10.
-12
DICE-THROW S-E-C- 2.44-135.- 3.50- V-Y 05/01/04/03=218
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
5.
4.
3.
2.
1.
0.
-1.
-2.
-3
8.
6.
4.
2.
0.
-2.
-4.
-6.
-8
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

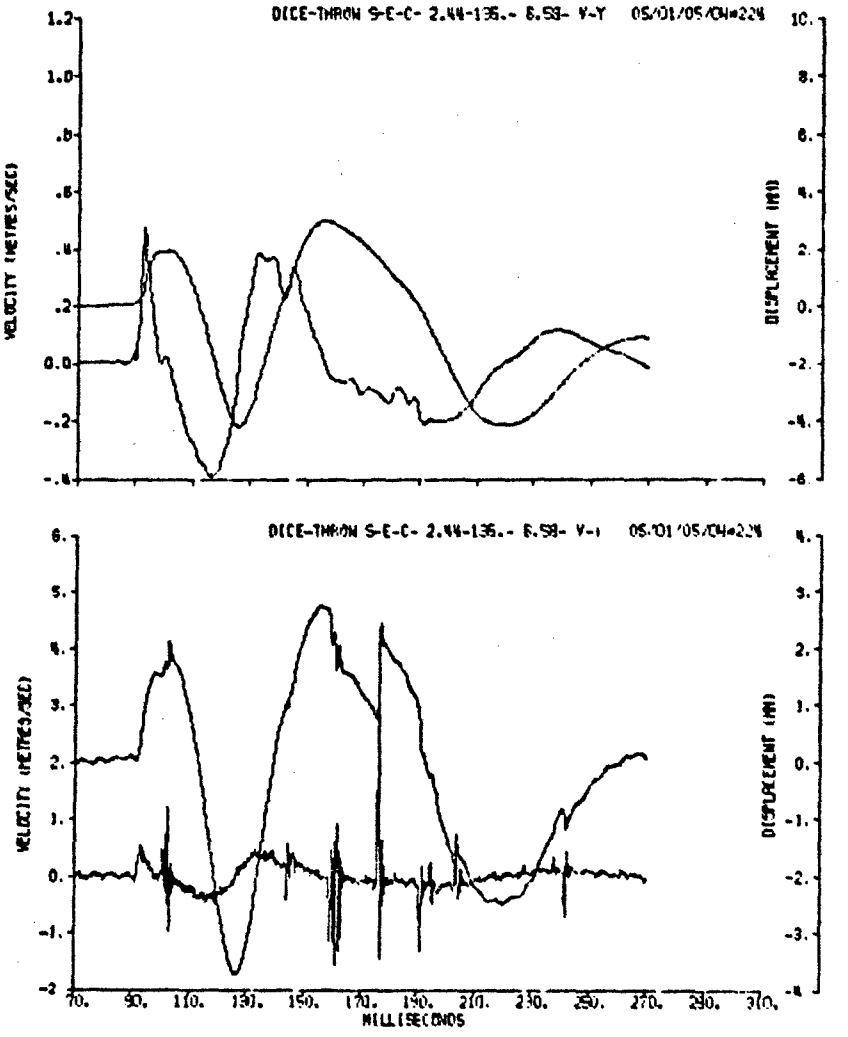

DICE-THROW S-E-C- 2.44- 45.- 6.58- V-X 05/01/06/044210
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44- 45.- 6.58- V-X 05/01/06/044210
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

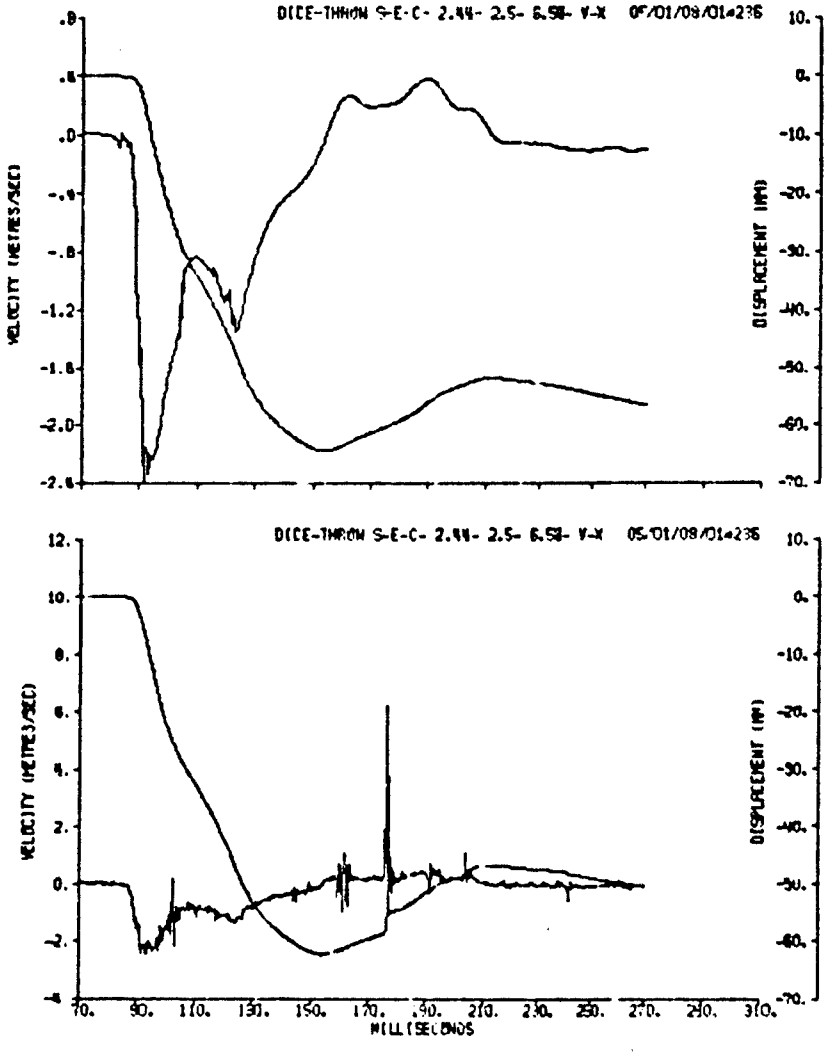

DICE-THROW S-E-C- 2.44- 45.- 6.58- V-Y
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44- 45.- 6.58- V-Y
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

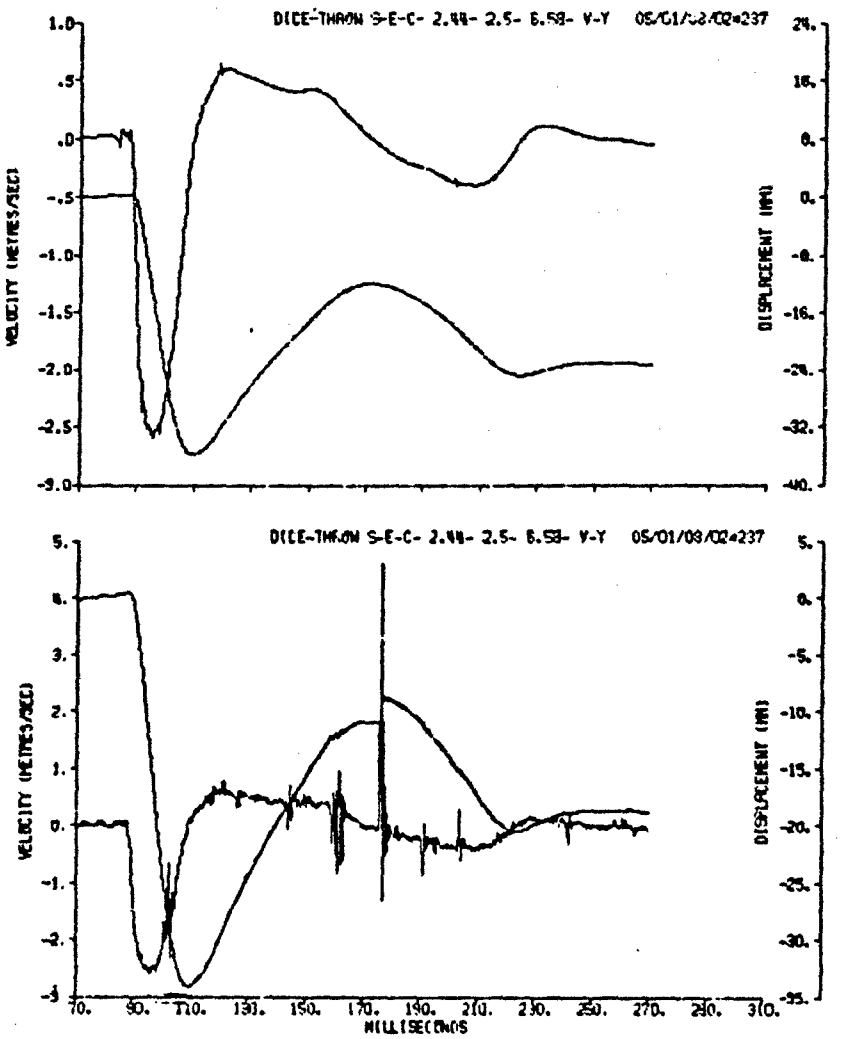

VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

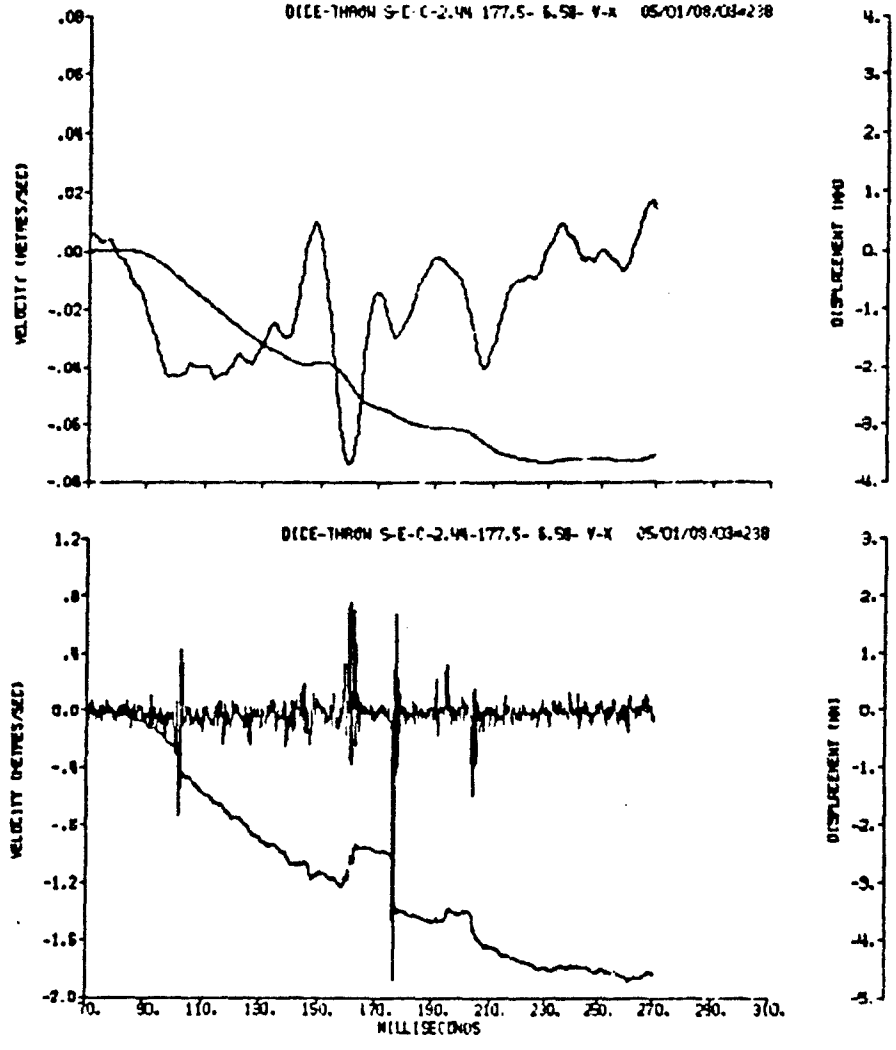

DICE-THROW S-E-C- 2.4%- 90.- 6.5%- V-Y 05/01/05/00=222
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.4%- 90.- 6.5%- V-Y 05/01/05/00=222
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

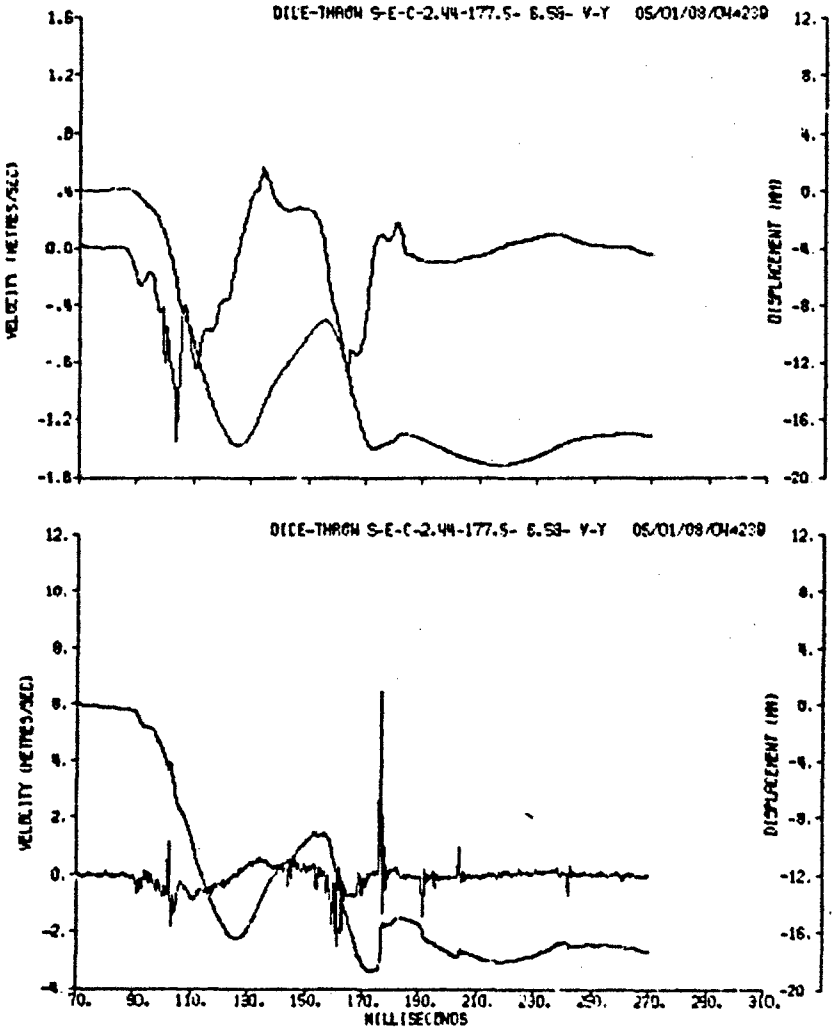

DICE-THROW S-E-C- 2.44-135.- 6.58- V-X 06/01/05/03=223
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44-135.- 6.58- V-X 06/01/05/03=223
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

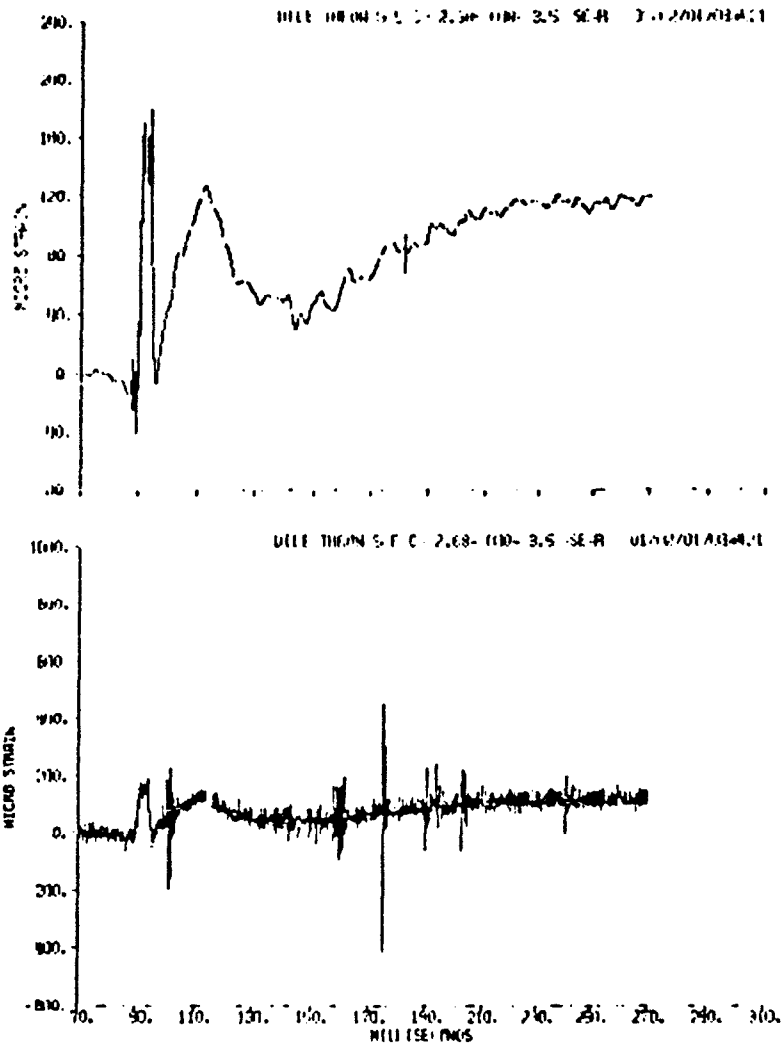

DICE-THROW S-E-C- 2.44-136.- 6.58- V-Y 05/01/05/CH=224
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44-136.- 6.58- V-
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

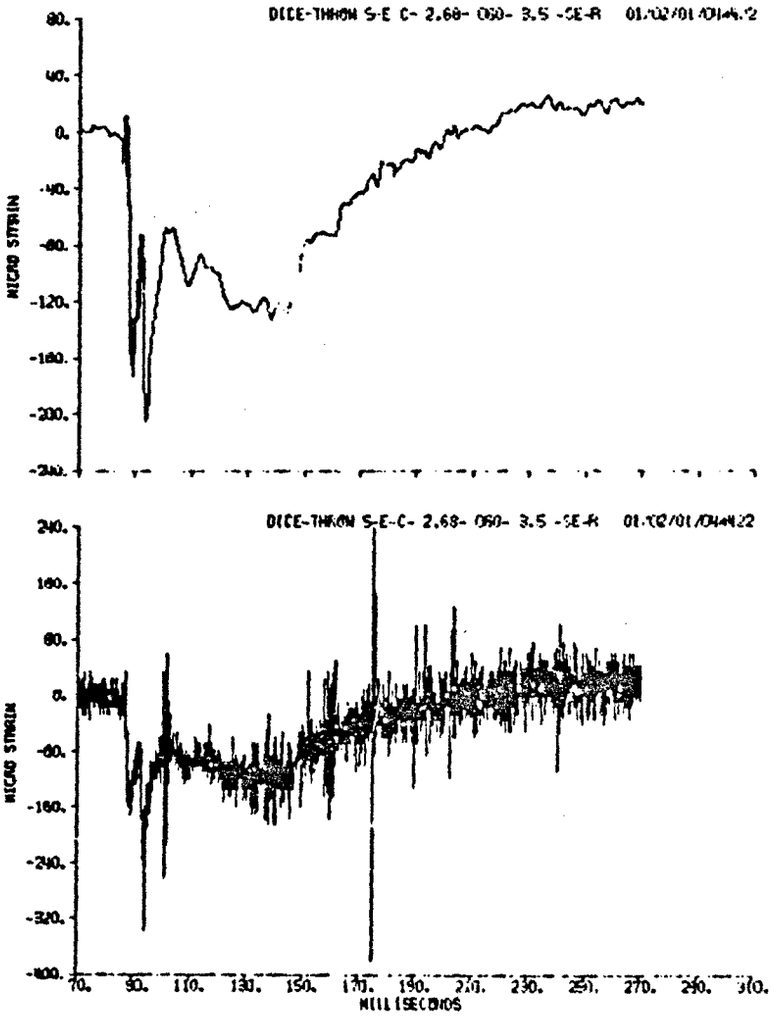

DICE-THROW S-E-C- 2.44- 2.5- 6.58- V-X 05/01/09/01=236
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-C- 2.44- 2.5- 6.58- V-X 05/01/09/01=236
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

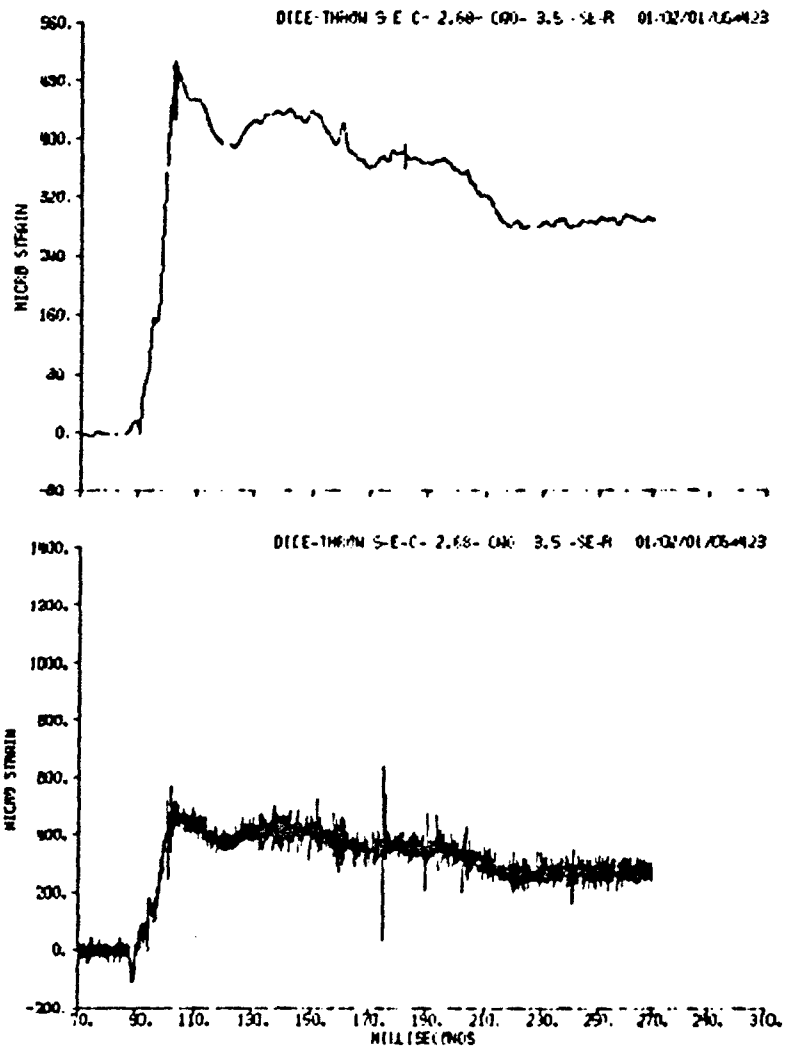

DICE-THROW S-E-C- 2.44- 2.5- 8.58- V-Y 05/01/08/02=237
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.0
.5
0.0
-.5
-1.0
-1.5
-2.0
-2.5
-3.0
24.
16.
8.
0.
-8.
-16.
-24.
-32.
-40.
DICE-THROW S-E-C- 2.44- 2.5- 8.58- V-Y 05/01/08/02=237
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
5.
4.
3.
2.
1.
0.
-1.
-2.
-3.
5.
0.
-5.
-10.
-15.
-20.
-25.
-30.
-35.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

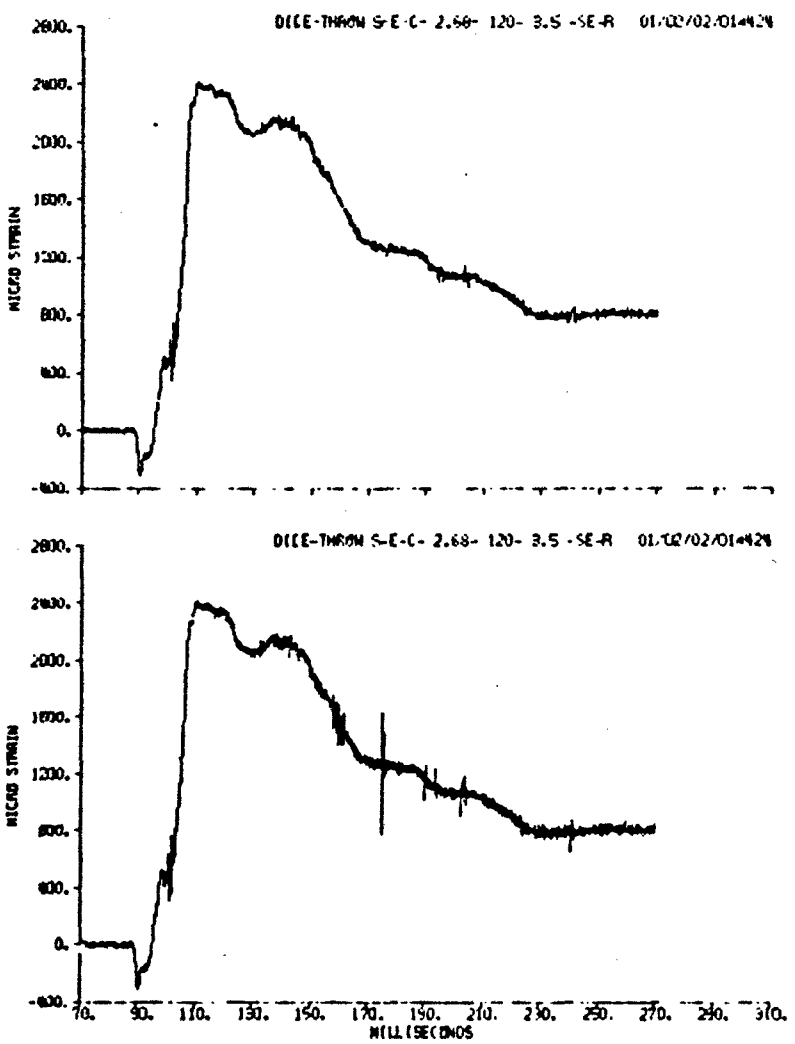

DICE-THROW S-E-C-2.4N-177.5- 6.5B- V-X 05/01/08/03=238
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.08
.06
.04
.02
.00
-.02
-.04
-.06
-.08
4.
3.
2.
1.
0.
-1.
-2.
-3.
-4.
DICE-THROW S-E-C-2.4N-177.5- 6.5B- V-X 05/01/08/03=238
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
-2.0
3.
2.
1.
0.
-1.
-2.
-3.
-4.
-5.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

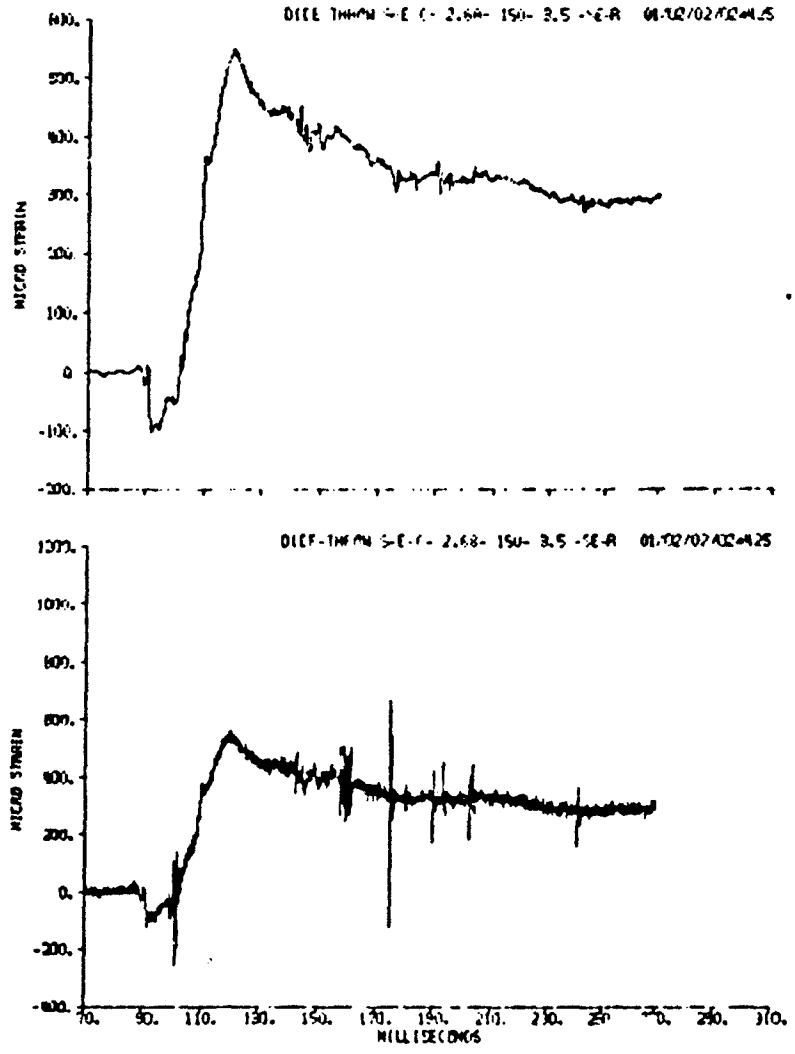

DICE-THROW S-E-C-2.44-177.5- 8.58- V-Y 05/01/08/04:39
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.6
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
12.
8.
4.
0.
-4.
-8.
-12.
-16.
-20
DICE-THROW S-E-C-2.44-177.5- 8.58- V-Y 05/01/08/04:39
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
12.
10.
8.
6.
4.
2.
0.
-2.
-4.
12.
8.
4.
0.
-4.
-8.
-12.
-16.
-20
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

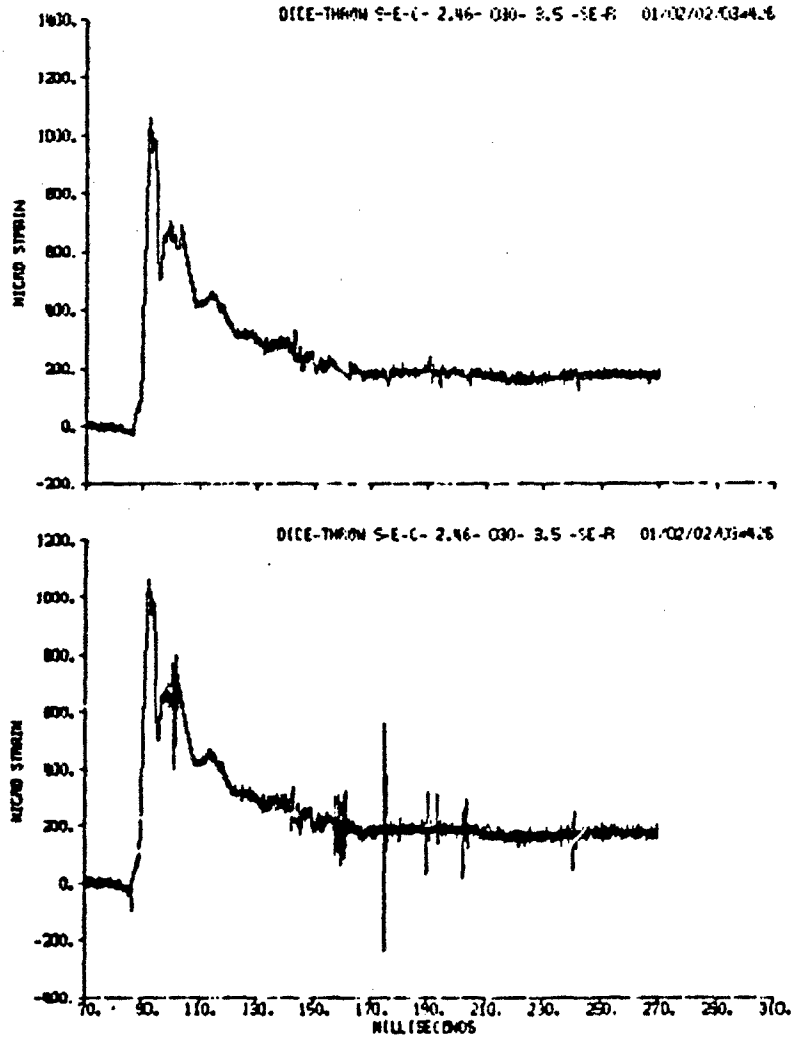

200.
100.
0
-100.
1000.
500.
0.
-500.
-1000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.

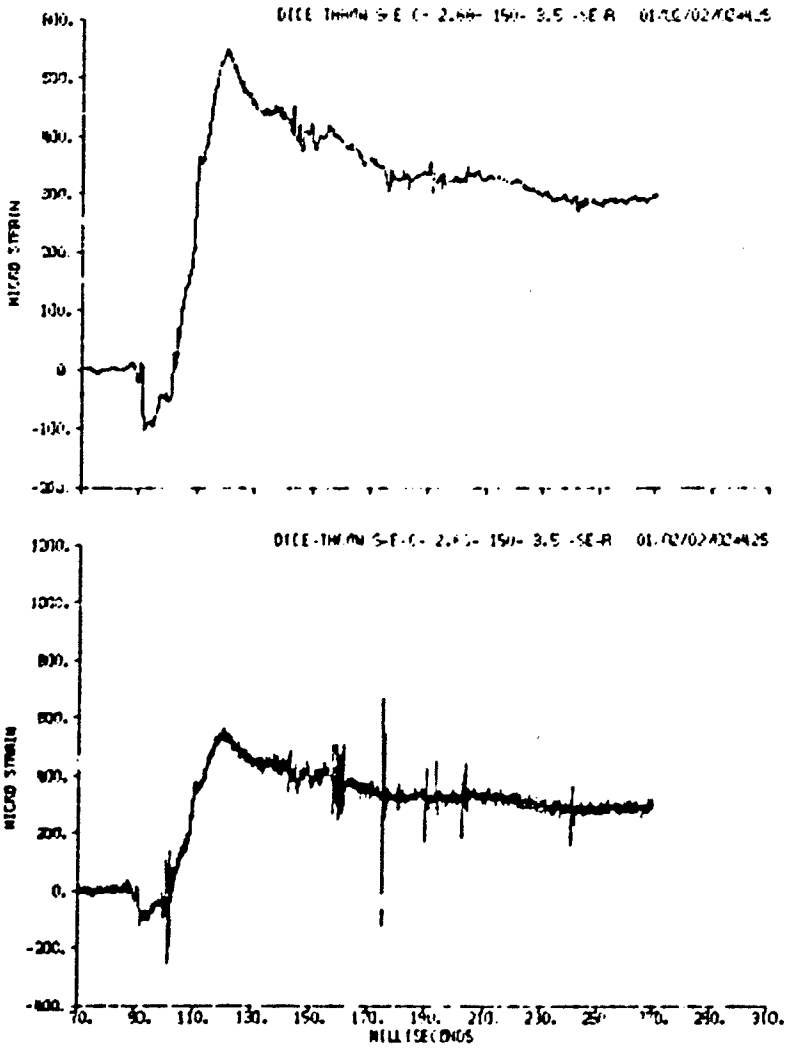

DICE-THROW S-E C- 2.68- 060- 3.5 -SE-R 01/02/01/0146.2
MICRO STRAIN
80.
40.
0.
-40.
-80.
-120.
-160.
-200.
DICE-THROW S-E-C- 2.68- 060- 3.5 -SE-R 01/02/01/0144.22
MICRO STRAIN
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

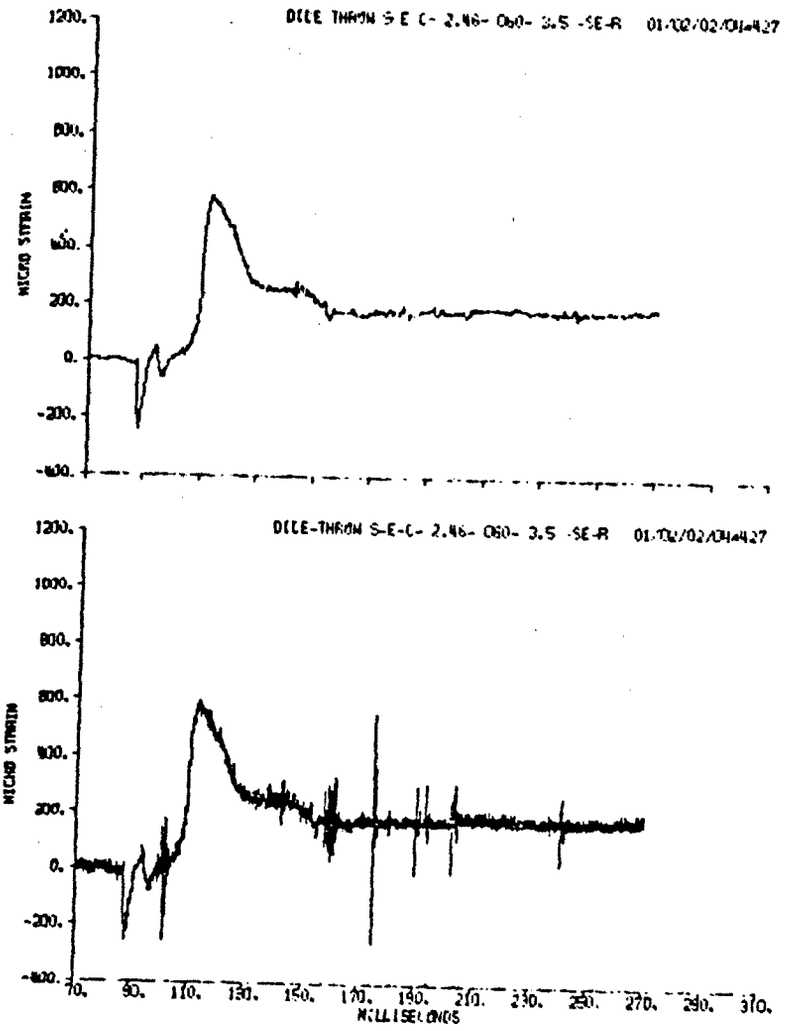

DICE-THROW S E C- 2.68- CAL- 3.5 -SE-R
MICRO STRAIN
960.
800.
640.
480.
320.
160.
0.
-80
DICE-THROW S-E-C- 2.68- CAL- 3.5 -SE-R
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
50.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

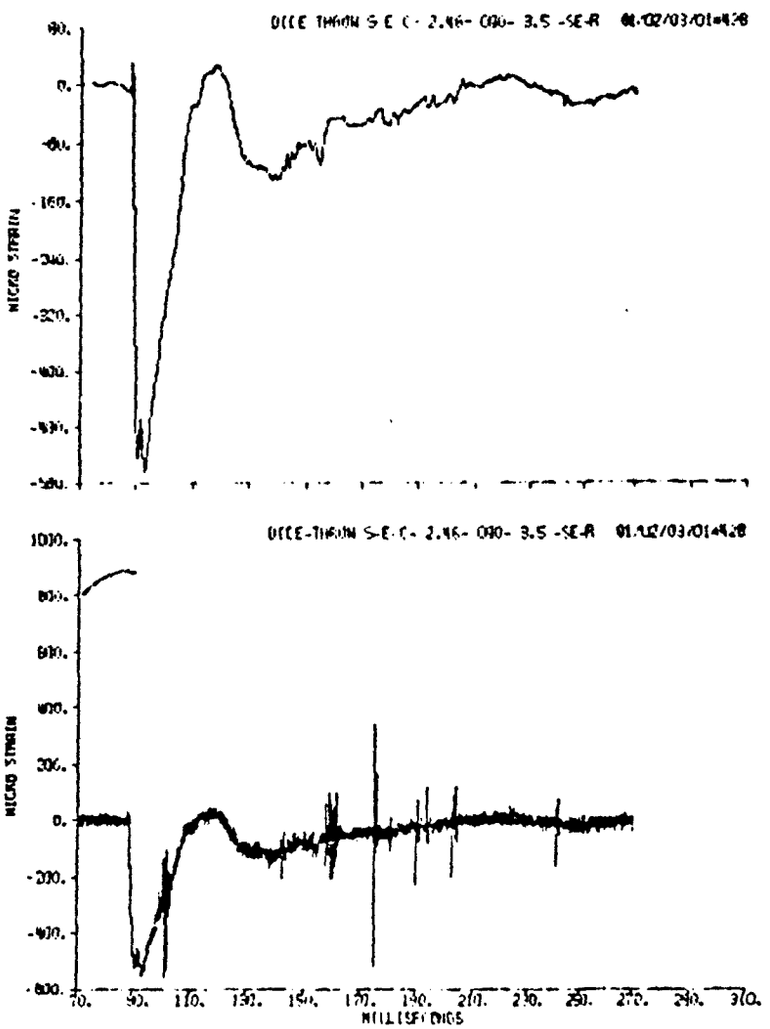

DICE-THROW S-E-C- 2.68- 120- 3.5 -SE-R
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
DICE-THROW S-E-C- 2.68- 120- 3.5 -SE-R
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

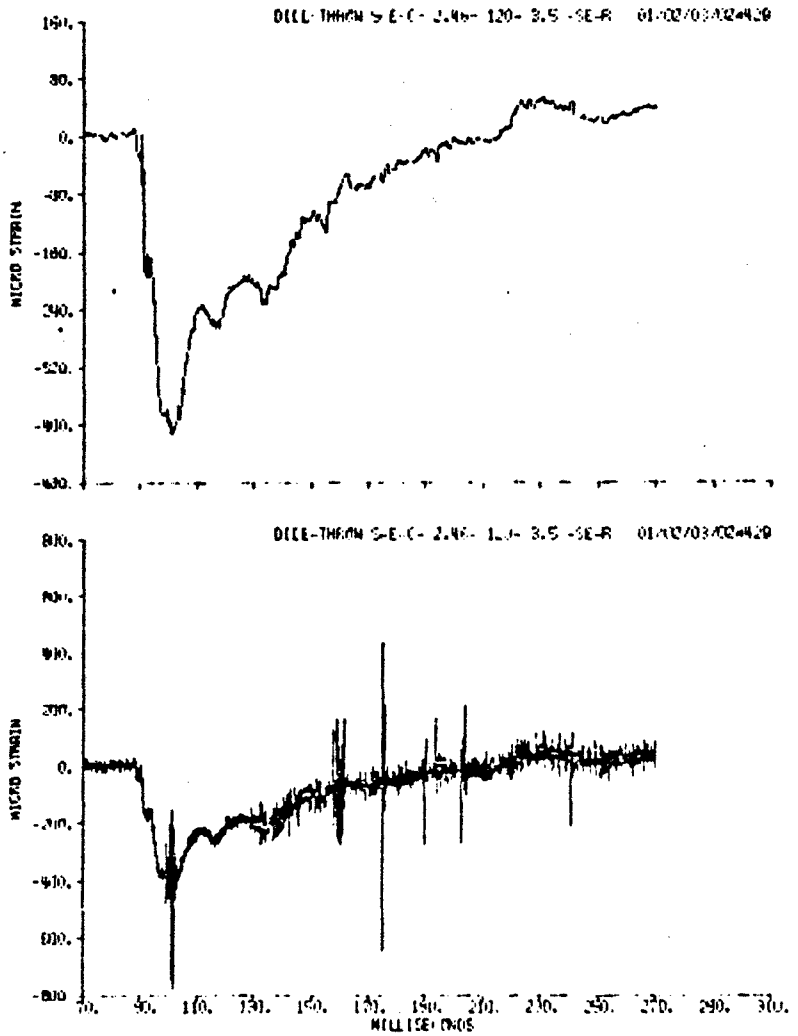

MICRO STRAIN
MILLISECONDS

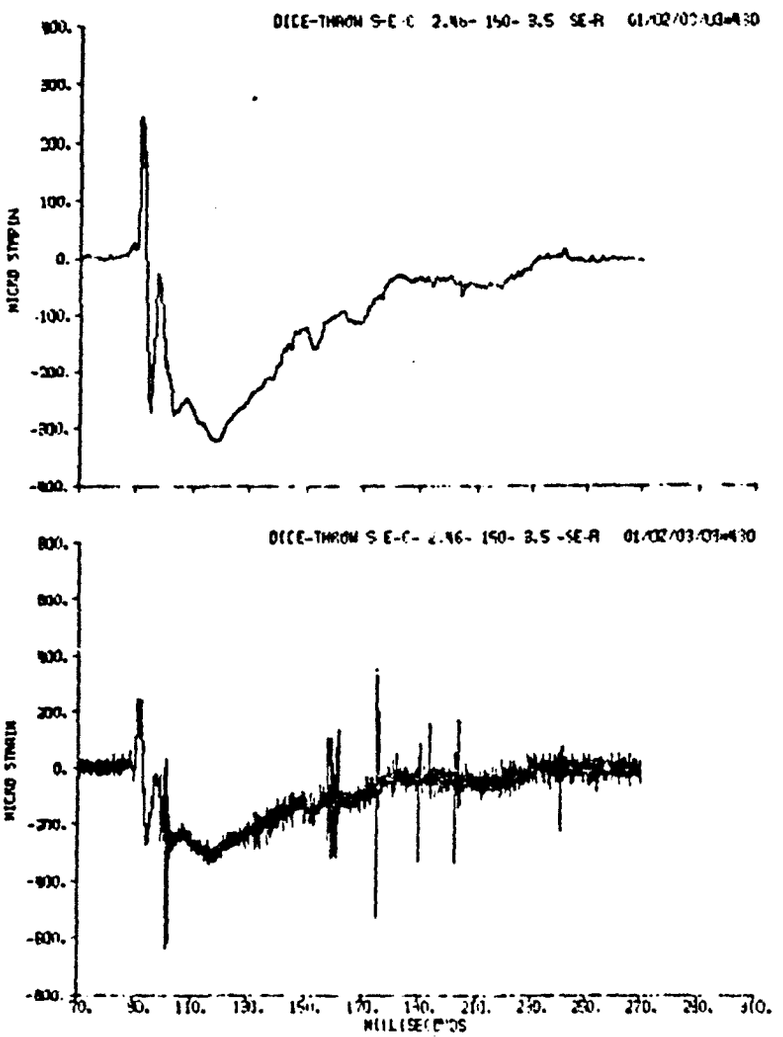

DICE-THROW S-E-C- 2.46- 030- 3.5 -SE-R
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-C- 2.46- 030- 3.5 -SE-R
MICRO STRAIN
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

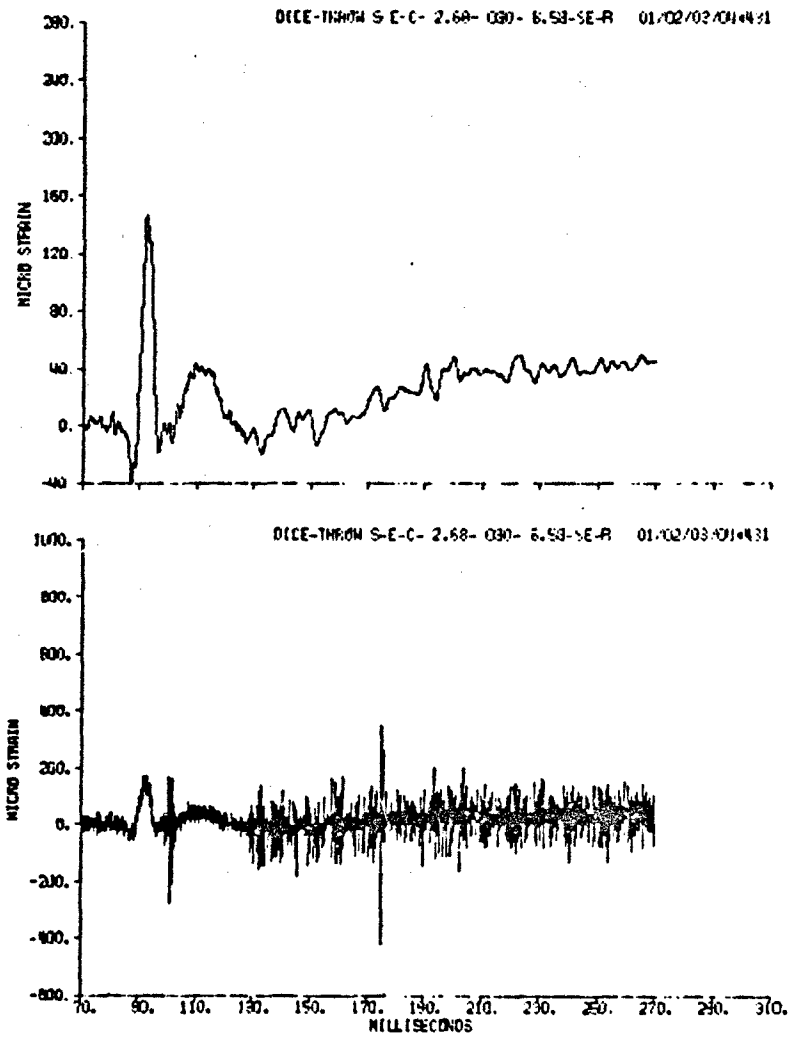

MICRO STRAIN
MILLISECONDS

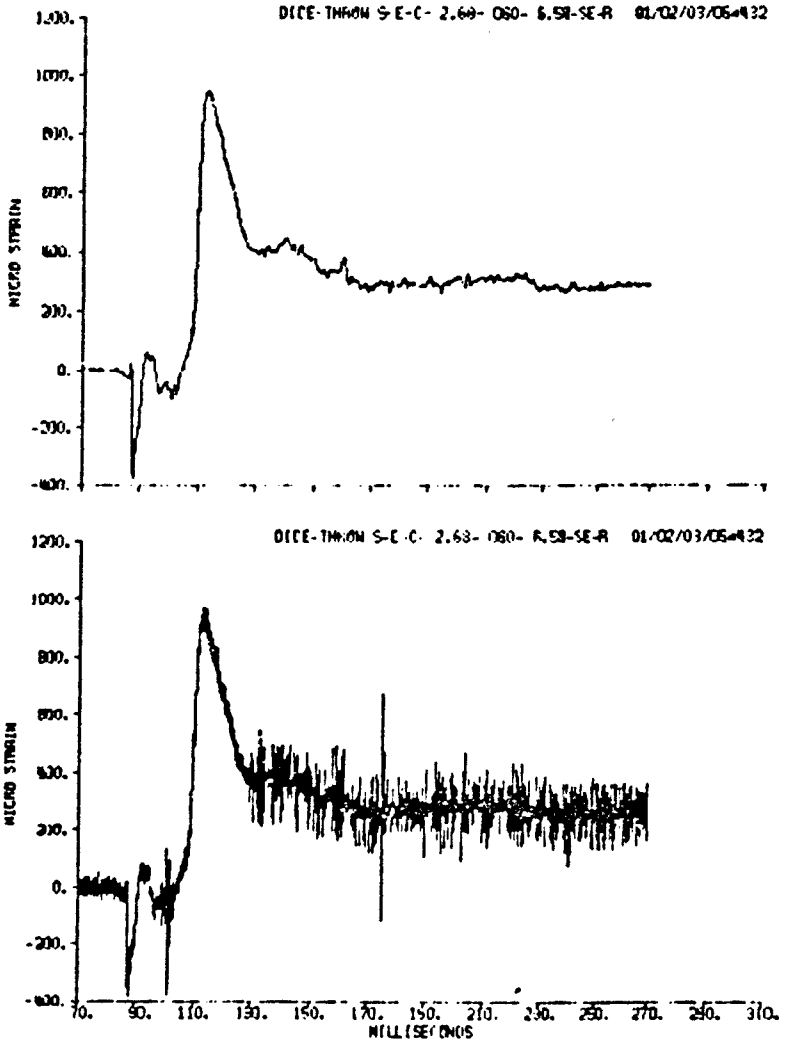

DICE THRON S E C- 2.46- O60- 3.5 -SE-R
1200.
1000.
800.
600.
400.
200.
0.
-200.
MICRO STRAIN
DICE-THRON S-E-C- 2.46- O60- 3.5 -SE-R
1200.
1000.
800.
600.
400.
200.
0.
-200.
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

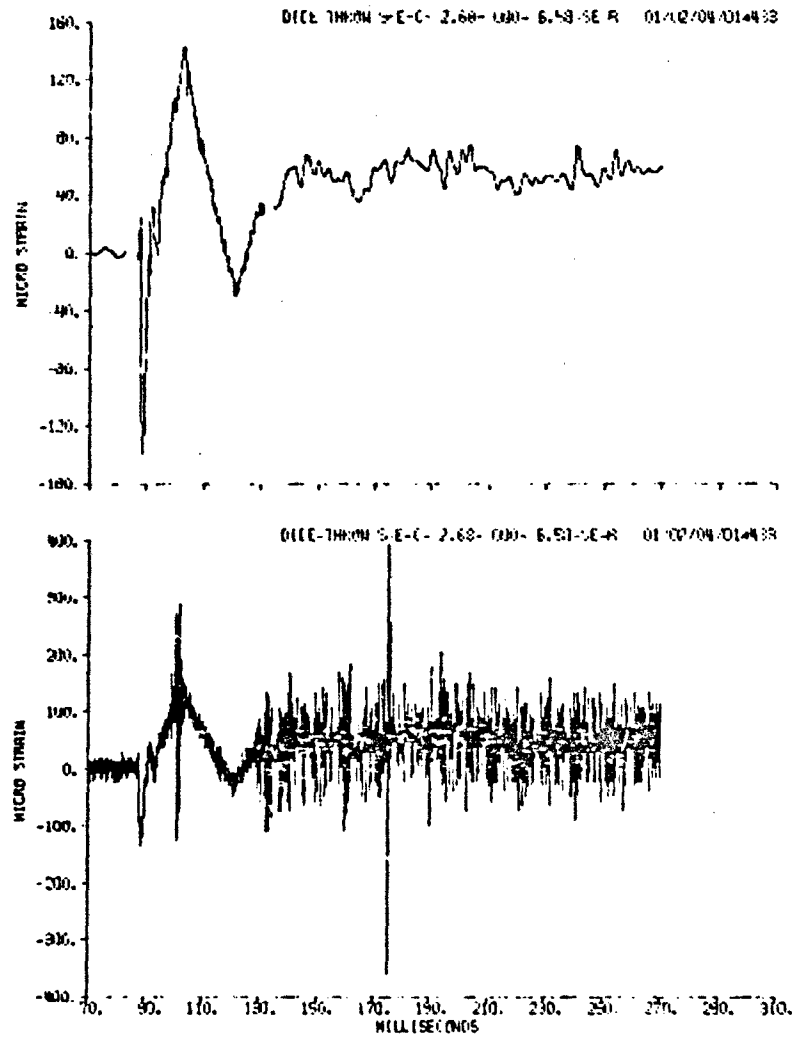

DICE THROW S E C - 2.46- 000- 3.5 -SE-R
MICRO STRAIN
DICE-THROW S-E-C - 2.46- 000- 3.5 -SE-R
MICRO STRAIN
MILLISECONDS

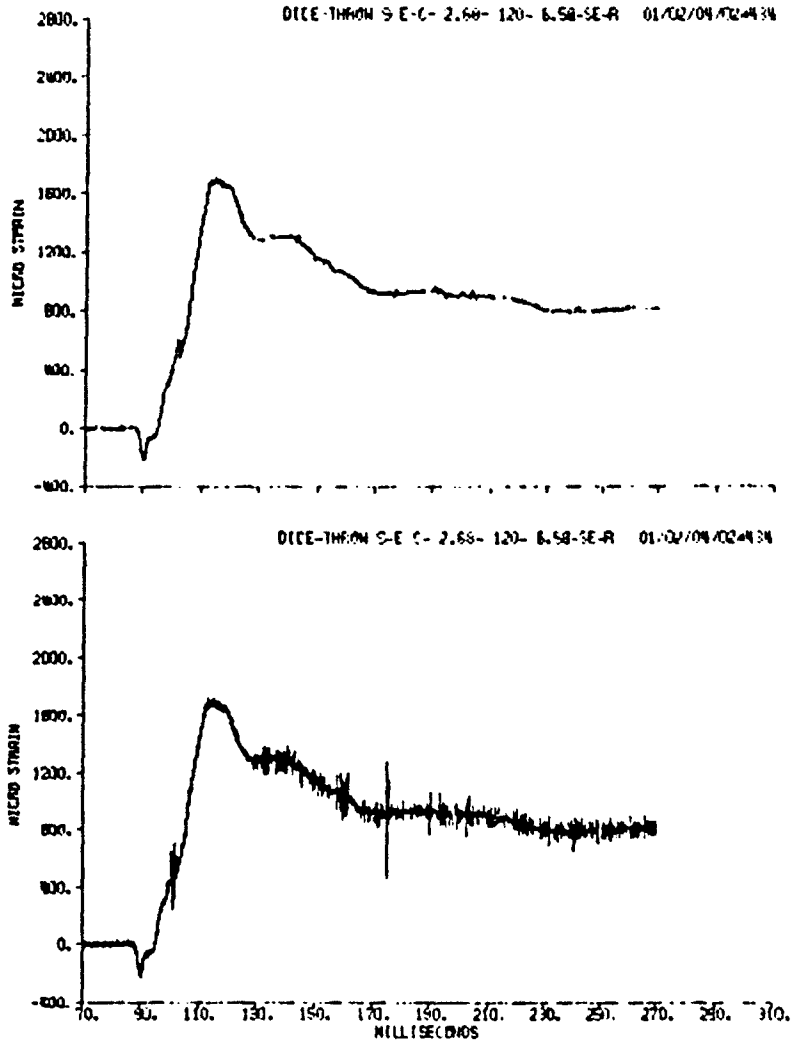

MICRO STRAIN
MILLISECONDS

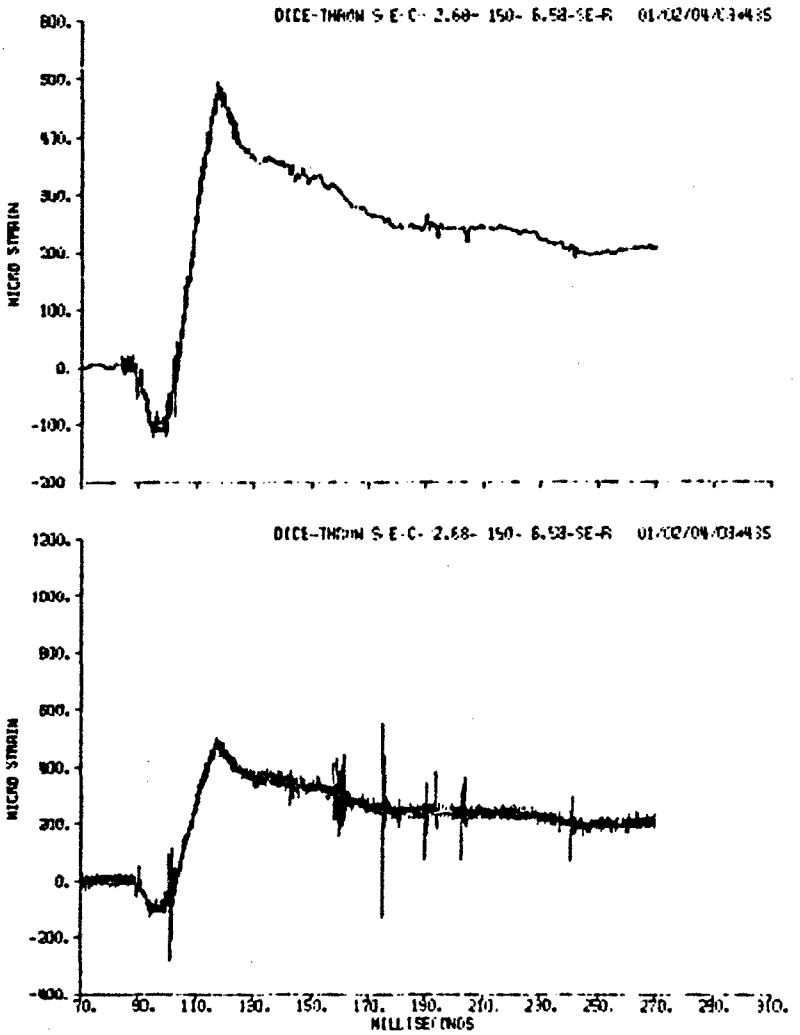

DICE-THROW S-E-C 2.46- 150- 3.5 SE-R
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
DICE-THROW S-E-C- 2.46- 150- 3.5 -SE-R
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

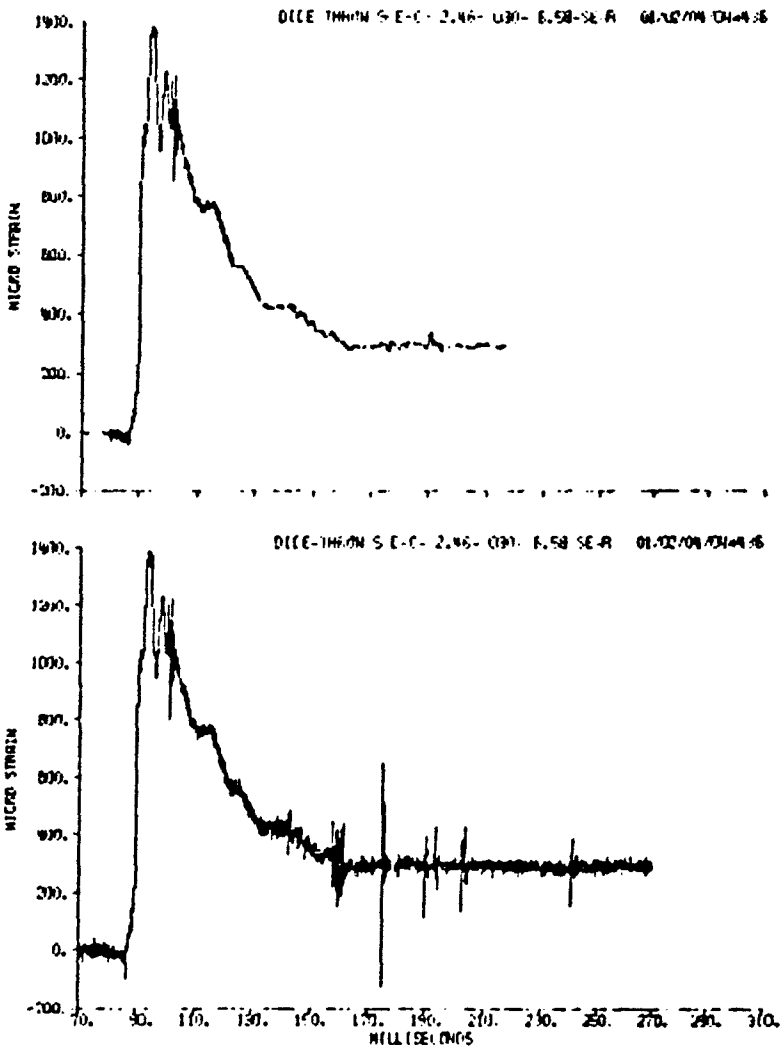

DICE-THROW S-E-C- 2.68- 030- 6.58-SE-R 01/02/03/01+431
MICRO STRAIN
280.
240.
200.
160.
120.
80.
40.
0.
-40
DICE-THROW S-E-C- 2.68- 030- 6.58-SE-R 01/02/03/01+431
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

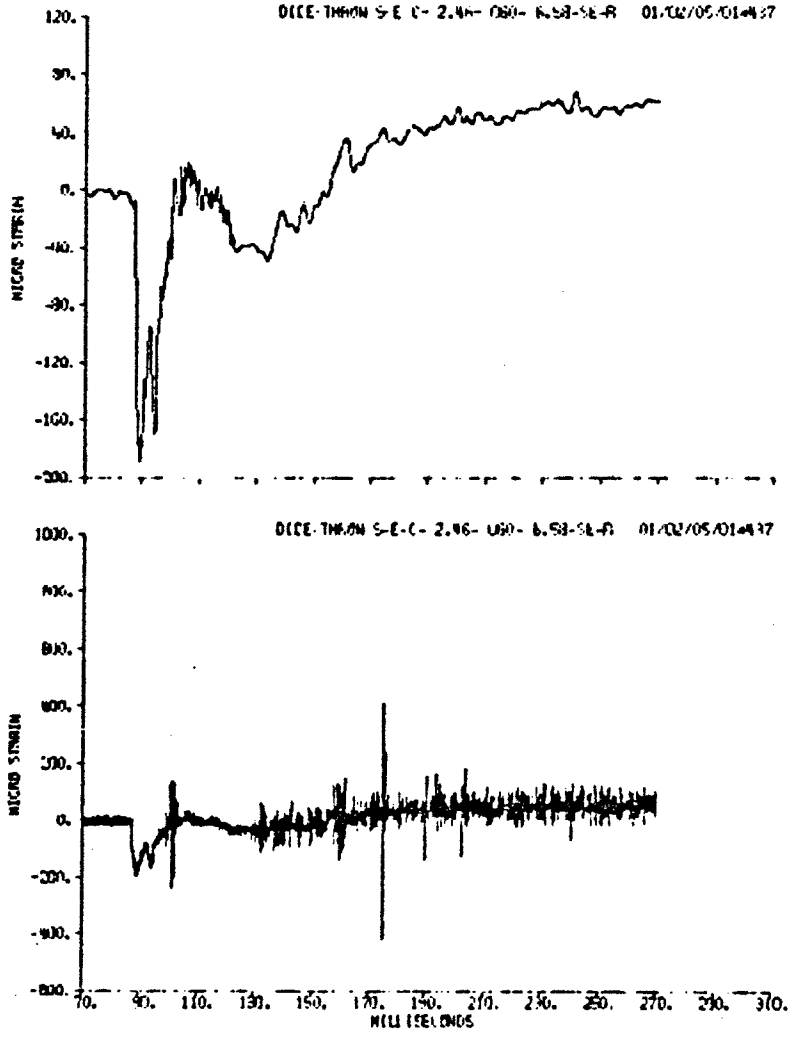

DICE-THROW S-E-C- 2.68- 060- 6.5R-SE-R 01/02/03/05=432
MICRO STRAIN
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
DICE-THROW S-E-C- 2.68- 060- 6.5R-SE-R 01/02/03/05=432
MICRO STRAIN
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

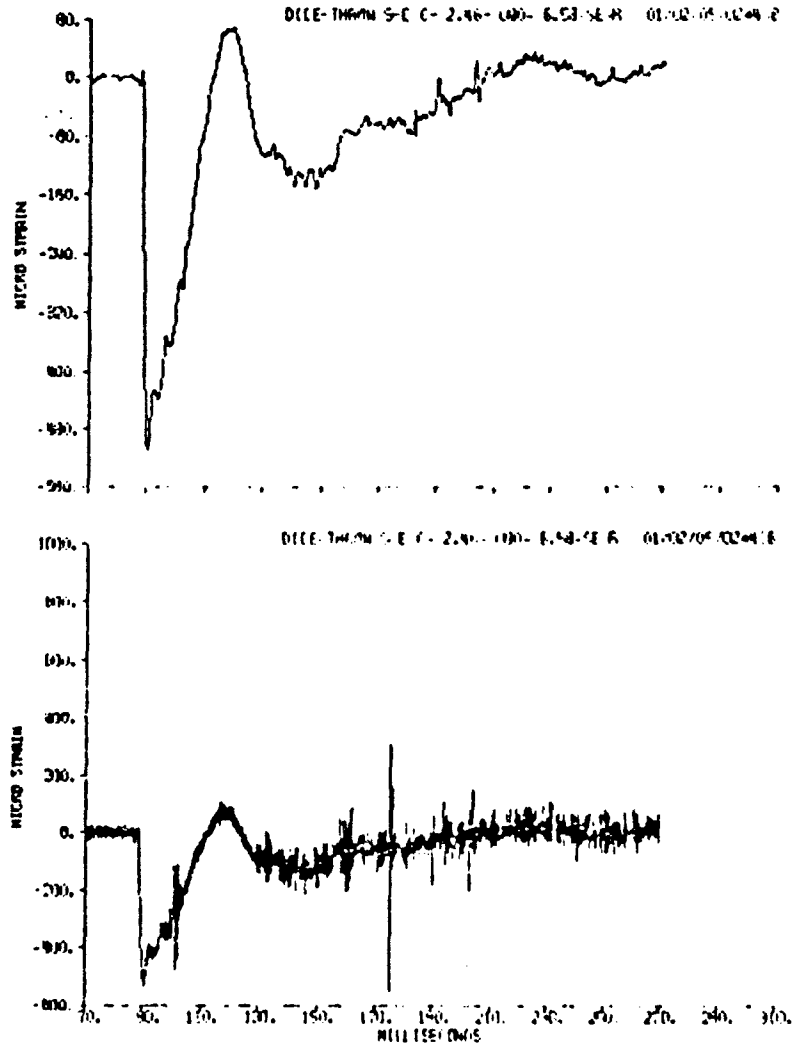

MICRO STRAIN
MILLISECONDS

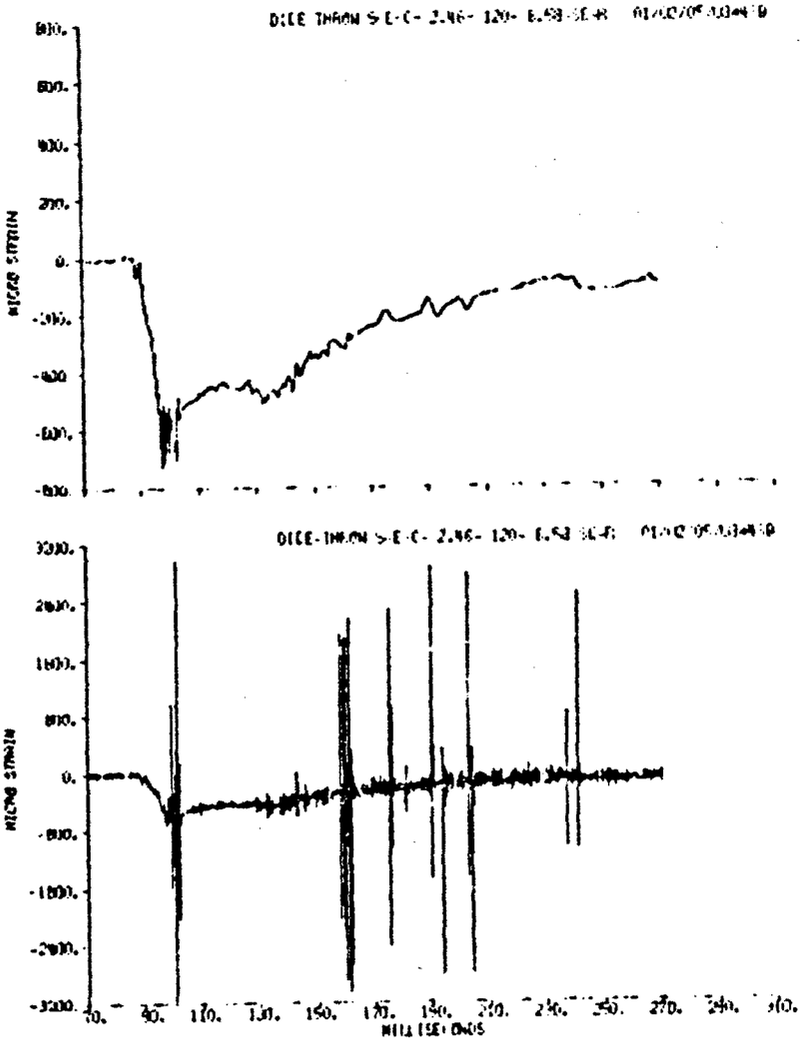

DICE-THROW S E-C- 2.66- 120- 8.58-SE-R
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
DICE-THROW S-E C- 2.66- 120- 8.58-SE-R
MICRO STRAIN
2800.
2400.
2000.
1600.
1200.
800.
400.
0.
-400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

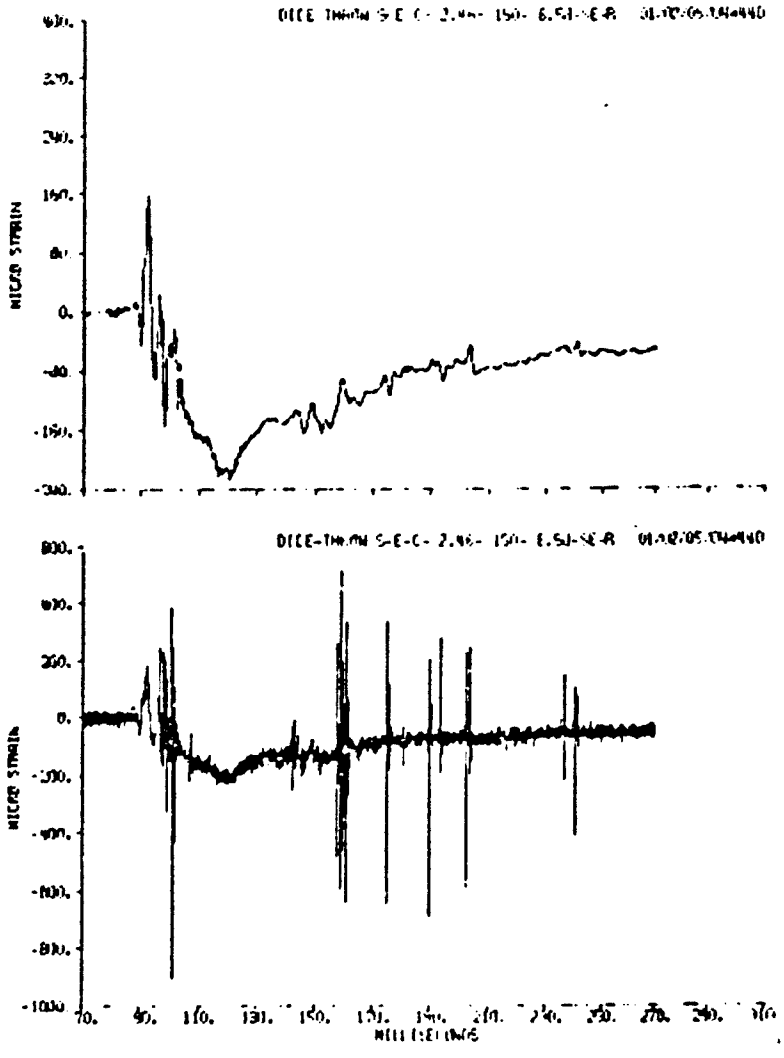

DICE-THROW S E-C- 2.68- 150- 6.58-SE-R
MICRO STRAIN
800.
600.
400.
200.
0.
-100.
-200
DICE-THROW S E-C- 2.68- 150- 6.58-SE-R
MICRO STRAIN
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

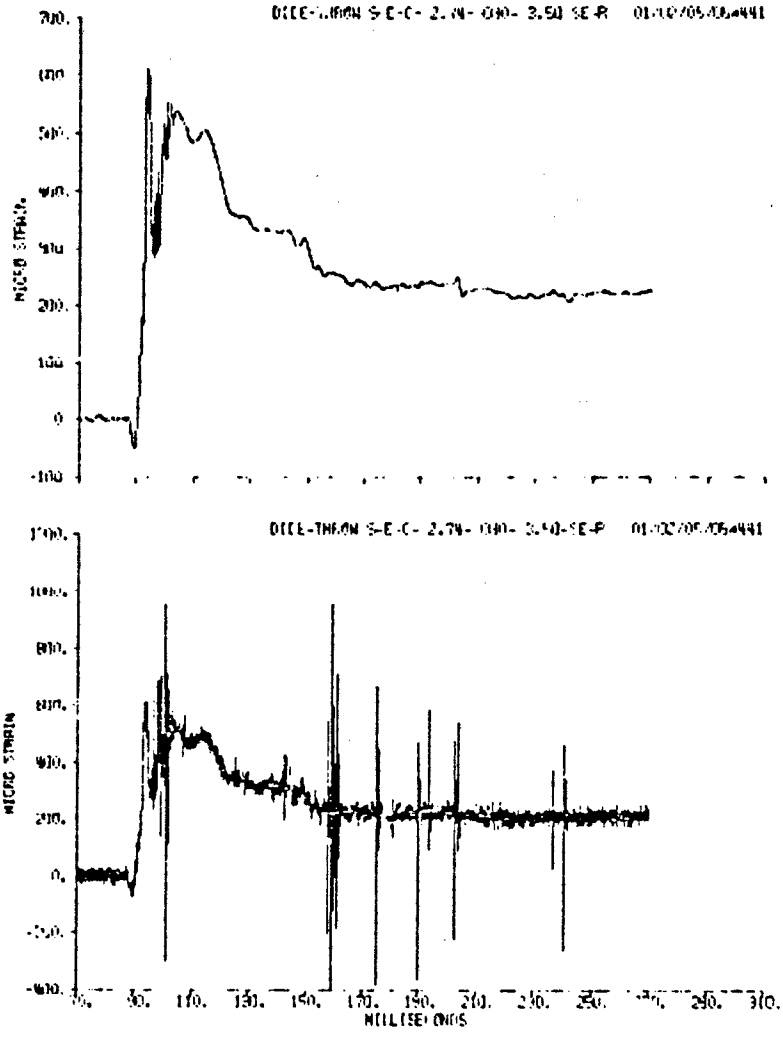

MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
MILLISECONDS

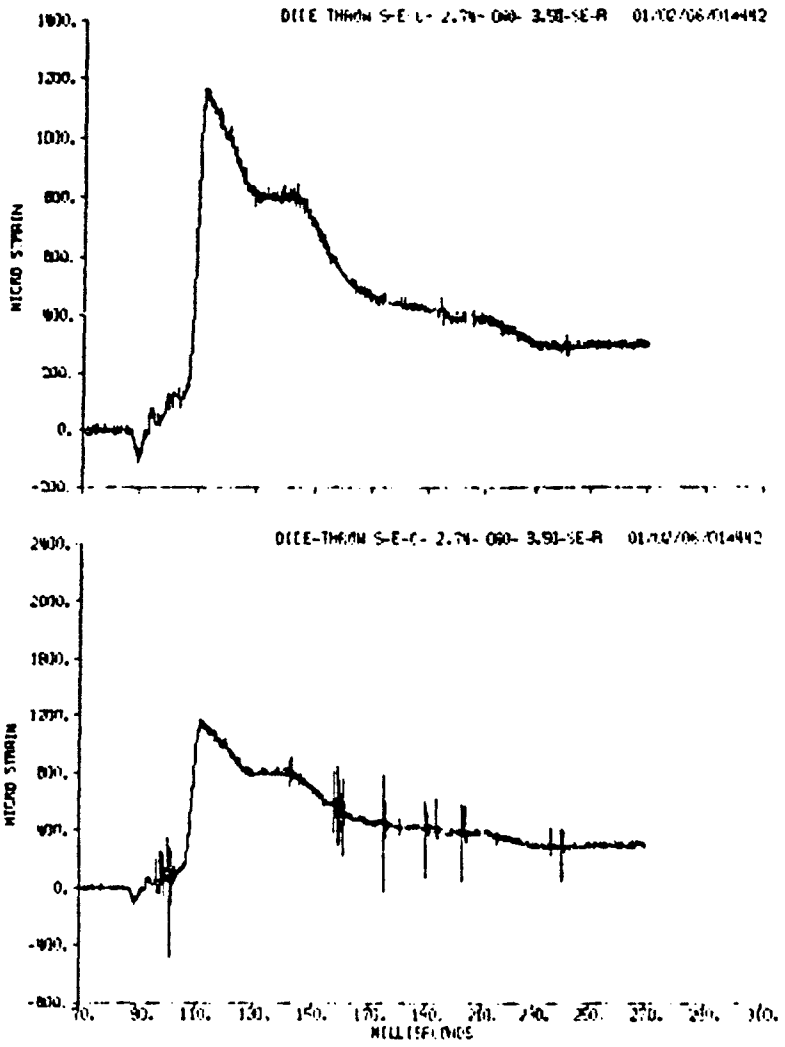

DICE-THROW S-E C- 2.4N- 060- 6.5B-SL-R 01/02/05/01:44:37
MICRO STRAIN
120.
80.
40.
0.
-40.
-80.
-120.
-160.
-200.
DICE-THROW S-E-C- 2.4N- 060- 6.5B-SL-R 01/02/05/01:44:37
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

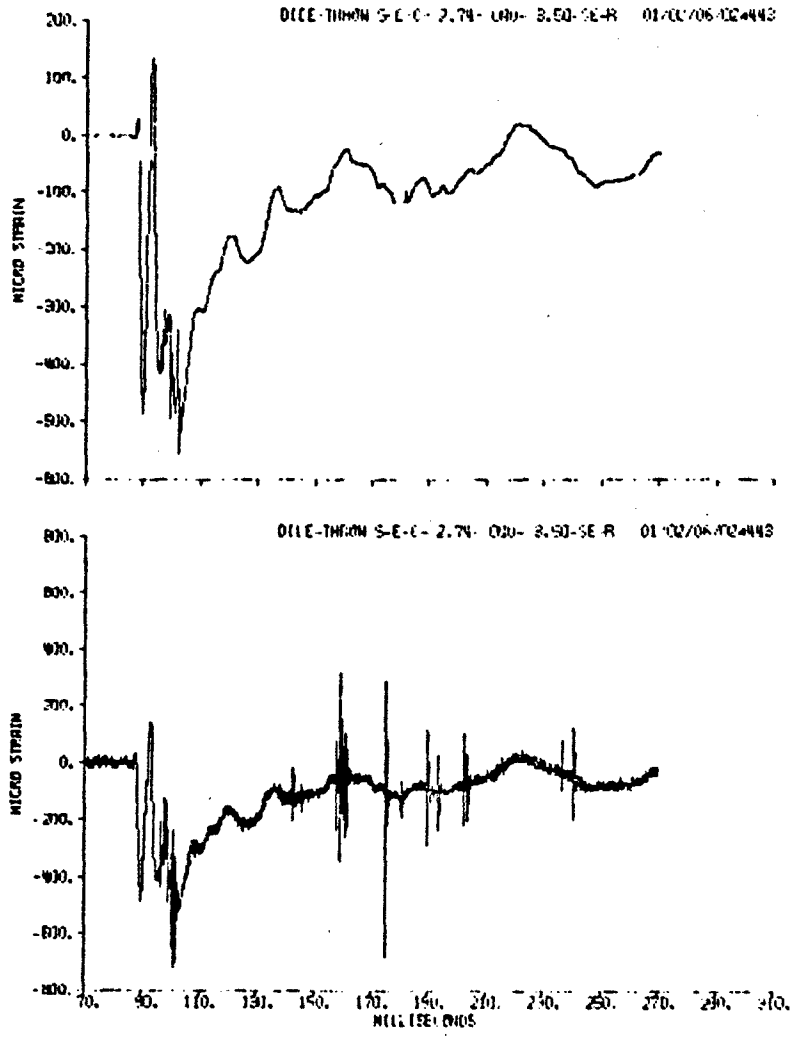

MICRO STRAIN
MICRO STRAIN

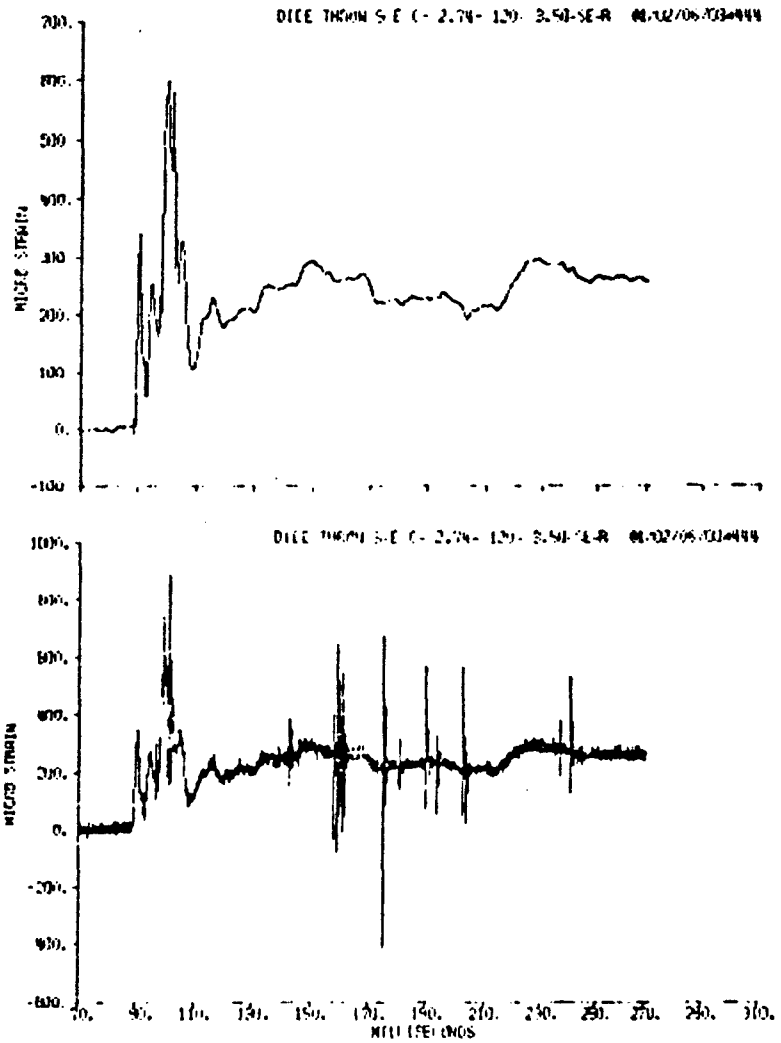

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

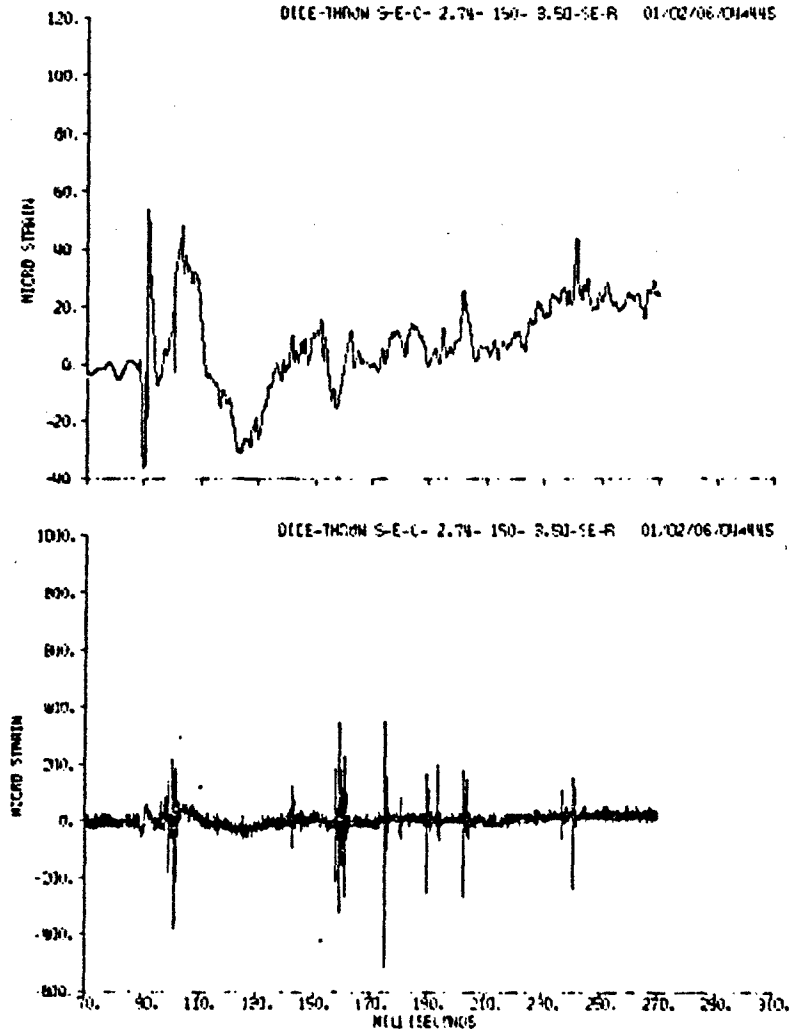

MICRO STRAIN
MICRO STRAIN

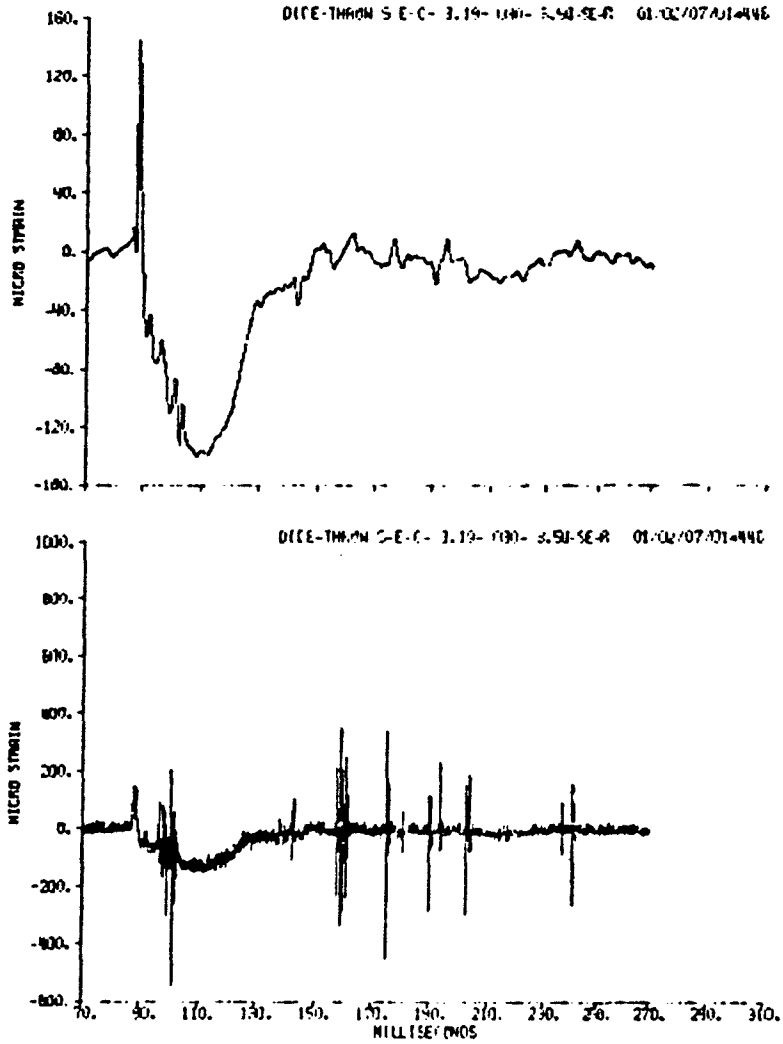

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

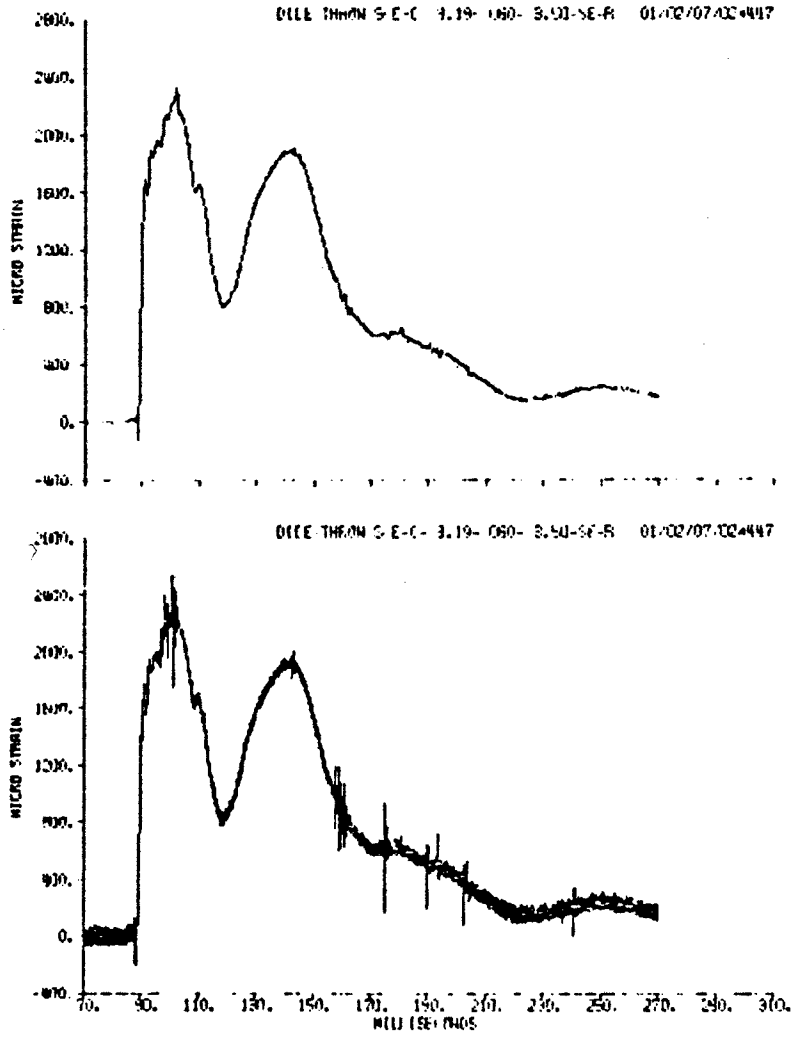

MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
MICRO STRAIN
2000.
1800.
1600.
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

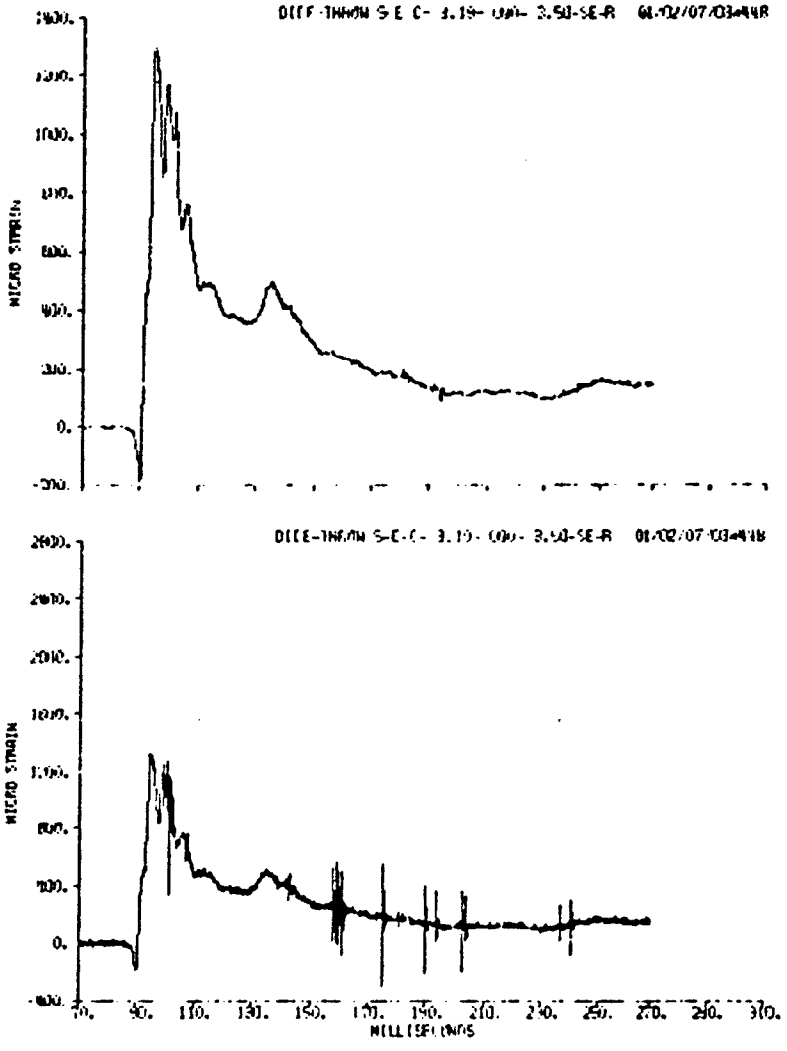

DICE-THROW S-E-C- 2.7N- 040- 3.5Q-SE-R
200.
100.
0.
-100.
-200.
-300.
-400.
-500.
-600.
MICRO STRAIN
DICE-THROW S-E-C- 2.7N- 020- 3.5Q-SE-R
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.

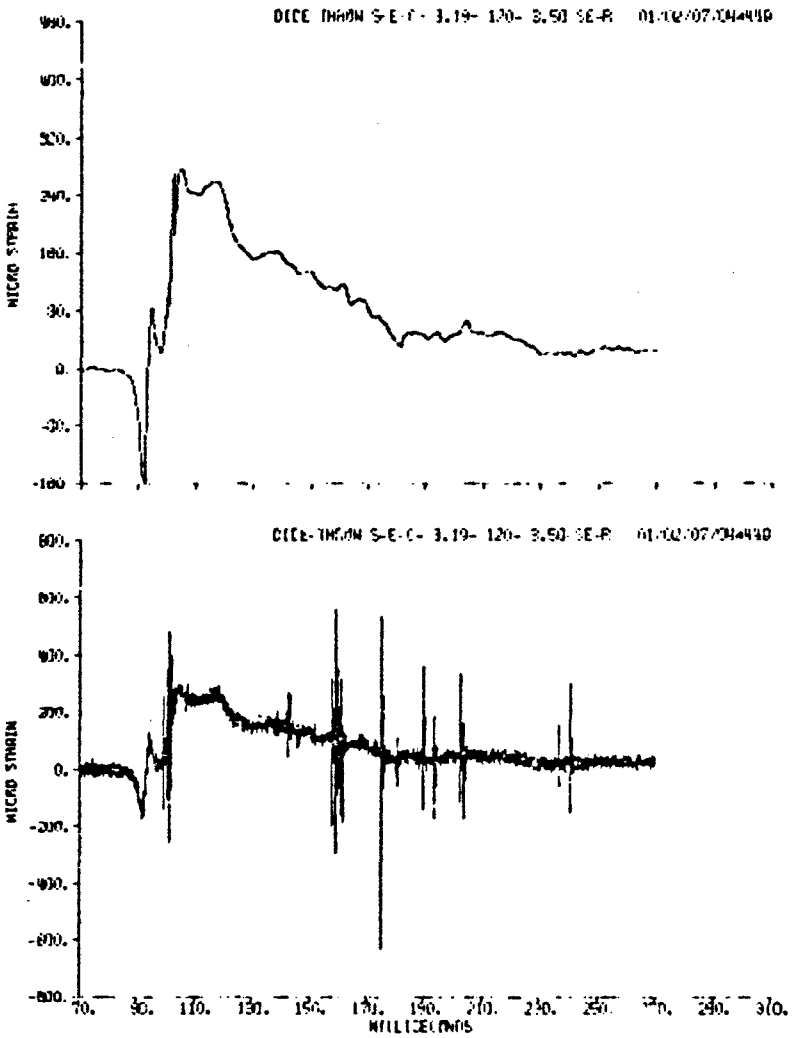

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

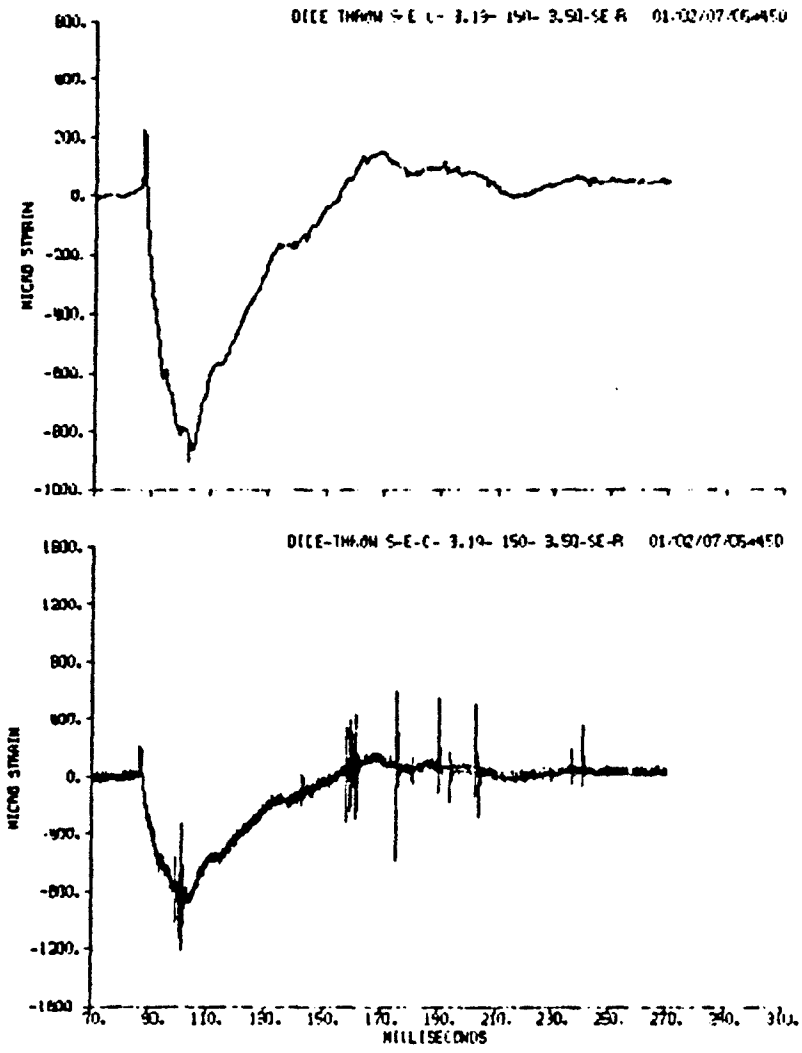

DICE-THROW S-E-C- 2.7#- 150- 3.50-SE-R 01/02/06/0144#5
MICRO STRAIN
120.
100.
80.
60.
40.
20.
0.
-20.
-40.
DICE-THROW S-E-C- 2.7#- 150- 3.50-SE-R 01/02/06/0144#5
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
10. 40. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

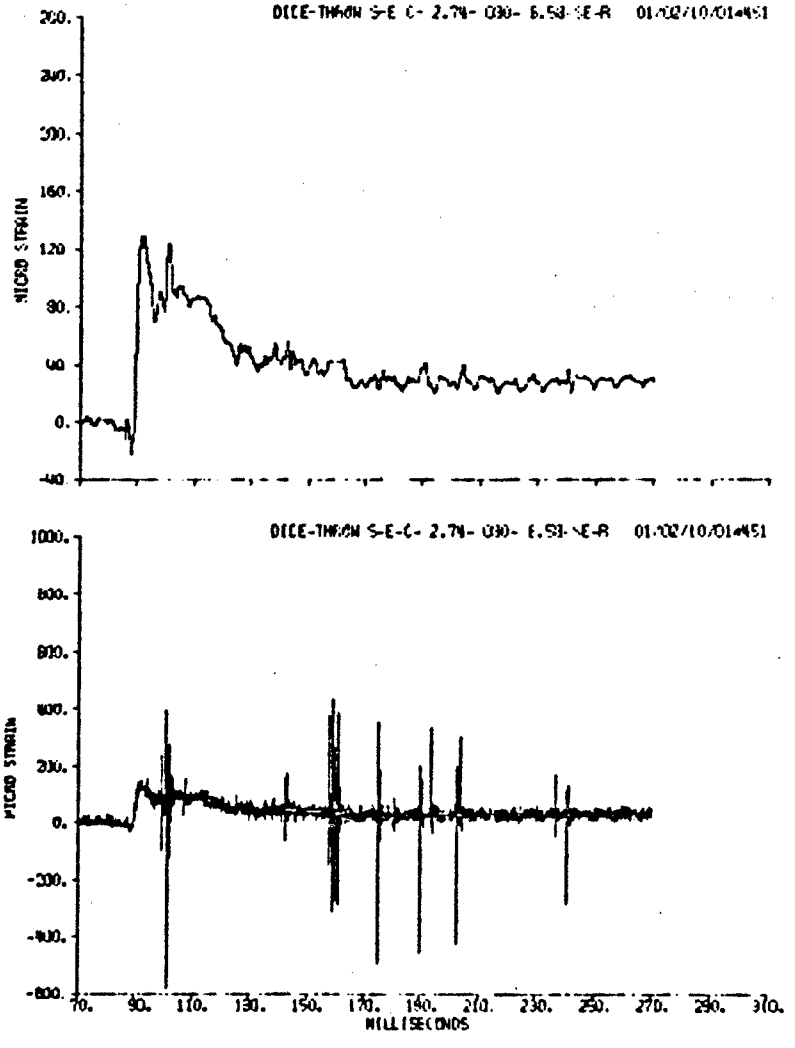

160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

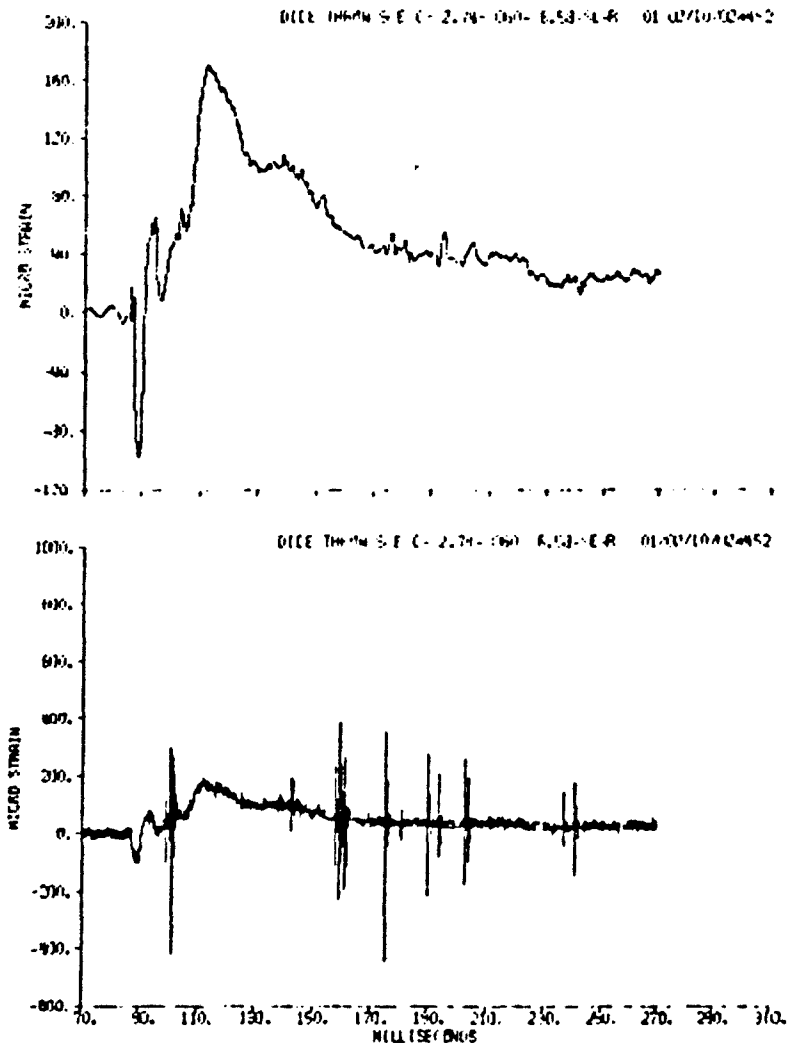

MICRO STRAIN
2000.
1000.
0.
-400.
MILLISECONDS

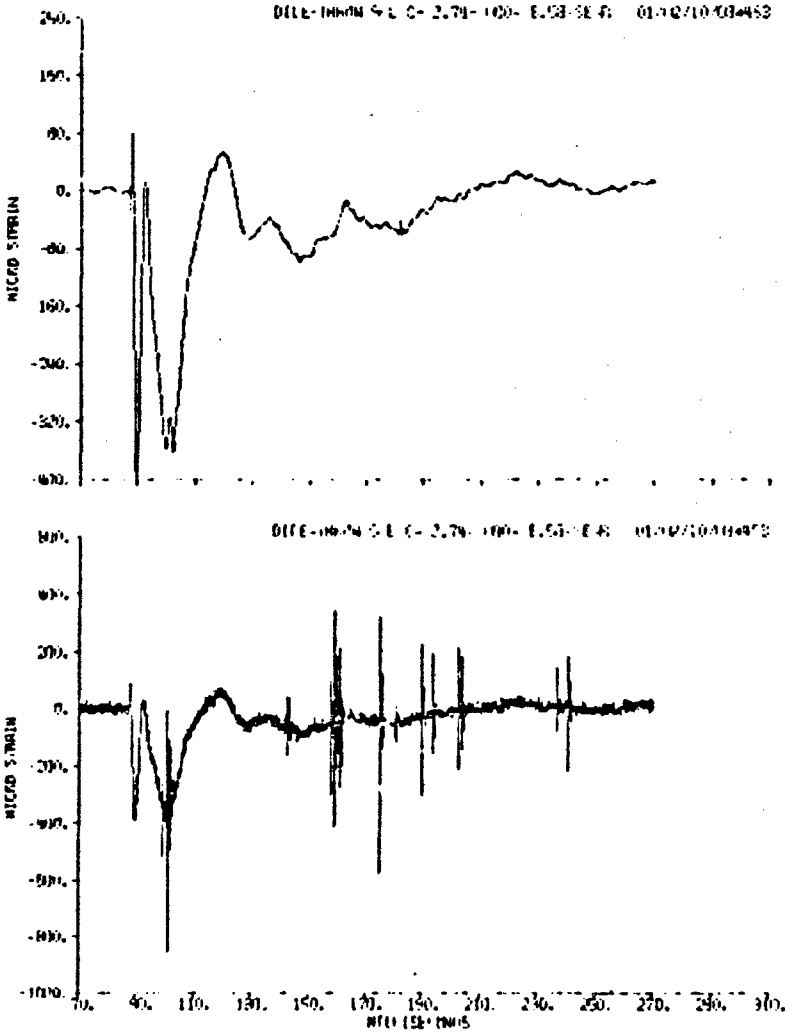

MICRO STRAIN
MILLISECONDS

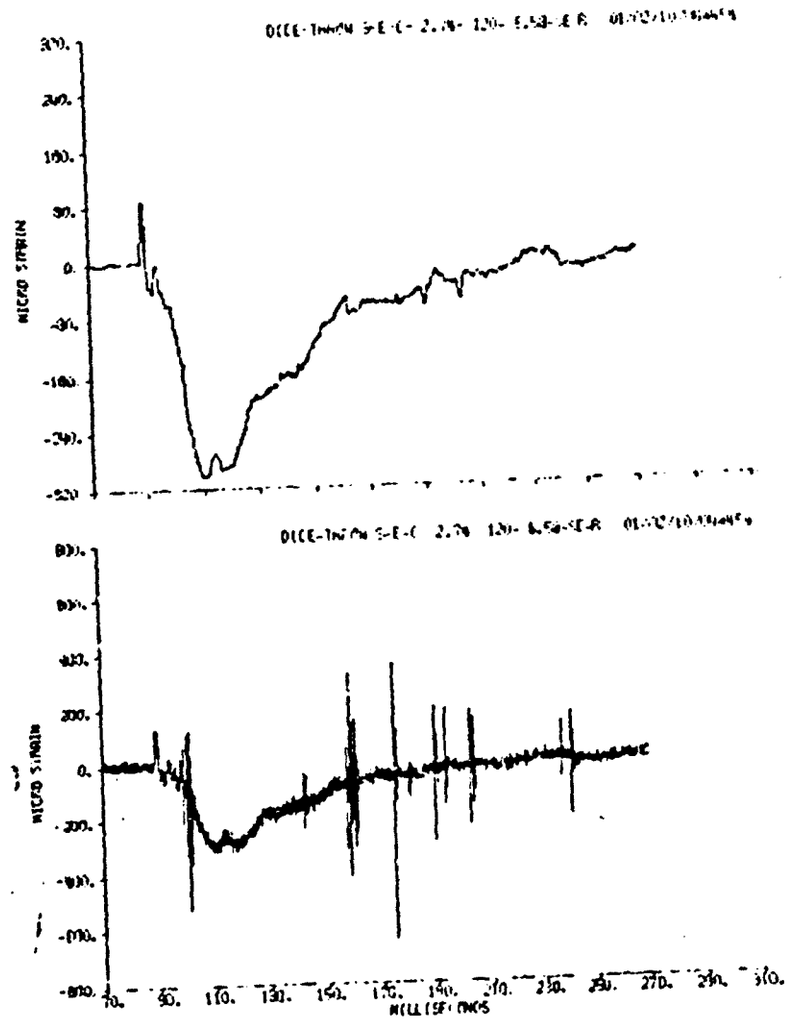

MICRO STRAIN
MILLISECONDS

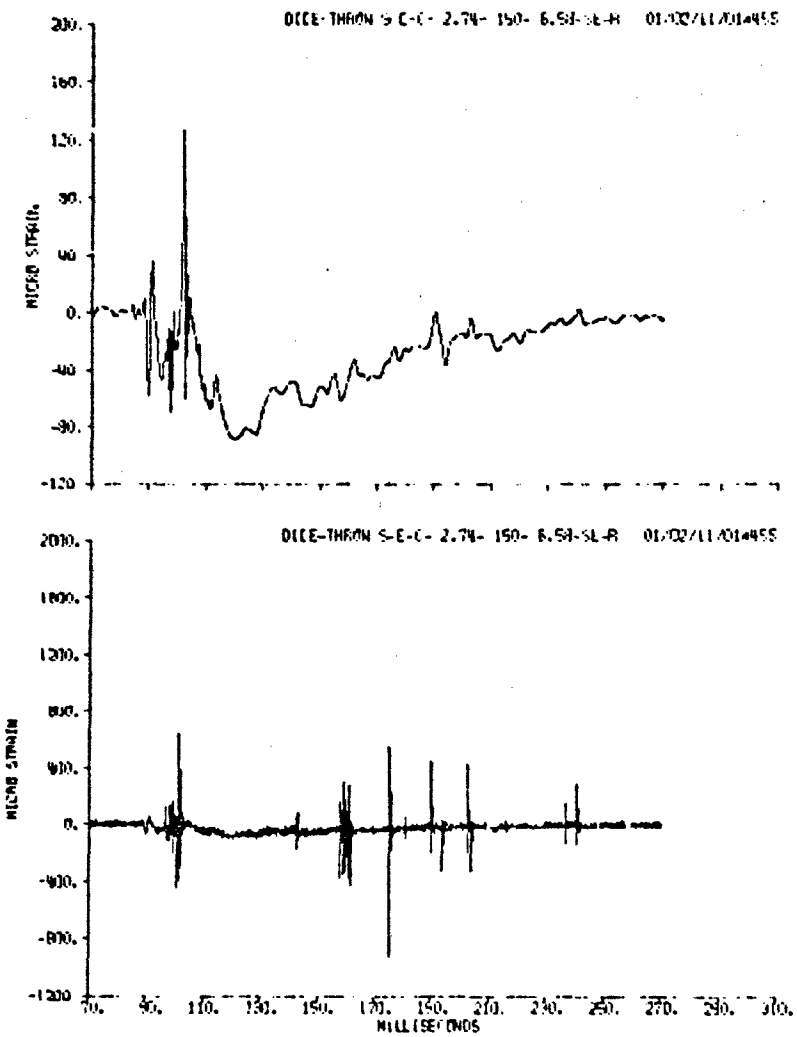

800.
600.
200.
0.
-200.
-400.
-600.
-800.
-1000.
MICRO STRAIN
1800.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

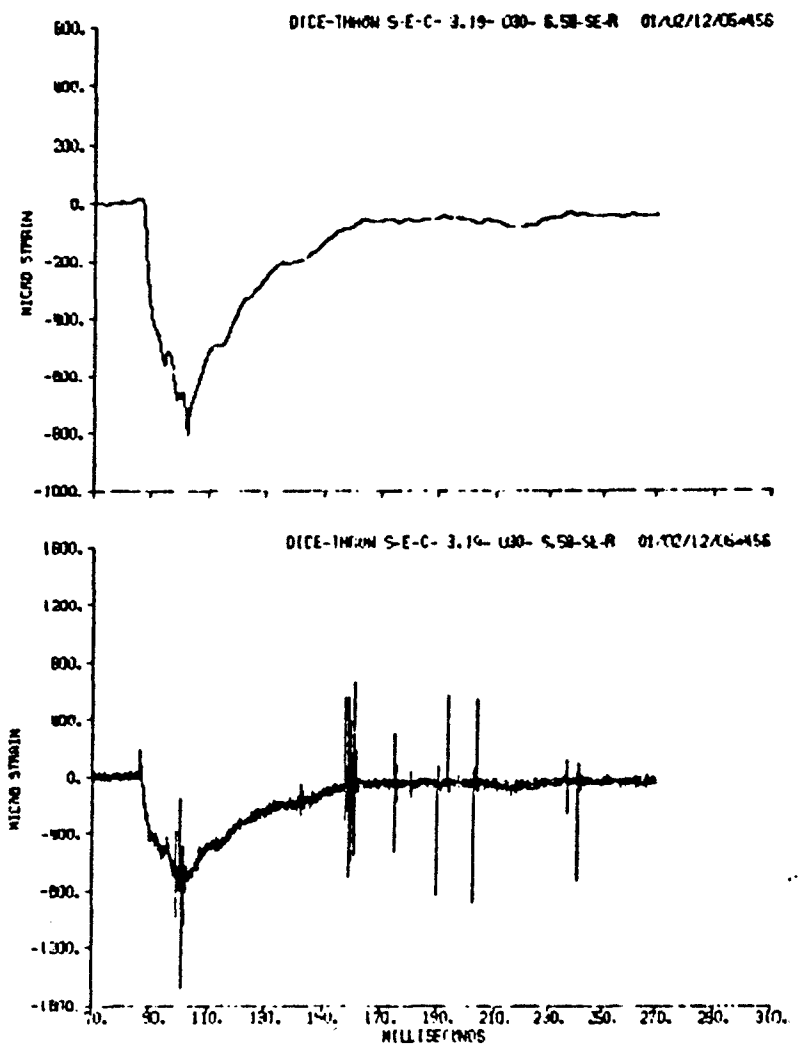

DICE-THROW S-E C- 2.7N- 030- 6.5S-SE-R 01/02/10/01+451
MICRO STRAIN
200.
160.
120.
80.
40.
0.
-40.
DICE-THROW S-E-C- 2.7N- 030- 6.5S-SE-R 01/02/10/01+451
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

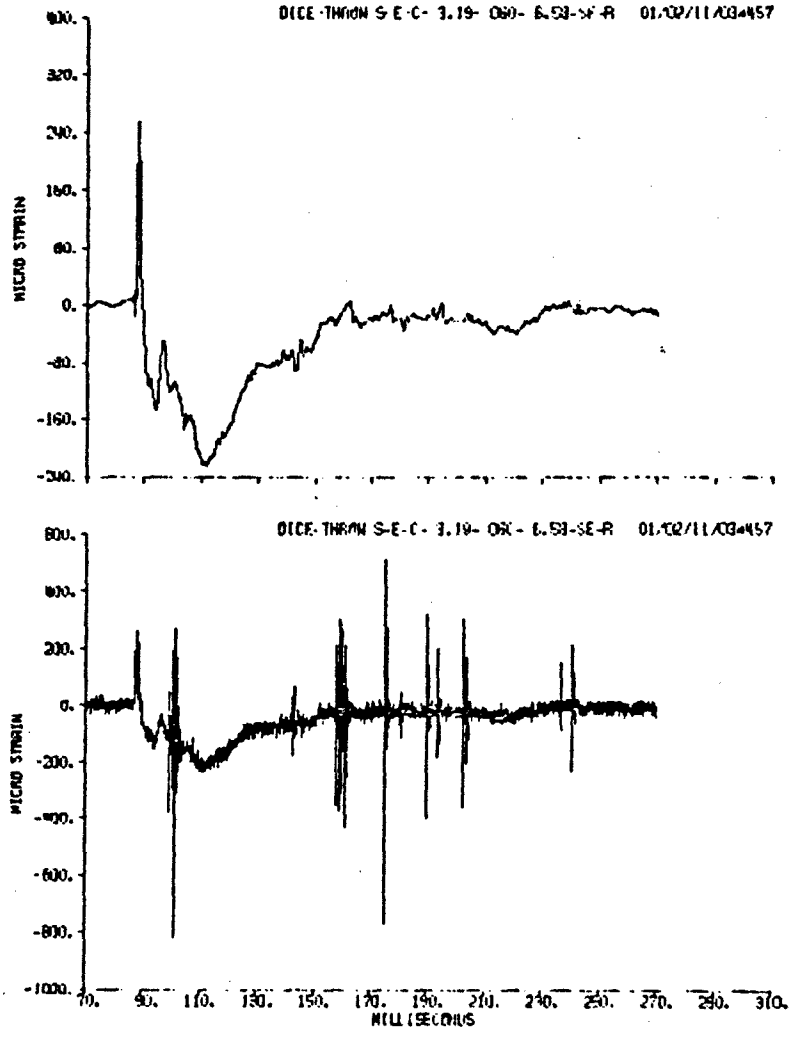

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

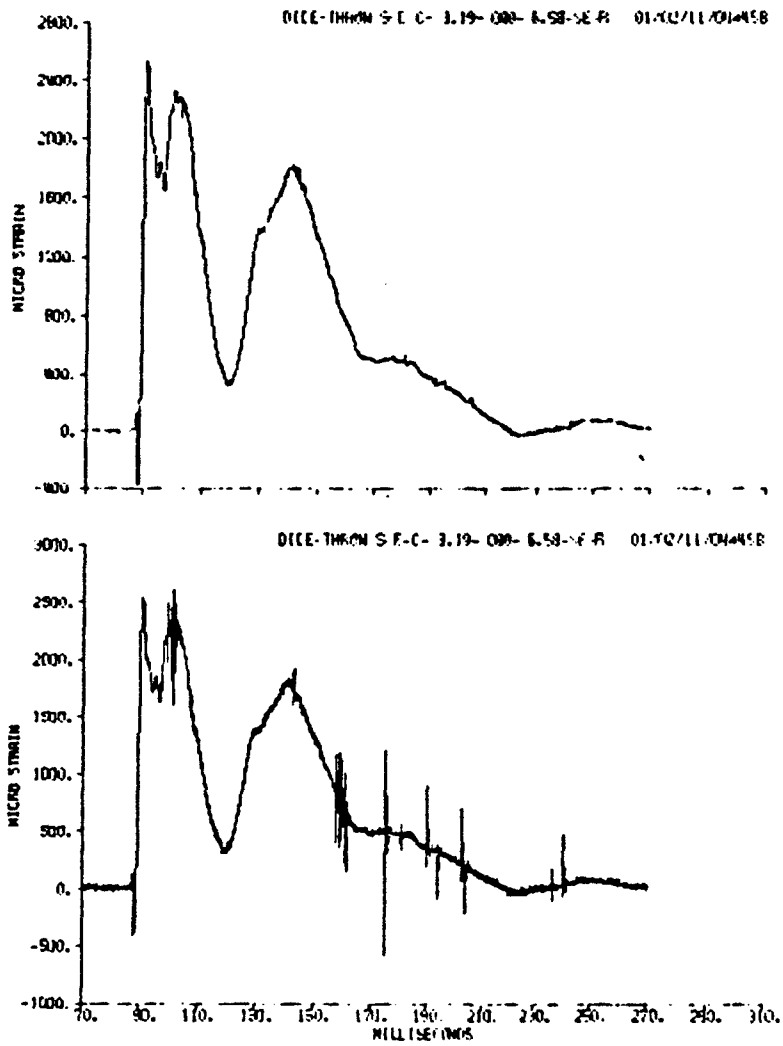

MICRO STRAIN
MICRO STRAIN

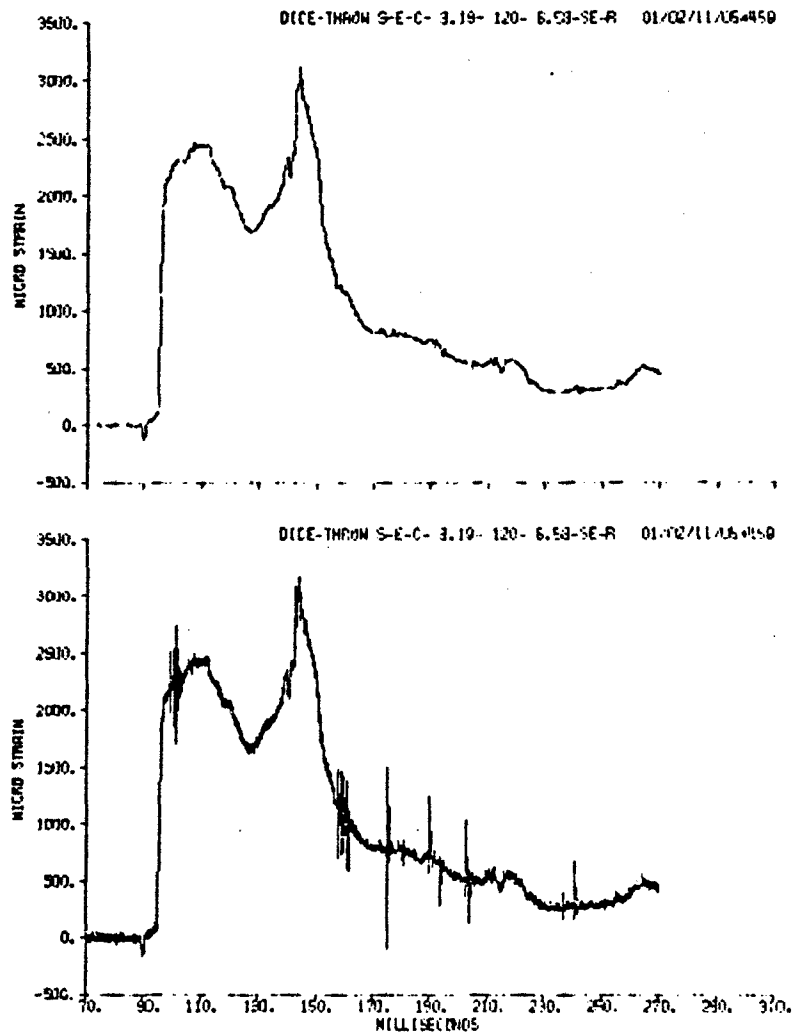

MICRO STRAIN
MILLISECONDS

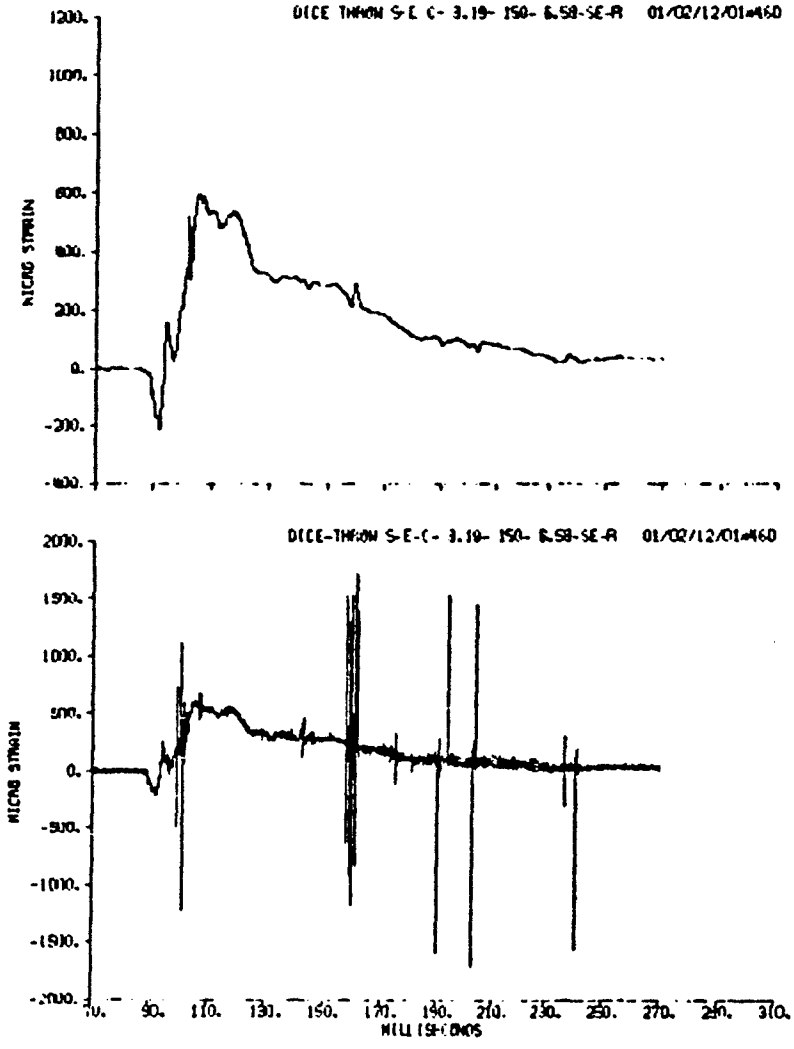

DECE-THRON S-E-C- 2.7%- 150- 6.5%-SL-R 01/02/11/014455
MICRO STRAIN
200.
160.
120.
80.
40.
0.
-40.
-80.
-120
DECE-THRON S-E-C- 2.7%- 150- 6.5%-SL-R 01/02/11/014455
MICRO STRAIN
2000.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS


DICE-THROW S-E-C- 3.19- 030- 6.58-SE-R 01/02/12/06=456
600.
400.
200.
0.
-200.
-400.
-600.
-800.
-1000.
MICRO STRAIN
DICE-THROW S-E-C- 3.19- 030- 6.58-SE-R 01/02/12/06=456
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
MICRO STRAIN
MILLISECONDS


DICE-THROW S-E-C- 3.19- 060- 6.58-SE-R 01/02/11/03=457
MICRO STRAIN
400.
320.
240.
160.
80.
0.
-80.
-160.
-240.
DICE-THROW S-E-C- 3.19- 060- 6.58-SE-R 01/02/11/03=457
MICRO STRAIN
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
-1000.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS


MICRO STRAIN
2500.
2000.
1500.
1000.
500.
0.
-500.
-1000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS


DICE-THROW S-E-C- 3.19- 120- 6.58-SE-R 01/02/11/06:459
MICRO STRAIN
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
DICE-THROW S-E-C- 3.19- 120- 6.58-SE-R 01/02/11/06:459
MICRO STRAIN
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.
-500.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS


DICE THROW S-E C- 3.19- 150- 6.58-SE-R 01/02/12/01=460
MICRO STRAIN
1200.
1000.
800.
600.
400.
200.
0.
-200.
-400.
DICE-THROW S-E-C- 3.19- 150- 6.58-SE-R 01/02/12/01=460
MICRO STRAIN
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
10.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

APPENDIX G

AIRCRAFT SHELTER "D" DATA PRESENTATION

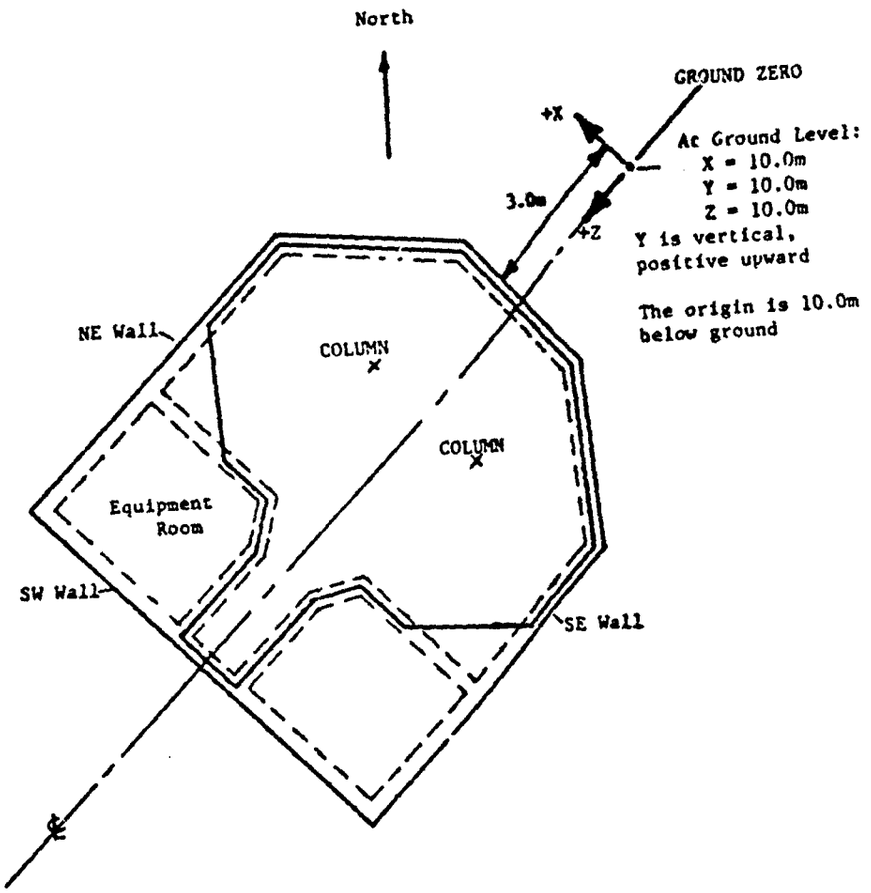


Figure G-1. Aircraft Shelter "B" Coordinate System

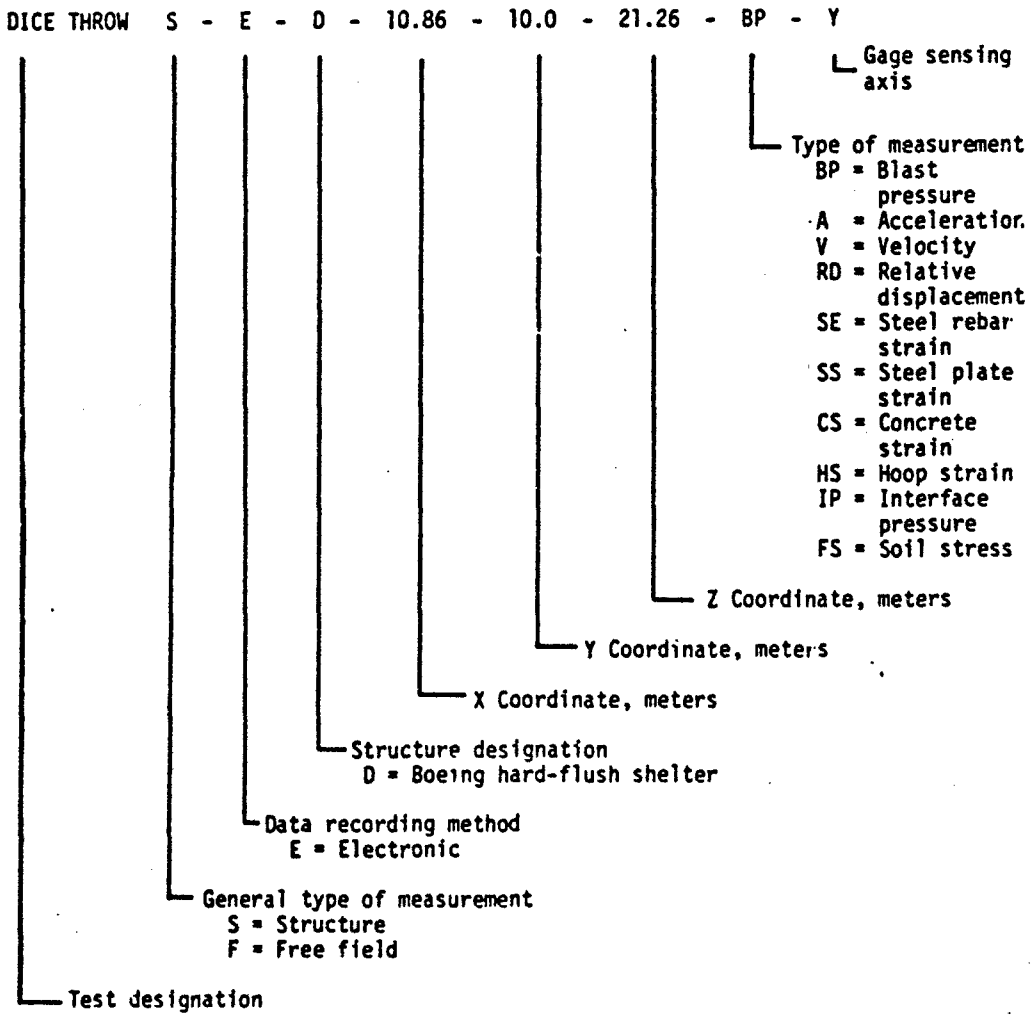


Figure G2. Measurement Designation System

DATA CORRECTIONS

DSP - points have been despiked.

SMT - a modified Hanning smooth has been performed.

FIL - a frequency cut-off or a band reject digital filter has been made.

BLC - the data has been baseline corrected.

INV - the polarity has been reversed.

On each page, the corrected plot is at the top and the uncorrected plot is at the bottom. Each acceleration plot is followed by its integral.

DICE THROW, SHELTER C DATA CORRECTIONS

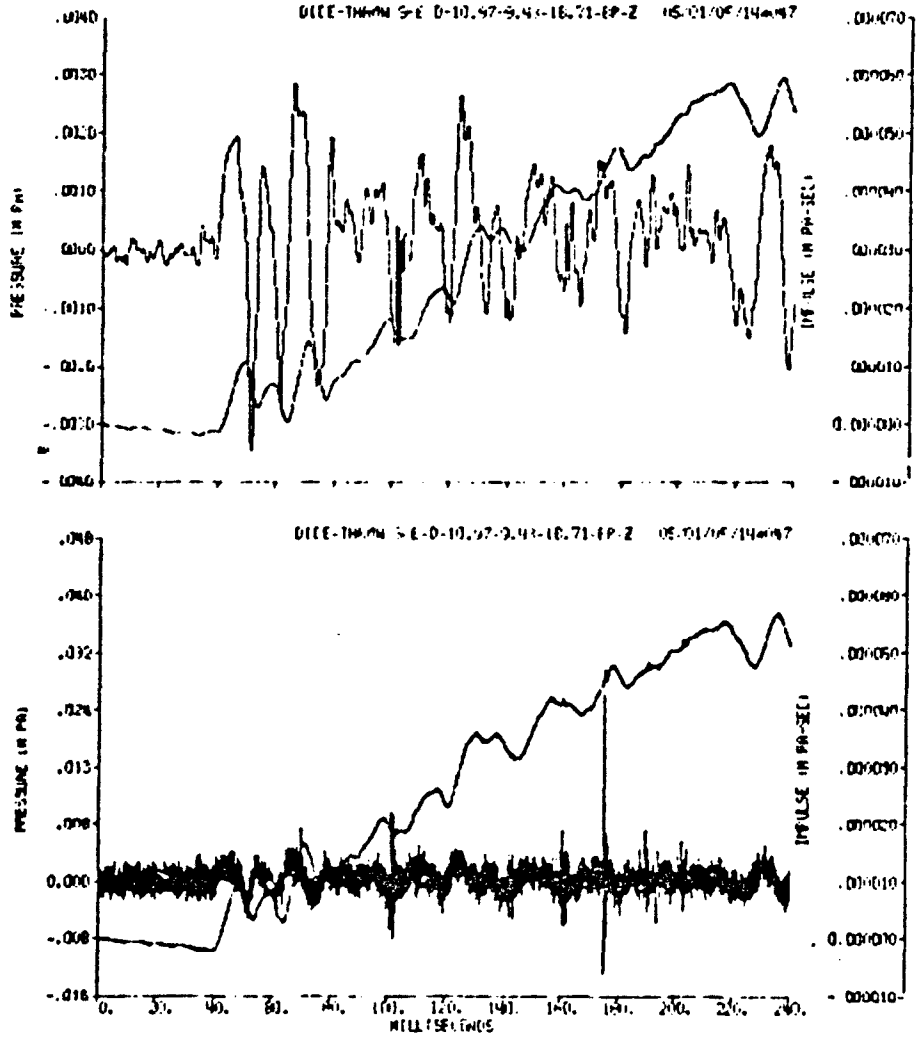
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
47	10.97	9.43	18.71	BP	Z	DSP, SMT	Seal Leakage Top of Equip Room wall
48	13.81	9.43	16.87	BP	X	Scratched	Top NW Wall
49	9.72	9.43	13.25	BP	Z	Scratched	Top NE Wall
50	10.55	9.43	21.02	BP	X	DSP, SMT	Top SW Wall
51	10.00	7.59	16.51	BP	Y	DSP, SMT, FIL	Center of Floor
52	10.86	10.00	14.09	BP	Y	DSP, SMT	Overpressure NE End Shelter
53	10.86	10.00	21.26	BP	Y	DSP, SMT	SW End Shelter
113	10.00	9.63	13.45	A	Y	DSP, SMT, BLC	NE End Roof
114	10.00	8.85	13.25	A	Y	DSP, SMT	Top NE Wall
115	10.00	8.85	13.25	A	Z	DSP, SMT	Top NE Wall
116	11.65	9.10	18.73	A	Y	DSP, SMT	Equip NE Wall (Upper Level)
117	11.65	9.10	18.73	A	Z	DSP	Equip NE Wall (Upper Level)
118	12.30	8.63	19.95	A	Y	DSP	(Upper Level) Equip Rm Floor
119	12.30	8.63	19.95	A	Z	SMT, BLC	(Upper Level) Equip Rm Floor
120	13.65	9.63	15.70	A	Y	DSP	NE Actuator
121	13.65	9.63	15.70	A	Z	DSP, SMT, BLC	NE Actuator
122	10.00	9.70	10.00	A	Y	DSP, SMT	FF .3m Deep
123	10.00	9.70	10.00	A	Z	DSP, SMT, FIL, BLC	FF .3m Deep
124	10.00	7.60	24.59	A	Y	DSP, SMT, FIL, BLC	FF 2.4m Deep
125	10.00	7.60	24.59	A	Z	DSP, SMT	FF 2.4m Deep
126	10.00	9.70	24.59	A	Y	DSP, SMT, BLC	FF .3m Deep
127	10.00	9.70	24.59	A	Z	DSP, SMT, FIL	FF .3m Deep
128	10.00	7.60	10.00	A	Y	DSP, SMT, FIL	FF 2.4m Deep
129	10.00	7.60	10.00	A	Z	DSP, SMT, FIL	FF 2.4m Deep

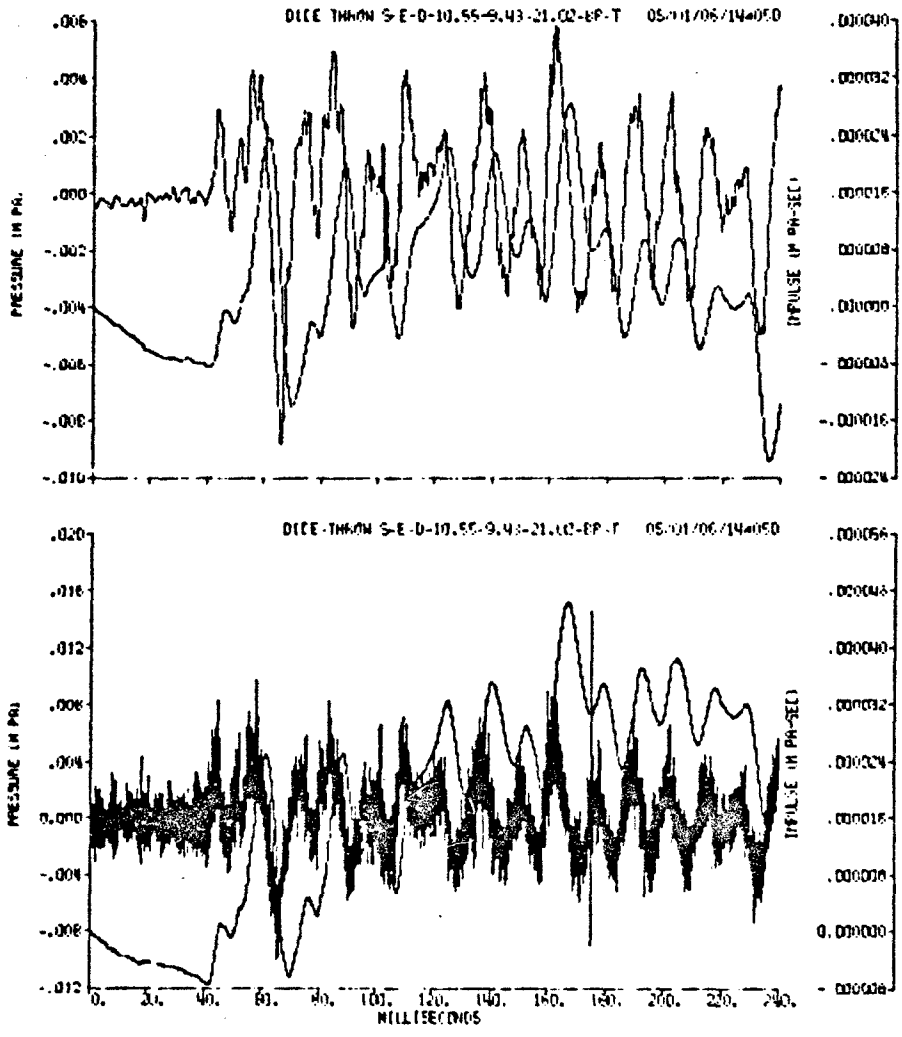
DICE THROW, SHELTER D DATA CORRECTIONS (cont'd)

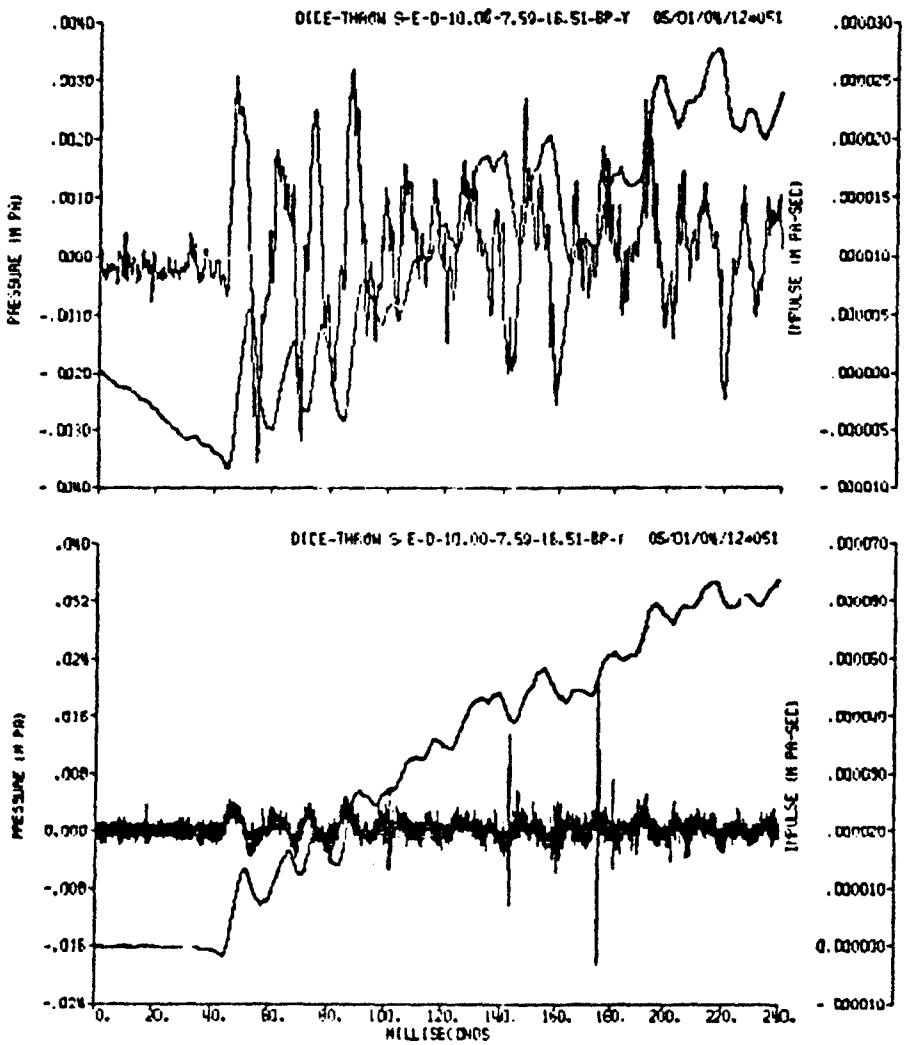
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
240	10.00	9.63	13.45	V	Y	DSP, SMT, BLC	NE End Roof
241	10.00	9.63	17.02	V	Y	DSP, SMT, BLC	Middle of Roof
242	10.00	9.43	13.25	V	Y	DSP, SMT, BLC	Top NE Wall
243	10.00	9.43	13.25	V	Z	DSP, SMT, BLC	Top NE Wall
246	10.00	7.39	16.86	V	Y	DSP, SMT, BLC	Mid Foundation
247	10.00	..39	16.86	V	Z	DSP, SMT	Mid Foundation
248	11.65	9.10	18.73	V	Y	DSP, SMT, BLC	Equip NE Wall (Up Level)
249	11.65	9.10	18.73	V	Z	DSP, SMT, BLC	Equip NE Wall (Up Level)
250	12.30	8.63	19.95	V	Y	DSP, SMT	Equip Rear Floor
251	12.30	8.63	19.95	V	Z	DSP, SMT, BLC	Equip Rear Floor
252	10.00	9.70	10.00	V	Y	DSP, SMT, BLC	FF .3m Deep
253	10.00	9.70	10.00	V	Z	DSP, SMT, BLC	FF .3m Deep
254	10.00	7.60	24.59	V	Y	DSP, SMT, BLC	FF 2.4 Deep
255	10.00	7.60	24.59	V	Z	DSP, SMT, BLC	FF 2.4 Deep
256	10.00	9.70	24.59	V	Y	DSP, SMT, BLC	FF .3 Deep
257	10.00	9.70	24.59	V	Z	DSP, SMT, FIL, BLC	FF .3 Deep
258	10.00	7.60	10.00	V	Y	DSP, SMT, BLC	FF 2.4 Deep
259	10.00	7.60	10.00	V	Z	DSP, SMT, BLC	FF 2.4 Deep
517	10.00	9.16	13.02	SE	X	DSP, SMT	Top NE Wall
518	10.00	9.00	13.23	SE	X	DSP, SMT	Top NE Wall
519	10.00	7.48	13.23	SE	Y	DSP, SMT	Bottom NE Wall
520	10.00	7.48	13.02	SE	Y	Scratched	Bottom NE Wall
521	10.83	9.98	15.91	SE	Z	DSP, SMT	Roof Above NW Column
522	11.00	9.98	15.81	SE	Z	DSP, SMT, FIL	Roof Above NW Column
523	9.87	9.63	17.02	SS	Z	DSP	Mid Roof
524	9.87	9.63	17.02	SS	X	DSP, SMT	Mid Roof
525	11.27	9.26	15.70	SS	Y	DSP, SMT	Top NW Column
526	11.27	7.94	15.70	SS	Y	DSP, SMT	BOT NW Column

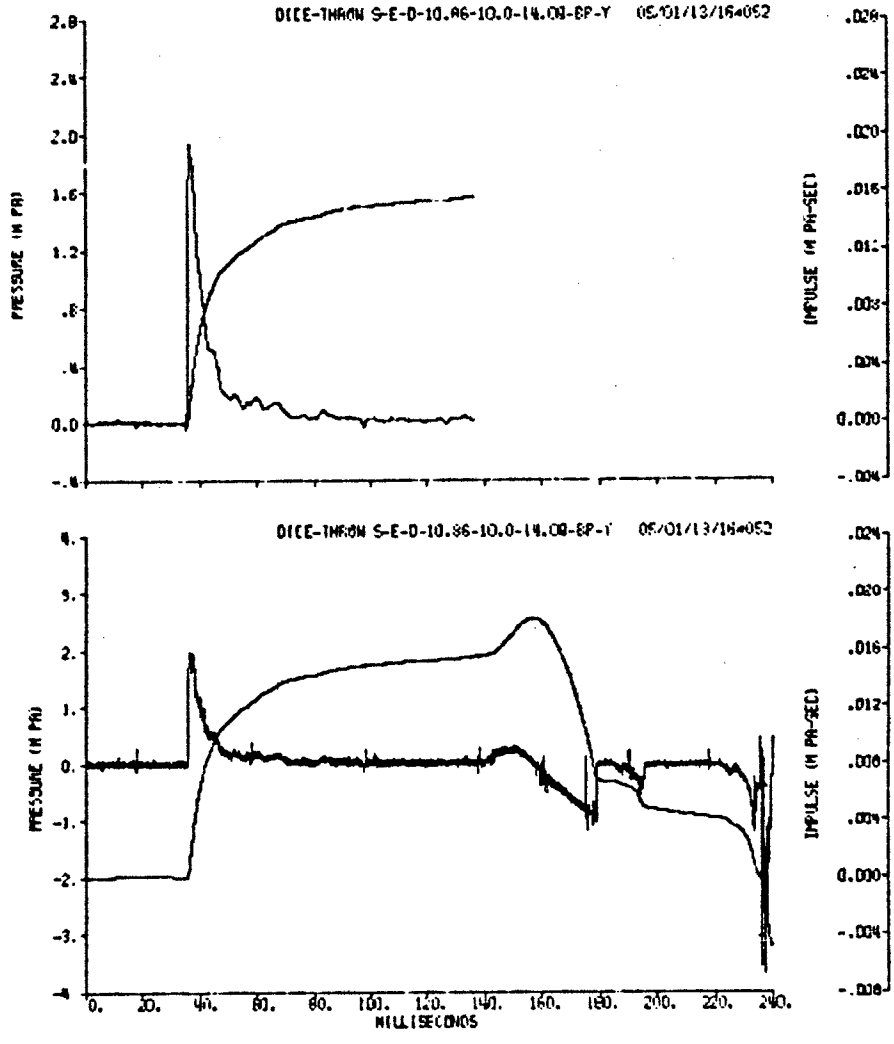
DICE THROW, SHELTER D DATA CORRECTIONS (cont'd)

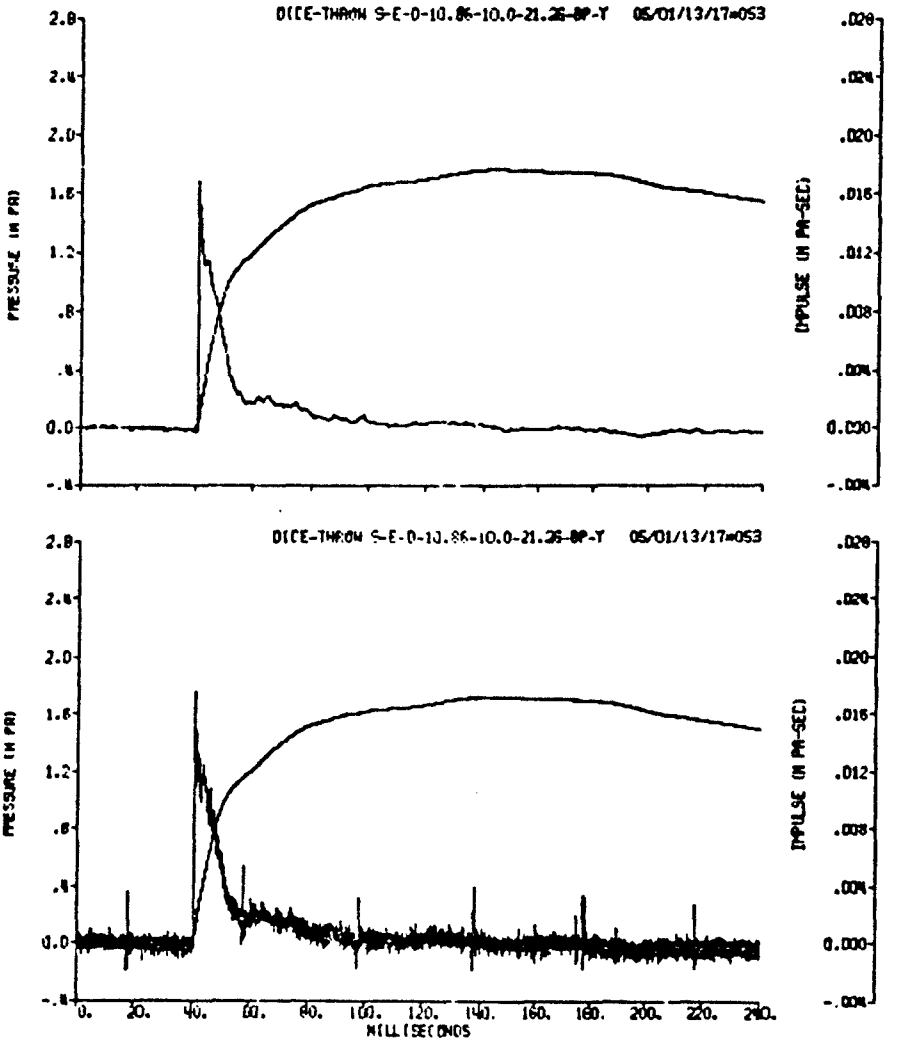
MEAS. NO.	COORDINATES X METERS	Y METERS	Z METERS	MEAS. TYPE	SENS. AXIS	DATA CORRECTIONS	GENERAL LOCATIONS
527	11.41	9.24	18.64	CS	Y	DSP, SMT - Concrete Strain	NE Wall Equip Rm. Concrete Strain
528	10.00	7.38	16.86	SE	Z	DSP, SMT	Mid Foundation
529	10.00	7.38	16.86	SE	X	DSP, SMT	Mid Foundation
530	11.35	9.22	18.43	SE	Y	DSP, SMT, FIL	NE Equip Rm Roof Tie Down
531	10.00	9.22	13.35	SE	Y	DSP, SMT	NE Wall Roof Tie Down
532	13.71	9.22	15.42	SE	Y	DSP, SMT	NW Wall Roof Tie Down
533	10.00	9.22	21.29	SE	Y	DSP, SMT	SW Wall Roof Tie Down
534	11.22	9.22	13.35	SE	Y	DSP, SMT, FIL	NE Wall Roof Tie Down
535	6.29	9.22	15.42	SE	Y	DSP, SMT	SE Wall Roof Tie Down
536	11.38	8.70	13.24	SE	X	DSP, SMT, FIL	Top NE Wall North Corner
537	11.38	8.70	13.17	SE	X	DSP, SMT	Top of NE Wall North Corner
538	8.61	8.73	13.24	SE	X	DSP, SMT	Top of NE Wall East Corner
539	8.61	8.73	13.17	SE	X	DSP, SMT, FIL	Top of NE Wall East Corner
540	8.73	9.26	15.70	SS	Y	DSP, SMT	Top of SE Corner
541	12.61	8.66	14.19	SS	X	Scratched	Top of North Wall
554	10.07	9.06	13.00	IP	Z	DSP, SMT	Top NE Wall Outside
555	10.15	9.11	13.00	IP	Z	DSP, SMT	Center of NE Wall (Outside)
556	10.00	7.6	13.00	FS	Z	DSP, SMT	Bottom of NE Wall (Outside)
557	10.00	7.26	13.46	FS	Y	DSP, SMT	Under NE Wall
558	8.33	7.26	15.81	FS	Y	DSP	Under South Column Footing
559	10.00	7.26	16.91	FS	Y	SMT	Under Center of Building
560	12.77	8.15	14.09	IP	Z	DSP, SMT	Center of North Wall (Outside)
561	14.06	8.14	16.06	IP	X	DSP, SMT	Center of NW Wall (Outside)
562	5.94	8.10	16.07	IP	X	DSP, SMT	Center of SE Wall (Outside)

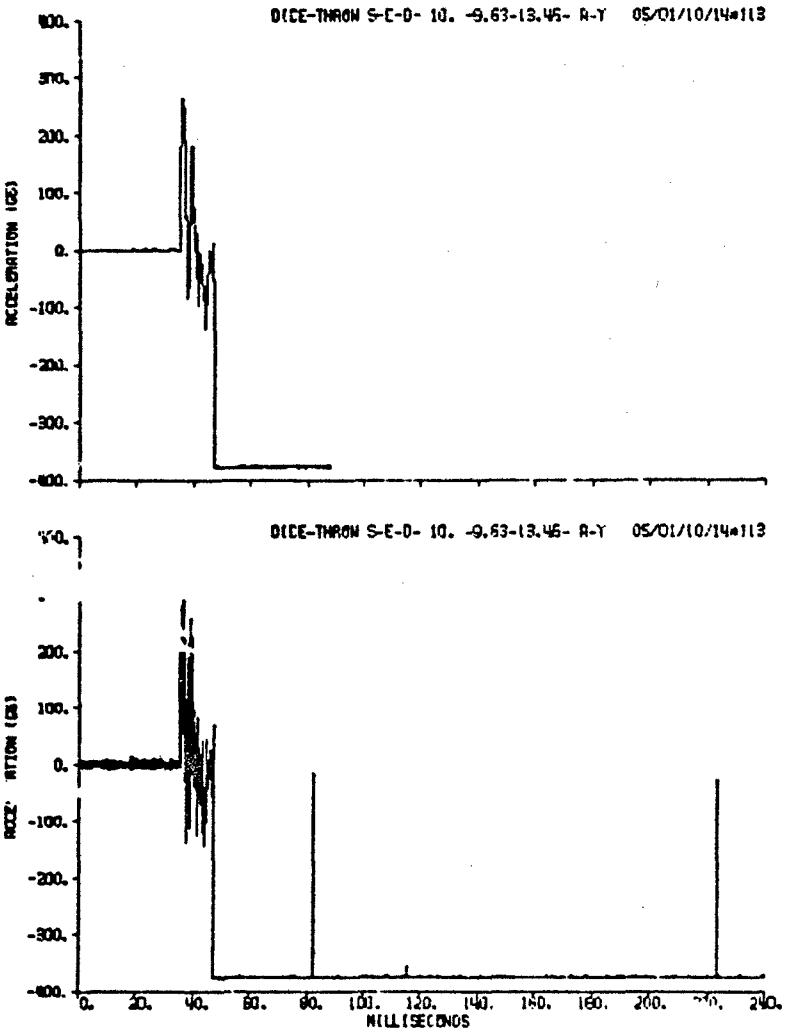


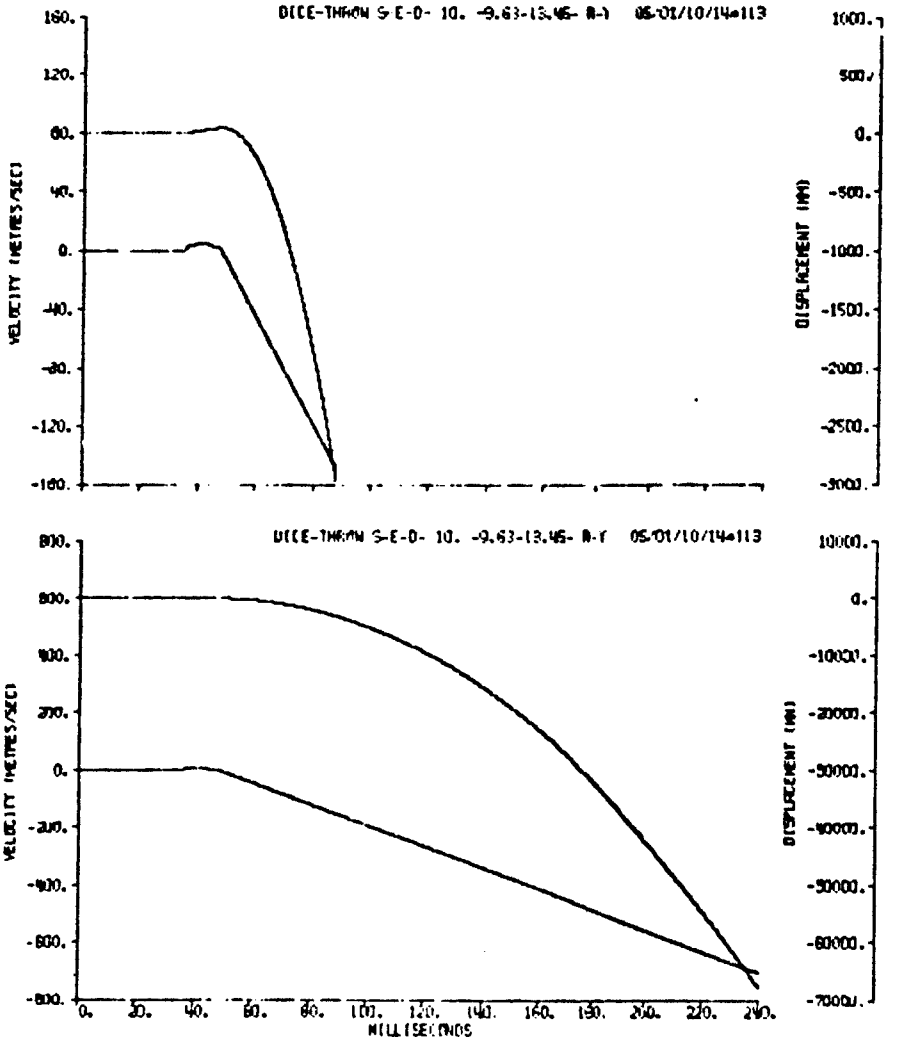

DICE THROW S-E-D-10.55-9.43-21.02-EP-T 05/01/06/14+050
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.008
.006
.004
.002
.000
-.002
-.004
-.006
-.008
-.010
.000040
.000032
.000024
.000016
.000008
.000000
-.000008
-.000016
-.000024
DICE-THROW S-E-D-10.55-9.43-21.02-EP-I 05/01/06/14+050
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.020
.016
.012
.008
.004
0.000
-.004
-.008
-.012
.000056
.000048
.000040
.000032
.000024
.000016
.000008
0.000000
-.000008
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

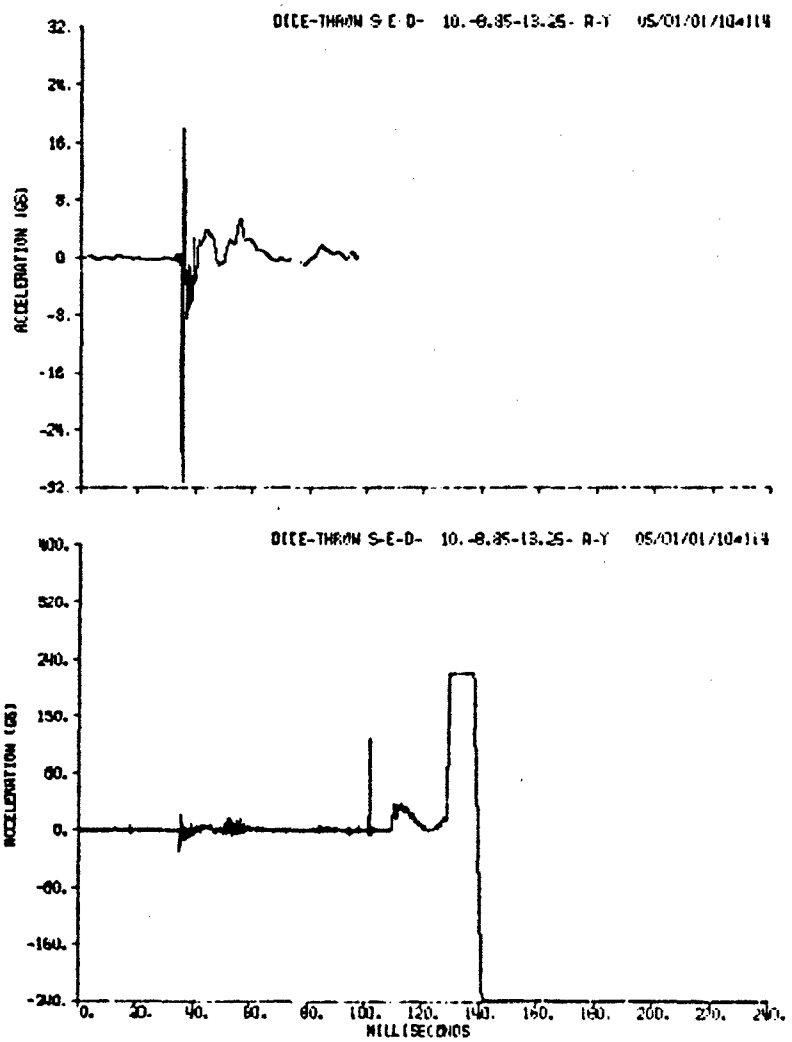

DICE-THROW S-E-0-10.00-7.59-18.51-BP-Y 05/01/0%/12+051
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.0040
.0030
.0020
.0010
.0000
-.0010
-.0020
-.0030
-.0040
.000030
.000025
.000020
.000015
.000010
.000005
.000000
-.000005
-.000010
DICE-THROW S-E-0-10.00-7.59-18.51-BP-Y 05/01/0%/12+051
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.040
.032
.024
.016
.008
0.000
-.008
-.016
-.024
.000070
.000060
.000050
.000040
.000030
.000020
.000010
0.000000
-.000010
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

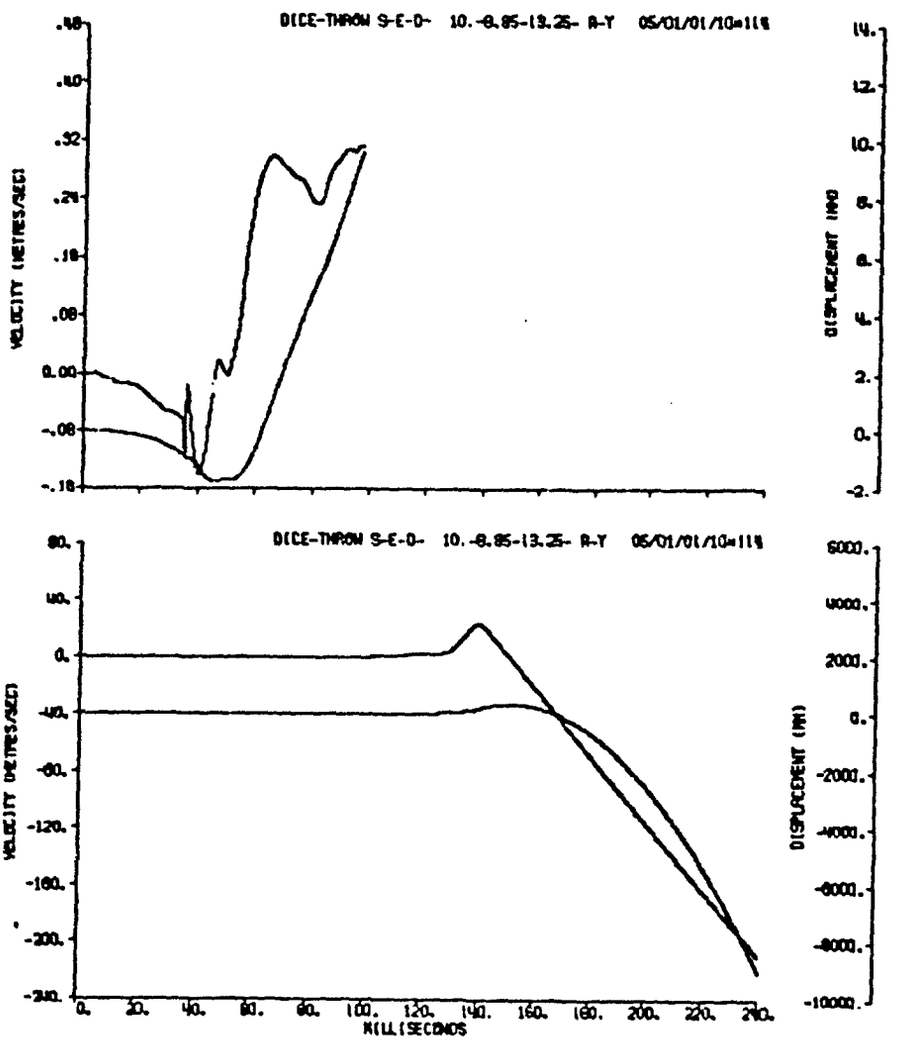

DICE-THROW S-E-0-10.86-10.0-14.00-SP-Y 05/01/13/16+052
PRESSURE (M PA)
IMPULSE (M PA-SEC)
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
.028
.024
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-0-10.86-10.0-14.00-SP-Y 05/01/13/16+052
PRESSURE (M PA)
IMPULSE (M PA-SEC)
4.
3.
2.
1.
0.
-1.
-2.
-3.
-4
.024
.020
.016
.012
.008
.004
0.000
-.004
-.008
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

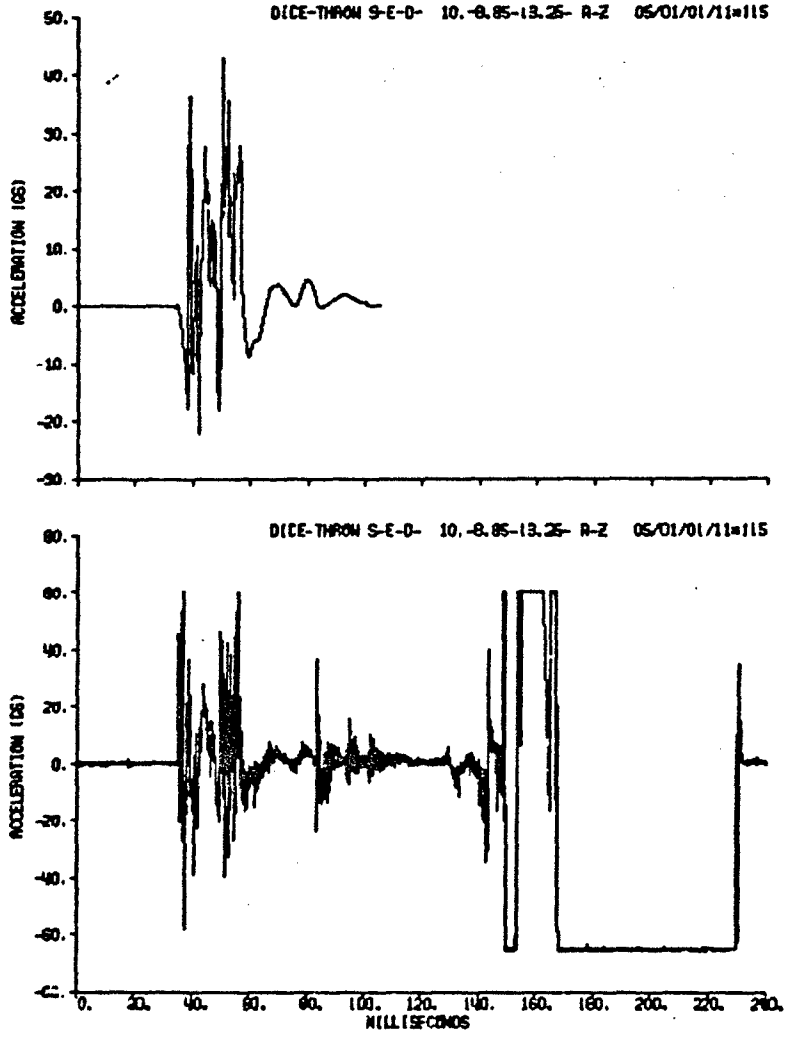

DICE-THROW S-E-0-10.86-10.0-21.26-BP-Y 05/01/13/17=053
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
DICE-THROW S-E-0-10.86-10.0-21.26-BP-Y 05/01/13/17=053
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

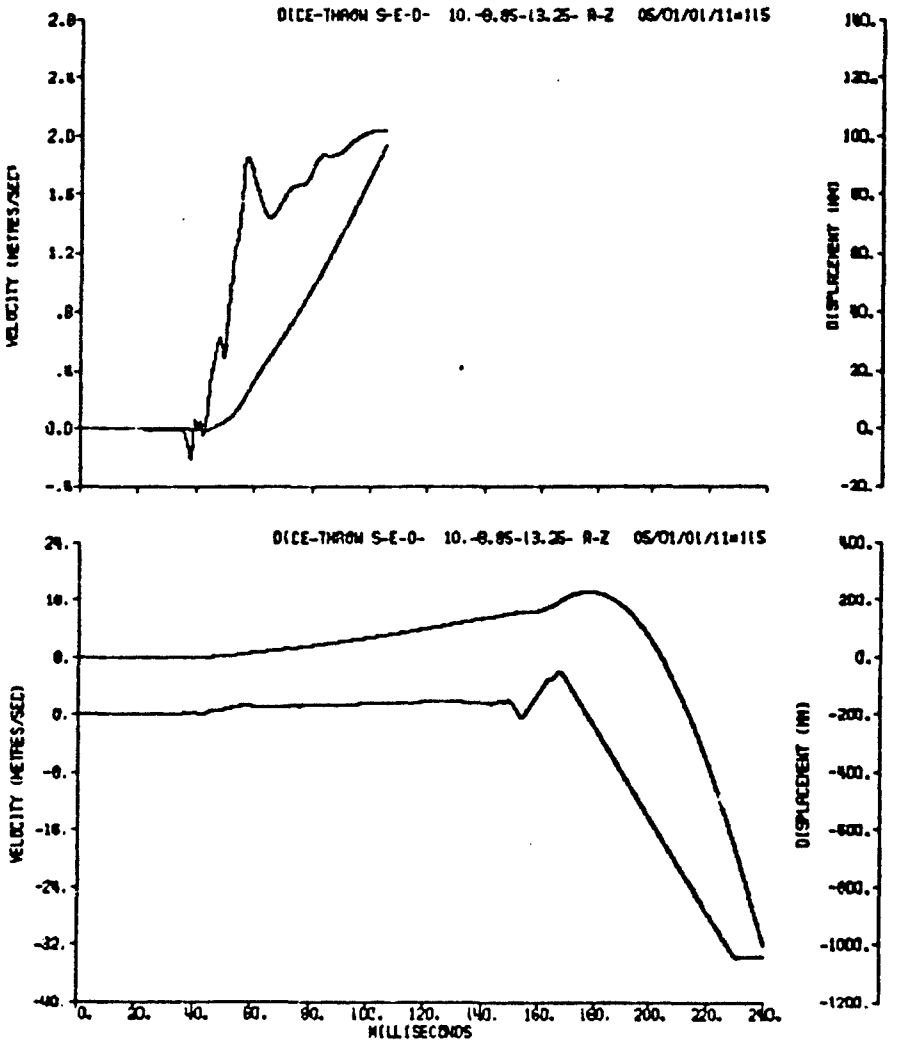

DICE-THROW S-E-D- 10. -9.63-13.45- A-Y 05/01/10/14*13
ACCELERATION (GS)
600.
500.
200.
100.
0.
-100.
-200.
-300.
-600.
DICE-THROW S-E-D- 10. -9.63-13.45- A-Y 05/01/10/14*13
ACCELERATION (GS)
200.
100.
0.
-100.
-200.
-300.
-600.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
240.
MILLISECONDS

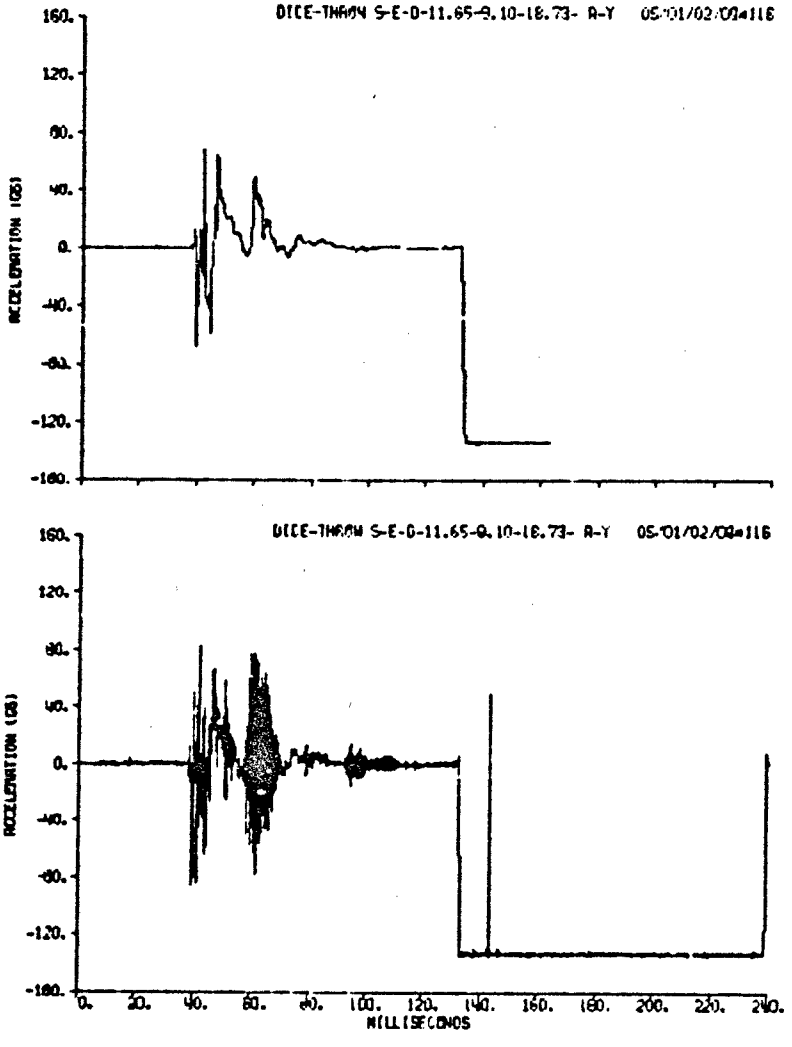

DICE-THROW S-E-0- 10. -9.63-13.46- A-1 05/01/10/14=113
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
-2500.
-3000.
DICE-THROW S-E-0- 10. -9.63-13.46- A-1 05/01/10/14=113
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
800.
400.
200.
0.
-200.
-400.
-600.
-800.
10000.
0.
-10000.
-20000.
-30000.
-40000.
-50000.
-60000.
-70000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

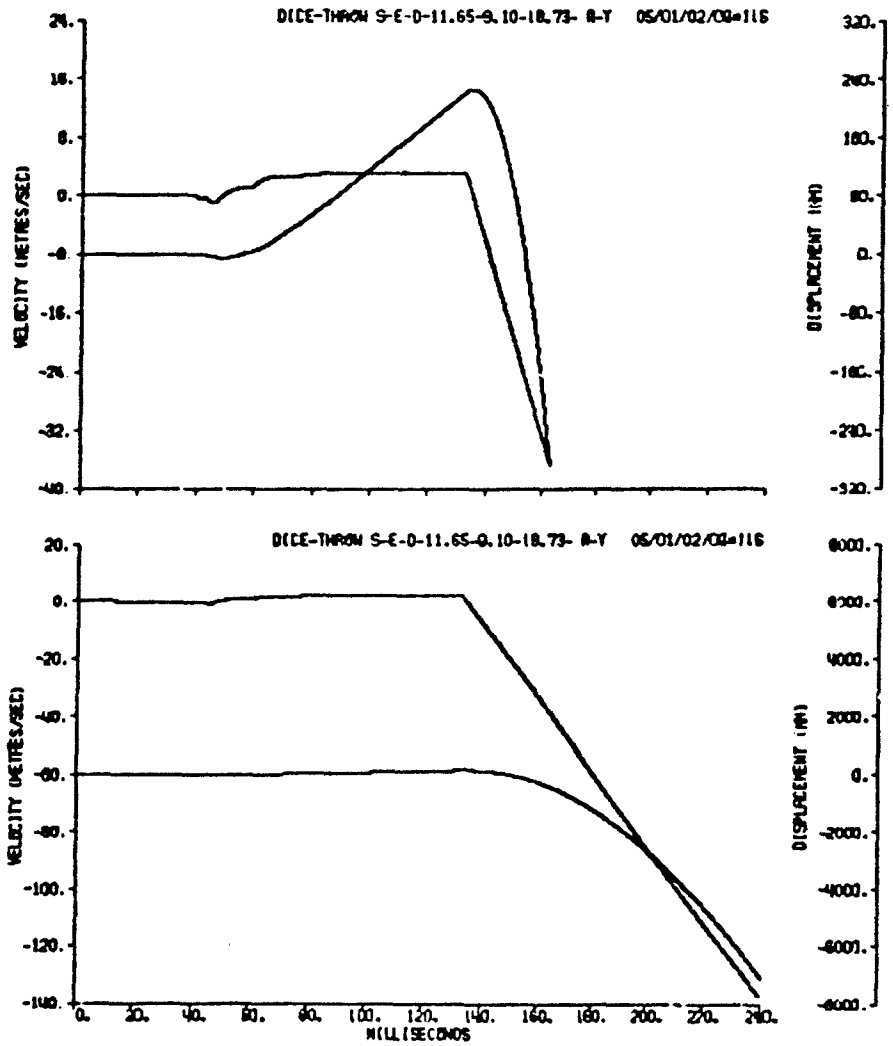

DICE-THROW S-E-D- 10.-8.35-13.25- A-Y 05/01/01/10+114
ACCELERATION (GS)
32.
24.
16.
8.
0
-8.
-16.
-24.
-32.
DICE-THROW S-E-D- 10.-8.35-13.25- A-Y 05/01/01/10+114
ACCELERATION (GS)
400.
320.
240.
160.
80.
0.
-80.
-160.
-240.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

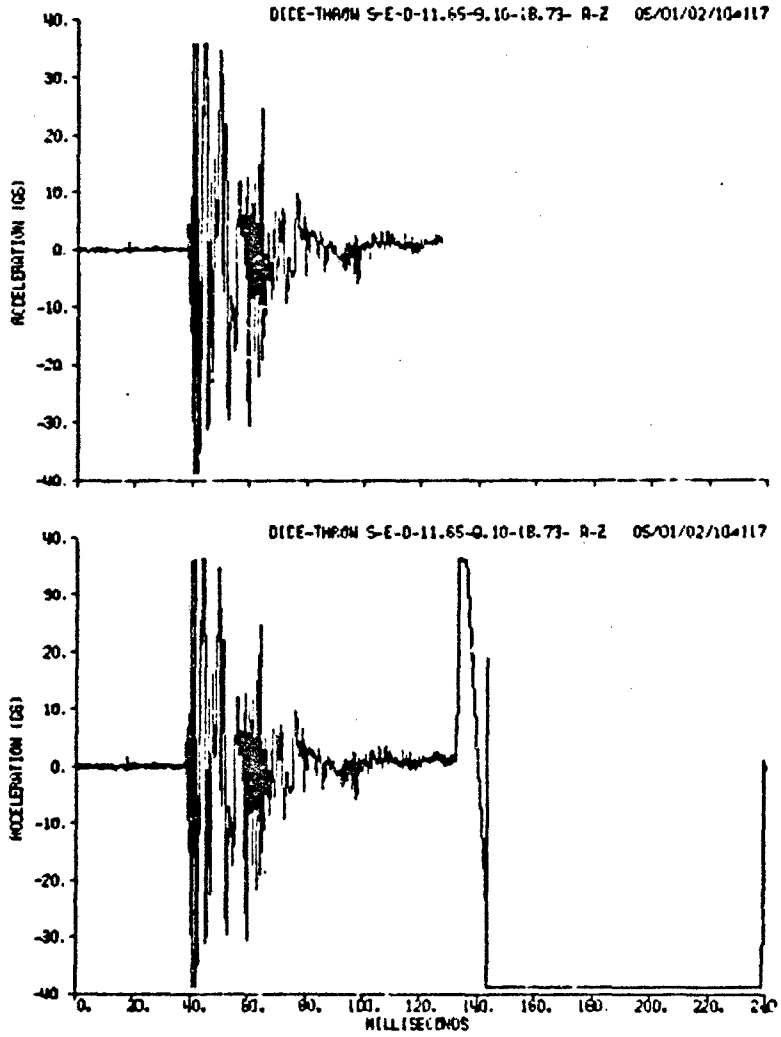

DICE-THROW S-E-0- 10.-8.85-13.25- R-Y 05/01/01/10=11%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0- 10.-8.85-13.25- R-Y 05/01/01/10=11%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

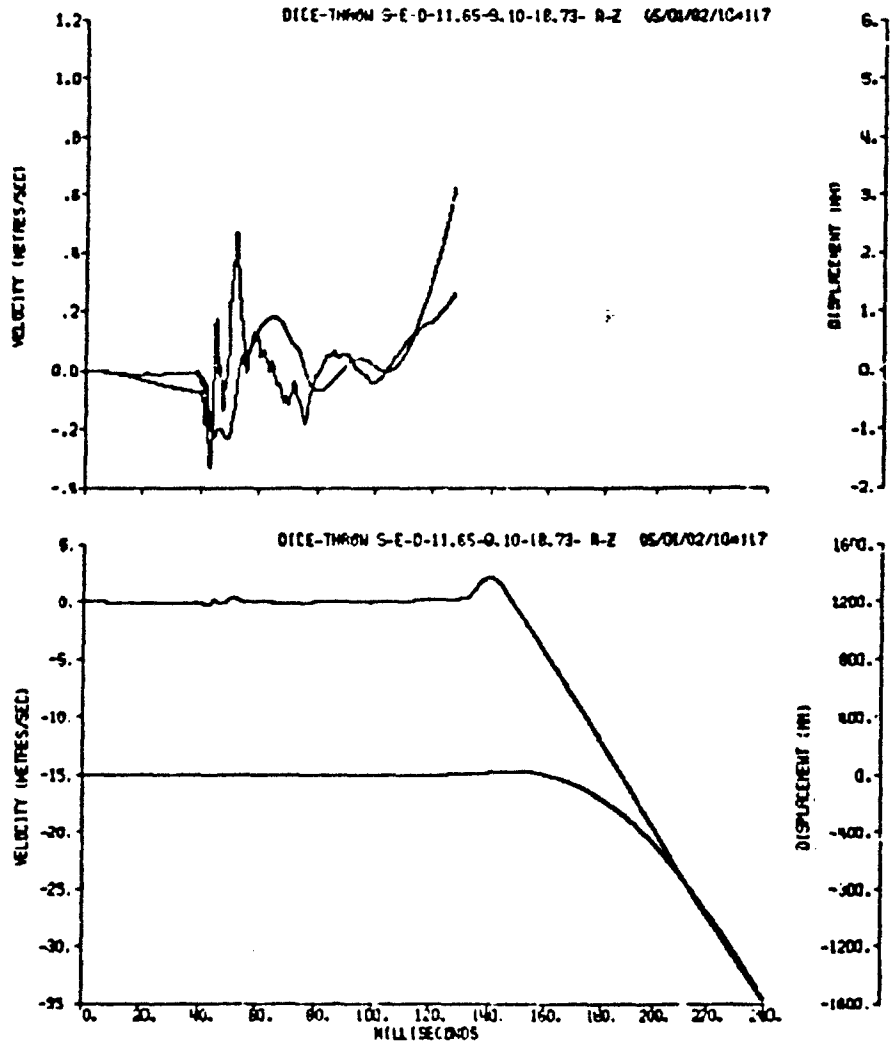

DICE-THROW 9-E-0- 10.-8.85-13.25- R-Z 05/01/01/11=115
ACCELERATION (GS)
50.
40.
30.
20.
10.
0.
-10.
-20.
-30.
DICE-THROW 9-E-0- 10.-8.85-13.25- R-Z 05/01/01/11=115
ACCELERATION (GS)
80.
60.
40.
20.
0.
-20.
-40.
-60.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

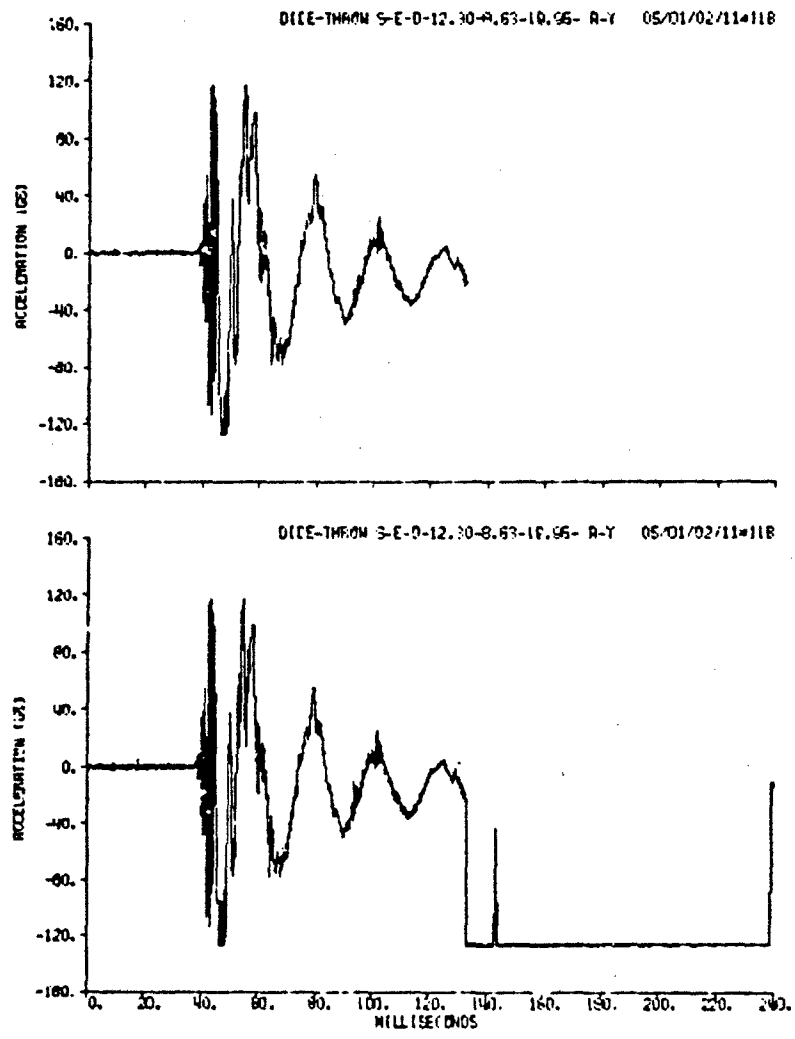

DICE-THROW S-E-0- 10.-8.85-13.25- R-Z 05/01/01/11=115
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.8
2.4
2.0
1.6
1.2
.8
.4
0.0
-.4
160.
120.
100.
80.
60.
40.
20.
0.
-20.
DICE-THROW S-E-0- 10.-8.85-13.25- R-Z 05/01/01/11=115
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
24.
16.
8.
0.
-8.
-16.
-24.
-32.
-40.
400.
200.
0.
-200.
-400.
-600.
-800.
-1000.
-1200.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

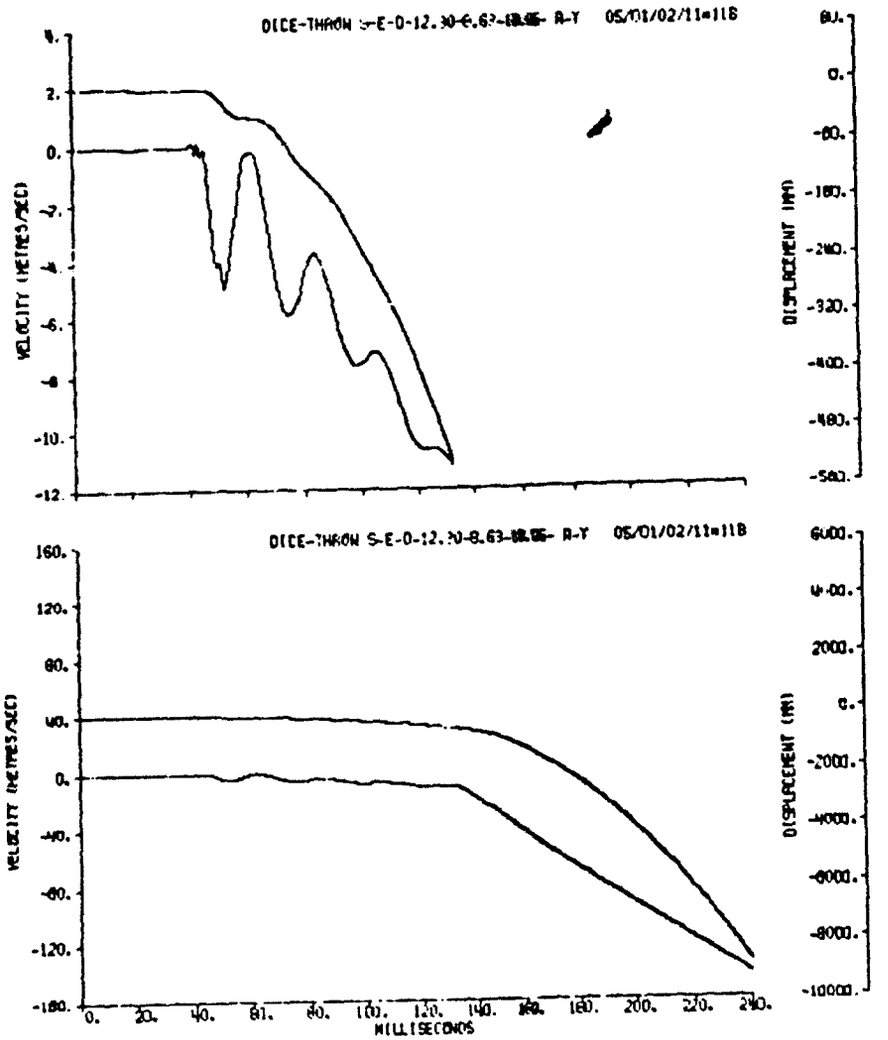

DICE-THROW S-E-D-11.65-0.10-18.73- A-Y 05/01/02/04=116
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
ACCELERATION (GS)
DICE-THROW S-E-D-11.65-0.10-18.73- A-Y 05/01/02/04=116
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
ACCELERATION (GS)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

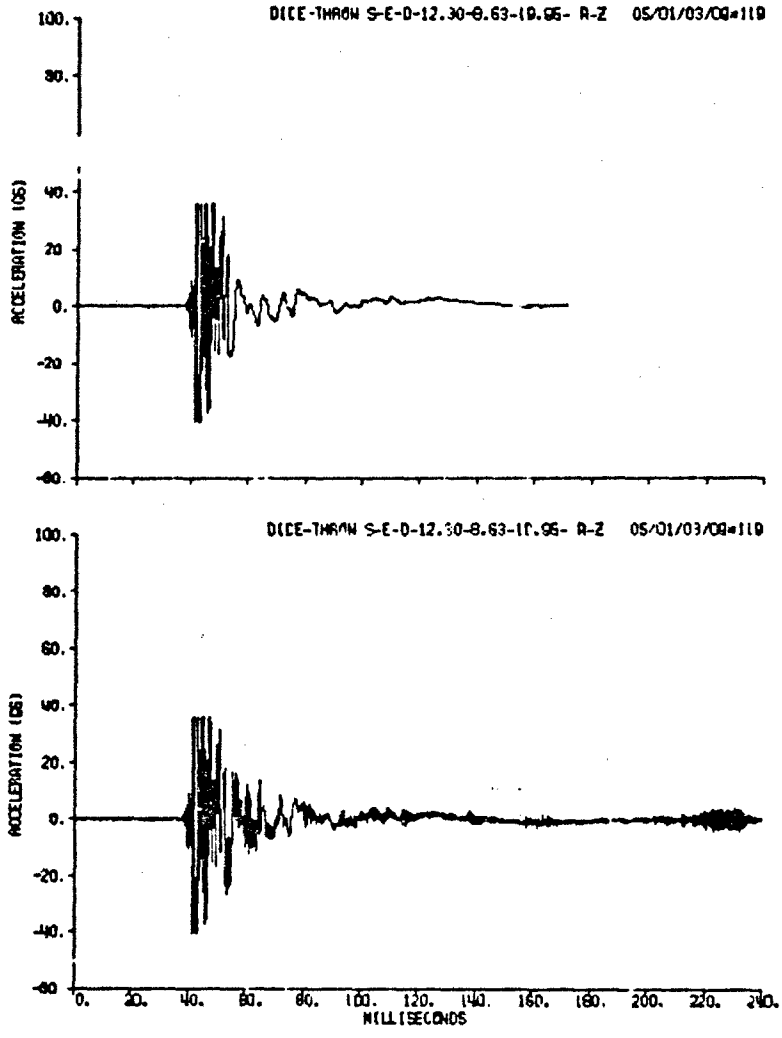

DICE-THROW S-E-0-11.65-0.10-18.73- 8-Y 05/01/02/09=116
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
24.
16.
8.
0.
-8.
-16.
-24.
-32.
-40.
320.
240.
160.
80.
0.
-80.
-160.
-240.
-320.
DICE-THROW S-E-0-11.65-0.10-18.73- 8-Y 05/01/02/09=116
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
20.
0.
-20.
-40.
-60.
-80.
-100.
-120.
-140.
8000.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
-8000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

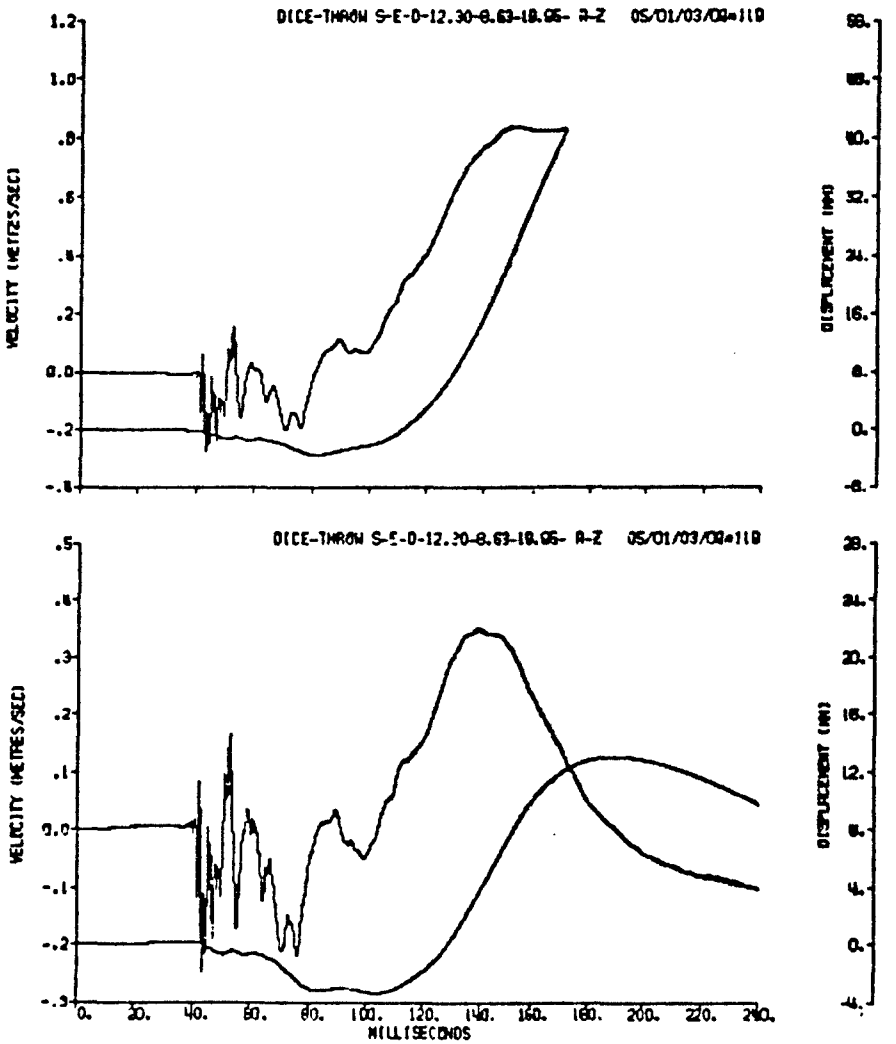

DICE-THROW S-E-0-11.65-0.10-18.73- R-Z 05/01/02/10=117
ACCELERATION (GS)
40.
30.
20.
10.
0.
-10.
-20.
-30.
-40.
DICE-THROW S-E-0-11.65-0.10-18.73- R-Z 05/01/02/10=117
ACCELERATION (GS)
40.
30.
20.
10.
0.
-10.
-20.
-30.
-40.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240
MILLISECONDS

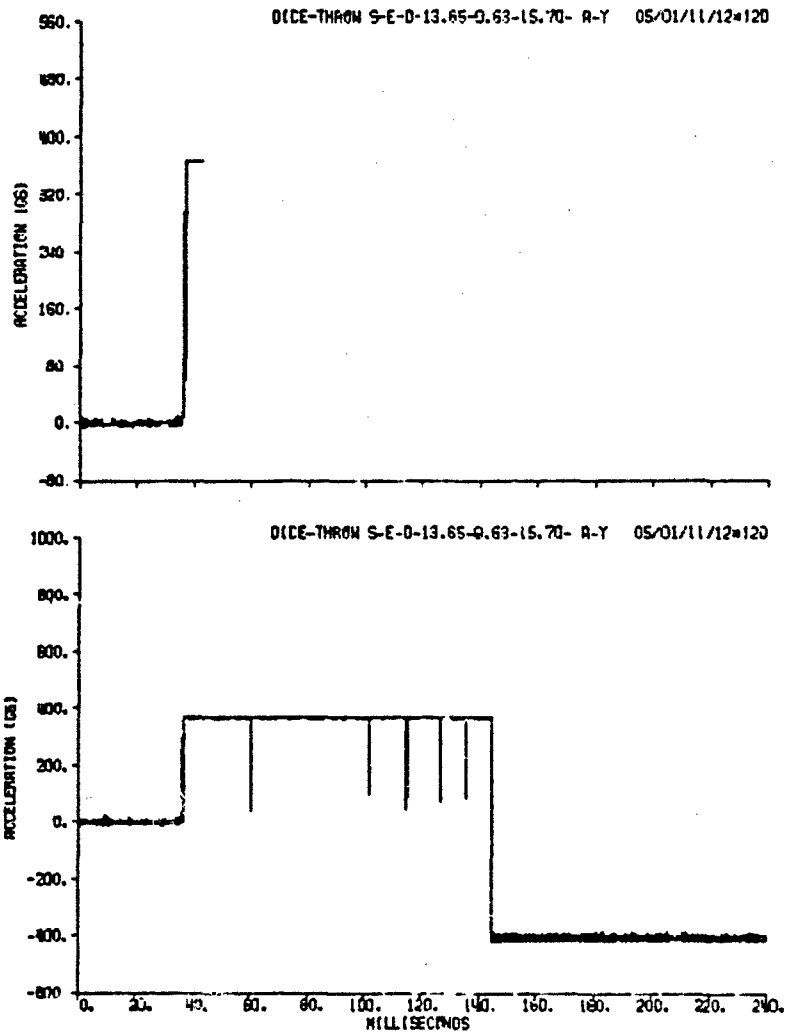

DICE-THROW S-E-D-11.65-0.10-18.73- R-Z 05/01/02/10+117
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.2
1.0
.8
.6
.4
.2
0.0
-.2
-.4
6.
5.
4.
3.
2.
1.
0.
-1.
-2.
DICE-THROW S-E-D-11.65-0.10-18.73- R-Z 05/01/02/10+117
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
5.
0.
-5.
-10.
-15.
-20.
-25.
-30.
-35.
1600.
1200.
800.
400.
0.
-400.
-800.
-1200.
-1600.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

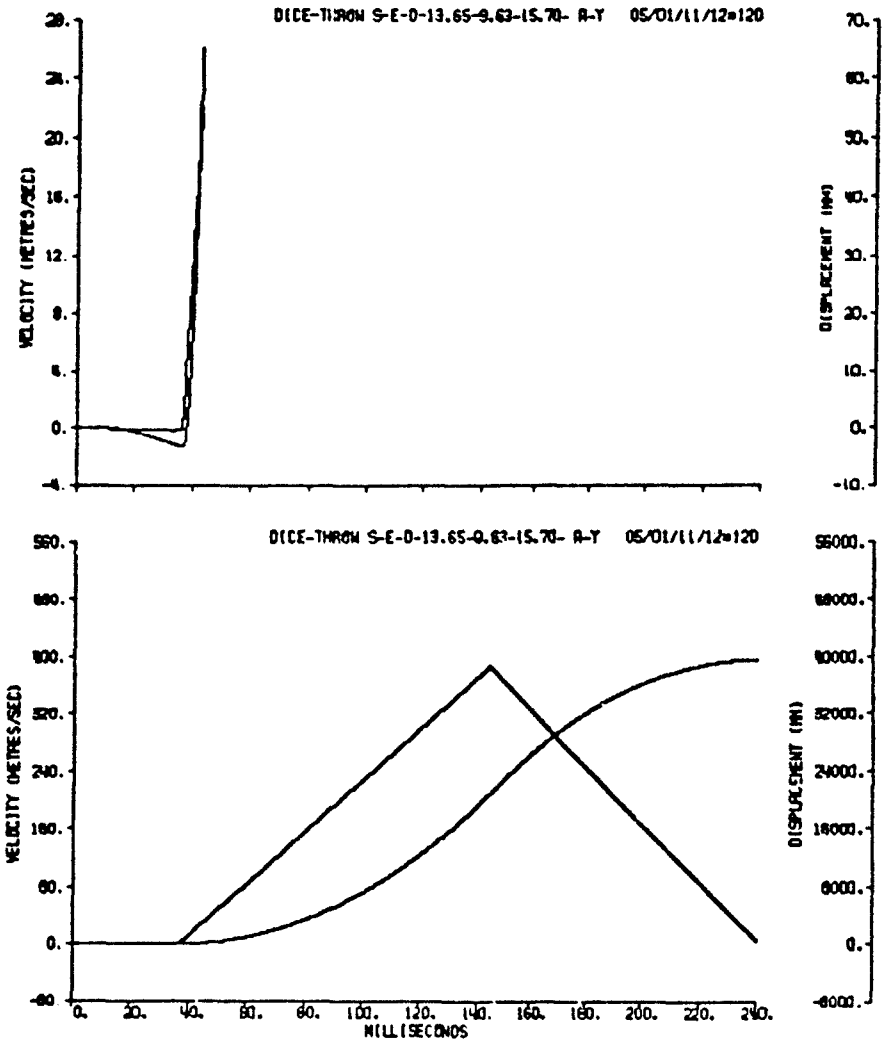

DICE-THROW S-E-0-12.30-8.63-10.96- R-Y 05/01/02/11=118
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
ACCELERATION (G3)
DICE-THROW S-E-0-12.30-8.63-10.96- R-Y 05/01/02/11=118
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
ACCELERATION (G3)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

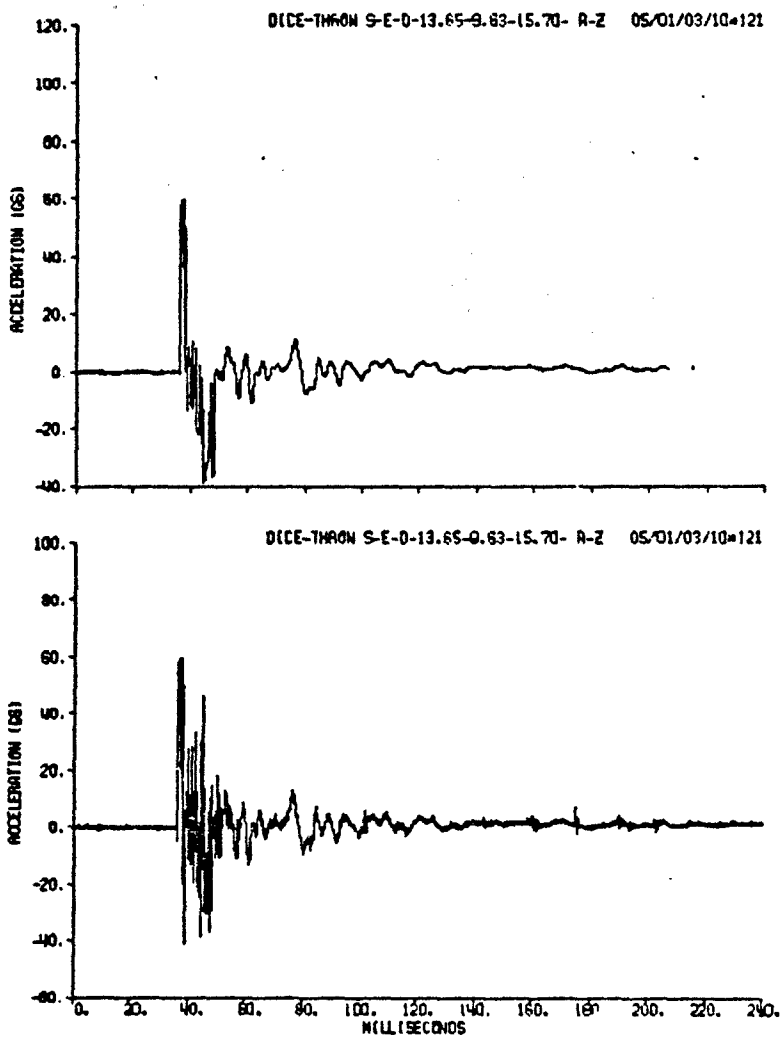

DICE-THROW S-E-0-12.30-8.63- R-Y 05/01/02/11=11B
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
2.
0.
-2.
-4.
-6.
-8.
-10.
-12.
60.
-60.
-180.
-240.
-320.
-400.
-480.
-560.
DICE-THROW S-E-0-12.30-8.63- R-Y 05/01/02/11=11B
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
160.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
6000.
4000.
2000.
0.
-2000.
-4000.
-6000.
-8000.
-10000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

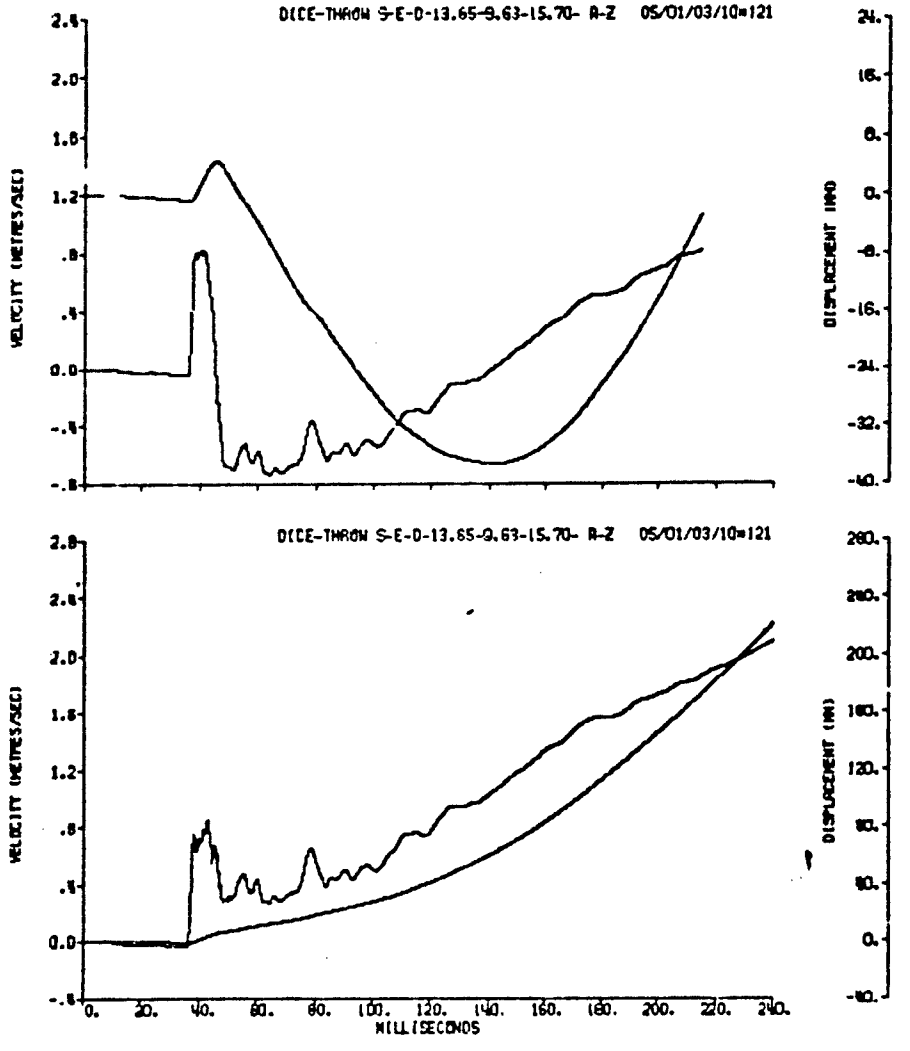

DICE-THROW S-E-D-12.30-8.63-10.95- R-Z 05/01/03/09=119
100.
80.
60.
40.
20.
0.
-20.
-40.
-60.
ACCELERATION (DG)
DICE-THROW S-E-D-12.30-8.63-10.95- R-Z 05/01/03/09=119
100.
80.
60.
40.
20.
0.
-20.
-40.
-60.
ACCELERATION (DG)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

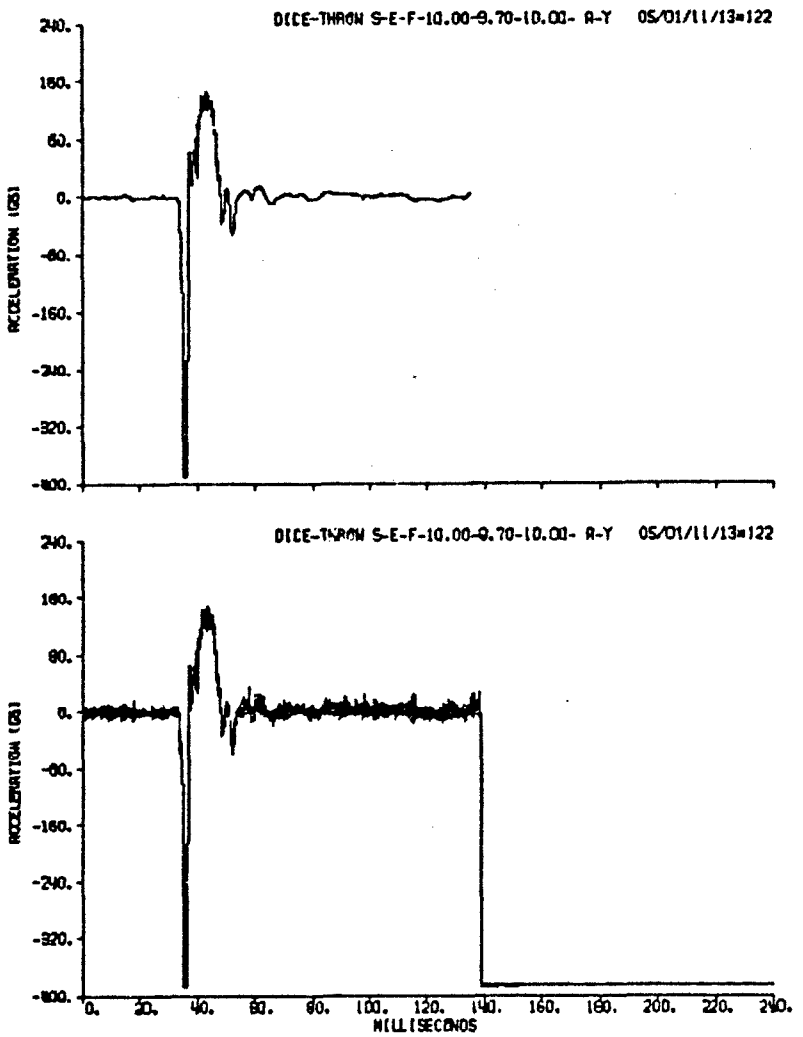

DICE-THROW S-E-0-12.30-8.63-18.05- R-Z 05/01/03/00=110
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.2
1.0
.8
.6
.4
.2
0.0
-.2
-.4
DICE-THROW S-E-0-12.30-8.63-18.05- R-Z 05/01/03/00=110
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.5
.4
.3
.2
.1
0.0
-.1
-.2
-.3
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

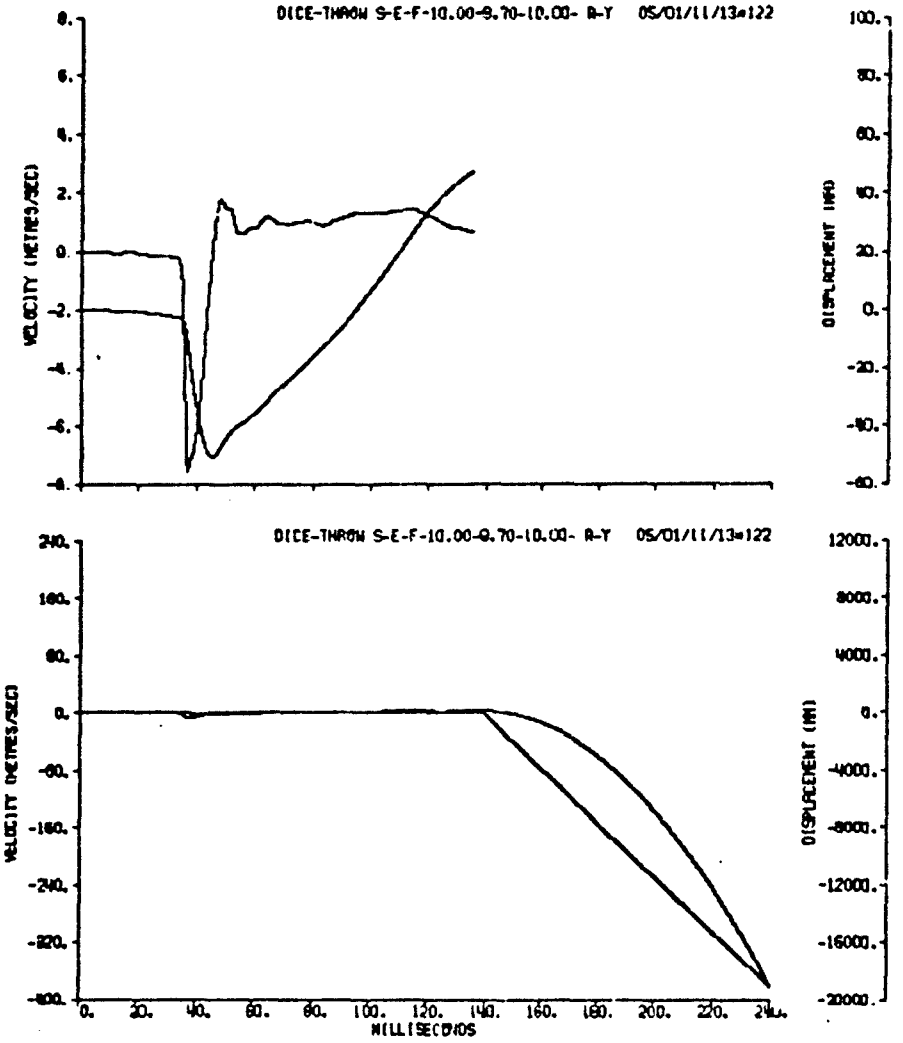

DICE-THROW S-E-D-13.65-0.63-15.70- A-Y 05/01/11/12*120
ACCELERATION (GS)
560.
480.
400.
320.
240.
160.
80.
0.
-80.
DICE-THROW S-E-D-13.65-0.63-15.70- A-Y 05/01/11/12*120
ACCELERATION (GS)
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

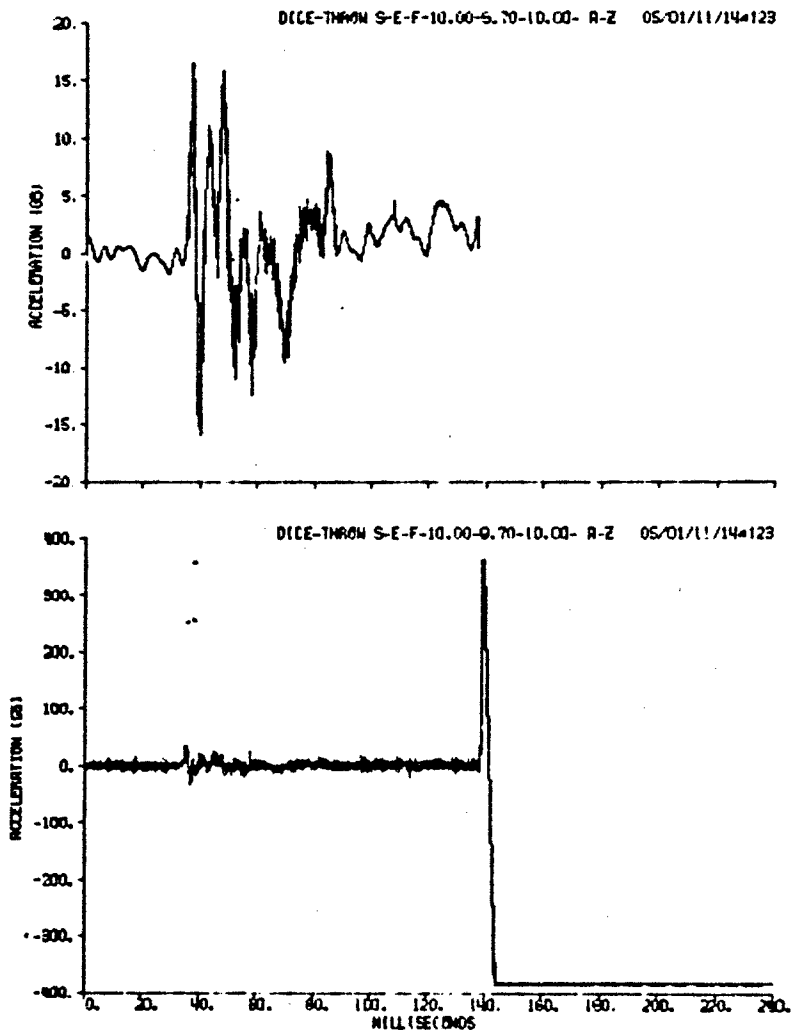

DICE-THROW S-E-0-13.65-0.63-15.70- A-Y 05/01/11/12=120
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0-13.65-0.63-15.70- A-Y 05/01/11/12=120
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

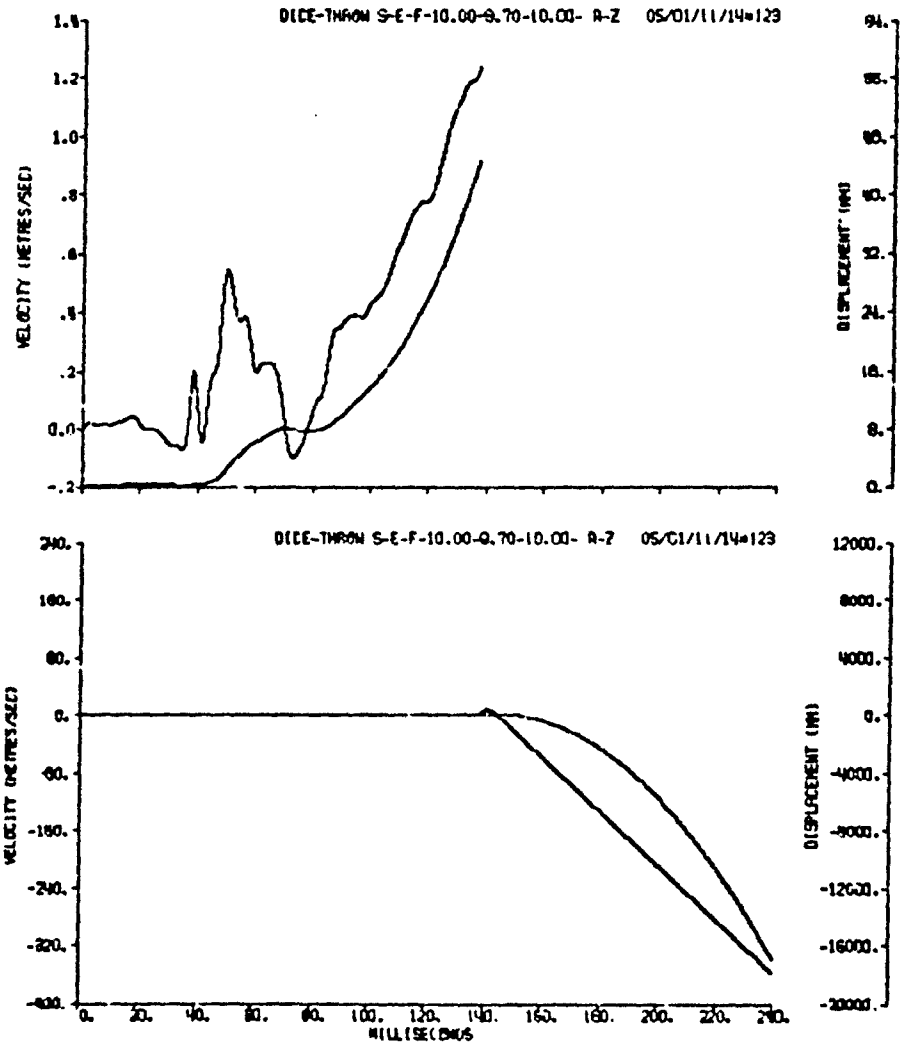

DICE-THROW S-E-0-13.65-0.63-15.70- A-Z 05/01/03/10=121
ACCELERATION (GS)
120.
100.
80.
60.
40.
20.
0.
-20.
-40.
DICE-THROW S-E-0-13.65-0.63-15.70- A-Z 05/01/03/10=121
ACCELERATION (GS)
100.
80.
60.
40.
20.
0.
-20.
-40.
-60.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

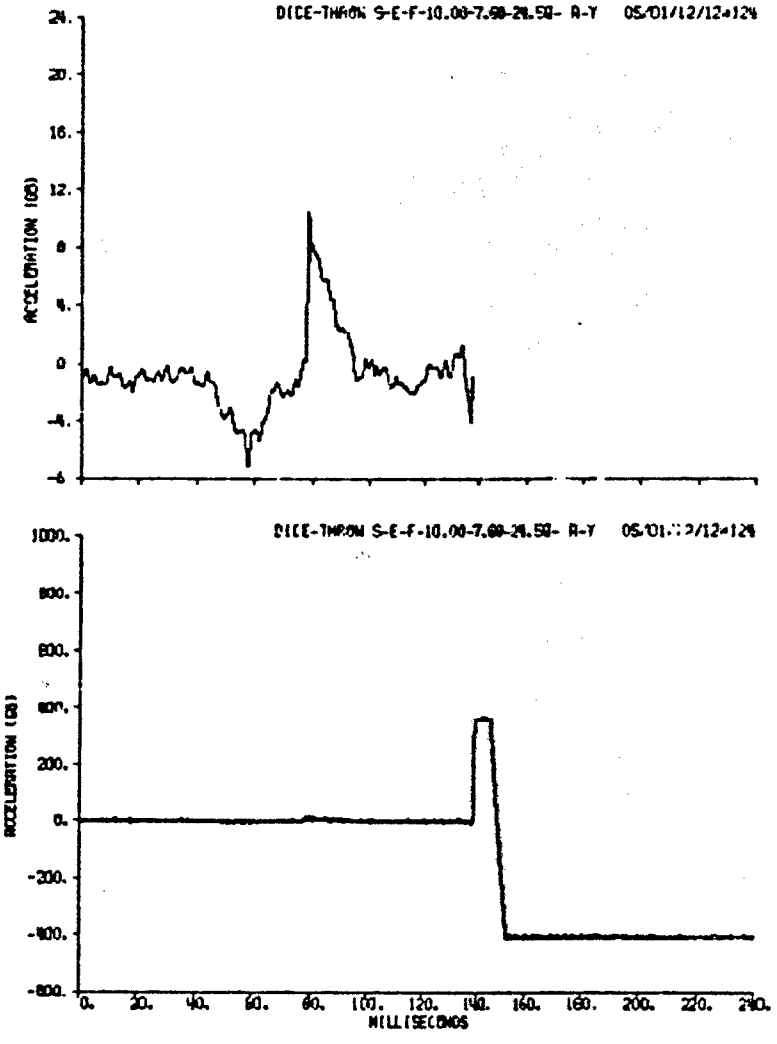

DICE-THROW S-E-D-13.65-9.63-15.70- R-Z 05/01/03/10=121
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-D-13.65-9.63-15.70- R-Z 05/01/03/10=121
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

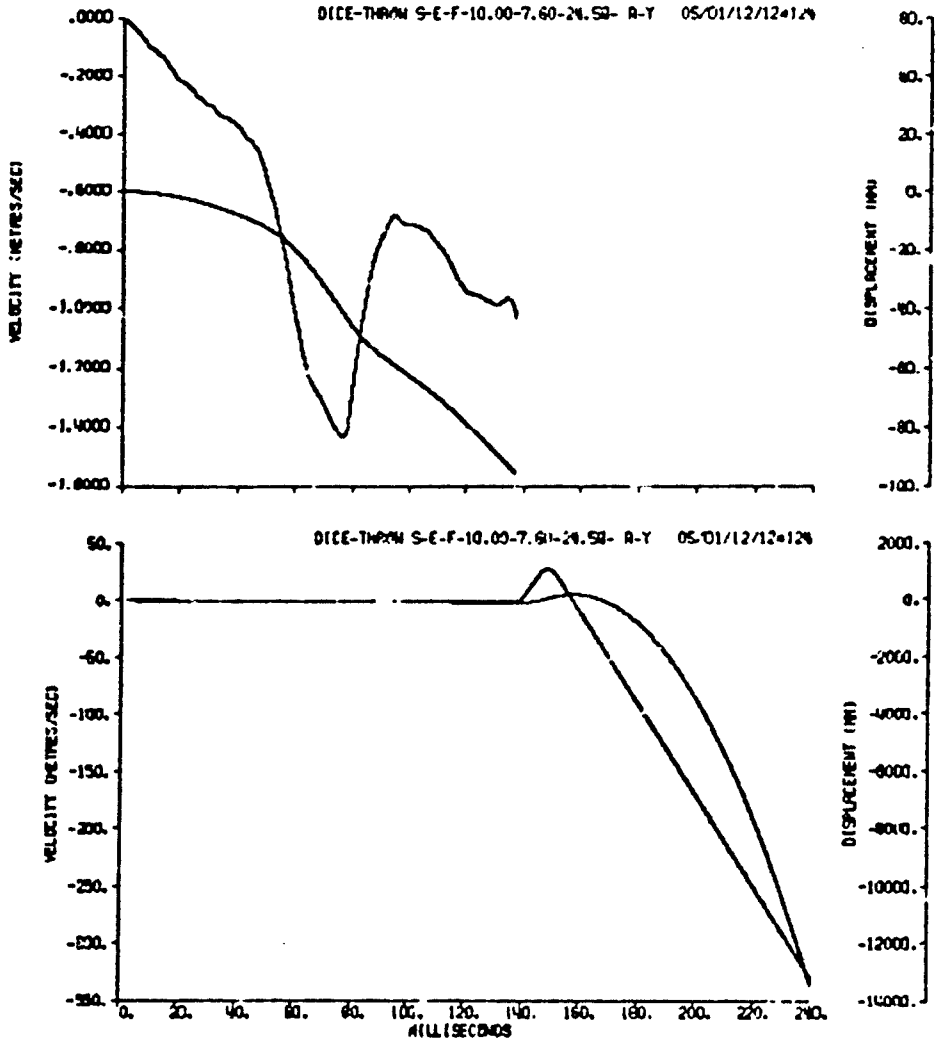

DICE-THROW S-E-F-10.00-0.70-10.00- A-Y 05/01/11/13=122
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
ACCELERATION (GS)
DICE-THROW S-E-F-10.00-0.70-10.00- A-Y 05/01/11/13=122
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
ACCELERATION (GS)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

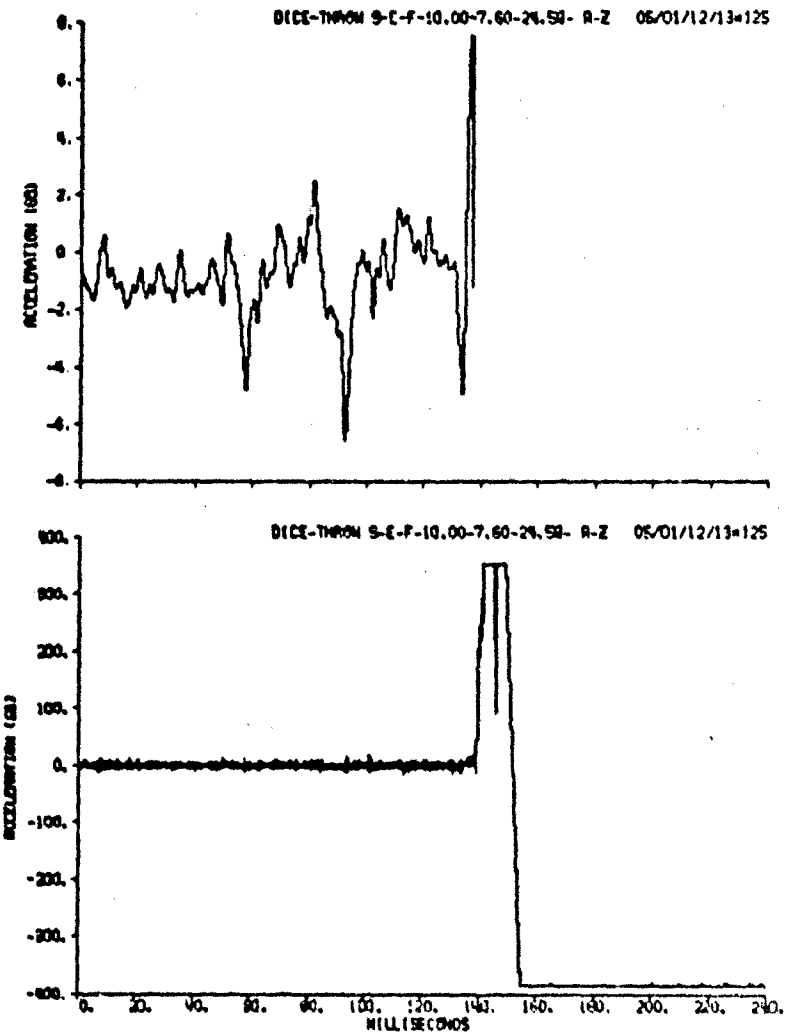

DICE-THROW S-E-F-10.00-0.70-10.00- A-Y 05/01/11/13=122
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
8.
6.
4.
2.
0.
-2.
-4.
-6.
-8.
100.
80.
60.
40.
20.
0.
-20.
-40.
-60.
DICE-THROW S-E-F-10.00-0.70-10.00- A-Y 05/01/11/13=122
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
-16000.
-20000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

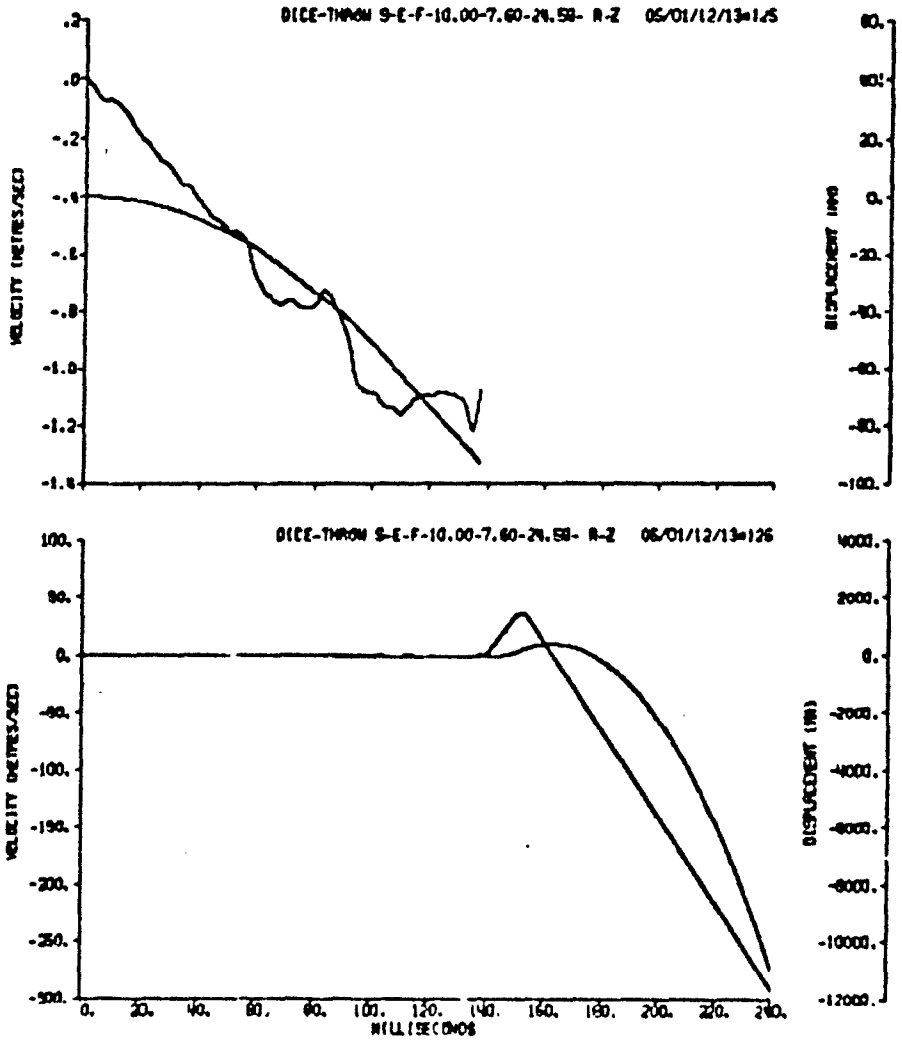

DICE-THROW S-E-F-10.00-5.70-10.00- A-Z 05/01/11/14+123
ACCELERATION (GS)
20.
15.
10.
5.
0
-5.
-10.
-15.
-20
DICE-THROW S-E-F-10.00-0.70-10.00- A-Z 05/01/11/14+123
ACCELERATION (GS)
300.
200.
100.
0.
-100.
-200.
-300.
-400.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

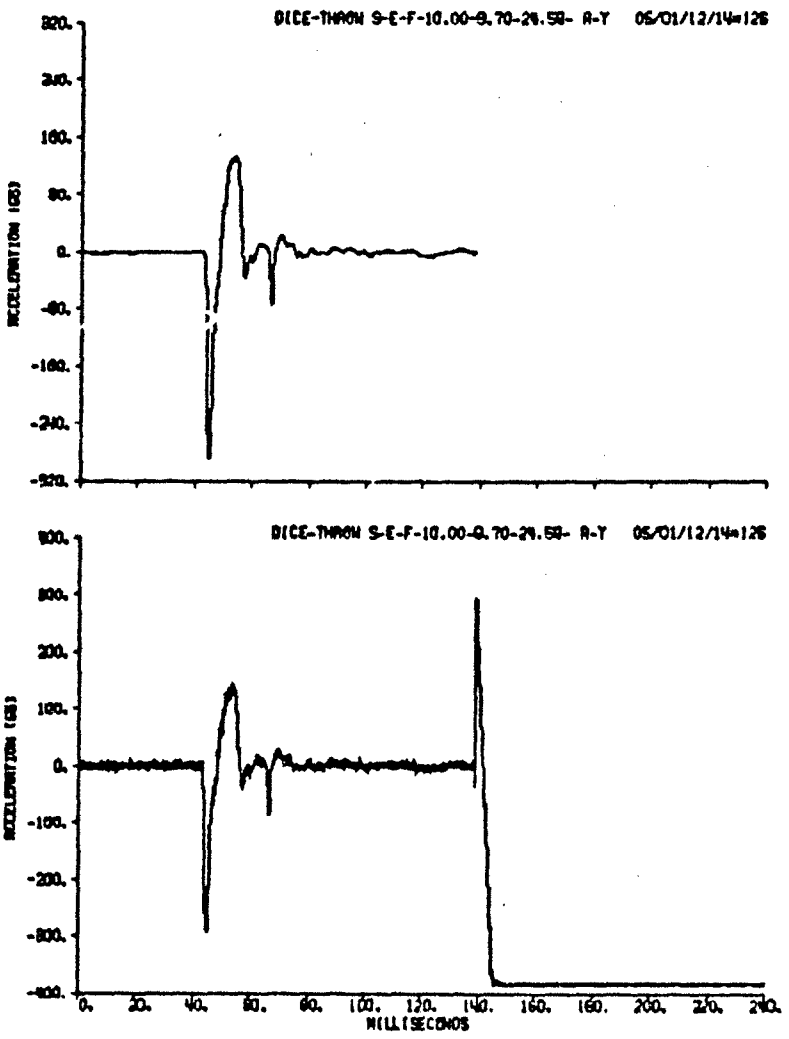

DICE-THROW S-E-F-10.00-0.70-10.00- A-Z 05/01/11/14=123
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.6
1.2
1.0
.8
.6
.4
.2
0.0
-.2
94.
88.
80.
72.
64.
56.
48.
40.
32.
24.
16.
8.
0.
DICE-THROW S-E-F-10.00-0.70-10.00- A-Z 05/01/11/14=123
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
-16000.
-20000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

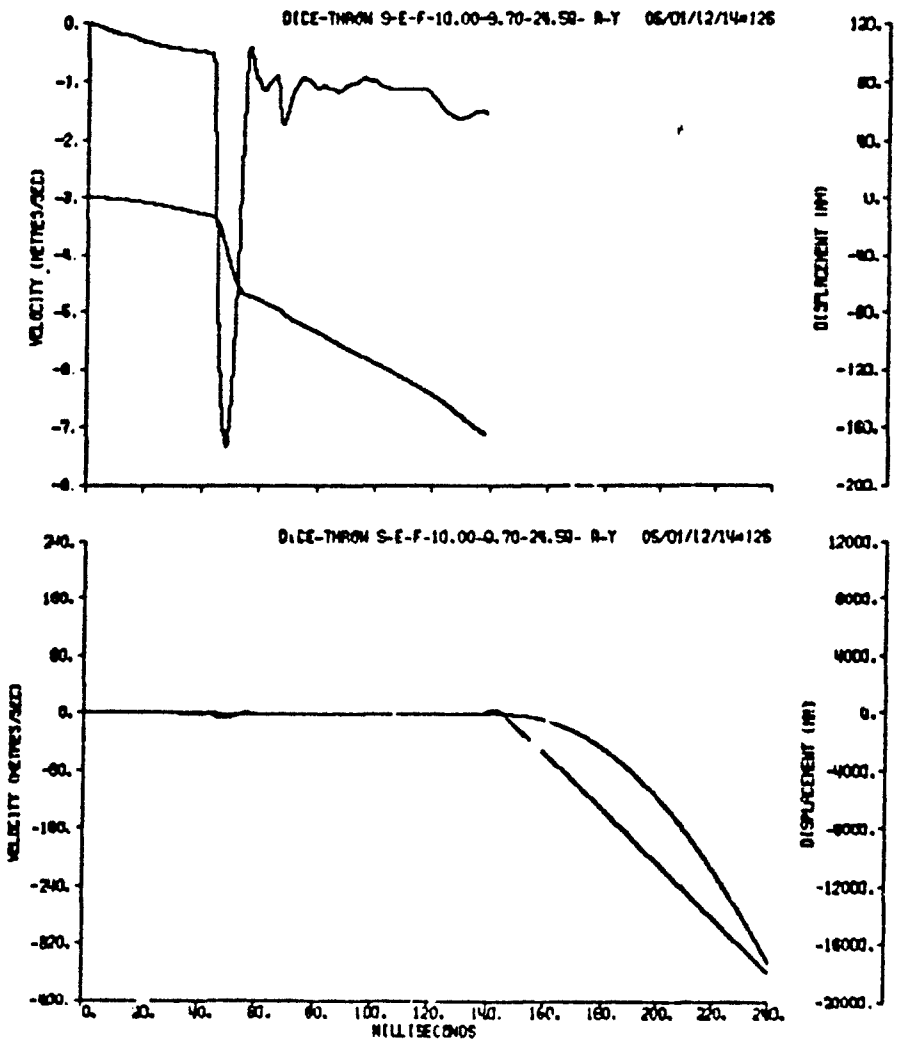

DICE-THROW S-E-F-10.00-7.00-26.50- R-Y 05/01/12/12+12%
ACCELERATION (GS)
24.
20.
16.
12.
8.
4.
0
-4.
-8
DICE-THROW S-E-F-10.00-7.00-26.50- R-Y 05/01/12/12+12%
ACCELERATION (GS)
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

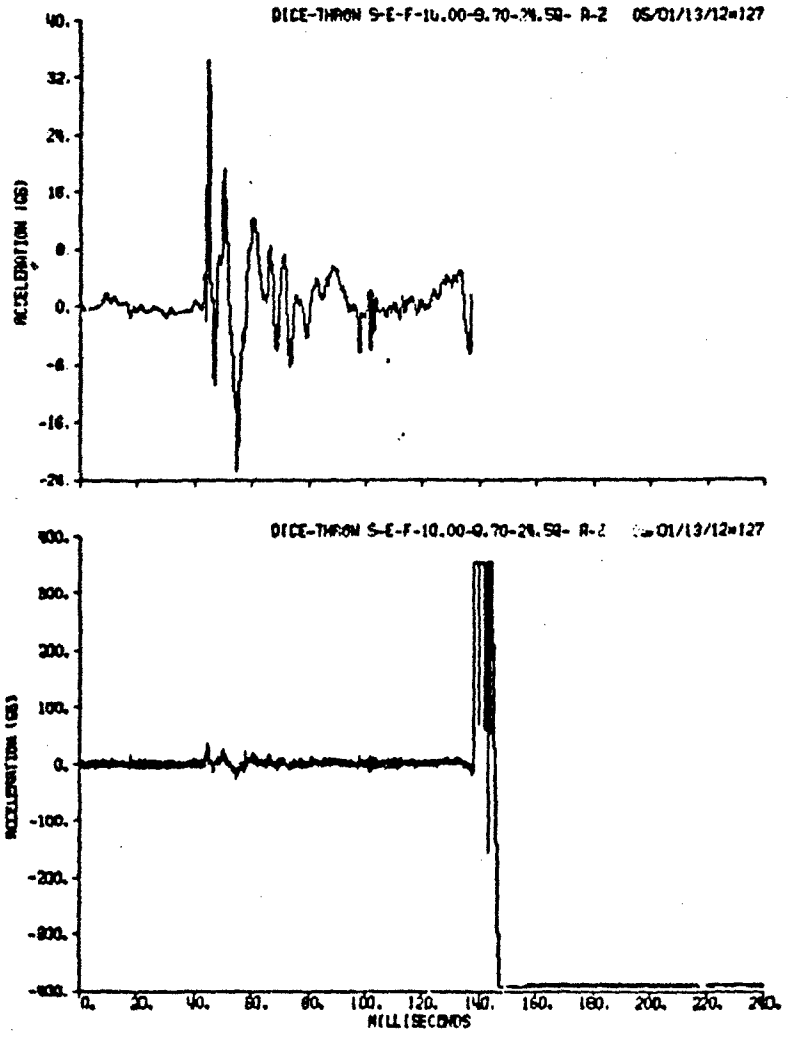

DICE-THROW S-E-F-10.00-7.60-24.50- R-Y 05/01/12/12+12%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.0000
-.2000
-.4000
-.6000
-.8000
-1.0000
-1.2000
-1.4000
-1.6000
80.
60.
40.
20.
0.
-20.
-40.
-60.
-80.
-100.
DICE-THROW S-E-F-10.00-7.60-24.50- R-Y 05/01/12/12+12%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
50.
0.
-50.
-100.
-150.
-200.
-250.
-300.
2000.
0.
-2000.
-4000.
-6000.
-8000.
-10000.
-12000.
-14000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

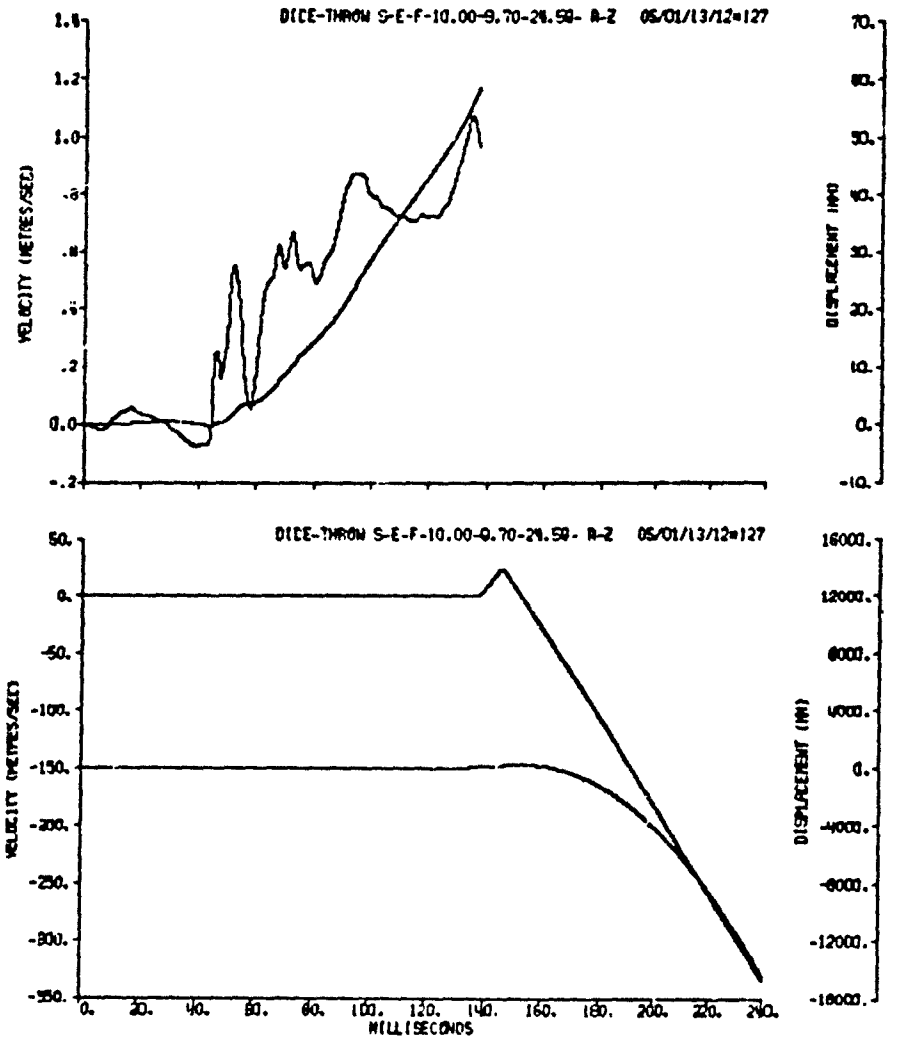

DICE-THROW S-E-F-10.00-7.60-24.50- R-Z 05/01/12/13=125
ACCELERATION (G'S)
DICE-THROW S-E-F-10.00-7.60-24.50- R-Z 05/01/12/13=125
ACCELERATION (G'S)
MILLISECONDS

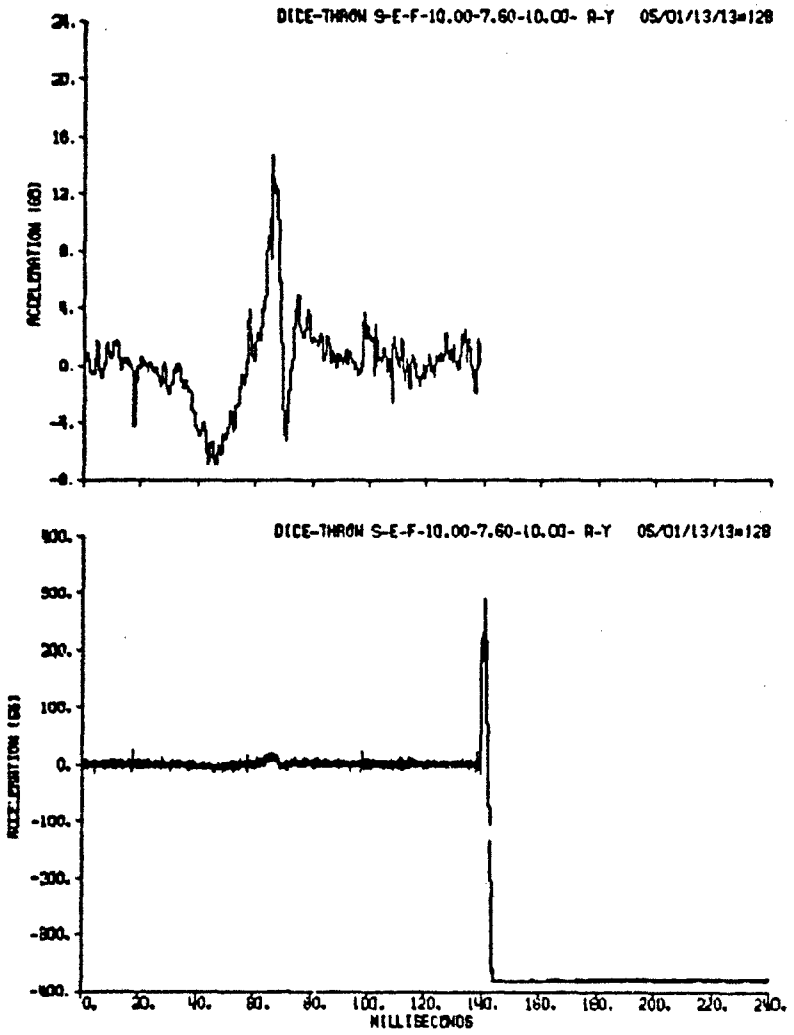

DICE-THROW S-E-F-10.00-7.60-24.58- R-Z 05/01/12/13=125
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-F-10.00-7.60-24.58- R-Z 05/01/12/13=126
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

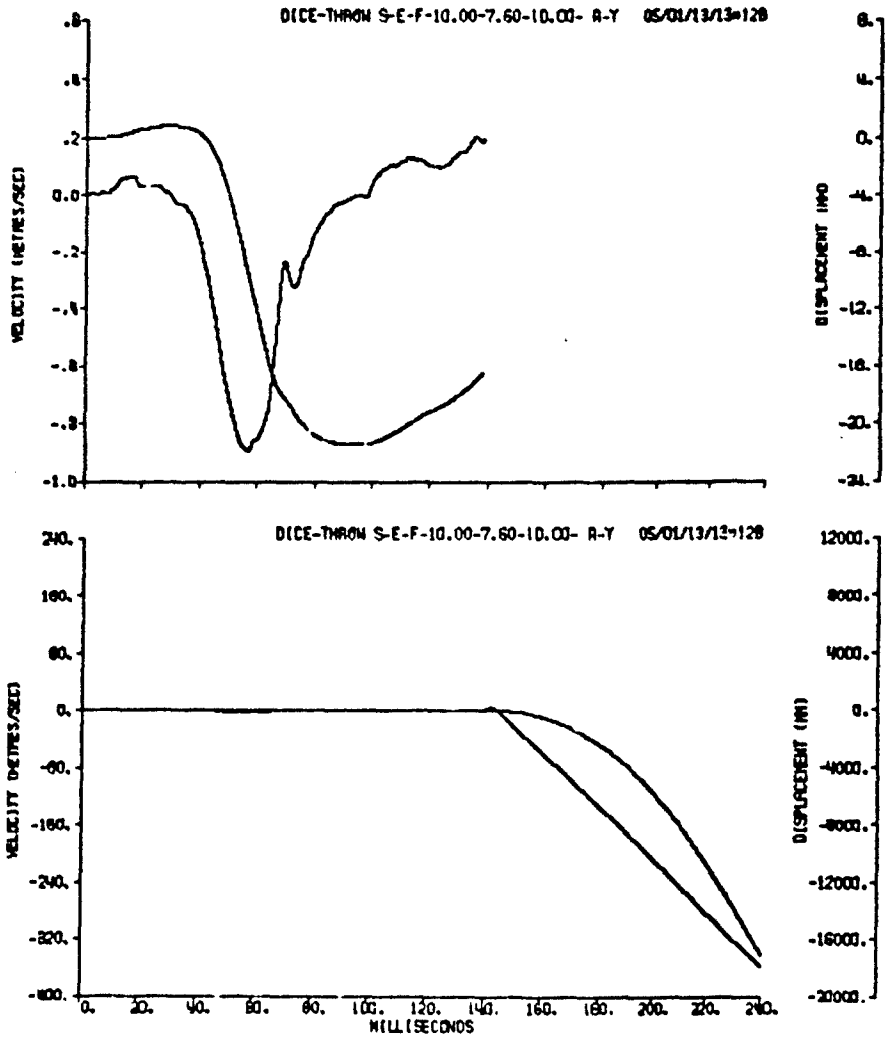

DICE-THROW S-E-F-10.00-0.70-24.50- A-Y 05/01/12/14=126
ACCELERATION (GS)
320.
240.
160.
80.
0.
-80.
-160.
-240.
-320.
DICE-THROW S-E-F-10.00-0.70-24.50- A-Y 05/01/12/14=126
ACCELERATION (GS)
300.
200.
100.
0.
-100.
-200.
-300.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

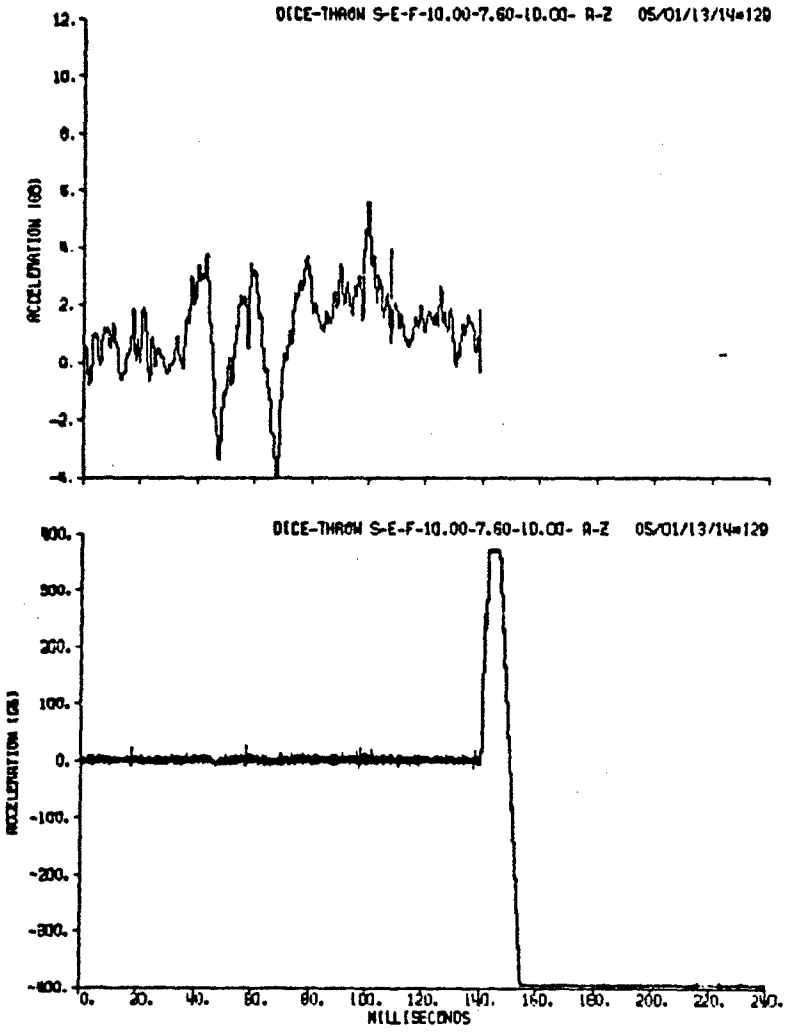

DICE-THROW S-E-F-10.00-0.70-26.50- A-Y 05/01/12/14=126
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
0.
-1.
-2.
-3.
-4.
-5.
-6.
-7.
-8.
120.
80.
40.
0.
-40.
-80.
-120.
-160.
-200.
DICE-THROW S-E-F-10.00-0.70-26.50- A-Y 05/01/12/14=126
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
240.
160.
80.
0.
-80.
-160.
-240.
-320.
-400.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
-16000.
-20000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

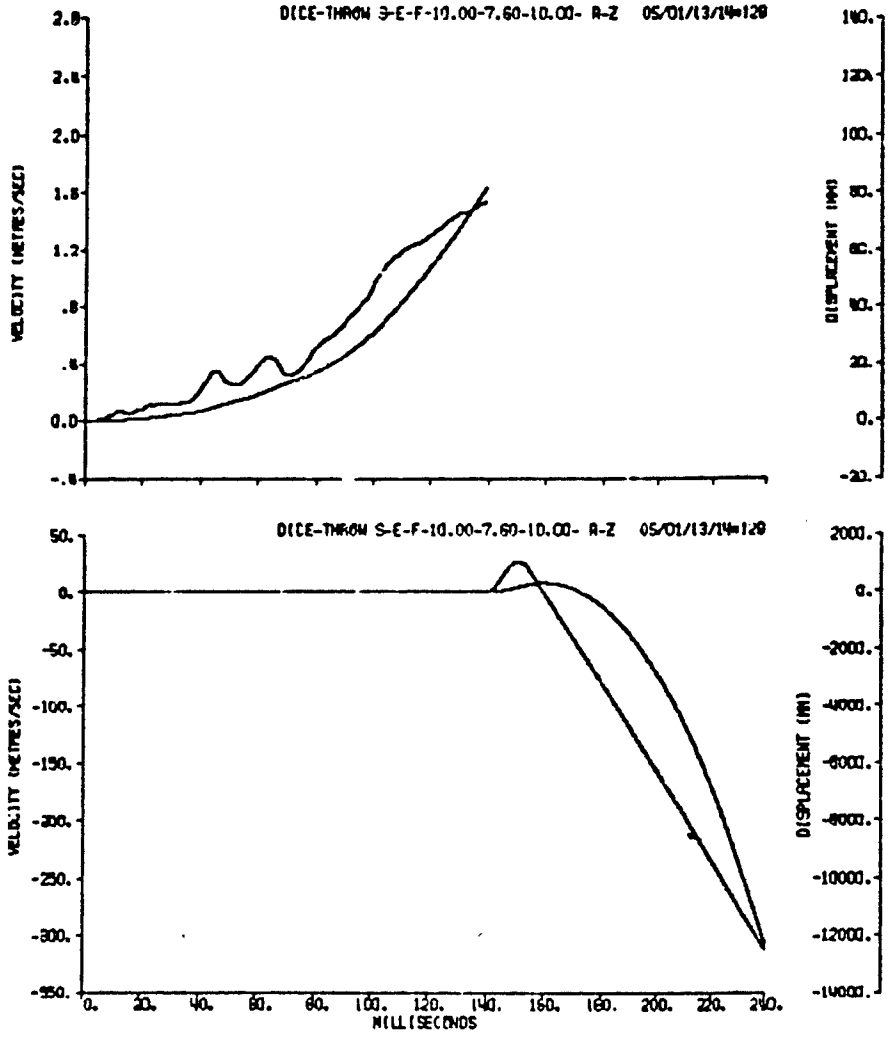

DICE-THROW S-E-F-10.00-0.70-2%.58- A-Z 05/01/13/12=127
ACCELERATION (GS)
40.
32.
24.
16.
8.
0.
-8.
-16.
-24.
DICE-THROW S-E-F-10.00-0.70-2%.58- A-Z 05/01/13/12=127
ACCELERATION (GS)
300.
200.
100.
0.
-100.
-200.
-300.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

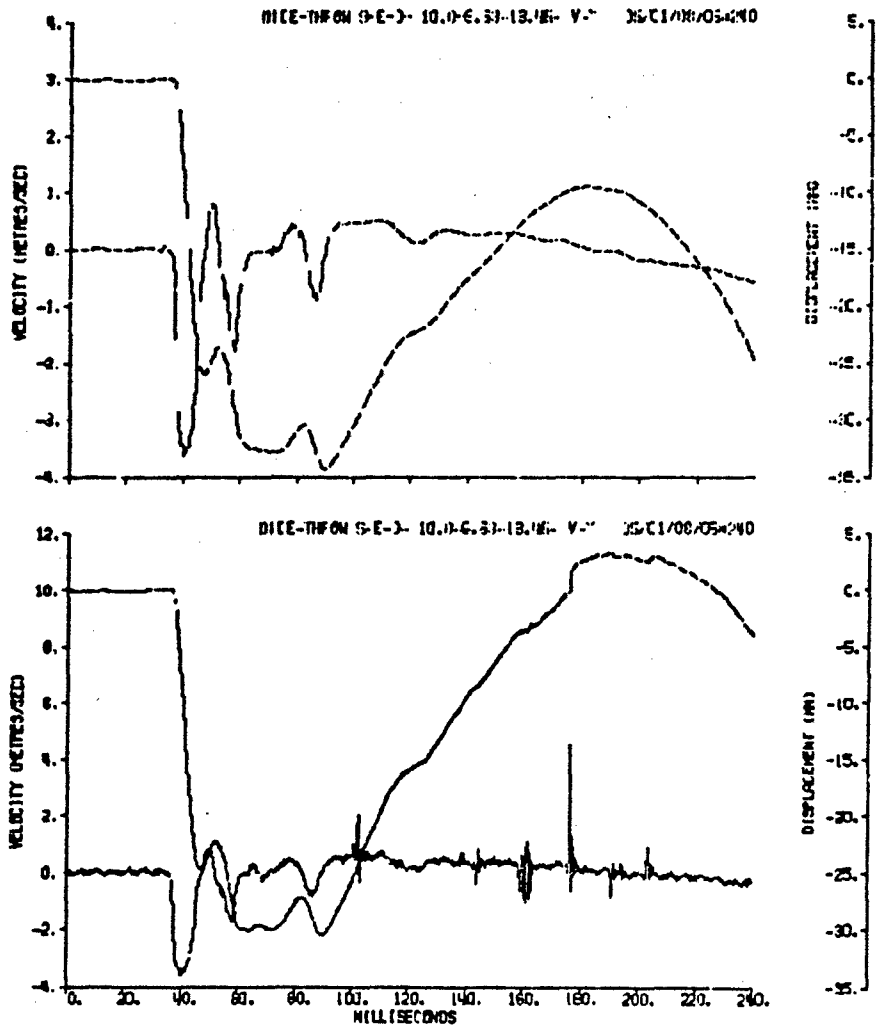

DICE-THROW S-E-F-10.00-0.70-24.50- A-Z 05/01/13/12=127
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.4
1.2
1.0
.8
.6
.4
.2
0.0
-.2
70.
60.
50.
40.
30.
20.
10.
0.
-10.
DICE-THROW S-E-F-10.00-0.70-24.50- A-Z 05/01/13/12=127
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
50.
0.
-50.
-100.
-150.
-200.
-250.
-300.
-350.
16000.
12000.
8000.
4000.
0.
-4000.
-8000.
-12000.
-16000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

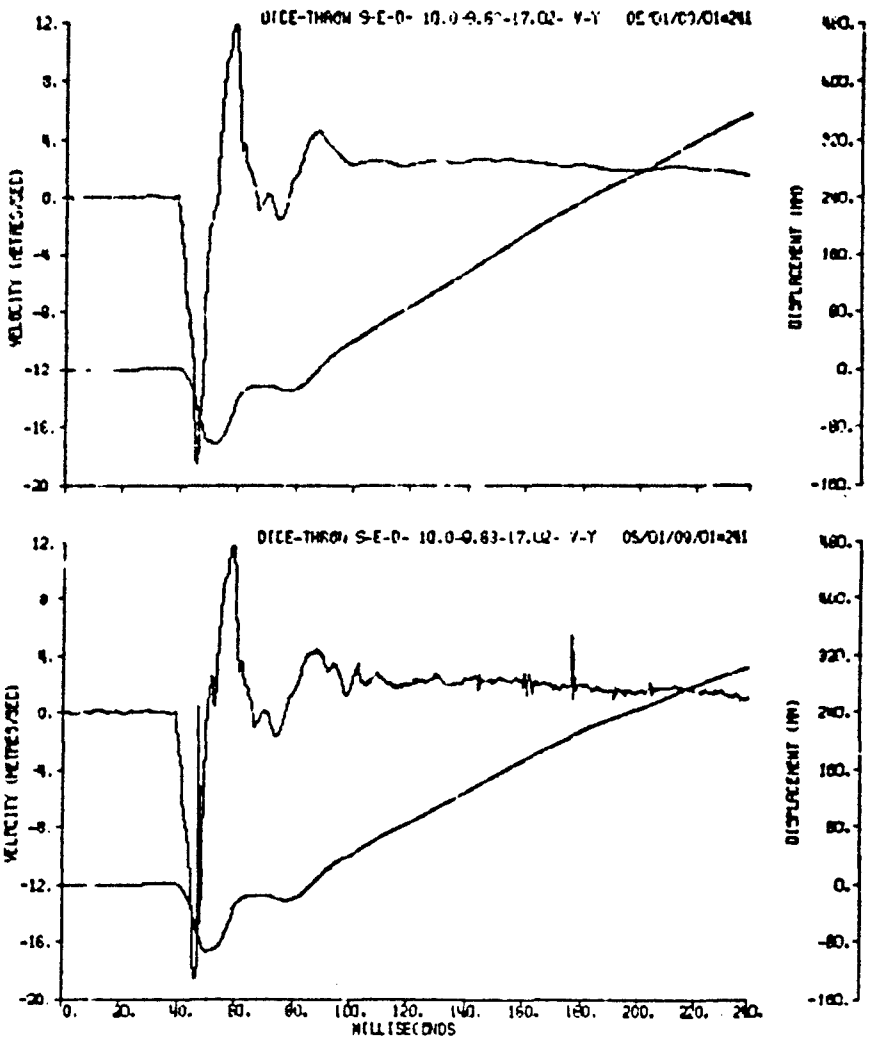

DICE-THROW S-E-F-10.00-7.60-10.00- R-Y 05/01/13/13=128
ACCELERATION (G0)
20.
16.
12.
8.
4.
0.
-4.
-8.
DICE-THROW S-E-F-10.00-7.60-10.00- R-Y 05/01/13/13=128
ACCELERATION (G0)
300.
200.
100.
0.
-100.
-200.
-300.
-400.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

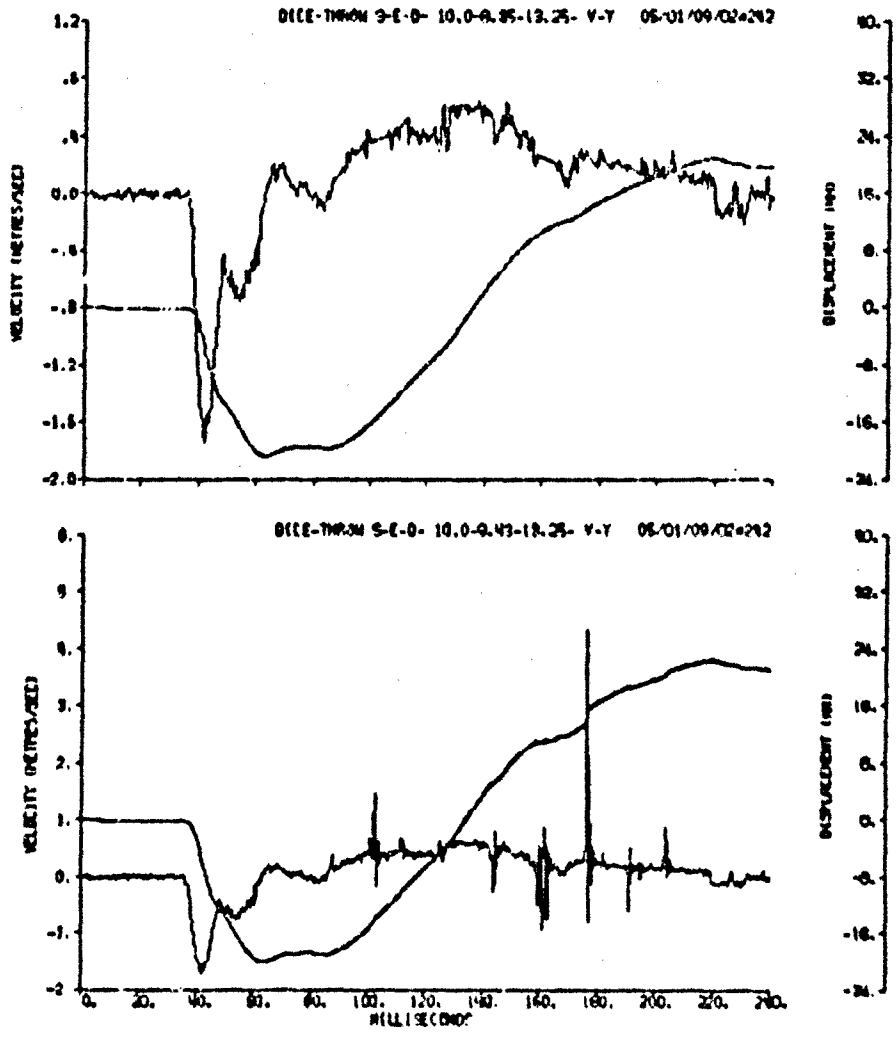

DICE-THROW S-E-F-10.00-7.60-10.00- A-Y 05/01/13/13=128
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-F-10.00-7.60-10.00- A-Y 05/01/13/13=128
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

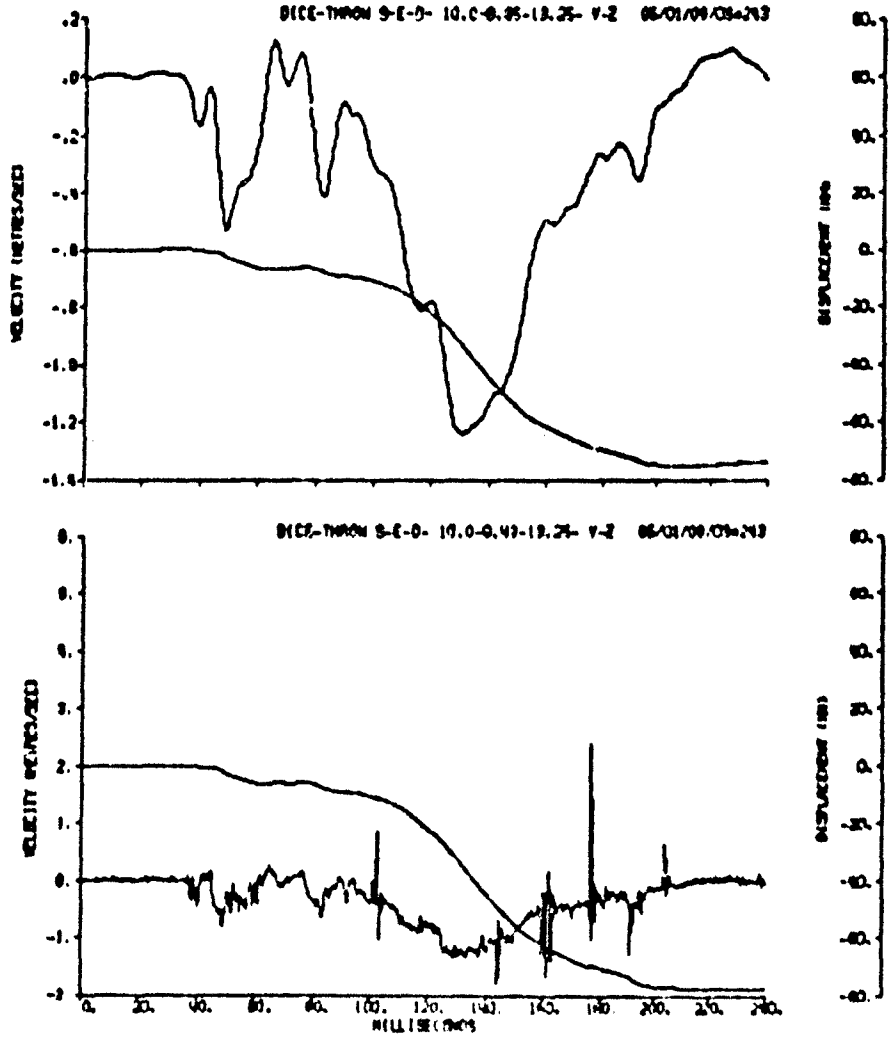

DICE-THROW S-E-F-10.00-7.60-10.00- A-Z 05/01/13/14=129
ACCELERATION (GS)
12.
10.
8.
6.
4.
2.
0.
-2.
-4.
DICE-THROW S-E-F-10.00-7.60-10.00- A-Z 05/01/13/14=129
ACCELERATION (GS)
300.
200.
100.
0.
-100.
-200.
-300.
-400.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

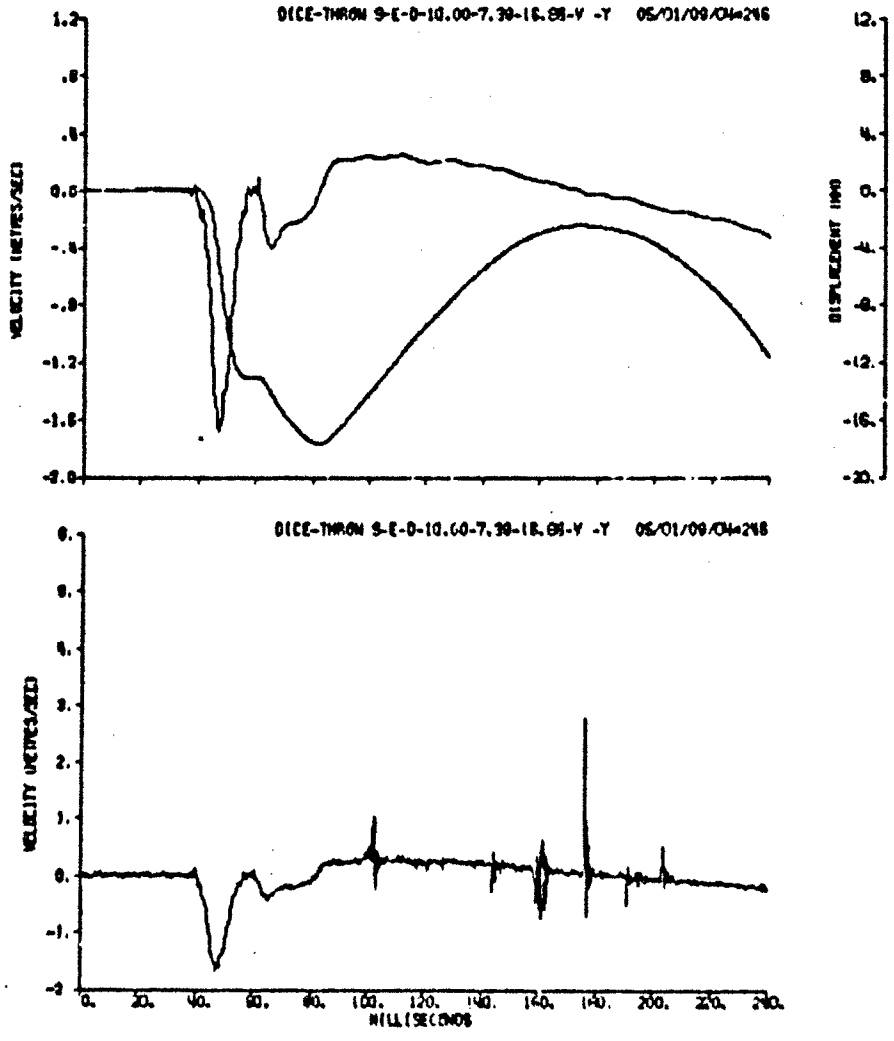

DICE-THROW 3-E-F-10.00-7.60-10.00- R-Z 05/01/13/14=120
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW 5-E-F-10.00-7.60-10.00- R-Z 05/01/13/14=120
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

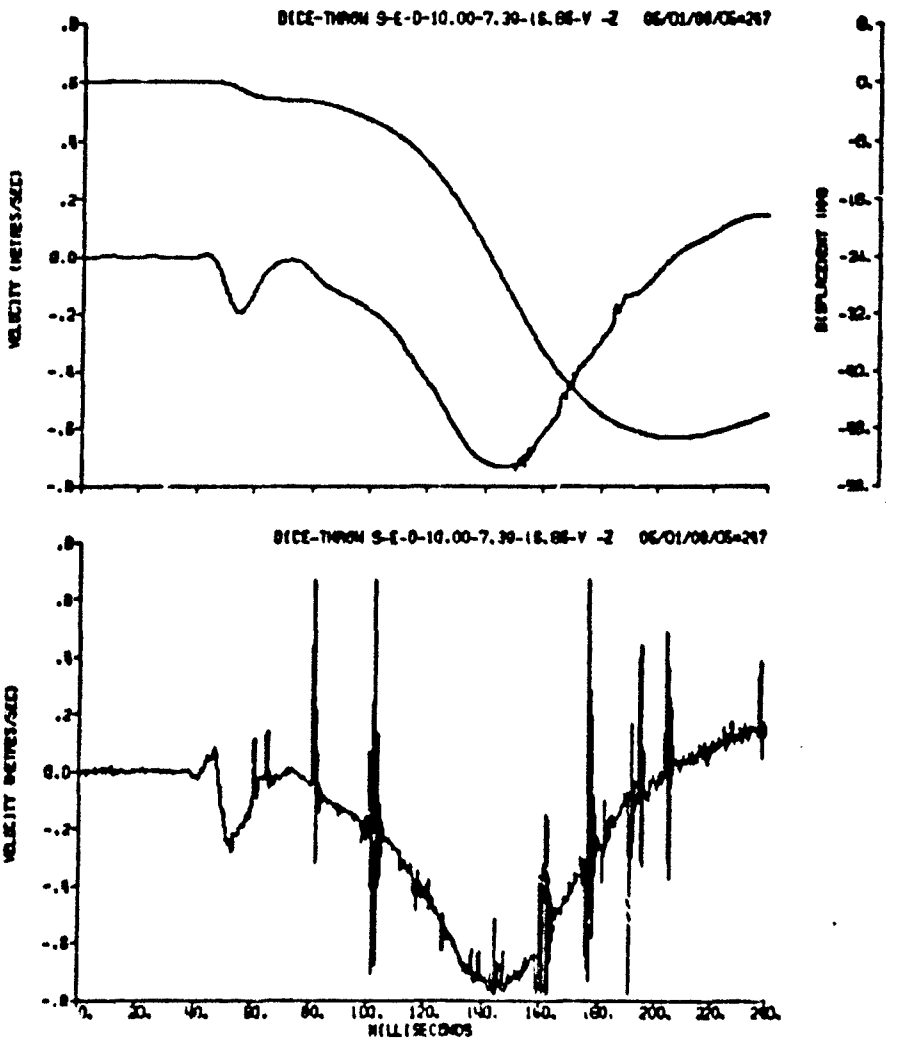

VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.

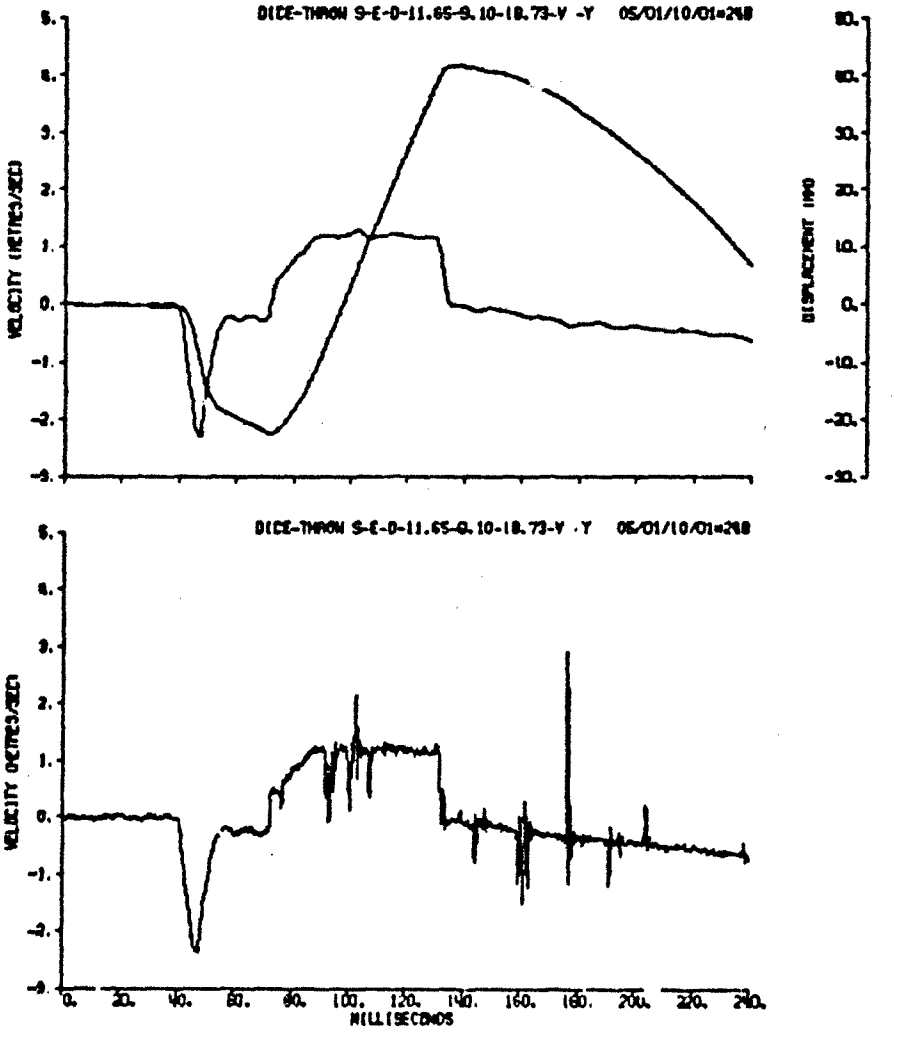

DICE-THROW S-E-0- 10.0-0.83-17.02- V-Y
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
12.
8.
4.
0.
-4.
-8.
-12.
-16.
-20.
480.
400.
320.
240.
160.
80.
0.
-80.
-160.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

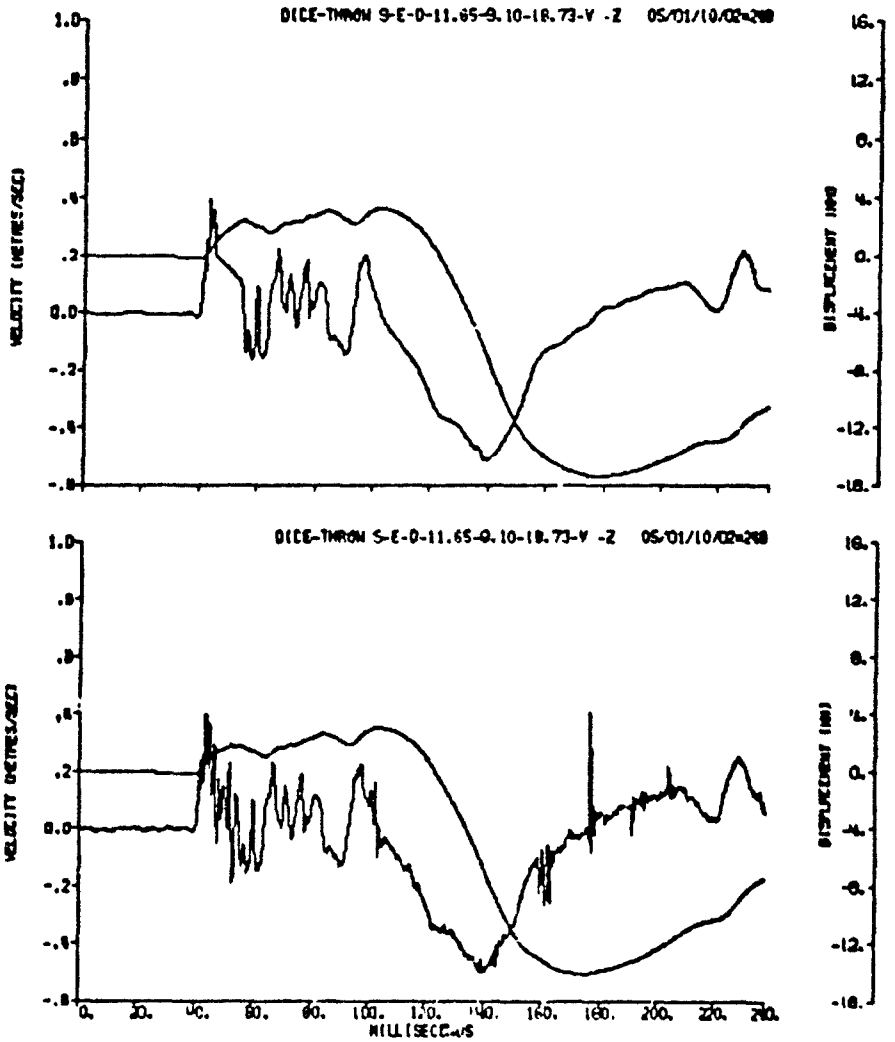

DICE-THROW 9-E-0- 10.0-0.85-13.25- V-Y
DICE-THROW 9-E-0- 10.0-0.43-13.25- V-Y
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

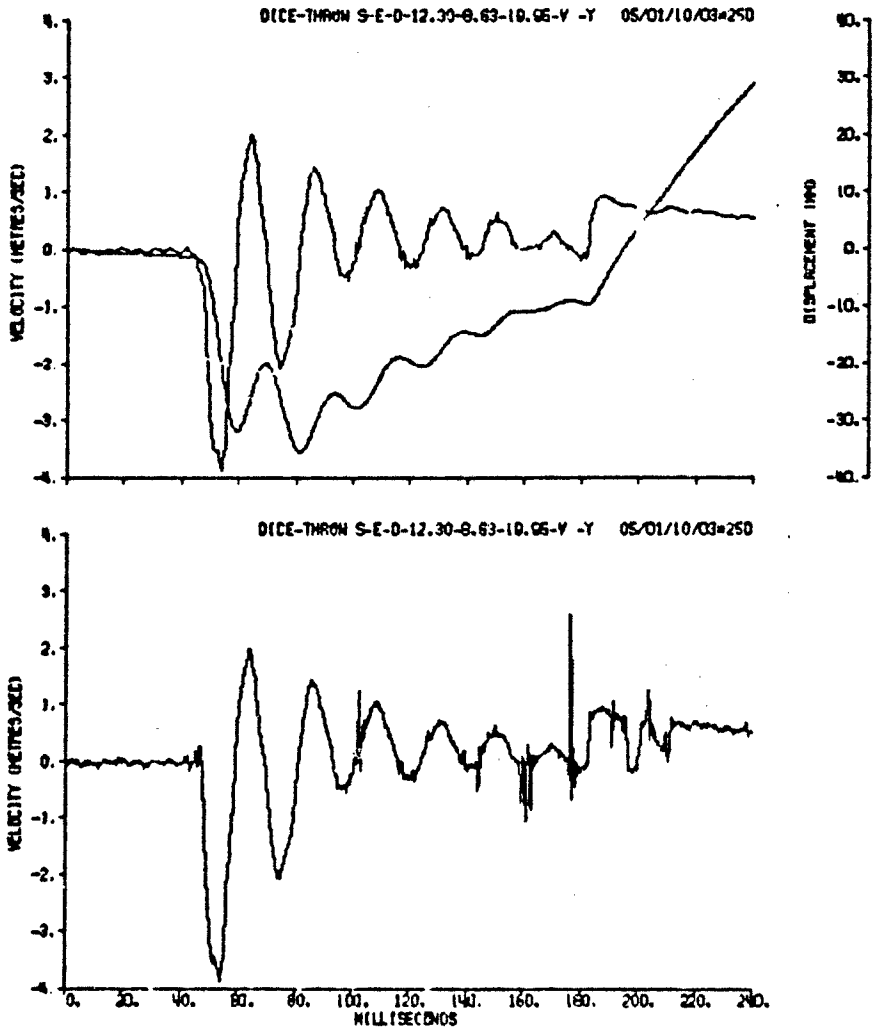


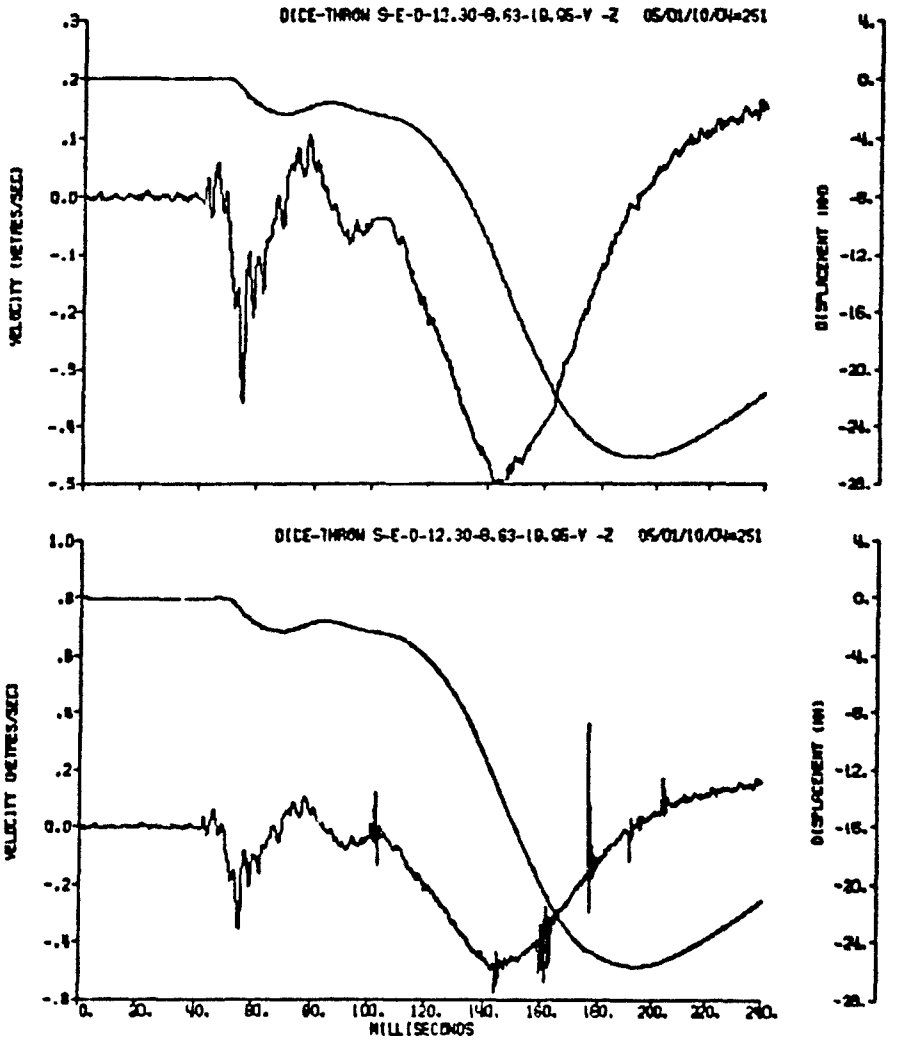

DICE-THROW 9-E-0-10.00-7.30-16.00-V -Y 05/01/09/04=246
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
1.2
.8
.4
0.0
-.4
-.8
-1.2
-1.6
-2.0
12.
8.
4.
0.
-4.
-8.
-12.
-16.
-20.
DICE-THROW 9-E-0-10.00-7.30-16.00-V -Y 05/01/09/04=246
VELOCITY (METRES/SEC)
6.
5.
4.
3.
2.
1.
0.
-1.
-2
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

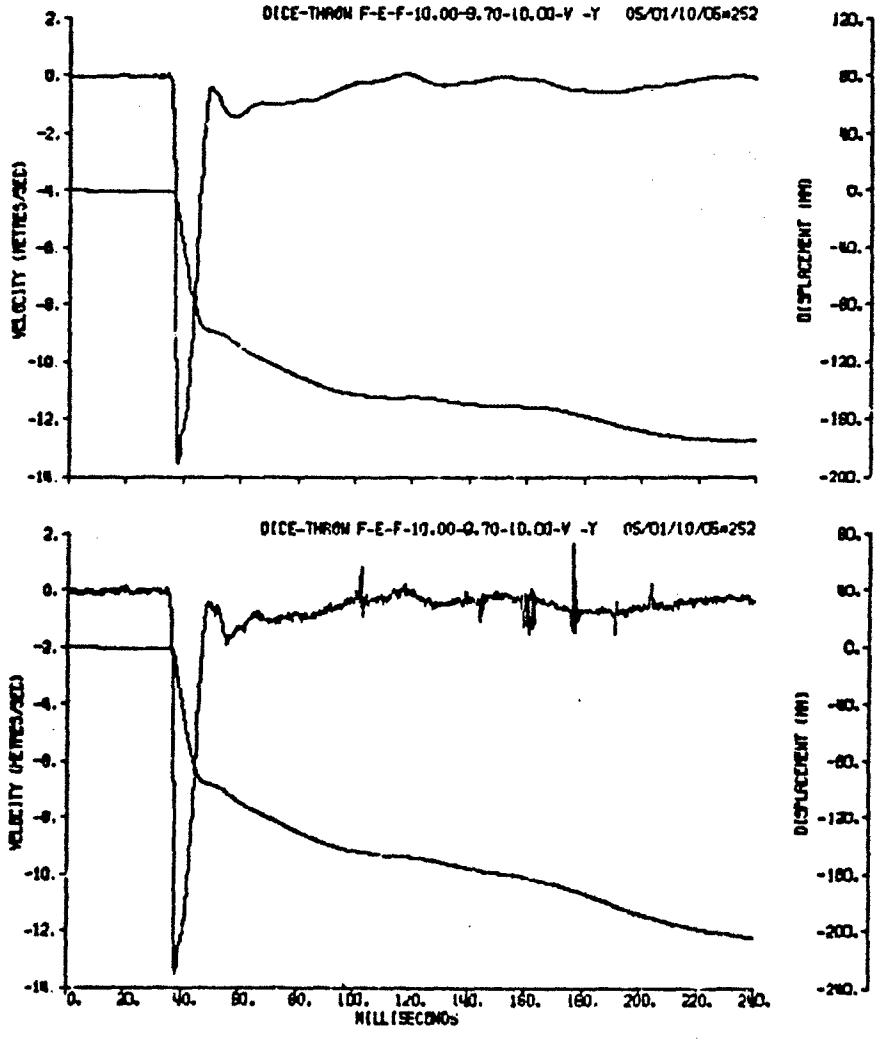

DICE-THROW S-E-0-10.00-7.30-18.88-V -2
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0-10.00-7.30-18.88-V -2
VELOCITY (METRES/SEC)
MILLISECONDS

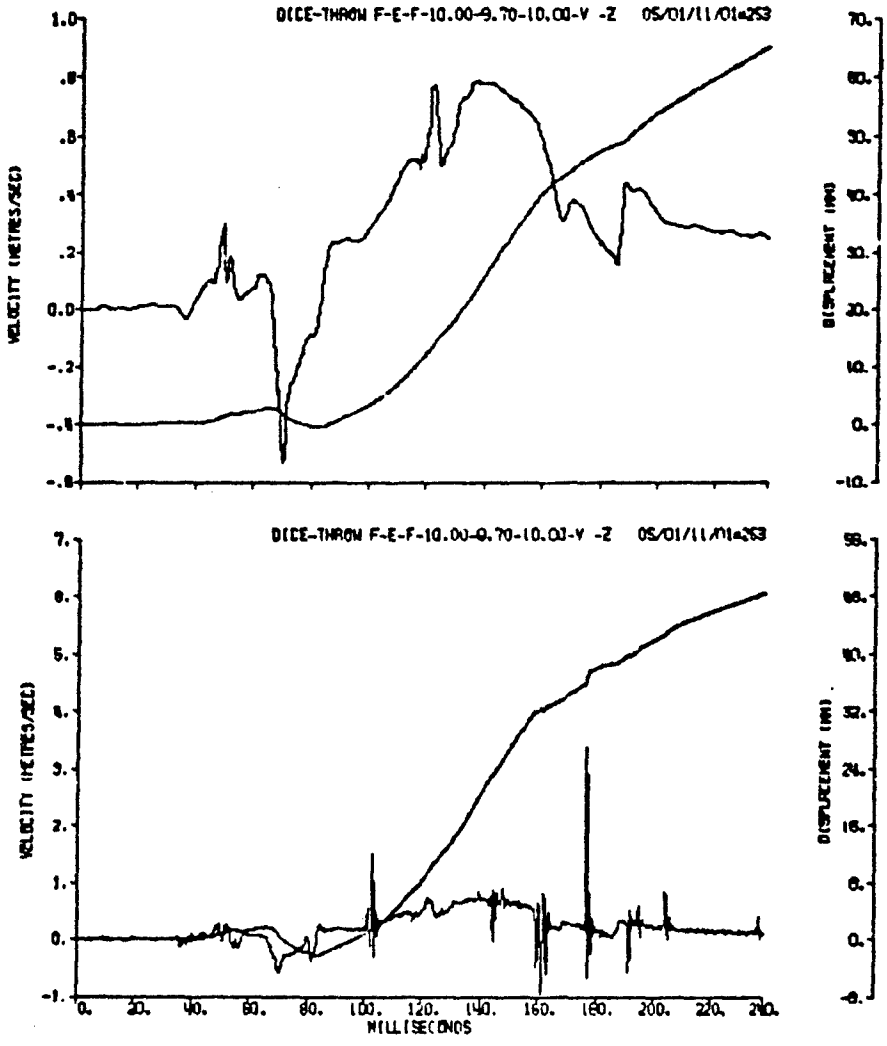

DICE-THROW S-E-0-11.65-S.10-18.73-V -Y 05/01/10/01=248
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0-11.65-S.10-18.73-V -Y 05/01/10/01=248
VELOCITY (METRES/SEC)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

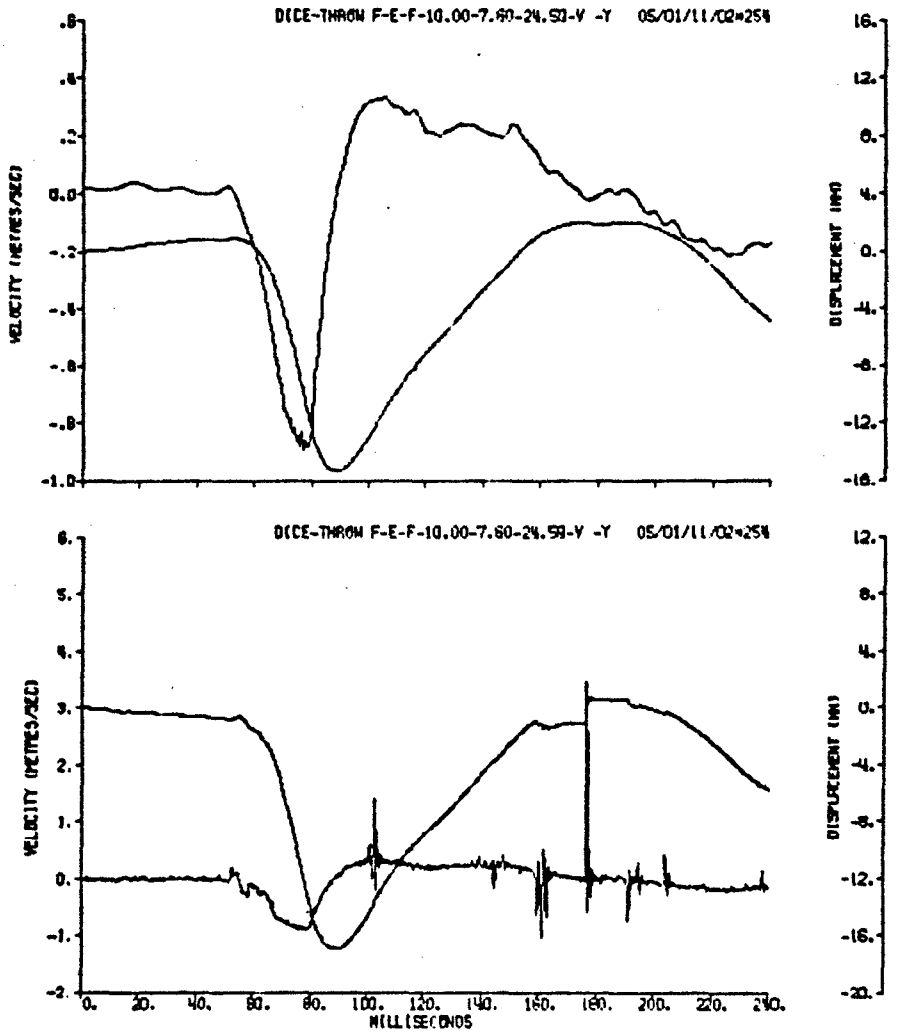

DICE-THROW S-E-0-11.65-0.10-18.73-V -Z 05/01/10/02=200
1.0
.8
.6
.2
0.0
-.2
-.6
-.8
16.
12.
8.
4.
0.
-4.
-8.
-12.
-16.
DICE-THROW S-E-0-11.65-0.10-18.73-V -Z 05/01/10/02=200
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

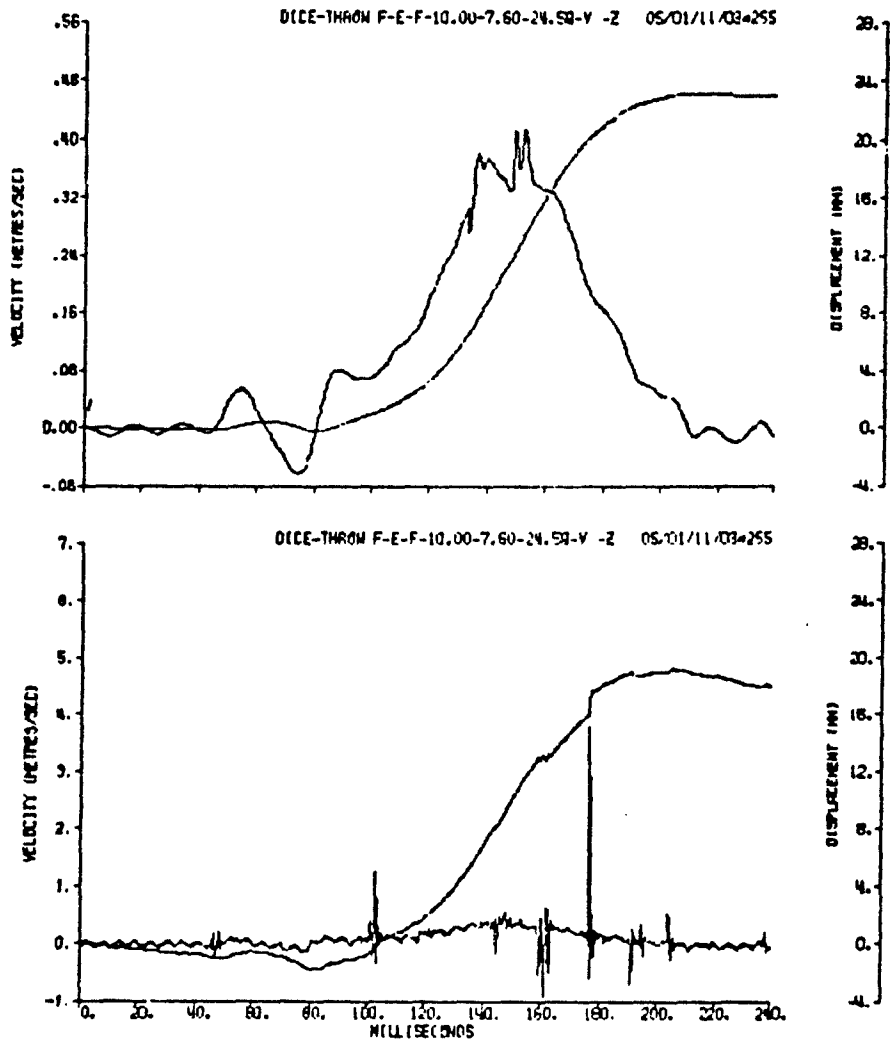

DICE-THROW S-E-0-12.30-0.63-10.95-V -Y 05/01/10/03=250
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0-12.30-0.63-10.95-V -Y 05/01/10/03=250
VELOCITY (METRES/SEC)
MILLISECONDS

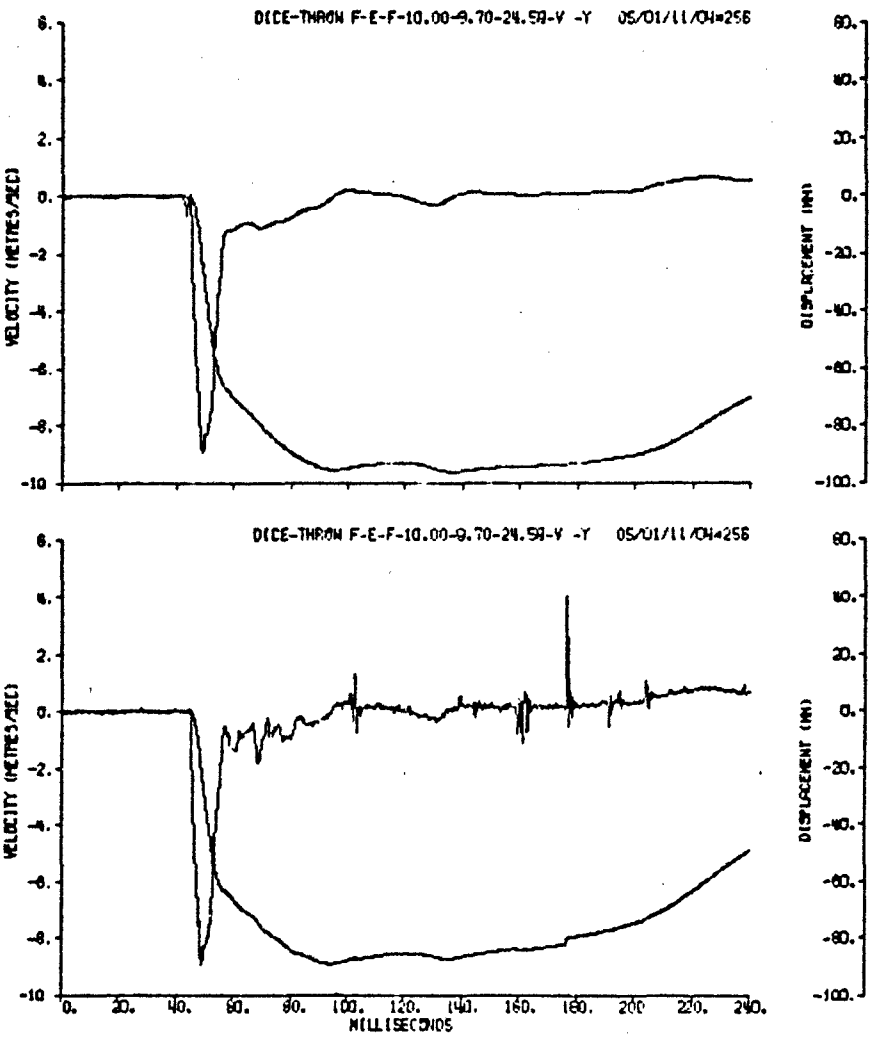

DICE-THROW S-E-0-12.30-0.63-10.05-V -Z 05/01/10/04=251
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW S-E-0-12.30-0.63-10.05-V -Z 05/01/10/04=251
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

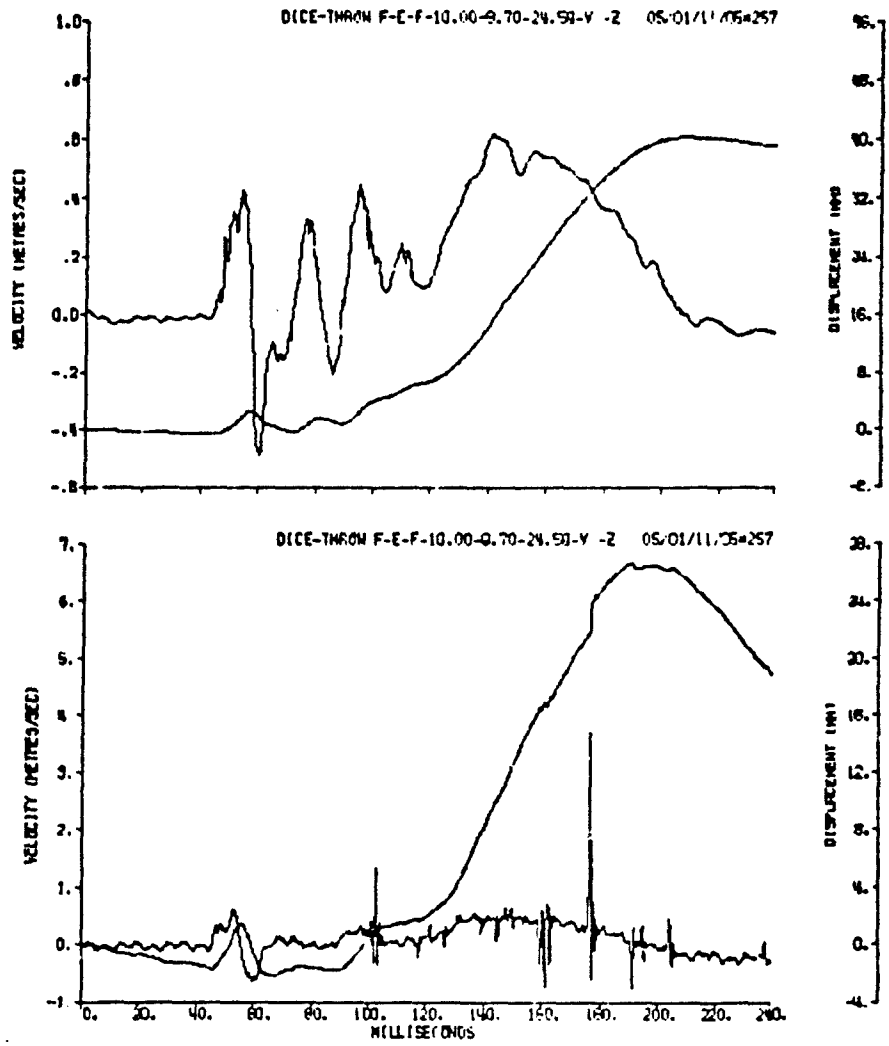

DICE-THROW F-E-F-10.00-0.70-10.00-V -Y 05/01/10/05=252
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-0.70-10.00-V -Y 05/01/10/05=252
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

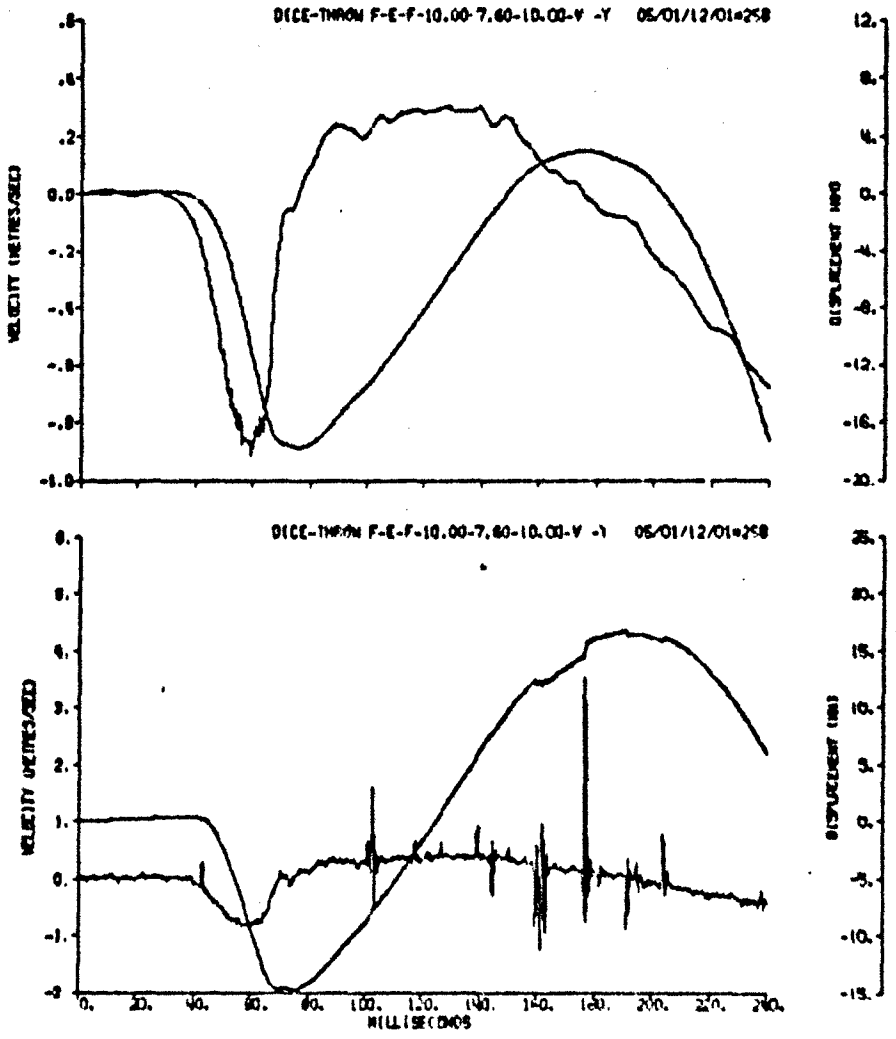

DICE-THROW F-E-F-10.00-9.70-10.00-V -Z 05/01/11/01=253
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-9.70-10.00-V -Z 05/01/11/01=253
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

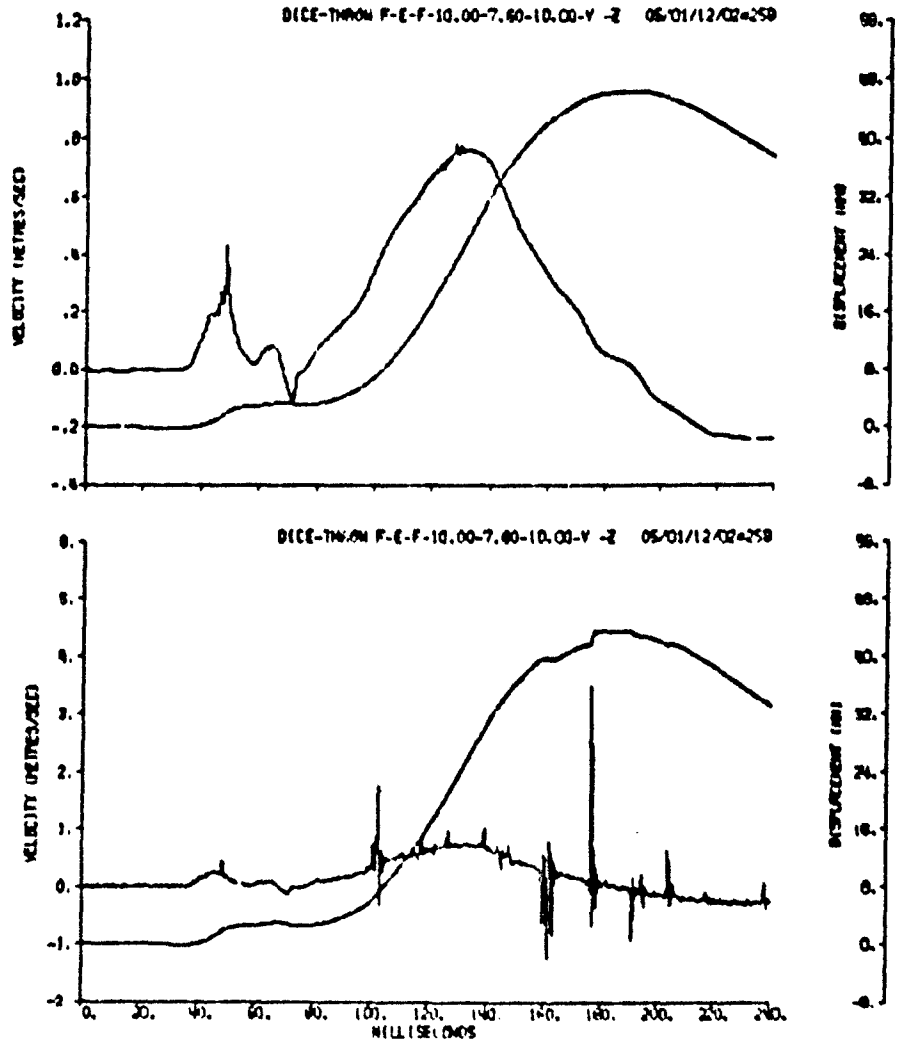

DICE-THROW F-E-F-10.00-7.60-24.50-V -Y 05/01/11/02=25%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-7.60-24.50-V -Y 05/01/11/02=25%
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

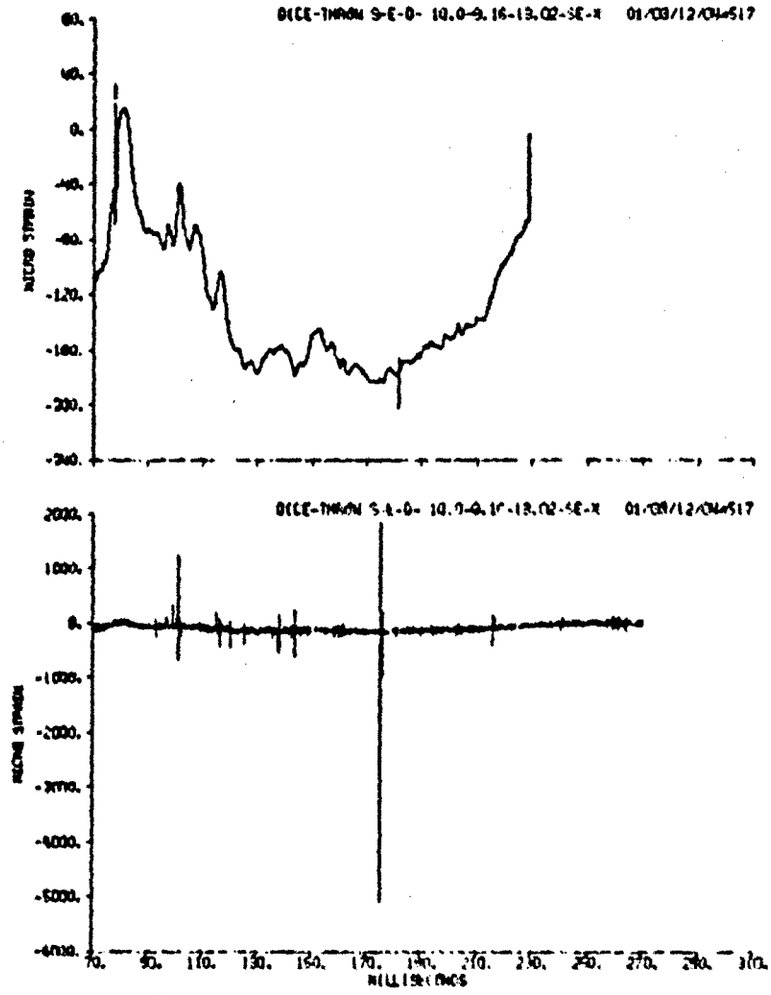

DICE-THROW F-E-F-10.00-7.60-24.59-V -Z 05/01/11/03=255
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
.56
.48
.40
.32
.24
.16
.08
0.00
-.08
28.
24.
20.
16.
12.
8.
4.
0.
-4.
DICE-THROW F-E-F-10.00-7.60-24.59-V -Z 05/01/11/03=255
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
7.
6.
5.
4.
3.
2.
1.
0.
-1.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

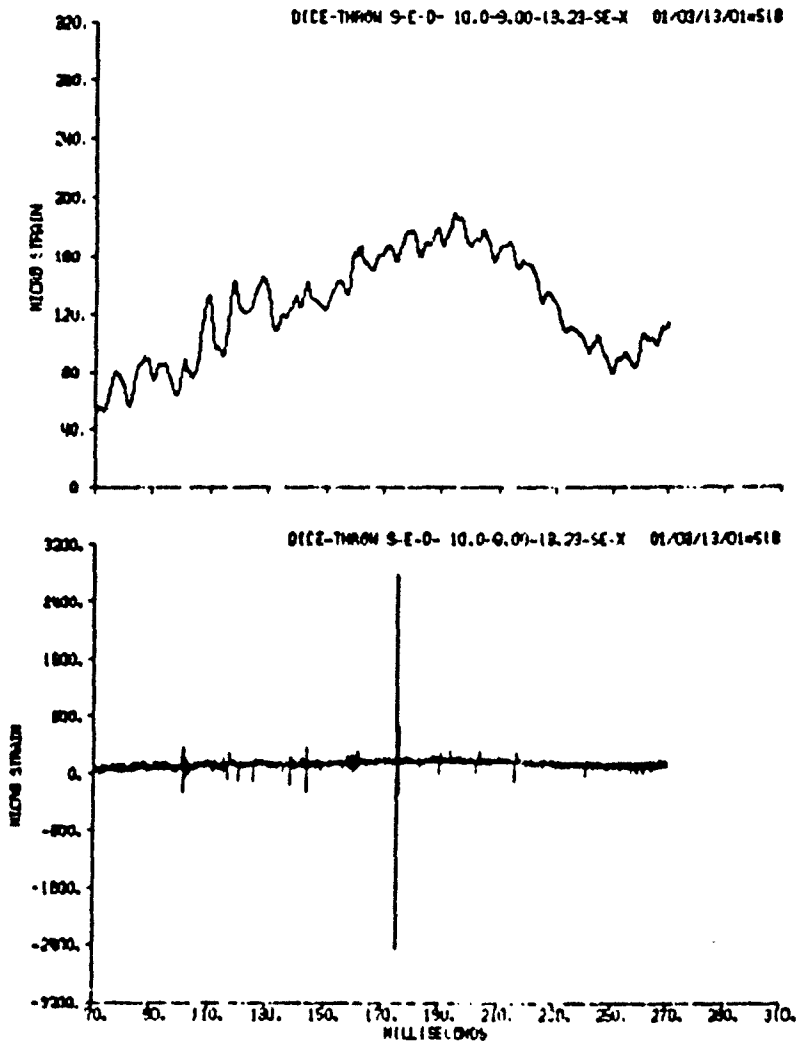

DICE-THROW F-E-F-10.00-9.70-24.59-V -Y 05/01/11/04=256
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-9.70-24.59-V -Y 05/01/11/04=256
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

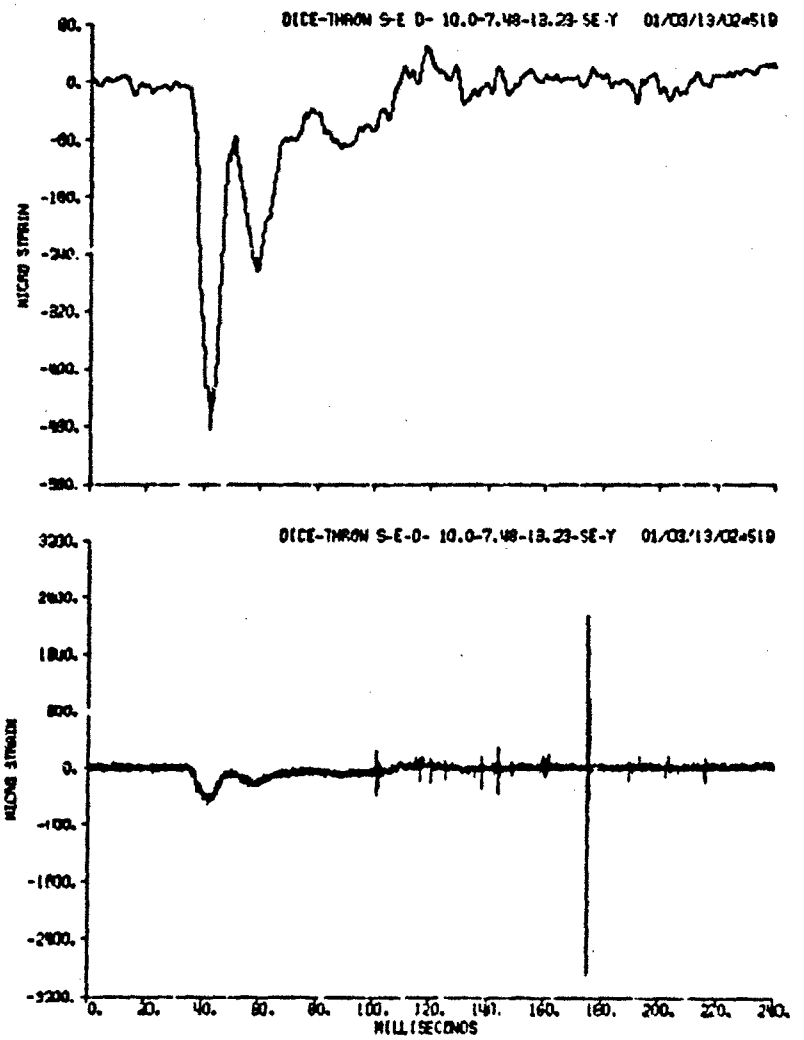

DICE-THROW F-E-F-10.00-0.70-24.50-V -2
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-0.70-24.50-V -2
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
MILLISECONDS

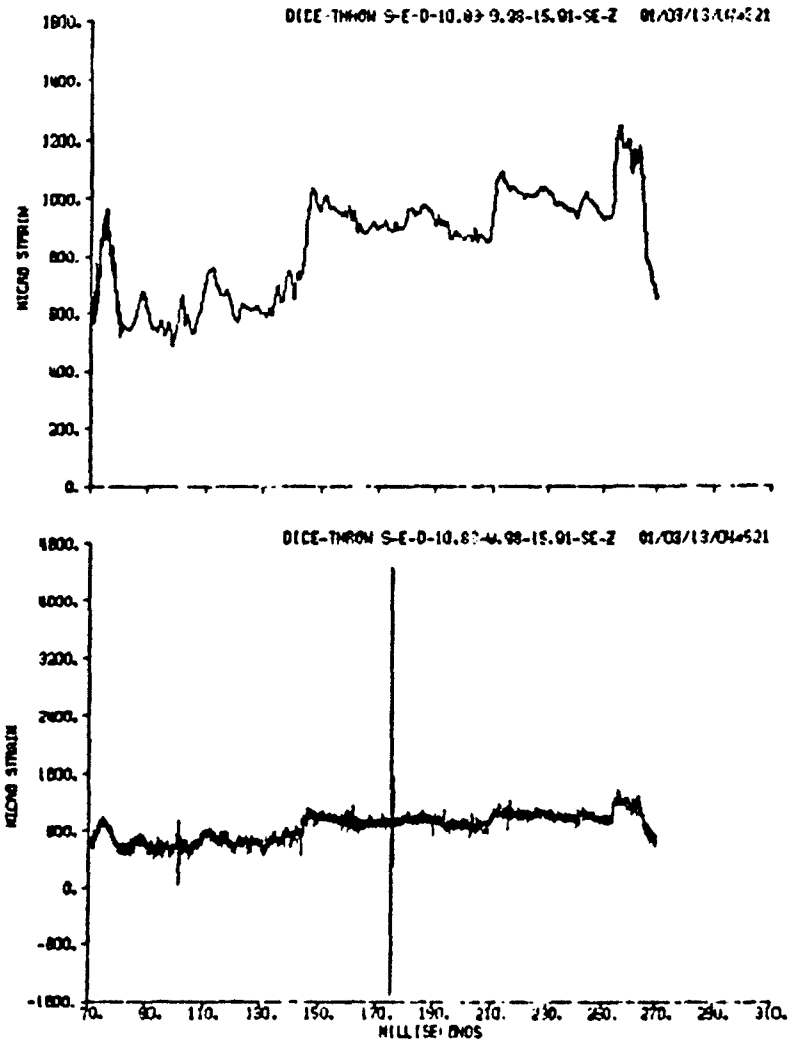

DICE-THROW F-E-F-10.00-7.60-10.00-V -Y 05/01/12/01=258
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DICE-THROW F-E-F-10.00-7.60-10.00-V -Y 05/01/12/01=258
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

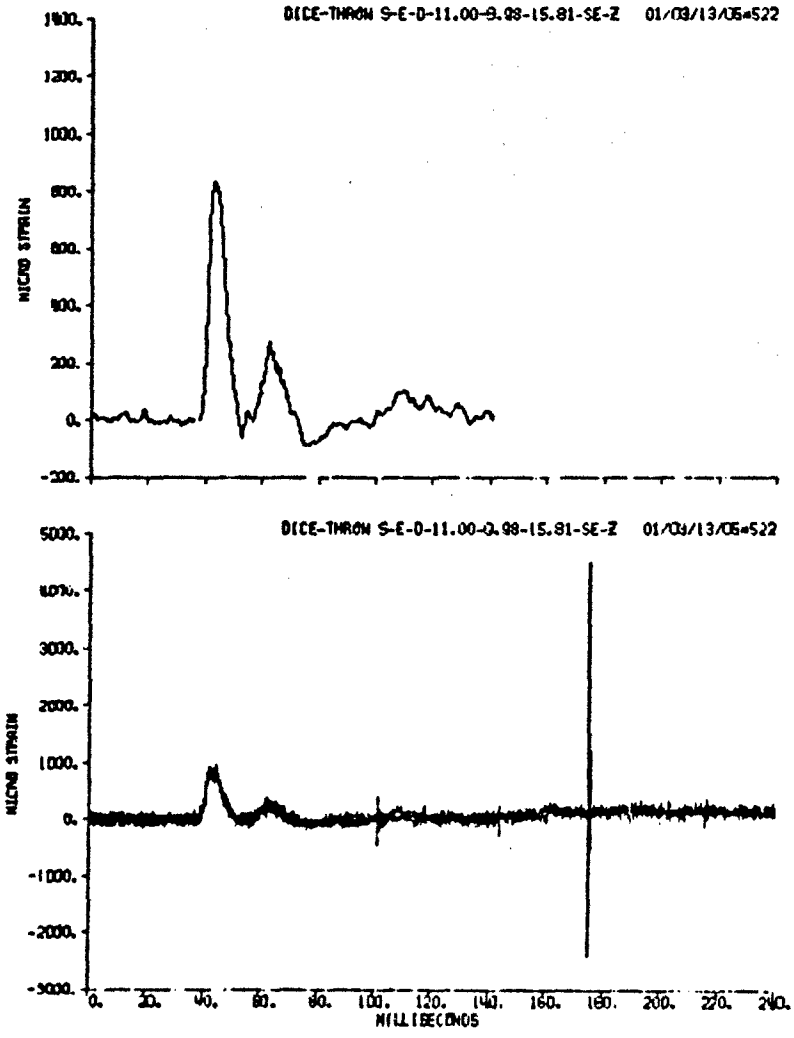

DIECE-THROW F-E-F-10.00-7.60-10.00-V -Z 05/01/12/02=259
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
DIECE-THROW F-E-F-10.00-7.60-10.00-V -Z 05/01/12/02=259
VELOCITY (METRES/SEC)
DISPLACEMENT (MM)
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

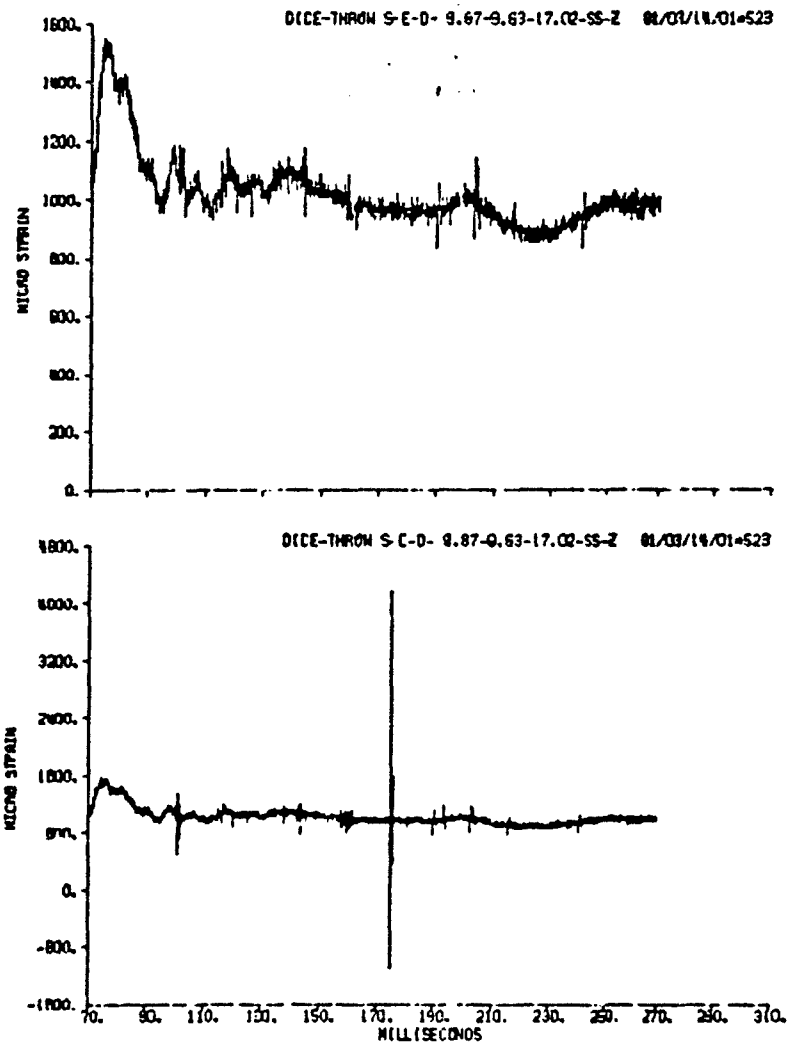

60.
40.
0.
-40.
-80.
-120.
-160.
-200.
-240.
2000.
1000.
0.
-1000.
-2000.
-3000.
-4000.
-5000.
-6000.
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.

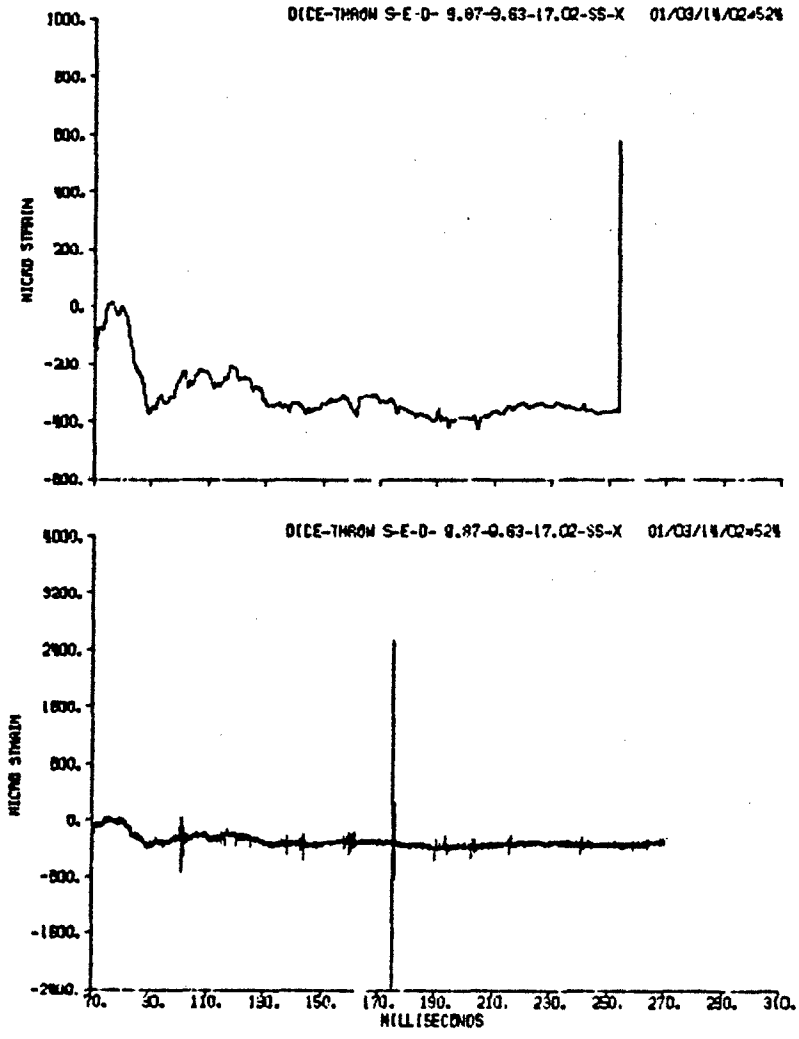

DICE-THROW S-E-D- 10.0-9.00-13.23-SE-X 01/03/13/01=518
MICRO STRAIN
320.
280.
240.
200.
160.
120.
80.
40.
0
DICE-THROW S-E-D- 10.0-9.00-13.23-SE-X 01/03/13/01=518
MICRO STRAIN
2400.
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

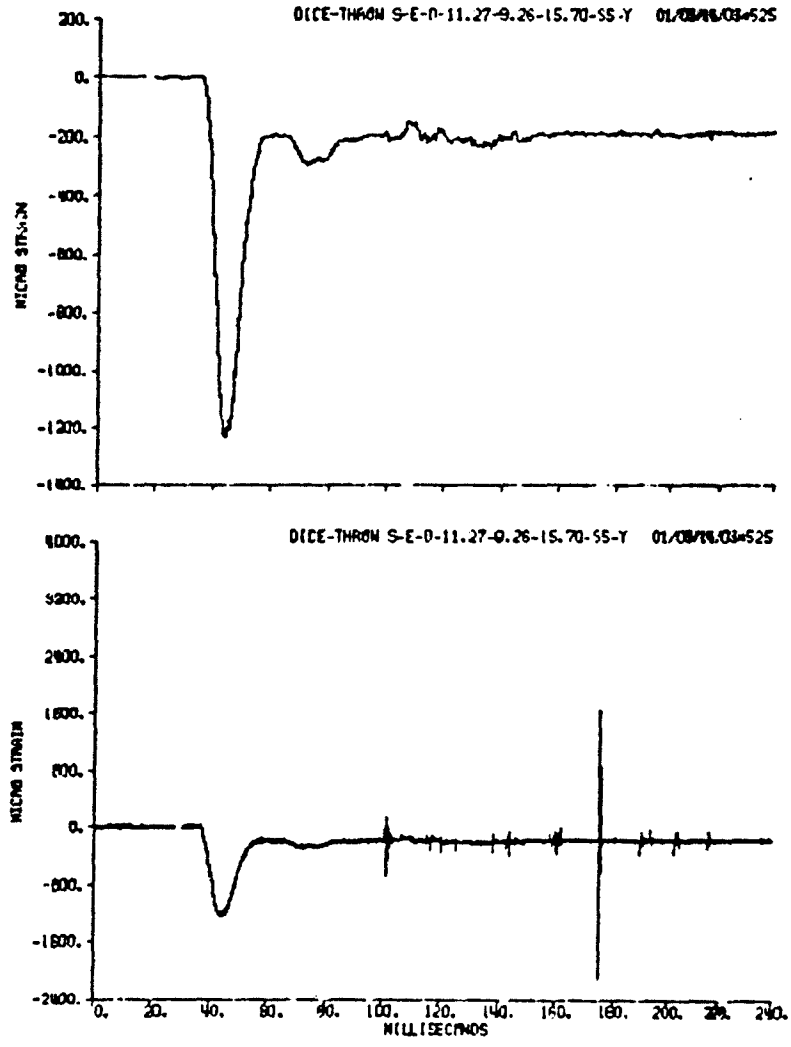

DICE-THROW S-E 0- 10.0-7.48-13.23-SE-Y 01/03/13/02=519
MICRO STRAIN
80.
0.
-80.
-160.
-240.
-320.
-400.
-480.
-560.
DICE-THROW S-E-0- 10.0-7.48-13.23-SE-Y 01/03/13/02=519
MICRO STRAIN
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

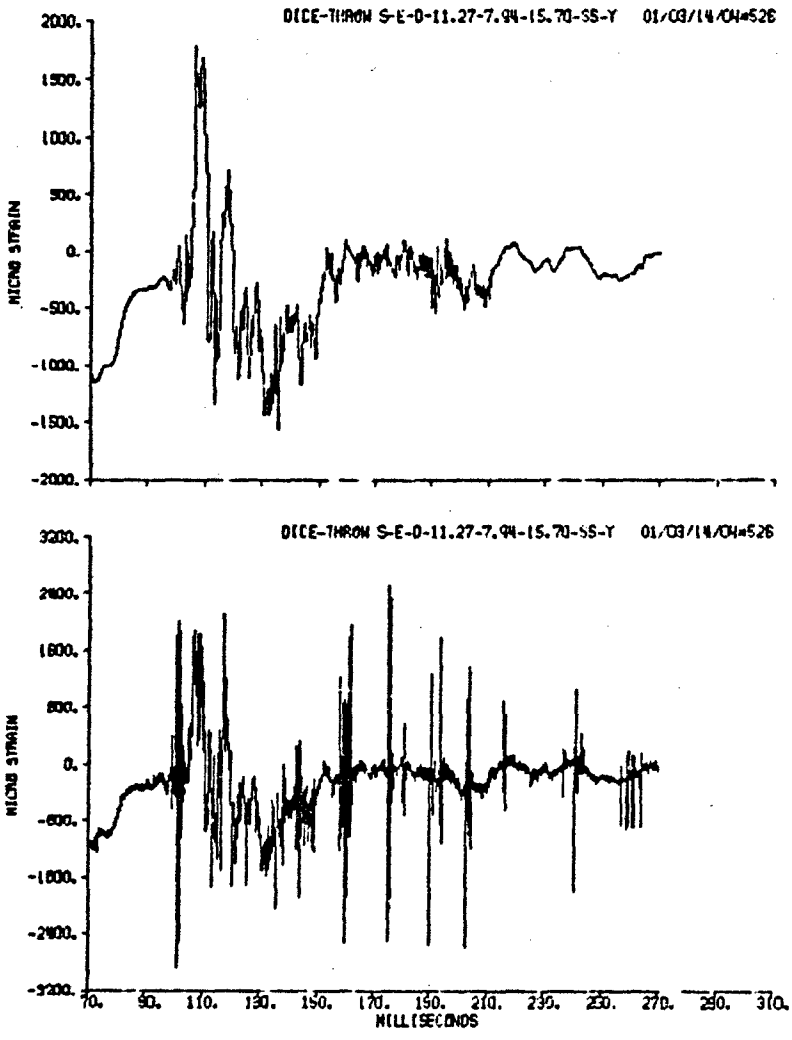

DICE-THROW S-E-D-10.88-9.98-15.91-SE-Z
1800.
1600.
1400.
1200.
1000.
800.
600.
400.
200.
0.
MICRO STRAIN
DICE-THROW S-E-D-10.88-9.98-15.91-SE-Z
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
MICRO STRAIN
70.
90.
110.
130.
150.
170.
190.
210.
230.
250.
270.
290.
310.
MILLISECONDS

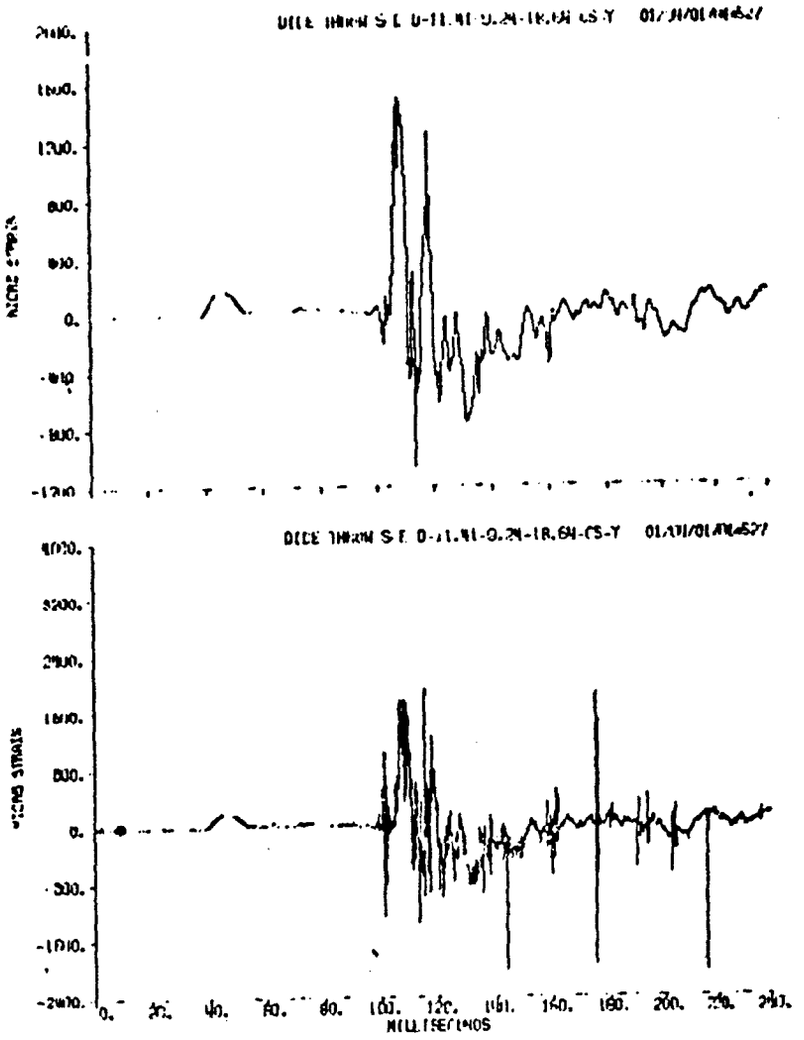

DICE-THROW S-E-D-11.00-0.98-15.81-SE-Z 01/09/13/05=522
MICRO STRAIN
1400.
1200.
1000.
800.
600.
400.
200.
0.
-200.
DICE-THROW S-E-D-11.00-0.98-15.81-SE-Z 01/09/13/05=522
MICRO STRAIN
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
-5000.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

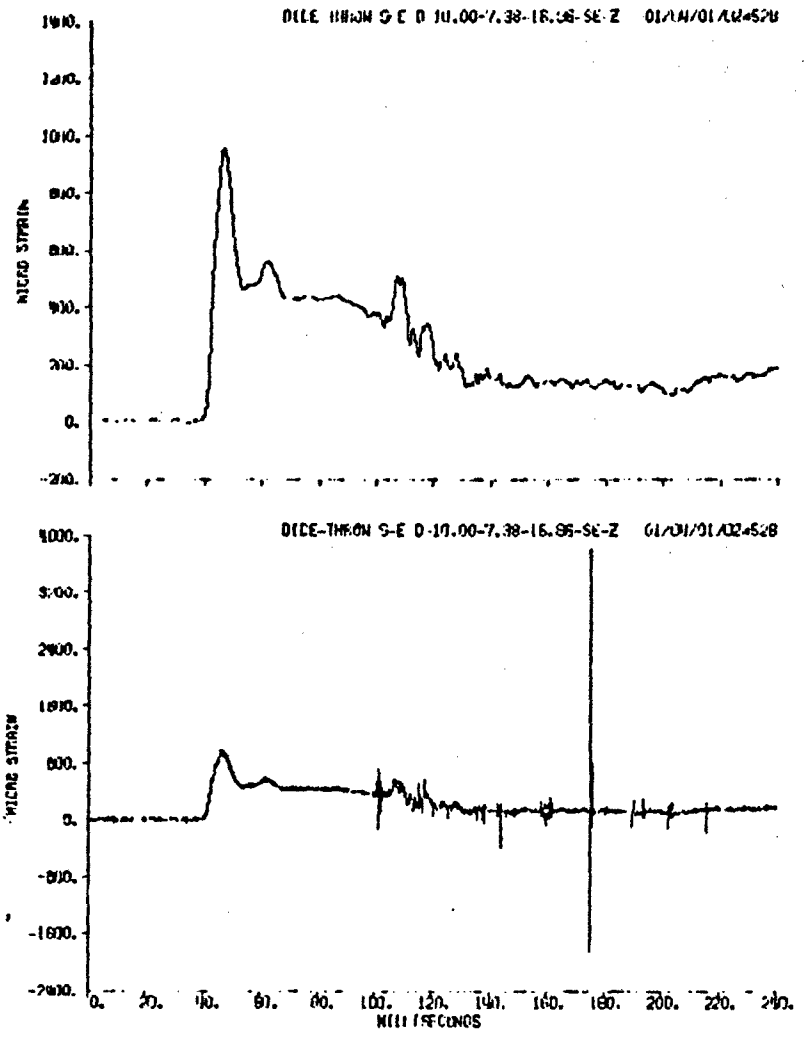

DICE-THROW S-E-D- 9.67-9.63-17.02-SS-Z 81/01/14.01=523
MICRO STRAIN
1600.
1400.
1200.
1000.
800.
600.
400.
200.
0.
DICE-THROW S-C-D- 9.87-9.63-17.02-SS-Z 81/01/14/01=523
MICRO STRAIN
4800.
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

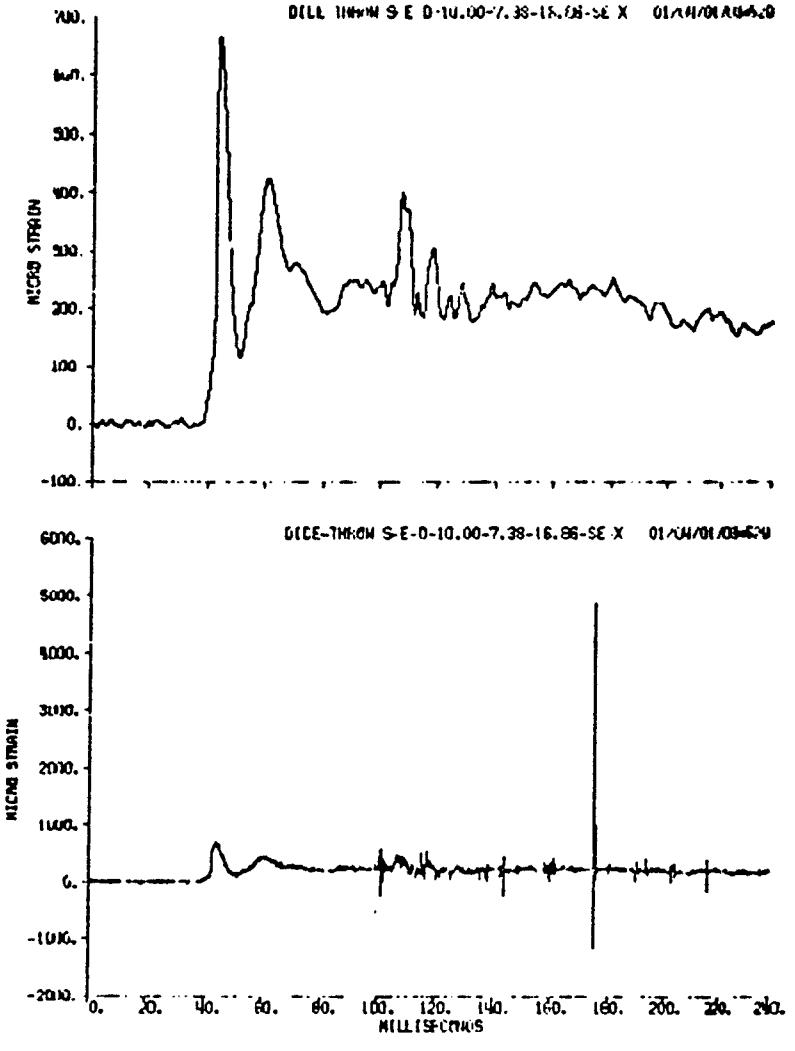

DICE-THROW S-E-D- 9.87-9.63-17.02-SS-X 01/03/1%/02=52%
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
DICE-THROW S-E-D- 9.87-9.63-17.02-SS-X 01/03/1%/02=52%
MICRO STRAIN
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

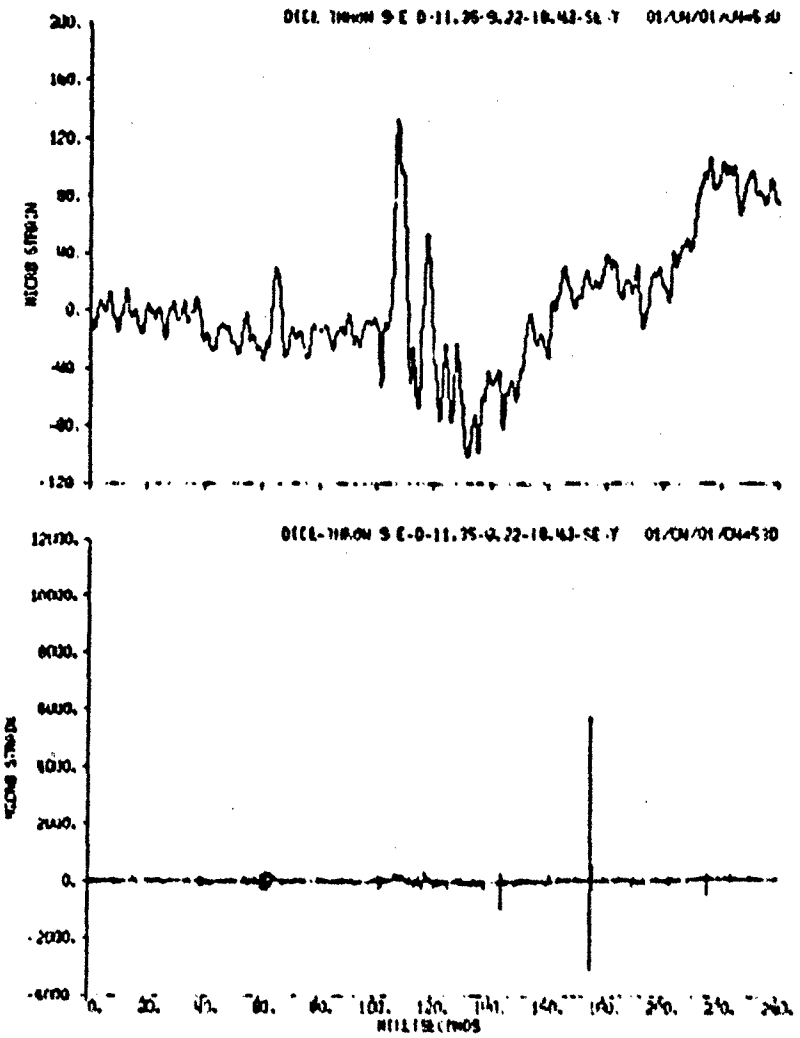

DICE-THROW S-E-0-11.27-9.26-15.70-SS-Y
200.
0.
-200.
-400.
-600.
-800.
-1000.
-1200.
-1400.
DICE-THROW S-E-0-11.27-9.26-15.70-SS-Y
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

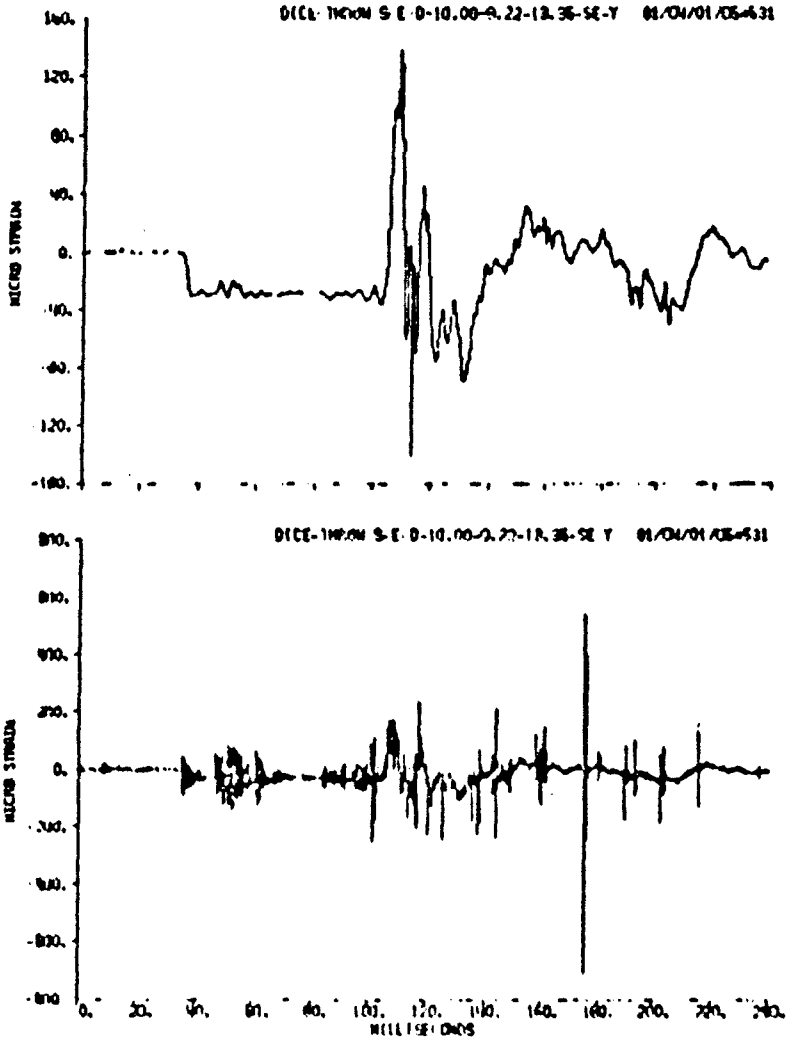

DICE-THROW S-E-0-11.27-7.94-15.70-SS-Y 01/03/14/04=526
MICRO STRAIN
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
-2000.
DICE-THROW S-E-0-11.27-7.94-15.70-SS-Y 01/03/14/04=526
MICRO STRAIN
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
-3200.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

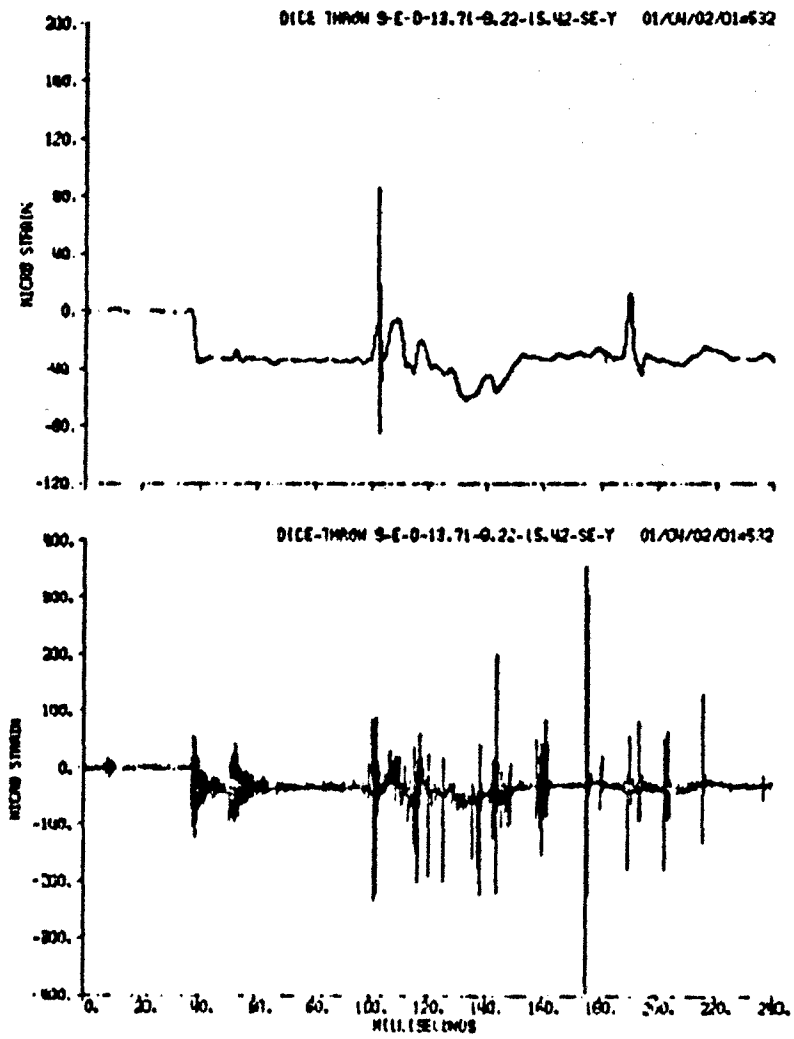

DICE THROW S E 0-11.91-0.24-18.64-CS-Y
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
-800.
-1000.
DICE THROW S E 0-11.91-0.24-18.64-CS-Y
MICRO STRAIN
4000.
3200.
2400.
1600.
800.
0.
-800.
-1600.
-2400.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

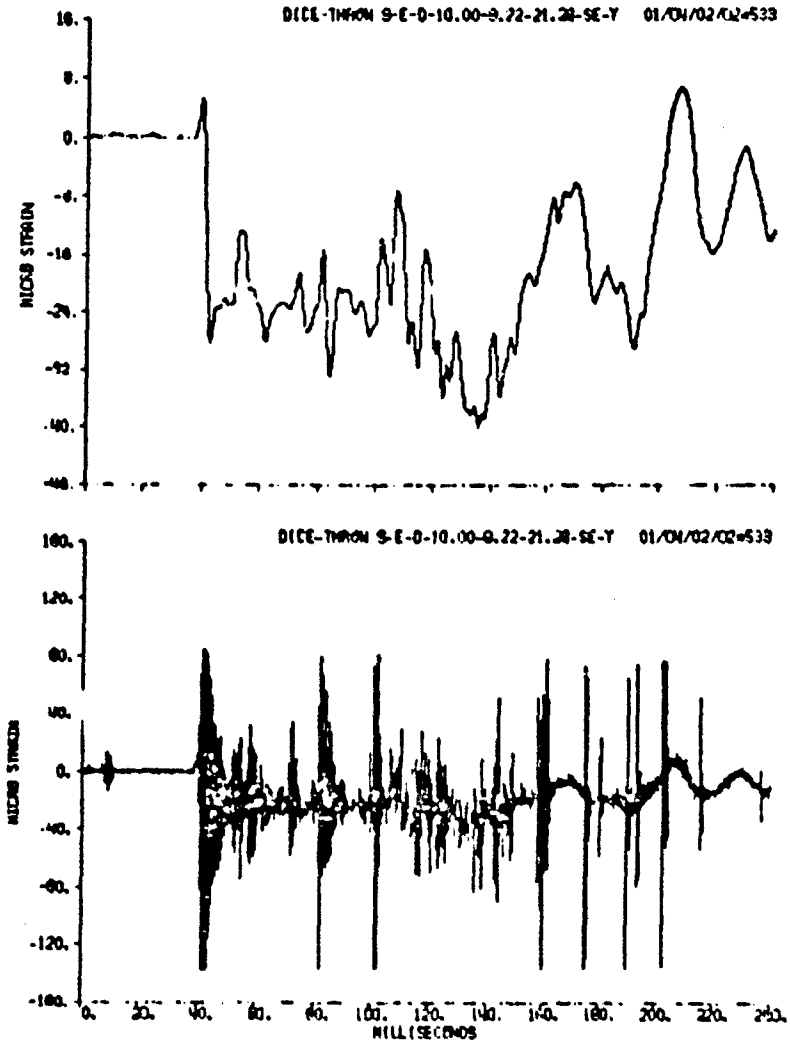

DICE THRON S-E D 10.00-7.38-16.86-SE-Z
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
DICE-THRON S-E D-10.00-7.38-16.86-SE-Z
MICRO STRAIN
3000.
2800.
1800.
800.
0.
-800.
-1600.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

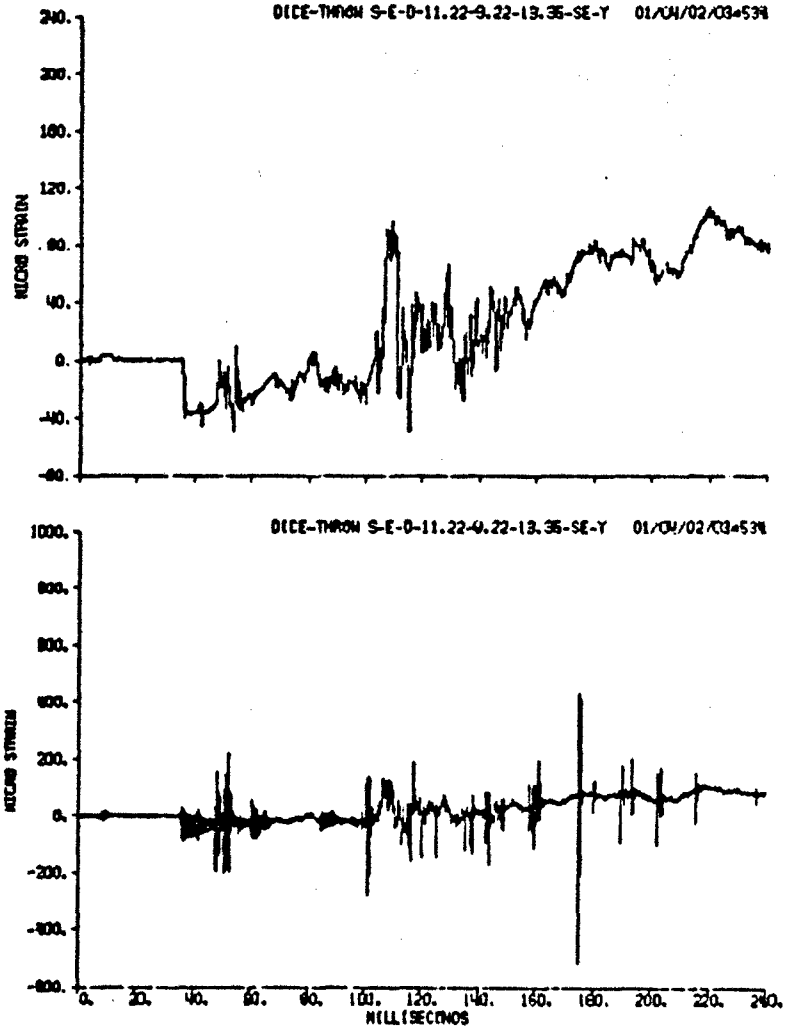

DELL THROW S-E 0-10.00-7.38-16.86-SE X
MICRO STRAIN
700.
600.
500.
400.
300.
200.
100
0.
-100.
DELL-THROW S-E-0-10.00-7.38-16.86-SE X
MICRO STRAIN
6000.
5000.
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

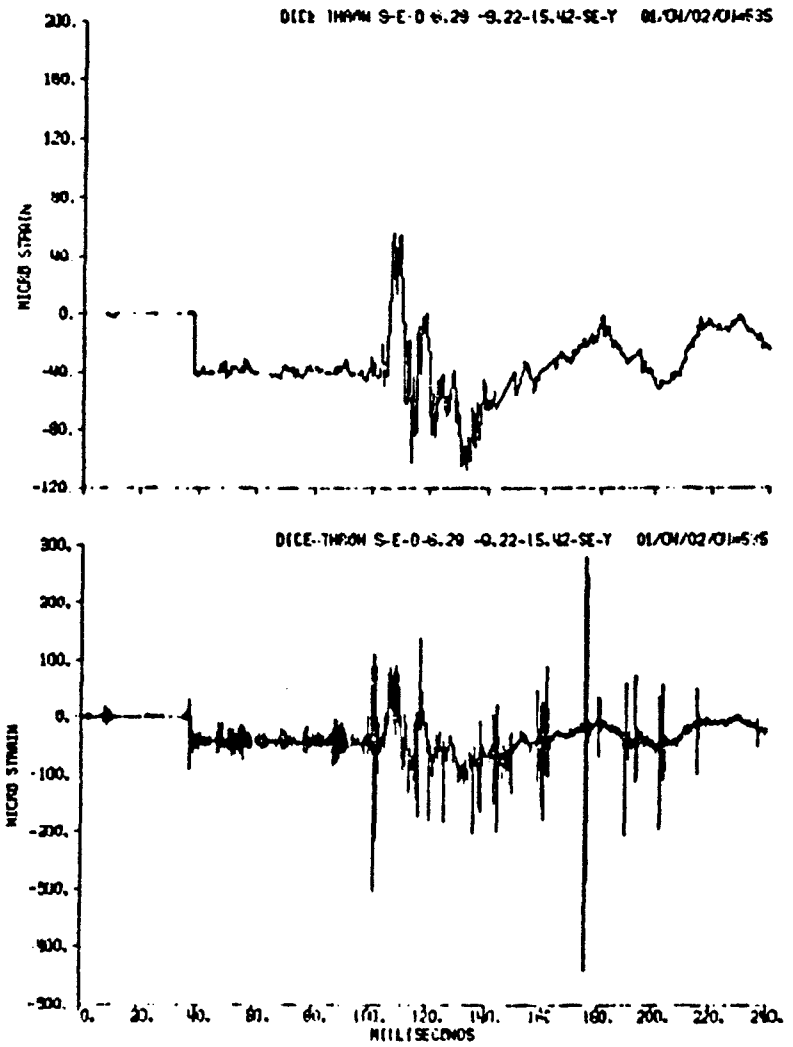

200.
160.
120.
80.
40.
0.
-40.
-80.
-120
MICRO STRAIN
12000.
10000.
8000.
6000.
4000.
2000.
0.
-2000.
-4000
MICRO STRAIN
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
MILLISECONDS

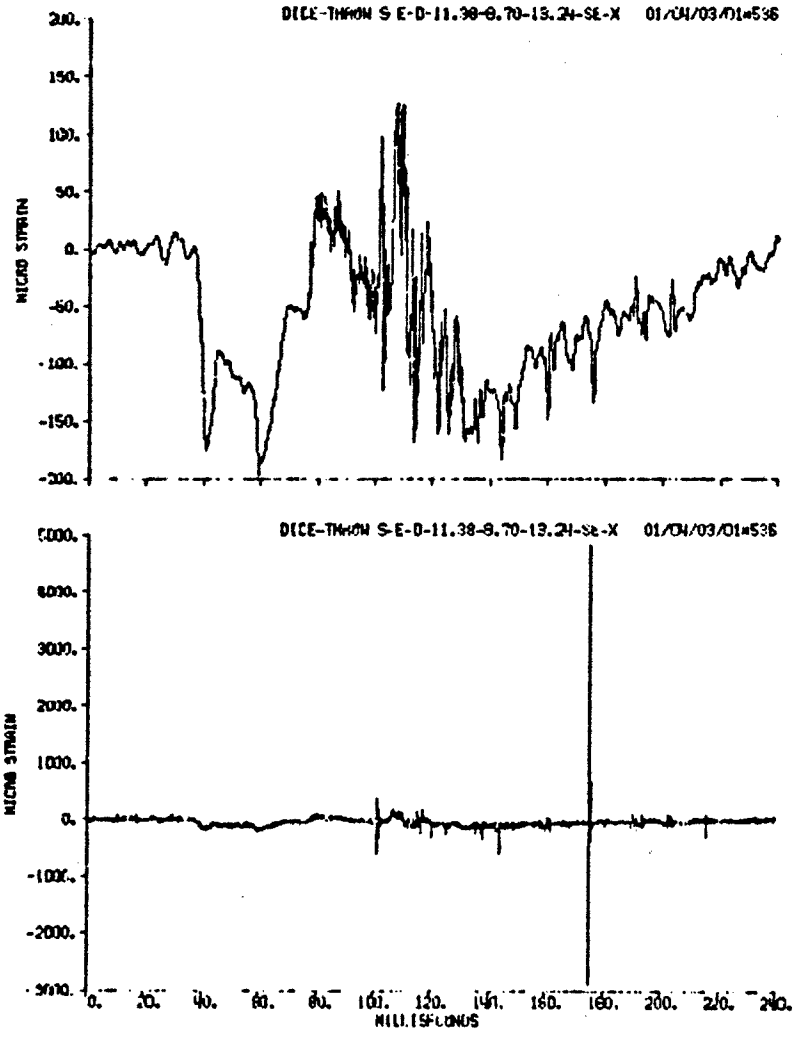

MICRO STRAIN
MICRO STRAIN
MILLISECONDS

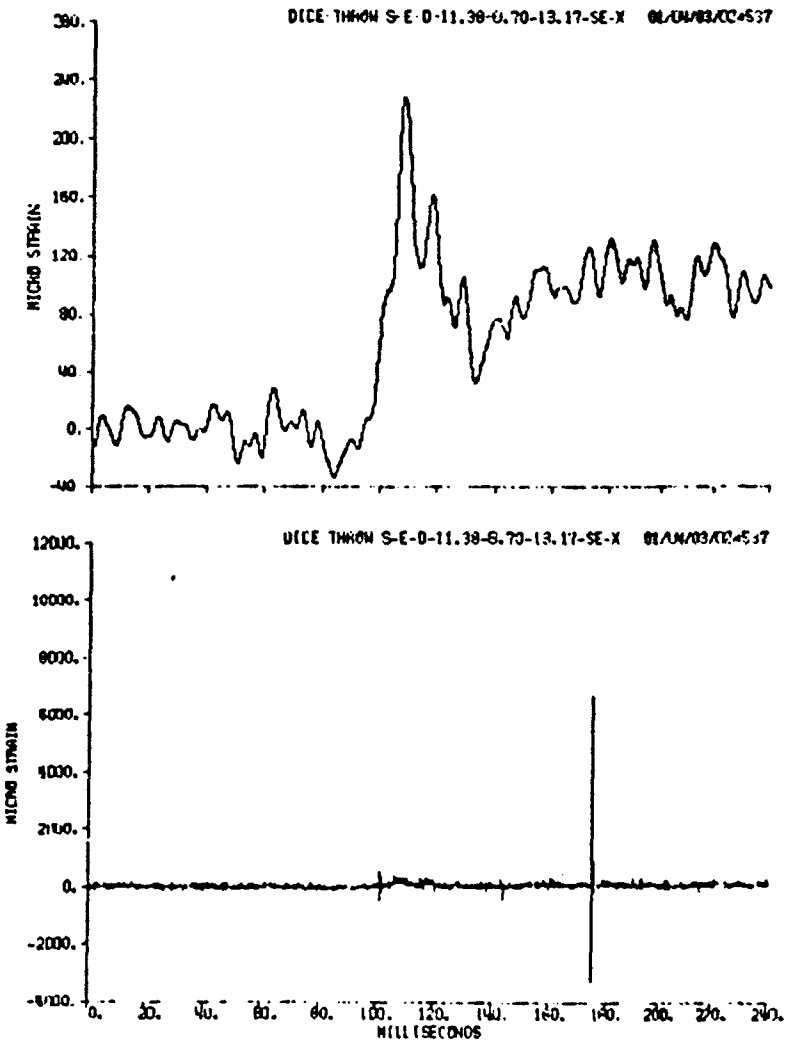

DICE THROW 9-E-0-13.71-8.22-15.42-SE-Y 01/CH/02/01=632
200.
160.
120.
80.
40.
0.
-40.
-80.
-120.
RECORD STRAIN
DICE-THROW 9-E-0-13.71-8.22-15.42-SE-Y 01/CH/02/01=532
800.
600.
200.
100.
0.
-100.
-200.
-800.
-600.
RECORD STRAIN
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

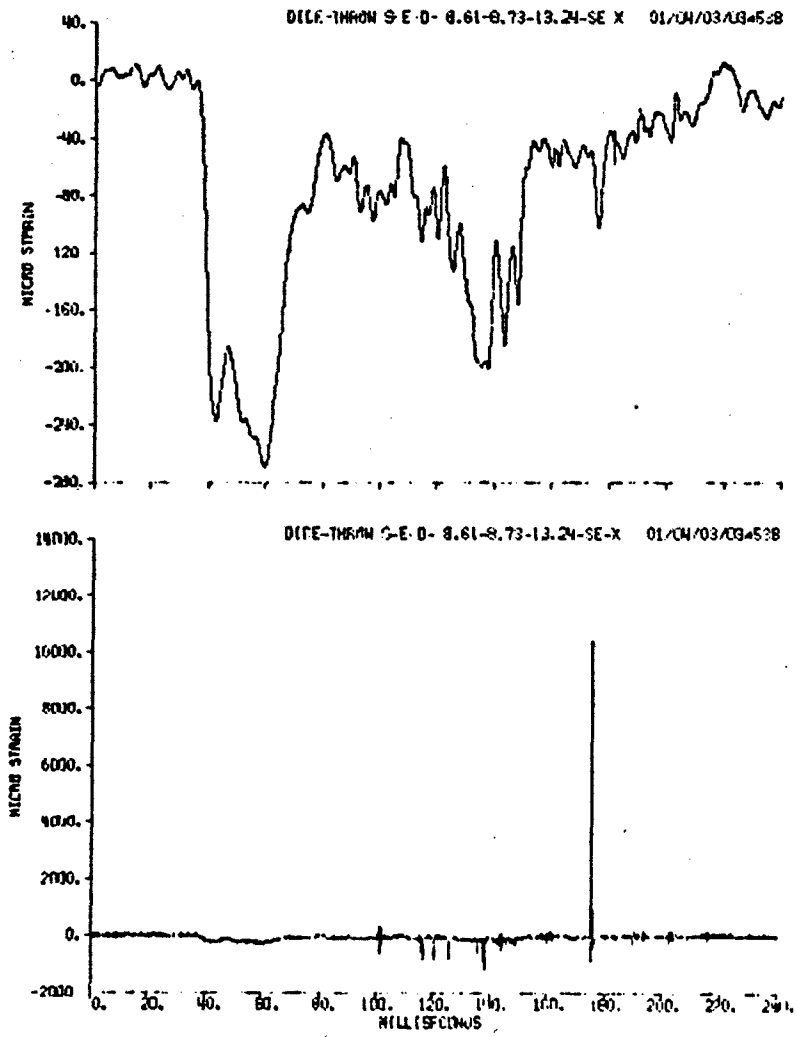

DICE-THROW 9-E-0-10.00-9.22-21.28-SE-Y 01/ON/02/02=533
MICRO STRAIN
DICE-THROW 9-E-0-10.00-9.22-21.28-SE-Y 01/ON/02/02=533
MICRO STRAIN
MILLISECONDS

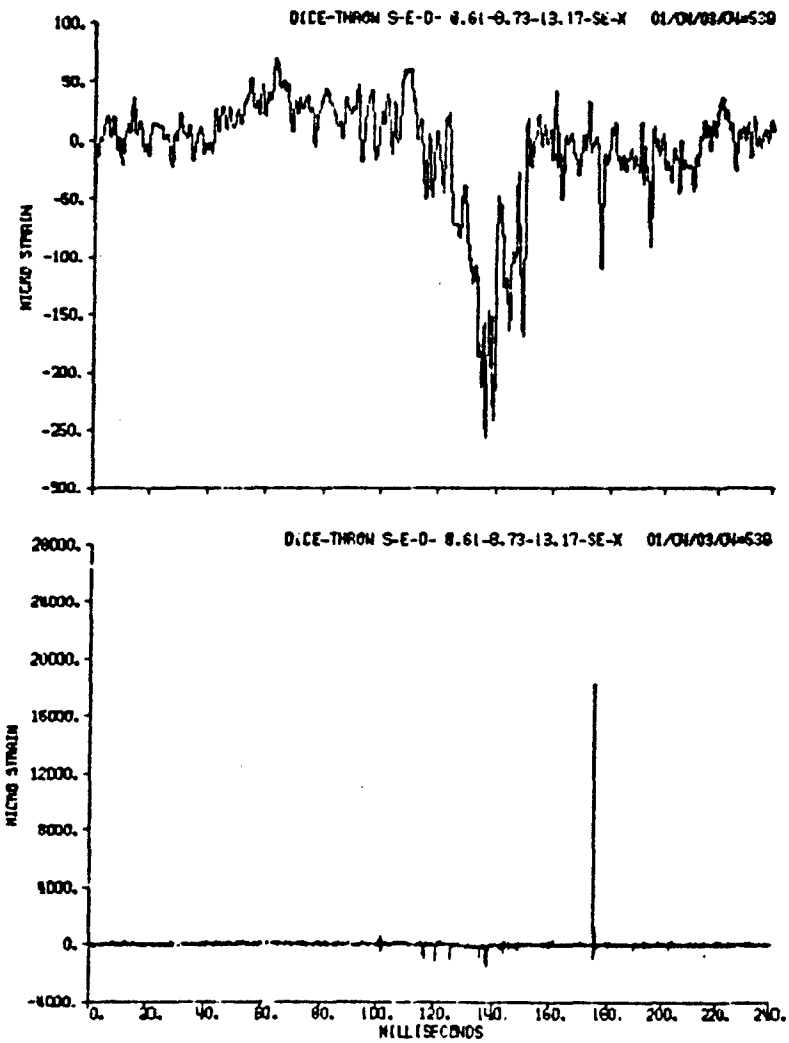

DICE-THROW S-E-0-11.22-9.22-13.35-SE-Y 01/CH/02/C3=53%
MICRO STRAIN
240.
200.
160.
120.
80.
40.
0.
-40.
-80.
DICE-THROW S-E-0-11.22-9.22-13.35-SE-Y 01/CH/02/C3=53%
MICRO STRAIN
1000.
800.
600.
400.
200.
0.
-200.
-400.
-600.
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

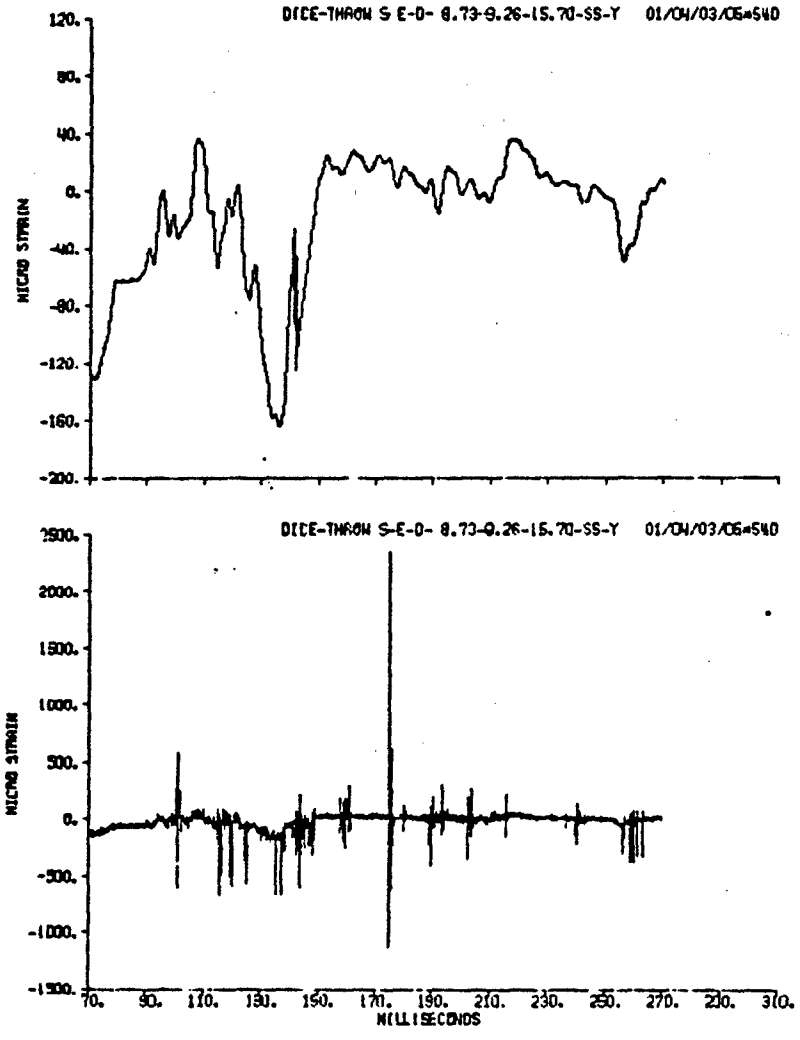

DICE THROW S-E-0 6.29 -0.22-15.42-SE-Y 01/01/02/01=635
MICRO STRAIN
200.
160.
120.
80.
40.
0.
-40.
-80.
-120.
DICE--THROW S-E-0-6.29 -0.22-15.42-SE-Y 01/01/02/01=515
MICRO STRAIN
300.
200.
100.
0.
-100.
-200.
-500.
-900.
-300.
0.
20.
40.
80.
60.
100.
120.
140.
160.
200.
220.
240.
MILLISECONDS

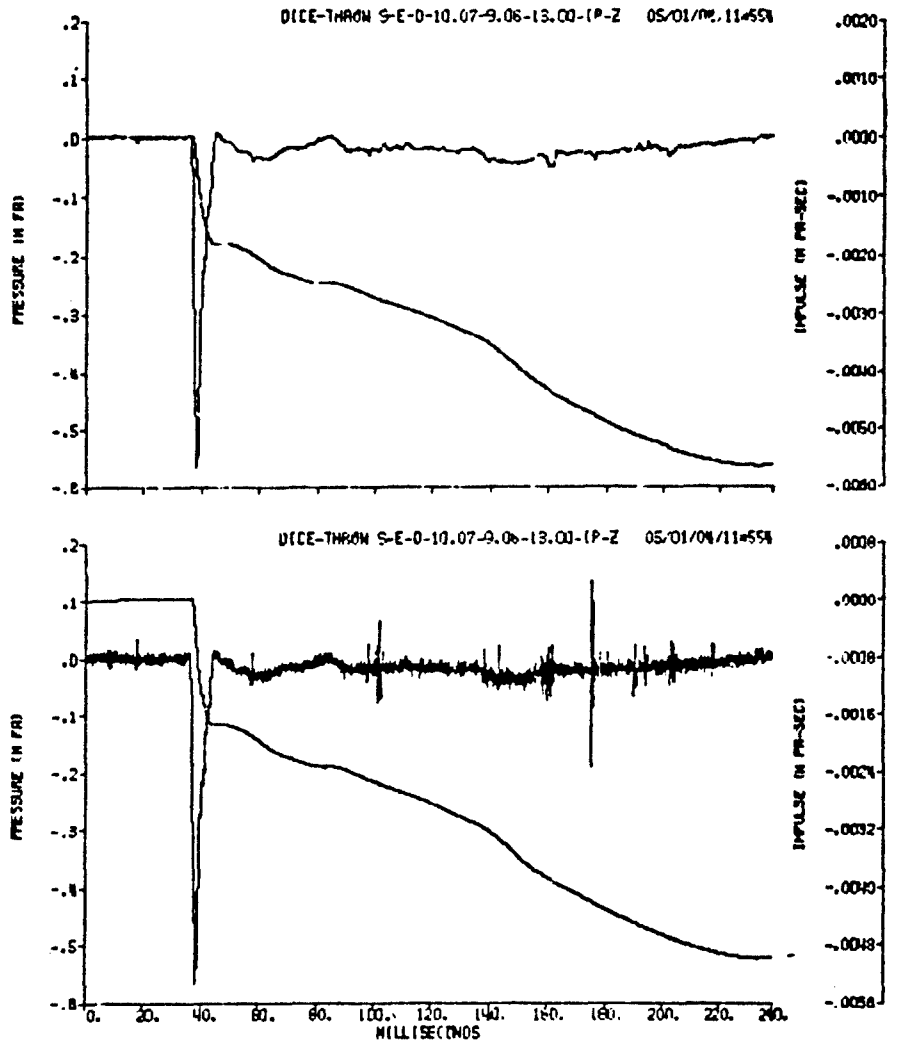

DICE-THHON S E-D-11.38-8.70-13.24-SE-X 01/CH/03/01=536
MICRO STRAIN
200.
150.
100.
50.
0.
-50.
-100.
-150.
-200.
DICE-THHON S-E-D-11.38-8.70-13.24-SE-X 01/CH/03/01=536
MICRO STRAIN
4000.
3000.
2000.
1000.
0.
-1000.
-2000.
-3000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

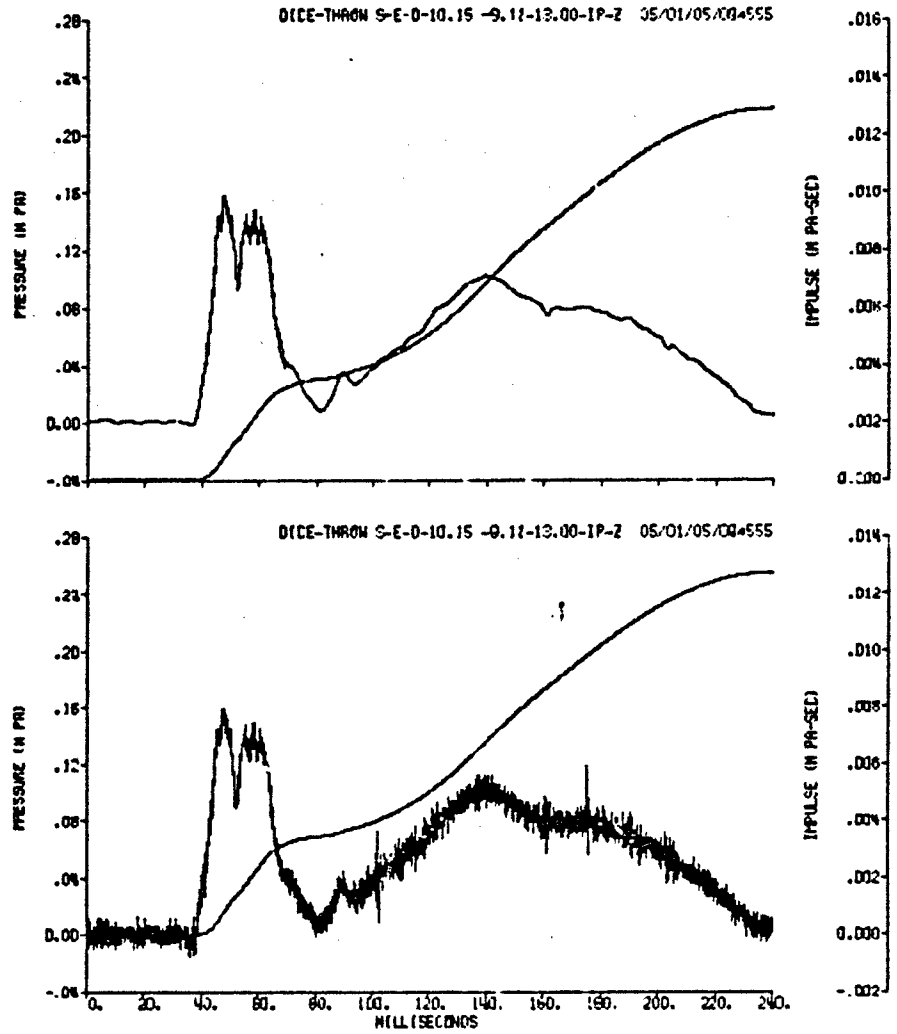

DICE THROW S-E-0-11.38-6.70-13.17-SE-X
MICRO STRAIN
390.
240.
200.
160.
120.
80.
40.
0.
-40
DICE THROW S-E-0-11.38-6.70-13.17-SE-X
MICRO STRAIN
12000.
10000.
8000.
6000.
4000.
2000.
0.
-2000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

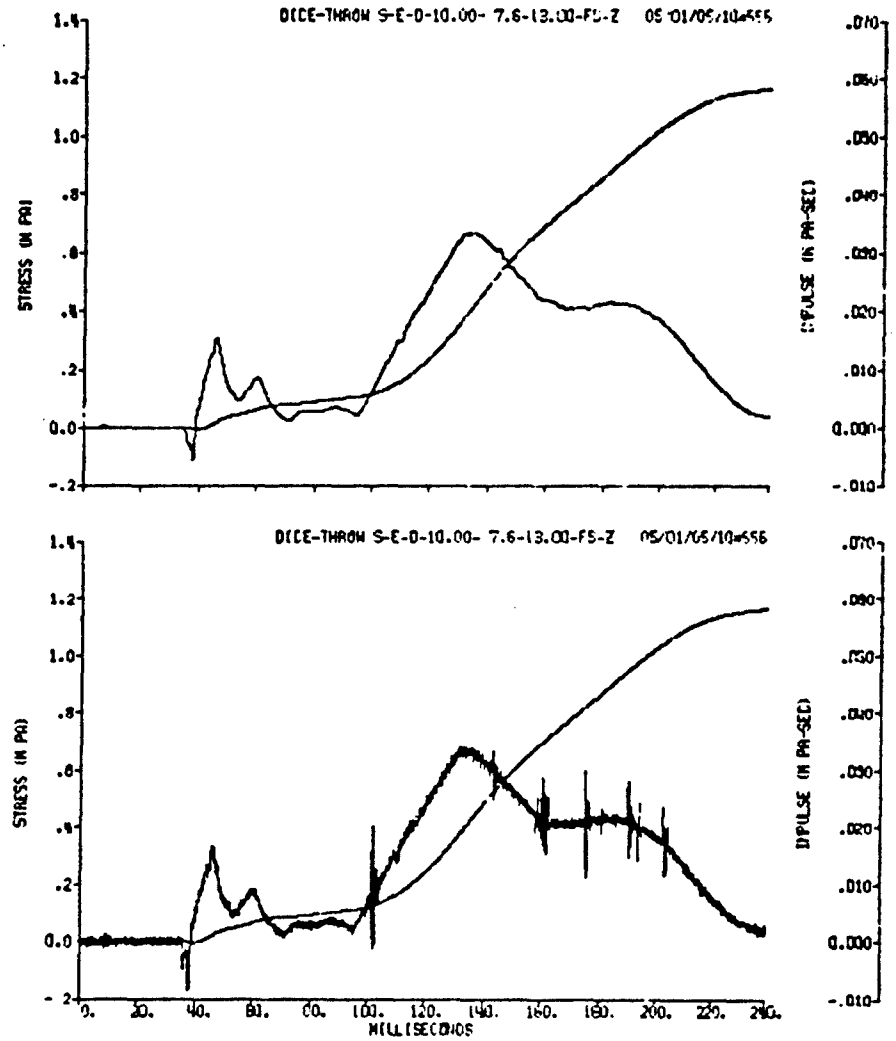

DIFF-THRUN S-E-D- 8.61-8.73-13.24-SE X 01/CH/03/CG=538
MICRO STRAIN
40.
0.
-40.
-80.
-120.
-160.
-200.
-240.
-280.
DIFF-THRUN S-E-D- 8.61-8.73-13.24-SE-X 01/CH/03/CG=538
MICRO STRAIN
12000.
10000.
8000.
6000.
4000.
2000.
0.
-2000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

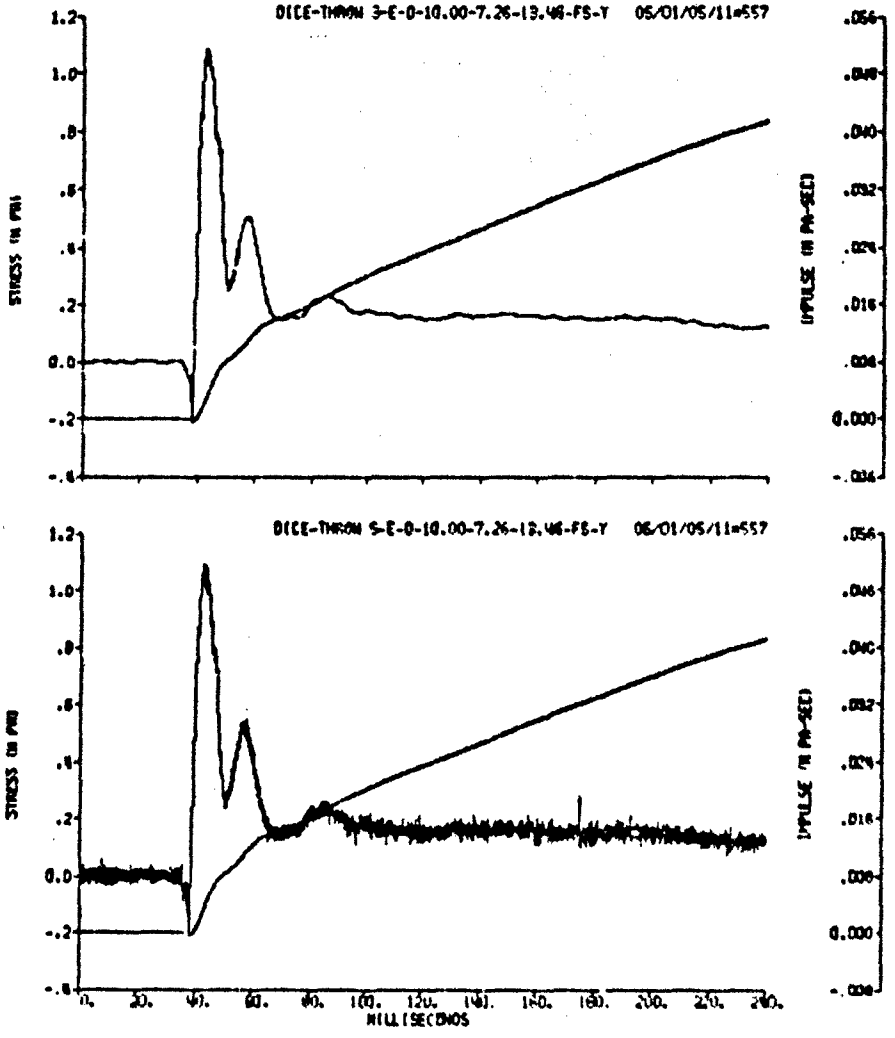

DICE-THROW S-E-0- 8.61-8.73-13.17-SE-X 01/CH/03/CH=539
MICRO STRAIN
100.
50.
0.
-50.
-100.
-150.
-200.
-250.
-300.
DICE-THROW S-E-0- 8.61-8.73-13.17-SE-X 01/CH/03/CH=539
MICRO STRAIN
20000.
16000.
12000.
8000.
4000.
0.
-4000.
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

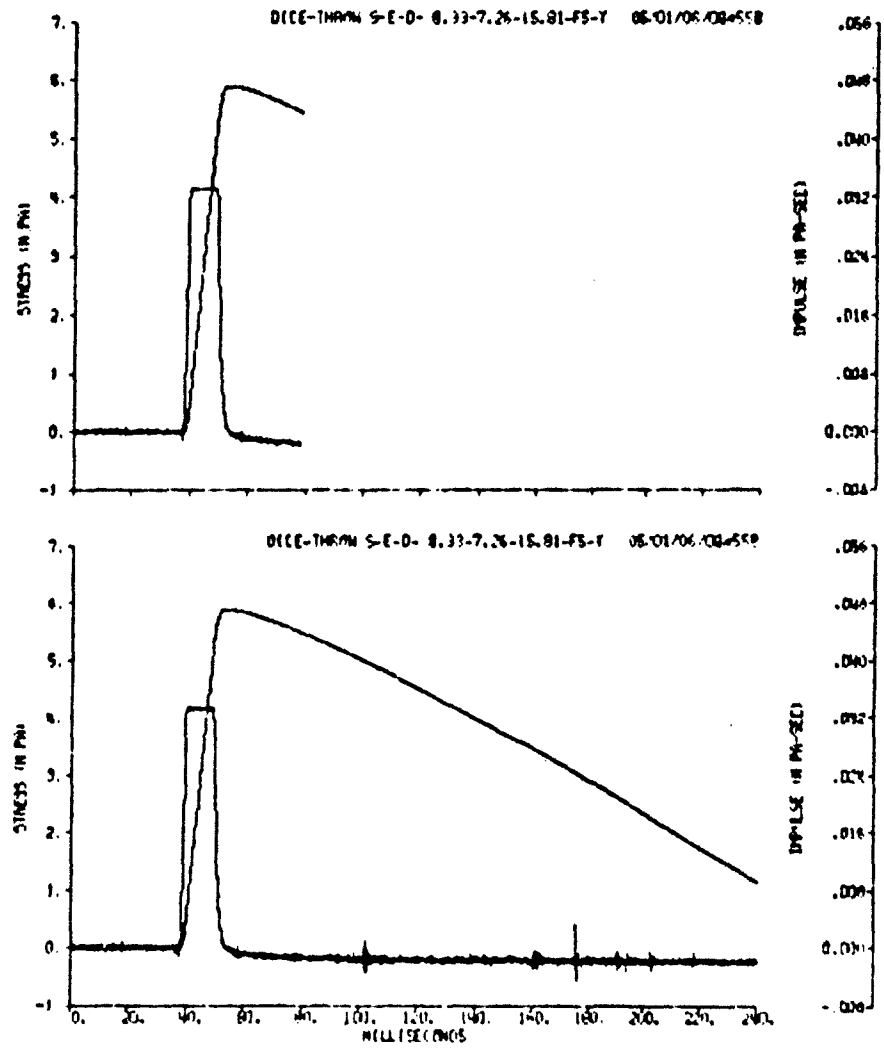

DICE-THROW S E-O- 8.73-9.26-15.70-SS-Y 01/CH/03/OS=540
MICRO STRAIN
120.
80.
40.
0.
-40.
-80.
-120.
-160.
-200.
DICE-THROW S-E-O- 8.73-9.26-15.70-SS-Y 01/CH/03/OS=540
MICRO STRAIN
2500.
2000.
1500.
1000.
500.
0.
-500.
-1000.
-1500.
70. 90. 110. 130. 150. 170. 190. 210. 230. 250. 270. 290. 310.
MILLISECONDS

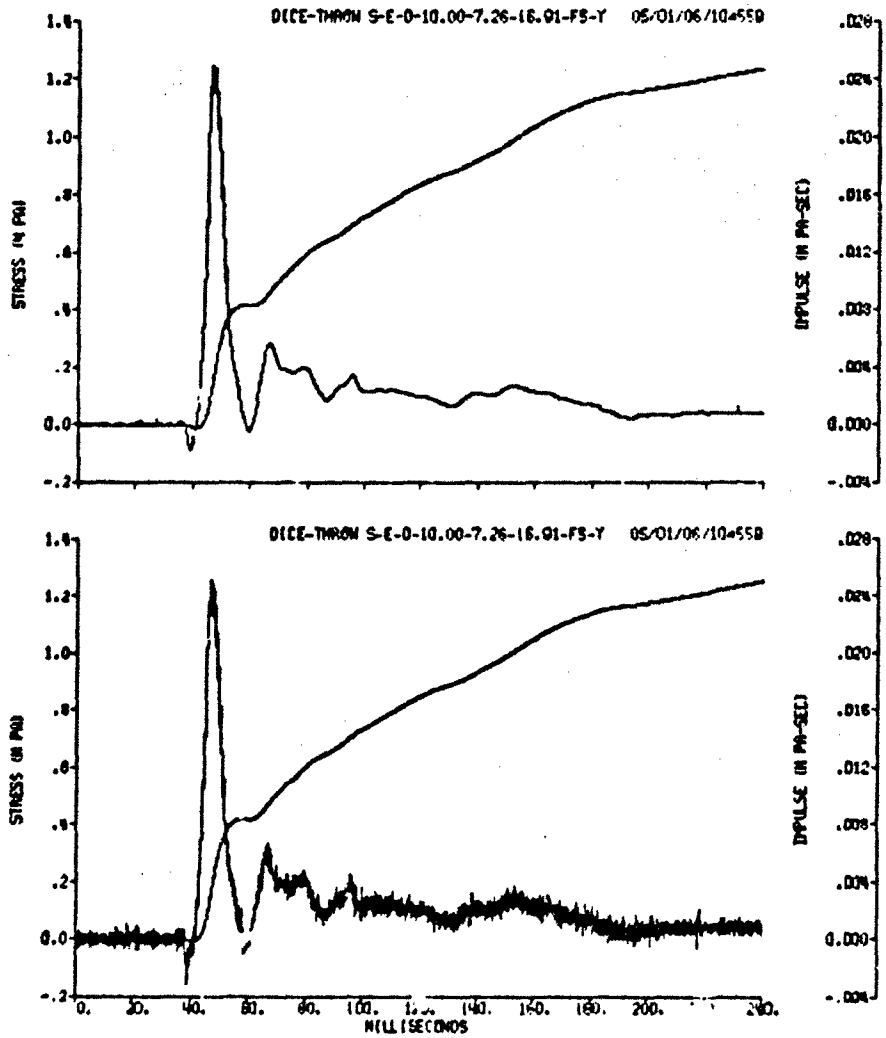

DICE-THROW S-E-0-10.07-9.06-13.00-(P-Z 05/01/0%,11=55%
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
.2
.1
.0
-.1
-.2
-.3
-.4
-.5
-.6
.0020
.0010
.0000
-.0010
-.0020
-.0030
-.0040
-.0050
-.0060
DICE-THROW S-E-0-10.07-9.06-13.00-(P-Z 05/01/0%/11=55%
.0008
.0000
-.0008
-.0016
-.0024
-.0032
-.0040
-.0048
-.0056
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS

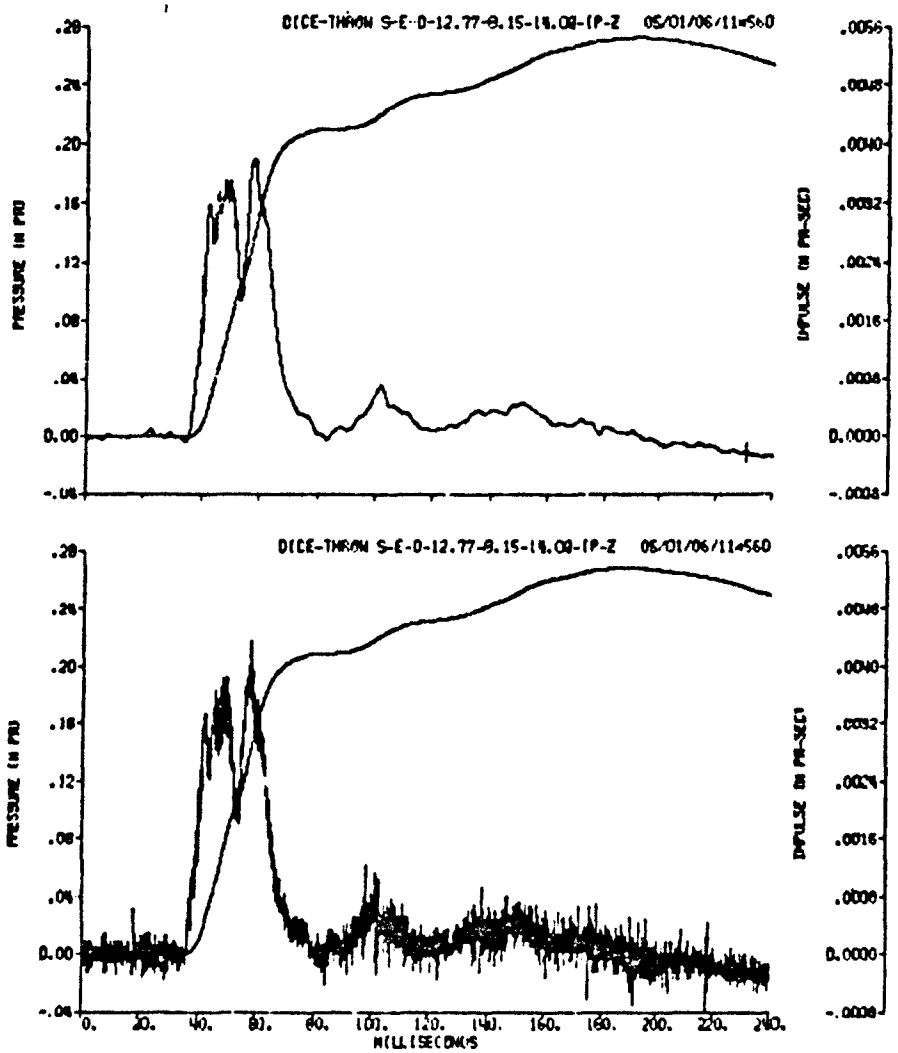

DICE-THROW S-E-0-10.1S -9.1I-13.00-IP-Z 05/01/05/004555
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.28
.24
.20
.16
.12
.08
.04
0.00
-.04
.016
.014
.012
.010
.008
.006
.004
.002
0.000
DICE-THROW S-E-0-10.1S -9.1I-13.00-IP-Z 05/01/05/004555
PRESSURE (N PA)
IMPULSE (N PA-SEC)
.014
.012
.010
.008
.006
.004
.002
0.000
-.002
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS

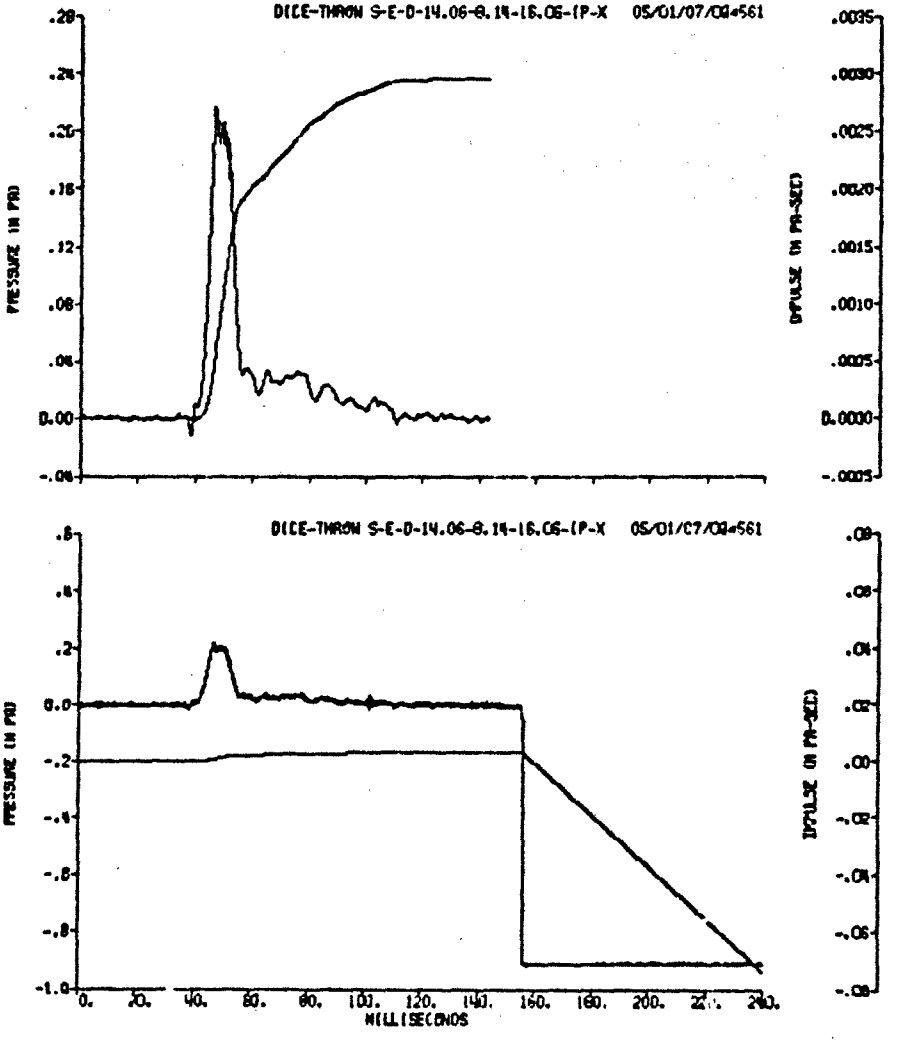

DICE-THROW S-E-0-10.00- 7.6-13.00-FS-Z 05/01/05/10=555
STRESS (N PSI)
IMPULSE (N PA-SEC)
DICE-THROW S-E-0-10.00- 7.6-13.00-FS-Z 05/01/05/10=556
STRESS (N PSI)
IMPULSE (N PA-SEC)
MILLISECONDS

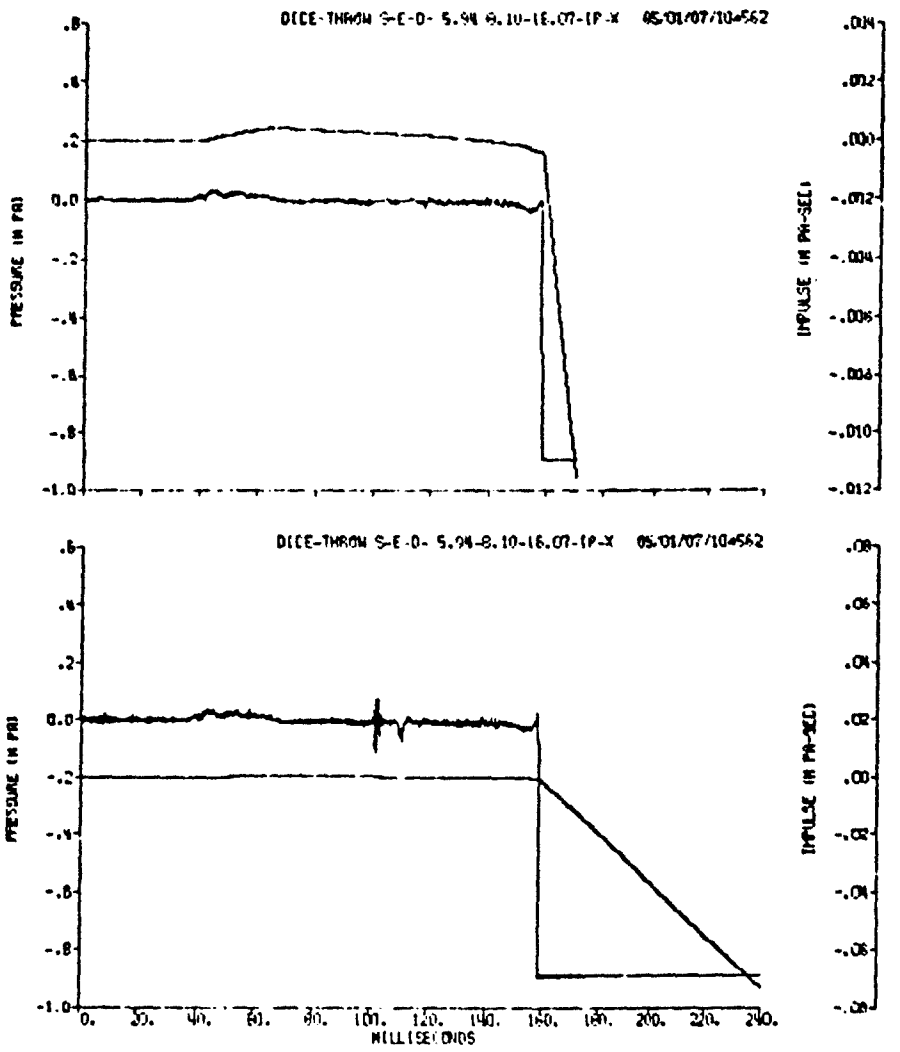

DICE-THROW 3-E-0-10.00-7.26-13.46-FS-Y 05/01/05/11=557
STRESS IN PSI
IMPULSE IN PA-SEC
DICE-THROW 5-E-0-10.00-7.26-13.46-FS-Y 05/01/05/11=557
STRESS IN PSI
IMPULSE IN PA-SEC
MILLISECONDS


DICE-THRW S-E-D- 8.33-7.2%-15.81-FS-Y
DICE-THRW S-E-D- 8.33-7.2%-15.81-FS-Y
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.


DICE-THROW S-E-0-10.00-7.26-16.91-FS-Y 05/01/06/10:55B
STRESS IN PSI
IMPULSE IN PSI-SEC
1.6
1.2
1.0
.8
.6
.4
.2
0.0
-.2
.020
.016
.012
.008
.004
0.000
-.004
DICE-THROW S-E-0-10.00-7.26-16.91-FS-Y 05/01/06/10:55B
STRESS IN PSI
IMPULSE IN PSI-SEC
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220.
MILLISECONDS


DICE-THROW S-E-0-12.77-8.15-1%.08-IP-Z 05/01/06/11=560
PRESSURE IN PSI
IMPULSE IN PSI-SEC
.28
.24
.20
.16
.12
.08
.04
0.00
-.04
.0056
.0048
.0040
.0032
.0024
.0016
.0008
0.0000
-.0008
DICE-THROW S-E-0-12.77-8.15-1%.08-IP-Z 05/01/06/11=560
0.
20.
40.
60.
80.
100.
120.
140.
160.
180.
200.
220.
240.
MILLISECONDS


DICE-THROW S-E-D-14.06-8.14-16.06-(P-X 05/01/07/03=561
PRESSURE (N PSI)
IMPULSE (N PSI-SEC)
.20
.16
.12
.08
.04
0.00
-.04
.0035
.0030
.0025
.0020
.0015
.0010
.0005
0.0000
-.0005
DICE-THROW S-E-D-14.06-8.14-16.06-(P-X 05/01/07/03=561
.8
.6
.4
.2
0.0
-.2
-.4
-.6
-.8
-1.0
.08
.06
.04
.02
.00
-.02
-.04
-.06
-.08
0. 20. 40. 60. 80. 100. 120. 140. 160. 180. 200. 220. 240.
MILLISECONDS


DICE-THROW S-E-D- 5.94-8.10-16.07-IP-X 05/01/07/10+562
PRESSURE IN PSI
IMPULSE IN PSI-SEC
DICE-THROW S-E-D- 5.94-8.10-16.07-IP-X 05/01/07/10+562
PRESSURE IN PSI
IMPULSE IN PSI-SEC
MILLISECONDS

DISTRIBUTION LIST

DEPARTMENT OF DEFENSE

Dir.
DNA
ATTN: STSI
3 cy ATTN: STTL
3 cy ATTN: SPSS

DDR&E
ATTN: Asst. Dir. Strat. Wpns.

Dir.
DIA

Director
OSD, ARPA
ATTN: NMR

Commander
FC DNA
2 cy ATTN: FCPR, Stop 44

JSTPS
ATTN: JLTW

DDC
2 cy ATTN: TCA

DEPARTMENT OF THE ARMY

CO
USACDC
Inst. Nuc. Stud.

CO
BRL
ATTN: DRXBR-TB
ATTN: DRXBR, John Keefer

Ch. Eng.
ATTN: DAEN-[illegible]DM

Dir.
USA Eng. WWES
3 cy ATTN: USA Eng. WWES

DEPARTMENT OF THE NAVY

Dir.
NRL
ATTN: 2027

Cdr.
NSWC
ATTN: 730

DEPARTMENT OF THE NAVY (Continued)

NCEL
3 cy ATTN: NCEL

DEPARTMENT OF THE AIR FORCE

Hq. USAF
ATTN: SA
ATTN: SAMI
ATTN: PREE
ATTN: PREPB
ATTN: RDPQ, 1C370
ATTN: RDQPN, 1D425
ATTN: RDQS

Hq. USAF, AFTAC
ATTN: TAP

AFCEC
5 cy ATTN: PREC

AFISC
ATTN: PQAL
ATTN: SE

Dir. Nuc. Surety
ATTN: SN, Stop 71

AFSC
ATTN: DOB

TAC
ATTN: DEE
ATTN: LGMD

CINCSAC
ATTN: DEE
ATTN: DOXS
ATTN: XPFC

ADC
ATTN: XPQY

AUL
ATTN: LDE

AU
ATTN: ED, Dir. Civ. Eng.

AFIT
ATTN: Tech. Lib., Bldg. 640, Area B
ATTN: CES

RTMENT OF THE AIR FORCE (Continued)

AF, SCLO
ATTN: Maj Pierson, LO

USAFA
ATTN: DFSLB
ATTN: FJSRL, CC

AFSC ORGANIZATIONS

AFML
ATTN: Tech. Lib.

RADC
ATTN: Doc. Lib.

KIRTLAND AFB ORGANIZATIONS

AFWL, Stop 53
ATTN: HO, Dr. Minge
2 cy ATTN: SUL
ATTN: DE
20 cy ATTN: DES

OTHER AIR FORCE AGENCIES

AFOSR

ERDA ACTIVITIES

Sandia Lab.
ATTN: Org. 3141, Tech. Lib.

Dir. Ofc.
LLL
ATTN: Tech. Info. Dept.

LLL
ATTN: Lib., Bldg. 50, Rm. 134

Dir
LASL

ADDITIONAL

2 BDM Corporation

2 Boeing Aerospace Company

2 Civil Nuclear Systems Corp.

Univ. of Wisconsin
Dept. of Civil Engineering
ATTN: Dr. David Wang

Official Record Copy, Capt H. T. Webster, AFWL/DES