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AFPTEF REPORT NO. 97-R-01
AFPTEF PROJECT NO. 95-P-108

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Design and Prototype of the ATCOM Shipping and Storage Containers CNU-582/E, CNU-583/E, CNU-584/E and CNU-585/E

DSN: 787-2638
Commercial: (937) 257-2638

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April 1997

AFPTEF PROJECT NO.: 95-P-108
TITLE: Design and Prototype of the ATCOM Shipping and Storage Containers

ABSTRACT

The US Army Aviation and Troop Command (ATCOM) St. Louis MO AMSAT-I-SDP program office requested engineering assistance designing a small number of reusable, sealed, aluminum containers that would replace their existing line of many specialized wooden crates.

AFPTEF recommended reducing the more than 20 different containers to 4. Three of the new container designs (designated #2, #5 and #6) utilize an existing proven AFPTEF design. These three container sizes are 1675 (66") L x 510 (20") W x 457.2 (18") H, 1297 (51") x 1220 (48") x 533.2 (21"), and 1345 (53") x 1270 (50") x 1132.1 (45"). Container #3 is a totally new single walled design for which two new extrusions were designed and procured. The dimensions of this container are 2,388 L x 381 W x 394 H (94" x 15" x 15.5"). Item weights will range from 0.9 kg (2 lb.) to 70 kg (154 lb.). All containers will use polyurethane foam for the cushion system.

These stackable containers utilize standard cam-over center latches, pressure/vacuum relief valves, air filling valves, desiccant ports, and tie down rings. They are unpainted and will be manufactured exclusively from aluminum extrusions and sheet material. The life cycles of these containers are 20 years.

Prototype containers of the four designs have been fabricated and have successfully passed all qualification tests.

PROJECT ENGINEER MAN-HOURS: 895

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TABLE OF CONTENTS

APPENDICES

INTRODUCTION:

BACKGROUND:
The Aviation and Troop Command (ATCOM) St. Louis MO AMSAT-I-SDP program office requested engineering assistance designing a small number of reusable, sealed, aluminum containers that would replace their existing line of many specialized wooden crates.

ATCOM's major goals were not only to have better, more durable containers for their items, but also to reduce the number of different containers from more than 20 down to only 4, thus greatly simplifying their warehousing needs. These four container designs, CNU-582/E, -583/E, -584/E and -585/E (see Figure 1) are designated #2, #5, #6 and #3 respectively for the purposes of this report. Three of the new container designs, #2, #5 and #6 (see Figures 2, 3 and 4) utilize an existing AFPTEF design that has already been proven to be structurally sound and sealed. Container #3 (see Figure 5) is an entirely new single walled design for which two new extrusions were designed and procured by AFPTEF. Item weights will range from 0.9 kg (2 lb.) to 70 kg (154 lb.). All containers will use 3" thick polyurethane foam for the cushion system.

These stackable containers utilize standard cam-over center latches, pressure/vacuum relief valves, air filling valves, desiccant ports, and tie down rings. They are unpainted and will be manufactured exclusively from aluminum extrusions and sheet. The life cycles of these containers are 20 years. Many of the prototype components will be fabricated using a computer numerically controlled (CNC) 3-axis milling machine with machine code generated on Parametric Technology's Pro/Engineering software.

REQUIREMENTS:
AFPTEF in conjunction with AMSAT-I-SDP developed a Statement of Work (SOW) for the design of the containers. This was a tailoring of SAE ARP1967. See Appendix 5 for Statement of Work.

DEVELOPMENT:

DESIGN OF THE CONTAINER:
These are welded aluminum, controlled breathing, reusable containers. The bases of containers 2, 5 and 6 are one piece skid/double walled extrusions with integral forklift openings, humidity indicator, pressure relief valve, air filling valve and desiccant port for easy replacement of desiccant (the desiccant controls dehumidification). The base of container 3 is single walled with a small H-beam extrusion at the top and bottom edges. A silicone rubber gasket and quick release latches create a seal at the base/lid interface. The lid of containers 2, 5 and 6 is a single sheet of aluminum fit into channels in the corner post and lid extrusions. The lid of container 3 is also a single sheet but with a small J-channel extrusion at the edges. Stacking pads on the lids provide for stacking of like containers up to 16 feet high. The containers are unpainted which reduces the original cost, environmental hazardous waste, and the life-cycle cost of the containers.

The interiors of all the containers are three inches of polyurethane foam cushion on all surfaces (convoluted foam on the sides and flat foam on the top and bottom, see Figure 10). Because of their many different configurations, the items are not tied down inside the containers, but instead are wrapped and blocked with suitable materials using the same methods and procedures as previously used with the old wooden crates.

TESTING:

CONTAINER DESCRIPTIONS:

These containers are sealed, reusable, aluminum containers engineered for the physical and environmental protection of various repairable aircraft spare parts during worldwide transportation and storage. Each container consists of a cover and base equipped with the special features listed below. The container sizes are (container #2) 1675 (66") L x 510 (20") W x 457.2 (18") H, (container #3) 2,388 (94") x 381 (15") x 394 (15.5"), (container #5) 1297 (51") x 1220 (48") x 533.2 (21"), and (container #6) 1345 (53") x 1270 (50") x 1132.1 (45").

CONTAINER FEATURES				
	ATCOM CONTAINER #			
FEATURE	2	3	5	6
PRESSURE RELIEF VALVE	YES	YES	YES	YES
HUMIDITY INDICATOR	YES	YES	YES	YES
DESICCANT PORT	YES	YES	YES	YES
FORKLIFTABLE	YES	NO	YES	YES
COVER LATCHES	8	12	10	10
COVER LIFT HANDLES	2	NONE	4	4
COVER LIFT RINGS	NONE	NONE	NONE	2
BASE LIFT HANDLES	NONE	8	NONE	NONE
BASE TIE DOWN RINGS	4	NONE	4	4

TEST SPECIMENS:

AFPTEF fabricated one prototype container of each design in-house for testing. The prototype containers were fabricated IAW all the requirements and tolerances of the container drawing packages. The same drawing packages have been released for the manufacture of production quantities of the containers. Each face of each container was marked with a number for testing identification (see Figure 2).

TEST LOADS:

The heaviest item from each group was chosen as the test load for each of the containers. For containers 2 and 3, dummy loads were fabricated by AFPTEF that matched the weights and dimensions of Landing Gear, Fixed (NSN 1620-01-231-1831) (see Figure 6) and Shaft Assembly (NSN 1615-01-158-5788) (see Figure 7) respectively. For containers 5 and 6, the actual items, Control, Swashplate (NSN 1615-01-199-7646) (see Figure 8) and Support Structure (NSN 1560-

01-237-3689) (see Figure 9) respectively were obtained on loan from the Corpus Christi Army Depot (CCAD) in Texas.

TEST PROCEDURES:

The ATCOM 2, 5, and 6 containers were tested in accordance with the Air Force Packaging Technology & Engineering Facility (AFPTEF) standard long life container test. The ATCOM 3 container was tested under a modified form of the test plan since the container design was a departure from standard design. Both test plans referenced MIL-STD-648A and FED-STD-101C (see Appendix 1 for test plans).

The test methods specified in each container test plan constitute the procedure for performing the tests on that container. The performance criteria for evaluation of container acceptability was specified at 45 G's maximum and an initial and final leak rate of 0.0035 kg/cm²/hr (0.05 psi/hr) on all four containers. These tests are commonly applied to special shipping containers providing rough handling protection to sensitive items. The tests were performed at AFPTEF, AFMC LSO/LOP, 5215 Thurlow St, Wright-Patterson AFB, OH 45433-5540.

TEST SEQUENCES:

CONTAINER FACE IDENTIFICATION:

The correlation between numbered and designated container sides was as follows:

NUMBERED SIDE	DESIGNATED SIDE ATCOM 2	DESIGNATED SIDE ATCOM 3, ATCOM 5, ATCOM 6
1	Top	Top
2	Forward	Forward (Desiccant Port)
3	Bottom	Bottom
4	Aft	Aft
5	Left	Left
6	Right (Desiccant Port)	Right

INSTRUMENTATION (Container # 2)

The simulated load was instrumented with a piezoelectric triaxial accelerometer mounted to its outer surface as close to the items center of mass as possible. Accelerometer positive axis orientations were as follows:

X Axis - Directed through container Side 6 (Longitudinal motion).
Y Axis - Directed through container Side 1 (Vertical motion).
Z Axis - Directed through container Side 2 (Transverse motion).

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Shock Amplifier	Endevco	2740BT	GC11	Nov 96
Shock Amplifier	Endevco	2740BT	GC10	Nov 96
Shock Amplifier	Endevco	2740BT	GC09	Nov 96
Item Accelerometer	Endevco	2223D	FE97	Aug 97
Data Acquisition	GHI Systems	CAT	Ver. 2.11a	N/A

TEST SEQUENCES (Container # 2)

The test sequences are listed in the actual order performed and are labeled by container. With the exception of leak tests, all containers were tested with the appropriate simulated load in place.

LEAK TESTING (Container # 2) - Test Sequences 1 and 8

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Digital Manometer	Yokogawa	2655-22	85DJ6001	Sep 96
Data Acquisition Board	Data Translations	2801A		N/A
Data Acq. Software	Laboratory Technologies	Labtech Notebook		N/A
Vacuum/Pressure Pump	Thomas Industries	TA-0040-V	21663	N/A

TEST SEQUENCE 1 (Container # 2) - FED-STD-101C

Method 5009.3, Leaks in Containers, Pressure Test.

The container pressure relief valve in the desiccant port was removed and the relief valve hole used for attachment of the digital manometer and vacuum/pressure pump lines, and an internal temperature probe. The container was closed and sealed. The leak tests were conducted in accordance with FED-STD-101C, Method 5009.3, at ambient temperature and pressure. The pneumatic pressure leak technique was used and the container was pressurized to 0.1 kg/cm² (1.5 psi). A leak rate of less than 0.0035 kg/cm²/hr (0.05 psi/hr) sustained for a period of at least one half hour was required to pass the test.

ROUGH HANDLING TESTING (Container # 2) - Test sequences 2 through 5.

The following equipment was used for the rough handling tests:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Environmental Chamber	Tenney Engineering	12791	N/A	N/A
Pendulum Impact	AFPTEF	N/A	N/A	N/A

TEST SEQUENCE 2 (Container # 2) - FED-STD-101C

Method 5005.1 Cornerwise-Drop (Rotational) Test

Method 5008.1 Edgewise-Drop (Rotational) Test

The container was conditioned at 60°C. The cornerwise-drop tests were conducted in accordance with FED-STD-101C, Method 5005.1 and the edgewise drops in accordance with Method 5008.1. The drop height was 914 mm, Level A. If this height could not be reached the tip over

balance point was used. The container was dropped onto a one-inch thick steel plate inside the environmental chamber. One drop was made on each of two opposite corners and two adjacent sides.

TEST SEQUENCE 3 (Container # 2) - FED-STD-101C
Method 5012, Pendulum-Impact Test
The container was conditioned at 74°C. The pendulum-impact tests were conducted in accordance with FED-STD-101C, Method 5012. The container impact velocity was 2.1 m/second attained by raising the pendulum 22.5 cm. The container was removed from the conditioning chamber and moved quickly to the pendulum for two impacts. One impact was made on each of two adjacent sides.

TEST SEQUENCE 4 (Container # 2) - Test Sequence 2 (Rotational Drop) was repeated at low temperature. The container was conditioned at -29°C. One drop was made on each of two opposite corners and two adjacent edges not used in Sequence 2.

TEST SEQUENCE 5 (Container # 2) - Test Sequence 3 (Pendulum Impact) was repeated at low temperature. The container was conditioned at -54°C. One impact was made on each of two adjacent sides not used in Sequence 3.

VIBRATION TESTING (Container # 2) - Test sequences 6 and 7.
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Servohydraulic Vibration Machine	LAB	41012	89003	N/A
Feedback Hardware Controller	Data Physics Corp.	DP540		N/A
Feedback Software Controller	Data Physics Corp.	Ver. 1.22 7 CH,DWL		N/A
Feedback Shock Amplifier	Endevco	2740BT	FW26	Dec 96

TEST SEQUENCE 6 (Container # 2) - MIL-STD-648A
Paragraph 5.3.2, Resonance Strength and Dwell Test
The container was rigidly attached to the vibration platform. The test was conducted in accordance with MIL-STD-648A, Paragraph 5.3.2, at ambient temperature. A sinusoidal vibration excitation was applied in the vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input vibration from 5 to 12.5 Hz was at 0.125 inch double amplitude. Input vibration from 12.5 to 50.0 Hz was at 1.0 G (0 to peak). Transmissibility values during the frequency sweeps were calculated and recorded using the Data Physics software. The peak transmissibility was used to determine the frequency search range for the resonance dwell test.

For resonance dwell testing the vibration controller swept up the frequency range searching for a peak in the transmissibiliy signal (item vertical axis acceleration divided by table acceleration).

When the peak was identified the controller locked onto and tracked this peak for the 30 minute resonance dwell test.

TEST SEQUENCE 7 (Container # 2) - FED-STD-101C
Method 5019.1, Vibration (Repetitive Shock Test)
A sheet of 3/4-inch plywood was bolted to the top of the vibration table, and the container was placed on the plywood. Restraints were used to prevent the container from sliding off the table. The container was allowed about 1/2-inch unrestricted movement in any direction in the horizontal table plane. The test was conducted in accordance with FED-STD-101C, Method 5019.1, at ambient temperature. Using a constant one inch double amplitude table motion the table frequency was increased from 3.5 Hertz (Hz) until the container left the table surface (approximately 4.5 Hz). When a 1/16 inch thick metal bar could be inserted between table and the container the frequency sweep was halted and the container was allowed to bounce for a 2 hour period.

TEST SEQUENCE 8 (Container # 2) - Test Sequence 1 (Leaks in Containers, Pressure Test) was repeated to determine if previous test sequences had caused any container leaks.

TEST RESULTS (Container # 2)

Test Sequences 1 and 8 - Container Leak Test
The container passed both the initial and final leak tests with a rate less than the maximum allowed leak rate of 0.0035 kg/cm²/hr (0.05 psi/hr).

Test Sequences 2 and 4 - High and Low Temperature Rotational Drop Tests
Impact shock values (Gs) for all drops were below the specified fragility level (45 Gs). No damage to cushioning or simulated item was visible after any of the tests. See Appendix 2, Table 1.

Test Sequences 3 and 5 - Pendulum Impact Tests
Impact shock values (Gs) for all impacts were below the specified fragility level (45 Gs). No damage to cushioning, simulated item or container was visible after the tests. See Appendix 2, Table 2.

Test Sequence 6 - Resonance Strength and Dwell Test
The initial resonant frequency of the container was 9.3 Hz. The controller locked onto and tracked this peak for the 30 minute resonance dwell test. During this period, the maximum transmissibility of the cushioning/container system was 2.7 at resonance. See Appendix 2, Table 3

Test Sequence 7 - Repetitive Vibration Shock Test
No damage was visible to either the cushioning or the simulated load at the end of the 2 hours of testing.

INSTRUMENTATION (Container # 3)

The simulated load was instrumented with a piezoelectric triaxial accelerometer mounted to its outer surface as close to the items center of mass as possible (see Figure 11). Accelerometer positive axis orientations were as follows:

X Axis - Directed through container Side 2 (Longitudinal motion).
Y Axis - Directed through container Side 6 (Transverse motion).
Z Axis - Directed through container Side 1 (Vertical motion).

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Shock Amplifier	Endevco	2740BT	FY66	Sep 96
Shock Amplifier	Endevco	2740BT	FY49	Sep 96
Shock Amplifier	Endevco	2740BT	GC09	Nov 96
Item Accelerometer	Endevco	2223D	FE51	Dec 96
Data Acquisition	GHI Systems	CAT	Ver. 2.11a	N/A

TEST SEQUENCES (Container # 3)

The test sequences are listed in the actual order performed and are labeled by container. With the exception of leak tests, all containers were tested with the appropriate simulated load in place.

LEAK TESTING (Container # 3) - Test Sequences 1 and 8

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Digital Manometer	Yokogawa	2655-22	85DJ6001	Sep 96
Data Acquisition Board	Data Translations	2801A		N/A
Data Acq. Software	Laboratory Technologies	Labtech Notebook		N/A
Vacuum/Pressure Pump	Thomas Industries	TA-0040-V	21663	N/A

TEST SEQUENCE 1 (Container # 3) - FED-STD-101C
Method 5009.3, Leaks in Containers, Pressure Test.

The container pressure relief valve in the desiccant port was removed and the relief valve hole used for attachment of the digital manometer and vacuum/pressure pump lines, and an internal temperature probe. The container was closed and sealed. The leak tests were conducted in accordance with FED-STD-101C, Method 5009.3, at ambient temperature and pressure. The pneumatic pressure leak technique was used and the container was pressurized to 0.1 kg/cm^2 (1.5 psi). A leak rate of less than 0.0035 kg/cm^2/hr (0.05 psi/hr) sustained for a period of at least one half hour was required to pass the test.

ROUGH HANDLING TESTING (Container # 3) - Test sequences 2 through 5.
The following equipment was used for the rough handling tests:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Environmental Chamber	Tenney Engineering	12791	N/A	N/A
Pendulum Impact	AFPTEF	N/A	N/A	N/A

TEST SEQUENCE 2 (Container # 3) - FED-STD-101C
Method 5005.1 Cornerwise-Drop (Rotational) Test
Method 5008.1 Edgewise-Drop (Rotational) Test
The container was conditioned at 60°C. The cornerwise-drop tests were conducted in accordance with FED-STD-101C, Method 5005.1 and the edgewise drops in accordance with Method 5008.1. The drop height was 914 mm, Level A. If this height could not be reached the tip over balance point was used. The container was dropped onto a one-inch thick steel plate inside the environmental chamber. One drop was made on each of two opposite corners and two adjacent sides.

TEST SEQUENCE 3 (Container # 3) - Test Sequence 2 (Rotational Drop) was repeated at low temperature. The container was conditioned at -29°C. One drop was made on each of two opposite corners and two adjacent edges not used in Sequence 2.

VIBRATION TESTING (Container # 3) - Test sequences 4 and 5.
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Servohydraulic Vibration Machine	Team Corp.	Special	1988	N/A
Feedback Hardware Controller	Data Physics Corp.	DP540		N/A
Feedback Software Controller	Data Physics Corp.	V2.01.07		N/A
Feedback Shock Amplifier	Endevco	2740BT	FW26	Dec 96

TEST SEQUENCE 4 (Container # 3) - MIL-STD-648A
Paragraph 5.3.2, Resonance Strength and Dwell Test
The container was rigidly attached to the vibration platform. The test was conducted in accordance with MIL-STD-648A, Paragraph 5.3.2, at ambient temperature. A sinusoidal vibration excitation was applied in the vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input vibration from 5 to 12.5 Hz was at 0.125 inch double amplitude. Input vibration from 12.5 to 50.0 Hz was at 1.0 G (0 to peak). Transmissibility values during the frequency sweeps were calculated and recorded using the Data Physics software. The peak transmissibility was used to determine the frequency search range for the resonance dwell test.

For resonance dwell testing the vibration controller swept up the frequency range searching for a peak in the transmissibility signal (item vertical axis acceleration divided by table acceleration).

When the peak was identified the controller locked onto and tracked this peak for the 30 minute resonance dwell test.

TEST SEQUENCE 5 (Container # 3) - FED-STD-101C
Method 5019.1, Vibration (Repetitive Shock Test)

A sheet of 3/4-inch plywood was bolted to the top of the vibration table, and the container was placed on the plywood. Restraints were used to prevent the container from sliding off the table. The container was allowed about 1/2-inch unrestricted movement in any direction in the horizontal table plane. The test was conducted in accordance with FED-STD-101C, Method 5019.1, at ambient temperature. Using a constant one inch double amplitude table motion the table frequency was increased from 3.5 Hertz (Hz) until the container left the table surface (approximately 4.5 Hz). When a 1/16 inch thick metal bar could be inserted between table and the container the frequency sweep was halted and the container bounced for a 2 hour period.

TEST SEQUENCE 6 (Container # 3) - FED-STD-101C
Method 5016, Superimposed-Load (Stackability, with Dunnage)

Two 2 x 4 pieces of wood were placed lengthwise on container lid stacking points. 1837 kg of lead weights resting on wooden skids were evenly distributed along the 2 x 4's to conform to Level A stacking requirements. This weight remained in place for one hour.

TEST SEQUENCE 7 (Container # 3) - Test Sequence 1 (Leaks in Containers, Pressure Test) was repeated to determine if previous test sequences had caused any container leaks.

TEST RESULTS (Container # 3)

Test Sequences 1 and 7 - Container Leak Test

The container passed both the initial and final leak tests with a rate less than the maximum allowed leak rate of 0.0035 kg/cm²/hr (0.05 psi/hr).

Test Sequences 2 and 3 - High and Low Temperature Rotational Drop Tests

Impact shock values (Gs) for all drops were below the specified fragility level (45 Gs). No damage to cushioning or simulated item was visible after any of the tests. See Appendix 2, Table 1.

Test Sequence 4 - Resonance Strength and Dwell Test

The initial resonant frequency of the container was 13.7 Hz. The controller locked onto and tracked this peak for the 30 minute resonance dwell test. During this period, the maximum transmissibility of the cushioning/container system was 2.8 at resonance. See Appendix 2, Table 3.

Test Sequence 5 - Repetitive Vibration Shock Test

No damage was visible to either the cushioning or the simulated load at the end of the 2 hours of testing.

Test Sequence 6 - Superimposed-Load
No container deformation occurred as a result of this static loading. See Figure 12 for test setup.

INSTRUMENTATION (Container # 5)

The swashplate was instrumented with a piezoelectric triaxial accelerometer mounted to the center of a square aluminum plate one quarter inch thick. This plate was placed on the bottom surface of the item with the accelerometer located inside the item center hole on the items central axis. A second aluminum plate was placed on the top side of this center hole and the two plates clamped together with four bolts through the center hole held the accelerometer in place on the item. Accelerometer positive axis orientations were as follows:

X Axis - Directed through container Side 2 (Longitudinal motion).
Y Axis - Directed through container Side 6 (Transverse motion).
Z Axis - Directed through container Side 1 (Vertical motion).

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Shock Amplifier	Endevco	2740BT	GC11	Nov 96
Shock Amplifier	Endevco	2740BT	GC10	Nov 96
Shock Amplifier	Endevco	2740BT	GC09	Nov 96
Item Accelerometer	Endevco	2223D	FE39	Dec 97
Data Acquisition	GHI Systems	CAT	Ver. 2.11a	N/A

TEST SEQUENCES (Container # 5)

The test sequences are listed in the actual order performed and are labeled by container. With the exception of leak tests, all containers were tested with the appropriate simulated load in place.

LEAK TESTING (Container # 5) - Test Sequences 1 and 8
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Digital Manometer	Yokogawa	2655-22	85DJ6001	Sep 96
Data Acquisition Board	Data Translations	2801A		N/A
Data Acq. Software	Laboratory Technologies	Labtech Notebook		N/A
Vacuum/Pressure Pump	Thomas Industries	TA-0040-V	21663	N/A

TEST SEQUENCE 1 (Container # 5) - FED-STD-101C
Method 5009.3, Leaks in Containers, Pressure Test.
The container pressure relief valve in the desiccant port was removed and the relief valve hole used for attachment of the digital manometer and vacuum/pressure pump lines, and an internal temperature probe. The container was closed and sealed. The leak tests were conducted in

accordance with FED-STD-101C, Method 5009.3, at ambient temperature and pressure. The pneumatic pressure leak technique was used and the container was pressurized to 0.1 kg/cm² (1.5 psi). See Figure 13. A leak rate of less than 0.0035 kg/cm²/hr (0.05 psi/hr) sustained for a period of at least one half hour was required to pass the test.

VIBRATION TESTING (Container # 5) - Test sequences 2 and 3.
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Servohydraulic Vibration Machine	Team Corp.	Special	1988	N/A
Feedback Hardware Controller	Data Physics Corp.	DP540		N/A
Feedback Software Controller	Data Physics Corp.	Ver. 1.22 7 CH,DWL		N/A
Feedback Shock Amplifier	Endevco	2740BT	FW26	Dec 96

TEST SEQUENCE 2 (Container # 5) - MIL-STD-648A
Paragraph 5.3.2, Resonance Strength and Dwell Test
The container was rigidly attached to the vibration platform. The test was conducted in accordance with MIL-STD-648A, Paragraph 5.3.2, at ambient temperature. A sinusoidal vibration excitation was applied in the vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input vibration from 5 to 12.5 Hz was at 0.125 inch double amplitude. Input vibration from 12.5 to 50.0 Hz was at 1.0 G (0 to peak). Transmissibility values during the frequency sweeps were calculated and recorded using the Data Physics software. The peak transmissibility was used to determine the frequency search range for the resonance dwell test.

For resonance dwell testing the vibration controller swept up the frequency range searching for a peak in the transmissibility signal (item vertical axis acceleration divided by table acceleration). When the peak was identified the controller locked onto and tracked this peak for the 30 minute resonance dwell test.

TEST SEQUENCE 3 (Container # 5) - FED-STD-101C
Method 5019.1, Vibration (Repetitive Shock Test)
A sheet of 3/4-inch plywood was bolted to the top of the vibration table, and the container was placed on the plywood. Restraints were used to prevent the container from sliding off the table. The container was allowed about 1/2-inch unrestricted movement in any direction in the horizontal table plane. The test was conducted in accordance with FED-STD-101C, Method 5019.1, at ambient temperature. Using a constant one inch double amplitude table motion the table frequency was increased from 3.5 Hertz (Hz) until the container left the table surface (approximately 4.5 Hz). When a 1/16 inch thick metal bar could be inserted between table and the container the frequency sweep was halted and the container bounced for a 2 hour period.

ROUGH HANDLING TESTING (Container # 5) - Test sequences 4 through 7.
The following equipment was used for the rough handling tests:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Environmental Chamber	Tenney Engineering	12791	N/A	N/A
Pendulum Impact	AFPTEF	N/A	N/A	N/A

TEST SEQUENCE 4 (Container # 5) - FED-STD-101C
Method 5005.1 Cornerwise-Drop (Rotational) Test
Method 5008.1 Edgewise-Drop (Rotational) Test
The container was conditioned at 60°C. The cornerwise-drop tests were conducted in accordance with FED-STD-101C, Method 5005.1 and the edgewise drops in accordance with Method 5008.1. The drop height was 914 mm, Level A. If this height could not be reached the tip over balance point was used. The container was dropped onto a one-inch thick steel plate inside the environmental chamber. One drop was made on each of two opposite corners and two adjacent sides.

TEST SEQUENCE 5 (Container # 5) - FED-STD-101C
Method 5012, Pendulum-Impact Test
The container was conditioned at 74°C. The pendulum-impact tests were conducted in accordance with FED-STD-101C, Method 5012. The container impact velocity was 2.1 m/second attained by raising the pendulum 22.5 cm. The container was removed from the conditioning chamber and moved quickly to the pendulum for two impacts. One impact was made on each of two adjacent sides.

TEST SEQUENCE 6 (Container # 5) - Test Sequence 2 (Rotational Drop) was repeated at low temperature. The container was conditioned at -29°C. One drop was made on each of two opposite corners and two adjacent edges not used in Sequence 2.

TEST SEQUENCE 7 (Container # 5) - Test Sequence 3 (Pendulum Impact) was repeated at low temperature. The container was conditioned at -54°C. One impact was made on each of two adjacent sides not used in Sequence 3.

TEST SEQUENCE 8 (Container # 5) - Test Sequence 1 (Leaks in Containers, Pressure Test) was repeated to determine if previous test sequences had caused any container leaks.

TEST RESULTS (Container # 5)

Test Sequences 1 and 8 - Container Leak Test
The container passed both the initial and final leak tests with a rate less than the maximum allowed leak rate of 0.0035 kg/cm²/hr (0.05 psi/hr).

Test Sequences 2 and 4 - High and Low Temperature Rotational Drop Tests
Impact shock values (Gs) for all except one drop were below the specified fragility level (45 Gs). Examination of the recorded shock pulse waveforms indicates the presence of a 250 to 350 Hz

signal superimposed on the fundamental pulses. This resonance has been attributed to the accelerometer mounting system and is not a true measure of the shock induced into the item during impact. By using a 200 Hz software filter on the digitized shock pulse data the out of limits pulse from edge 3-5 was reduced by more than 50 percent and therefore, well within the 45 G fragility limit requirement. See Appendix 3, Container #5, Waveforms 1 and 2. No damage to cushioning or simulated item was visible after any of the tests. See Appendix 2, Table 1.

Test Sequences 3 and 5 - Pendulum Impact Tests
Impact shock values (Gs) for all impacts were below the specified fragility level (45 Gs). No damage to cushioning, simulated item or container was visible after the tests. See Appendix 2, Table 2.

Test Sequence 6 - Resonance Strength and Dwell Test
The initial resonant frequency of the container was 7.8 Hz. The controller locked onto and tracked this peak for the 30 minute resonance dwell test. During this period, the maximum transmissibility of the cushioning/container system was 5.6 at resonance. See Appendix 2, Table 3

Test Sequence 7 - Repetitive Vibration Shock Test
No damage was visible to either the cushioning or the simulated load at the end of the 2 hours of testing.

INSTRUMENTATION (Container # 6)

The Bifilar assembly was instrumented with a piezoelectric triaxial accelerometer mounted to a wood block. The block in turn was mounted by its ends between the internal walls of the assembly orienting the accelerometer as close to the items center of mass as possible. Accelerometer positive axis orientations were as follows:

X Axis - Directed through container Side 3 (Vertical motion).
Y Axis - Directed through container Side 6 (Transverse motion).
Z Axis - Directed through container Side 2 (Longitudinal motion).

The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Shock Amplifier	Endevco	2740BT	GC11	Nov 96
Shock Amplifier	Endevco	2740BT	GC10	Nov 96
Shock Amplifier	Endevco	2740BT	GC09	Nov 96
Item Accelerometer	Endevco	2223D	FE39	Dec 97
Data Acquisition	GHI Systems	CAT	Ver. 2.11a	N/A

TEST SEQUENCES (Container # 6)

The test sequences are listed in the actual order performed and are labeled by container. With the exception of leak tests, all containers were tested with the appropriate simulated load in place.

LEAK TESTING (Container # 6) - Test Sequences 1 and 8
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Digital Manometer	Yokogawa	2655-22	85DJ6001	Sep 96
Data Acquisition Board	Data Translations	2801A		N/A
Data Acq. Software	Laboratory Technologies	Labtech Notebook		N/A
Vacuum/Pressure Pump	Thomas Industries	TA-0040-V	21663	N/A

TEST SEQUENCE 1 (Container # 6) - FED-STD-101C
Method 5009.3, Leaks in Containers, Pressure Test.
The container pressure relief valve in the desiccant port was removed and the relief valve hole used for attachment of the digital manometer and vacuum/pressure pump lines, and an internal temperature probe. The container was closed and sealed. The leak tests were conducted in accordance with FED-STD-101C, Method 5009.3, at ambient temperature and pressure. The pneumatic pressure leak technique was used and the container was pressurized to 0.1 kg/cm^2 (1.5 psi). A leak rate of less than 0.0035 kg/cm^2/hr (0.05 psi/hr) sustained for a period of at least one half hour was required to pass the test.

VIBRATION TESTING (Container # 6) - Test sequences 2 and 3.
The following equipment and instrumentation were used:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Servohydraulic Vibration Machine	Team Corp.	Special	1988	N/A
Feedback Hardware Controller	Data Physics Corp.	DP540		N/A
Feedback Software Controller	Data Physics Corp.	Ver. 1.22 7 CH,DWL		N/A
Feedback Shock Amplifier	Endevco	2740BT	FW26	Dec 96

TEST SEQUENCE 2 (Container # 6) - MIL-STD-648A
Paragraph 5.3.2, Resonance Strength and Dwell Test
The container was rigidly attached to the vibration platform. The test was conducted in accordance with MIL-STD-648A, Paragraph 5.3.2, at ambient temperature. A sinusoidal vibration excitation was applied in the vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input vibration from 5 to 12.5 Hz was at 0.125 inch double amplitude. Input vibration from 12.5 to 50.0 Hz was at 1.0 G (0 to peak). Transmissibility values during the frequency sweeps were calculated and recorded using the Data Physics software. The peak transmissibility was used to determine the frequency search range for the resonance dwell test.

For resonance dwell testing the vibration controller swept up the frequency range searching for a peak in the transmissibility signal (item vertical axis acceleration divided by table acceleration). When the peak was identified the controller locked onto and tracked this peak for the 30 minute resonance dwell test.

TEST SEQUENCE 3 (Container # 6) - FED-STD-101C

Method 5019.1, Vibration (Repetitive Shock Test)

A sheet of 3/4-inch plywood was bolted to the top of the vibration table, and the container was placed on the plywood. Restraints were used to prevent the container from sliding off the table. The container was allowed about 1/2-inch unrestricted movement in any direction in the horizontal table plane. The test was conducted in accordance with FED-STD-101C, Method 5019.1, at ambient Temperature. Using a constant one inch double amplitude table motion the table frequency was increased from 3.5 Hertz (Hz) until the container left the table surface (approximately 4.5 Hz). When a 1/16 inch thick metal bar could be inserted between table and the container the frequency sweep was halted and the container was allowed to bounce for a 2 hour period.

ROUGH HANDLING TESTING (Container # 6) - Test sequences 4 through 7.

The following equipment was used for the rough handling tests:

EQUIPMENT	MANUFACTURER	MODEL	SN	CAL. DUE DATE
Environmental Chamber	Tenney Engineering	12791	N/A	N/A
Pendulum Impact	AFPTEF	N/A	N/A	N/A

TEST SEQUENCE 4 (Container # 6) - FED-STD-101C

Method 5005.1 Cornerwise-Drop (Rotational) Test

Method 5008.1 Edgewise-Drop (Rotational) Test

The container was conditioned at 60°C. The cornerwise-drop tests were conducted in accordance with FED-STD-101C, Method 5005.1 and the edgewise drops in accordance with Method 5008.1. The drop height was 914 mm, Level A. If this height could not be reached the tip over balance point was used. The container was dropped onto a one-inch thick steel plate inside the environmental chamber. One drop was made on each of two opposite corners and two adjacent sides.

TEST SEQUENCE 5 (Container # 6) - FED-STD-101C

Method 5012, Pendulum-Impact Test

The container was conditioned at 74°C. The pendulum-impact tests were conducted in accordance with FED-STD-101C, Method 5012. The container impact velocity was 2.1 m/second attained by raising the pendulum 22.5 cm. The container was removed from the conditioning chamber and moved quickly to the pendulum for two impacts. One impact was made on each of two adjacent sides.

TEST SEQUENCE 6 (Container # 6) - Test Sequence 2 (Rotational Drop) was repeated at low temperature. The container was conditioned at -29°C. One drop was made on each of two opposite corners and two adjacent edges not used in Sequence 2.

TEST SEQUENCE 7 (Container # 6) - Test Sequence 3 (Pendulum Impact) was repeated at low temperature. The container was conditioned at -54°C. One impact was made on each of two adjacent sides not used in Sequence 3.

TEST SEQUENCE 8 (Container # 6) - Test Sequence 1 (Leaks in Containers, Pressure Test) was repeated to determine if previous test sequences had caused any container leaks.

TEST RESULTS (Container # 6)

Test Sequences 1 and 8 - Container Leak Test

The container passed both the initial and final leak tests with a rate less than the maximum allowed leak rate of 0.0035 kg/cm²/hr (0.05 psi/hr).

Test Sequences 2 and 4 - High and Low Temperature Rotational Drop Tests

Impact shock values (Gs) for all drops were below the specified fragility level (45 Gs). No damage to cushioning or simulated item was visible after any of the tests. See Appendix 2, Table 1.

Test Sequences 3 and 5 - Pendulum Impact Tests

Impact shock values (Gs) for all impacts were below the specified fragility level (45 Gs). No damage to cushioning, simulated item or container was visible after the tests. See Appendix 2, Table 2.

Test Sequence 6 - Resonance Strength and Dwell Test

The initial resonant frequency of the container was 8.5 Hz. The controller locked onto and tracked this peak for the 30 minute resonance dwell test. During this period, the maximum transmissibility of the cushioning/container system was 3.2 at resonance. See Appendix 2, Table 3

Test Sequence 7 - Repetitive Vibration Shock Test

No damage was visible to either the cushioning or the simulated load at the end of the 2 hours of testing.

TEST CONCLUSIONS:

Vibration and leak test results met the quantitative requirements of the test plans for all of the containers. No excessive damage occurred to the cushioning or containers with the test loads. Therefore, these containers are considered to have met all test requirements.

PROJECT CONCLUSIONS:

The design used for containers 2, 5 and 6 was reproven to be sound and adaptable to a wide range of configurations and sizes.

The new design used for container 3 proved to be somewhat difficult to fabricate the first time. The extrusions are small and the walls are a single sheet of aluminum and are susceptible to warping during the welding process. The extrusions are not mitered at the corners, but instead are bent around a large radius to form the container corners. This bending process for the lid extrusion presented initial difficulties by tending to twist due to its asymmetrical cross section.

APPENDIX 1

TEST PLANS

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 1357.0 X 357.6 X 162.7 EXTERIOR: 1675.0 X 510.0 X 457.2	WEIGHT (Kgs) GROSS: 89.3	ITEM: 23.6	CUBE (CU. M) 0.4	QUANTITY: 1	DATE: 18 Jan 96
ITEM NAME: Landing Gear, Fixed, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #2				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of fixed landing gear or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	EXAMINATION OF PRODUCT			
	MIL-C-4150 Para. 4.5.3 Table II	The container shall be examined to determine conformance with material, workmanship, and requirements as specified in Table II of MIL-C-4150.	Ambient temp.	Visual Inspection (VI)
2.	QUALITY CONFORMANCE TESTS.			
	WEIGHT TEST. MIL-C-4150 Para. 4.5.4 Para. 4.6.3.6	Container tare weight shall not be greater than 67.0 kg. Gross weight to be 90.0 kg.	Ambient Temp.	Scale
	Performance Tests.			
3.	Reusability			
	MIL-C-4150	The case shall be opened and closed five times to demonstrate reusability without degradation. Ease of operation and freedom from interference shall constitute acceptance.	Ambient Temp.	VI
4.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 6.89 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTAINER SIZE (L x W x D) (INCHES) INTERIOR: / EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. FT)	QUANTITY:	DATE:
1357.0 X 357.6 X 162.7 / 1675.0 X 510.0 X 457.2	89.3	23.6	0.4	1	18 Jan 96
ITEM NAME: Landing Gear, Fixed, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #2				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of fixed landing gear or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
5.	Vibration Test.			
a.	MIL-STD-648 Para. 5.3.2	The case shall be vibrated from 5 Hz to 50 Hz at a sweep rate of one half octave per minute with a total sweep time of 7.5 minutes. Case shall then be vibrated for 30 minutes at the predominant resonance.	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5019	The case shall be vibrated for not less than two hours	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces
6.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 6.89 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1357.0 X 357.6 X 162.7 EXTERIOR: 1675.0 X 510.0 X 457.2	WEIGHT (Kgs) GROSS: 89.3	ITEM: 23.6	CUBE (CU. FT) 0.4	QUANTITY: 1	DATE: 18 Jan 96
ITEM NAME: Landing Gear, Fixed, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Container #2				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of fixed landing gear or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
7.	ROUGH HANDLING TESTS (High temperature 60 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 914.4 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
b.		Cornerwise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 914.4 mm.	Drop on adjacent sides. Drop on sides not tested in #6	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at 73.9 C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an end. Total of two impacts.	(VI) Tri-axial accelerometer to measure G-forces
8.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 6.89 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:	
PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1357.0 X 357.6 X 162.7 EXTERIOR: 1675.0 X 510.0 X 457.2	WEIGHT (Kgs) GROSS: 89.3	ITEM: 23.6	CUBE (CU. FT) 0.4	QUANTITY: 1	DATE: 18 Jan 96
ITEM NAME: Landing Gear, Fixed, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Container #2			CONTAINER COST:		
PACK DESCRIPTION: Aluminum Container, Test Load of fixed landing gear or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
9.	ROUGH HANDLING TESTS (Low temperature -28.8 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 914.4 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
b.		Cornerwise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 914.4 mm.	Drop on adjacent sides. Drop on sides not tested in #6	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at -53.9C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an end. Total of two impacts.	(VI) Tri-axial accelerometer to measure G-forces
10.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 6.89 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR:	EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. M)	QUANTITY:	DATE:
2411 X 381 X 426	2438 X 408 X 443	68.0	8.2	0.44	1	24 Jan 96
ITEM NAME: Aviation Spare Parts				MANUFACTURER: AFPTEF Prototype	
CONTAINER NAME: ATCOM Family of Containers, Container #3				CONTAINER COST:	
PACK DESCRIPTION: Polyurethane foam encapsulation.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	Leak Test			
a.	FED-STD-101 Method 5009 Procedure 6.1	Vacuum Retention Technique, 6894 Pa (27.69 in water or 1.0 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient temp.	Water Manometer (WM) or Pressure Transducer (PT)
b.	FED-STD-101 Method 5009 Procedure 6.3	Pneumatic Pressure Technique, 10341 Pa (41.54 in water or 1.5 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient Temp.	Water Manometer (WM) or Pressure Transducer (PT)
2.	Rough Handling Tests (Low Temperature -29°C)			
a.	FED-STD-101 Method 5005. Package Level A	Cornerwise-drop (rotational) test. Condition to -29°C for not less than 24 hours. Drop height 610 mm (24 inches). Maximum 45 G's allowed.	One drop on diagonally opposite bottom corners. Total of 2 drops.	Visual Inspection (VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008. Package Level A	Edgewise-drop (rotational) test. Condition to -29°C for not less than 24 hours. Drop height 610 mm \924 inches. Maximum 45 G's allowed.	One drop on bottom side and end edges. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces

COMMENTS:

PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR:	EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. FT)	QUANTITY:	DATE:
2411 X 381 X 426	2438 X 408 X 443	68.0	8.2	0.44	1	24 Jan 96
ITEM NAME: Aviation Spare Parts				MANUFACTURER: AFPTEF	
CONTAINER NAME: ATCOM Family of Containers, Container #3				CONTAINER COST:	
PACK DESCRIPTION: Polyurethane foam encapsulation.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
3.	Leak Test FED-STD-101 Method 5009 Procedure 6.3	Pneumatic Pressure Technique, 10341 Pa (41.54 in water or 1.5 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient temp.	Water Manometer (WM) or Pressure Transducer (PT)
4.	* ROUGH HANDLING TESTS (High temperature +60°C)			
a.	FED-STD-101 Method 5005 Package Level A	Cornerwise-drop (rotational) test. Condition to 60°C for not less than 24 hours. Drop height 610 mm (24 inches). Maximum 45 G's allowed.	One drop on diagonal opposite bottom corners. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008 Package Level A	Edgewise-drop (rotational) test. Condition to 60°C for not less than 24 hours. Drop height 610 mm (24 inches). Maximum 45 G's allowed.	One drop on bottom side and end edges. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
5.	Leak Test FED-STD-101 Method 5009 Procedure 6.3	Pneumatic Pressure Technique, 10341 Pa (41.54 in water or 1.5 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient temp.	Water Manometer (WM) or Pressure Transducer (PT)

COMMENTS:

* Corner and edges to be tested shall not be the ones tested in test 2.

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)					AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR:	EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. FT)	QUANTITY:	DATE:
2411 X 381 X 426	2438 X 408 X 443	68.0	8.2	0.44	1	24 Jan 96
ITEM NAME: Aviation Spare Parts				MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #3					CONTAINER COST:	
PACK DESCRIPTION: Polyurethane foam encapsulation.						
CONDITIONING: As noted below						

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
6.	Vibration Test			
a.	MIL-STD-648 Para 5.3.2	Resonance Survey and Dwell Test. The container shall be vibrated from 5 Hz to 50 Hz at a sweep rate of one half octave per minute with a total sweep time of 7.5 minutes. Container shall then be vibrated for 30 minutes at the predominant resonance. Maximum 45 G's allowed.	Ambient temp.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5019	Repetetive Shock Test. Maximum 45 G's allowed.	Ambient temp.	(VI) Tri-axial accelerometer to measure G-forces
7.	Leak Test			
	FED-STD-101 Method 5009 Procedure 6.3	Pneumatic Pressure Technique, 10341 Pa (41.54 in water or 1.5 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient temp.	Water Manometer (WM) or Pressure Transducer (PT)

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)					AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR:	EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. FT)	QUANTITY:	DATE:
2411 X 381 X 426	2438 X 408 X 443	68.0	8.2	0.44	1	24 Jan 96
ITEM NAME: Aviation Spare Parts				MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #3					CONTAINER COST:	
PACK DESCRIPTION: Polyurethane foam encapsulation.						
CONDITIONING: As noted below						

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
8.	Static Loading Test			
a.	FED-STD-101 Method 5016 Package Level A	Superimposed_Load Test. Container stacking height 4.9 m (16 feet). Load weight 1361.2 Kg (3000 lbs.)	Ambient temp.	(VI)
9.	Leak Test			
	FED-STD-101 Method 5009 Procedure 6.3	Pneumatic Pressure Technique, 10341 Pa (41.54 in water or 1.5 psi). After temperature stabilization, 172.35 Pa (0.6923 in water or 0.025 psi) leakage allowed over 30 minutes test duration.	Ambient temp.	Water Manometer (WM) or Pressure Transducer (PT)

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 1205.0 X 1130.6 X 391.2 EXTERIOR: 1295.0 X 1220.0 X 533.2	WEIGHT (Kgs) GROSS: 161.8	ITEM: 70.0	CUBE (CU. M) 0.8	QUANTITY: 1	DATE: 15 Feb 96
ITEM NAME: Control, Swashplate, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #5				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of swashplate control or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	EXAMINATION OF PRODUCT MIL-C-4150 Para. 4.5.3 Table II	The container shall be examined to determine conformance with material, workmanship, and requirements as specified in Table II of MIL-C-4150.	Ambient temp.	Visual Inspection (VI)
2.	QUALITY CONFORMANCE TESTS. WEIGHT TEST. MIL-C-4150 Para. 4.5.4 Para. 4.6.3.6	Container tare weight shall not be greater than 95.0 kg. Gross weight to be 165.0 kg.	Ambient Temp.	Scale
	Performance Tests.			
3.	Reusability MIL-C-4150	The case shall be opened and closed five times to demonstrate reusability without degradation. Ease of operation and freedom from interference shall constitute acceptance.	Ambient Temp.	VI
4.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1205.0 X 1130.6 X 391.2 EXTERIOR: 1295.0 X 1220.0 X 533.2	WEIGHT (Kgs) GROSS: 161.8	ITEM: 70.0	CUBE (CU. FT) 0.8	QUANTITY: 1	DATE: 15 Feb 96
ITEM NAME: Control, Swashplate, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #5				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of swashplate control or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
5.	Vibration Test.			
a.	MIL-STD-648 Para. 5.3.2	The case shall be vibrated from 5 Hz to 50 Hz at a sweep rate of one half octave per minute with a total sweep time of 7.5 minutes. Case shall then be vibrated for 30 minutes at the predominant resonance.	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5019	The case shall be vibrated for not less than two hours	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces
6.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1205.0 X 1130.6 X 391.2 EXTERIOR: 1295.0 X 1220.0 X 533.2	WEIGHT (Kgs) GROSS: 161.8	ITEM: 70.0	CUBE (CU. FT) 0.8	QUANTITY: 1	DATE: 15 Feb 96
ITEM NAME: Control, Swashplate, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #5				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of swashplate control or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
7.	ROUGH HANDLING TESTS (High temperature 60 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 812.8 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008.1 Level A	Edgewise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 812.8 mm.	Drop on adjacent sides. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at 73.9 C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an adjacent end. Total of two impacts.	(VI) Tri-axial accelerometer to measure G-forces
8.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:	
PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)			AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1205.0 X 1130.6 X 391.2 EXTERIOR: 1295.0 X 1220.0 X 533.2	WEIGHT (Kgs) GROSS: 161.8 ITEM: 70.0	CUBE (CU. FT) 0.8	QUANTITY: 1	DATE: 15 Feb 96
ITEM NAME: Control, Swashplate, Dummy Load		MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #5			CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of swashplate control or simulated load with identical center of gravity and tie down points.				
CONDITIONING: As noted below				

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
9.	ROUGH HANDLING TESTS (Low temperature -28.8 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 812.8 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops. Drop on corners not tested in 7a.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008.1 Level A	Edgewise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 812.8 mm.	Drop on adjacent sides. Drop on sides not tested in 7b. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at -53.9C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an adjacent end. Impact sides not tested in 7c. Total of 2 impacts.	(VI) Tri-axial accelerometer to measure G-forces
10.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:	
PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 1307. X 1180. X 1022.1 EXTERIOR: 1397. X 1270. X 1132.1	WEIGHT (Kgs) GROSS: 198.7	ITEM: 63.6	CUBE (CU. M) 2.0	QUANTITY: 1	DATE: 06 Mar 96
ITEM NAME: Bifilar Assembly, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #6				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of bifilar assembly or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	EXAMINATION OF PRODUCT MIL-C-4150 Para. 4.5.3 Table II	The container shall be examined to determine conformance with material, workmanship, and requirements as specified in Table II of MIL-C-4150.	Ambient temp.	Visual Inspection (VI)
2.	QUALITY CONFORMANCE TESTS. WEIGHT TEST. MIL-C-4150 Para. 4.5.4 Para. 4.6.3.6	Container tare weight shall not be greater than 140.0 kg. Gross weight to be 204.0 kg.	Ambient Temp.	Scale
	Performance Tests.			
3.	Reusability MIL-C-4150	The case shall be opened and closed five times to demonstrate reusability without degradation. Ease of operation and freedom from interference shall constitute acceptance.	Ambient Temp.	VI
4.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: / EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. FT)	QUANTITY:	DATE:
1307. X 1180. X 1022.1 / 1397. X 1270. X 1132.1	198.7	63.6	2.0	1	06 Mar 96
ITEM NAME: Bifilar Assembly, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #6				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of bifilar assembly or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
5.	Vibration Test.			
a.	MIL-STD-648 Para. 5.3.2	The case shall be vibrated from 5 Hz to 50 Hz at a sweep rate of one half octave per minute with a total sweep time of 7.5 minutes. Case shall then be vibrated for 30 minutes at the predominant resonance.	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5019	The case shall be vibrated for not less than two hours	Ambient temp. Accelerometer located in back, bottom, lefthand side of case. Normal shipping position	(VI) Tri-axial accelerometer to measure G-forces

COMMENTS:	
PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1307. X 1180. X 1022.1 EXTERIOR: 1397. X 1270. X 1132.1	WEIGHT (Kgs) GROSS: 198.7	ITEM: 63.6	CUBE (CU. FT) 2.0	QUANTITY: 1	DATE: 06 Mar 96
ITEM NAME: Bifilar Assembly, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #6				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of bifilar assembly or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
6.	ROUGH HANDLING TESTS (High temperature 60 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 812.8 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008.1 Level A	Edgewise-drop (rotational) test. Condition to 60°C (+5.6/-0) for not less than 24 hours. Drop height 812.8 mm.	Drop on adjacent sides. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at 73.9 C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an adjacent end. Total of two impacts.	(VI) Tri-axial accelerometer to measure G-forces

COMMENTS:	
PREPARED BY: Jason Gilreath, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Container Engineering & Design Branch

AIR FORCE PACKAGING TECHNOLOGY & ENGINEERING FACILITY (Container Test Plan)				AFPEA PROJECT NUMBER: 95-P-108	
CONTIANER SIZE (L x W x D) (INCHES) INTERIOR: 1307. X 1180. X 1022 | EXTERIOR: 1397. X 1270. X 1132.1	WEIGHT (Kgs) GROSS: 198.7	ITEM: 63.6	CUBE (CU. FT) 2.0	QUANTITY: 1	DATE: 06 Mar 96
ITEM NAME: Bifilar Assembly, Dummy Load			MANUFACTURER: AFPTEF		
CONTAINER NAME: ATCOM Family of Containers, Container #6				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of bifilar assembly or simulated load with identical center of gravity and tie down points.					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
7.	ROUGH HANDLING TESTS (Low temperature -28.8 deg C.			
a.	FED-STD-101 Method 5005.1 Level A	Cornerwise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 812.8 mm.	Drop on diagonally opposite bottom corners. Total of 2 drops. Drop on corners not tested in 7a.	(VI) Tri-axial accelerometer to measure G-forces
b.	FED-STD-101 Method 5008.1 Level A	Edgewise-drop (rotational) test. Condition to -28.8°C (+0/-5.6) for not less than 24 hours. Drop height 812.8 mm.	Drop on adjacent sides. Drop on sides not tested in 7b. Total of 2 drops.	(VI) Tri-axial accelerometer to measure G-forces
c.		Pendulum Impact test. Condition at -53.9C for not less than 24 hours. Impact velocity 2.13 m/sec.	One impact on a side and an adjacent end. Impact sides not tested in 7c. Total of 2 impacts.	(VI) Tri-axial accelerometer to measure G-forces
8.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 kPa. 0.3 Pa/hr leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply.	Pressure Transducer or Water Manometer

COMMENTS:

PREPARED BY:	APPROVED BY:
Jason Gilreath, Mechanical Engineer	Ted Hinds, Chief, Container Engineering & Design Branch

APPENDIX 2

TEST DATA

TABLE 1. Cornerwise and Edgewise Rotational Drops

	+60°C		-29°C	
CONTAINER	IMPACT LOCATION	PEAK G	IMPACT LOCATION	PEAK G
ATCOM #2	3-2-5	22	3-2-6	30
	3-4-6	15	3-4-5	38
	3-4	11	3-2	22
	3-5	23	3-6	46
ATCOM #3	3-2-5	21	3-2-6	38
	3-4-6	19	3-4-5	36
	3-4	23	3-2	50
	3-5	17	3-6	31
ATCOM #5	3-2-5	12	3-2-6	17
	3-4-6	11	3-4-5	21
	3-4	12	3-2	15
	3-6	19	3-5	56
ATCOM #6	3-2-5	26	3-2-6	29
	3-4-6	19	3-4-5	27
	3-2	25	3-4	25
	3-5	16	3-6	21

TABLE 2. Pendulum Impacts

	+74°C		-54°C	
CONTAINER	IMPACT FACE	PEAK G	IMPACT FACE	PEAK G
ATCOM #2	4	14	2	16
	5	8	6	13
ATCOM #5	2	*	4	11
	5	28	6	13
ATCOM #6	4	26	2	16
	5	30	6	17

* Data not available due to recording equipment malfunction.

TABLE 3. Container Resonant Frequency and Transmissibility Values.

CONTAINER	FREQUENCY	TRANSMISSIBILITY
ATCOM #2	9.3 Hz	2.7
ATCOM #3	13.7 Hz	2.8
ATCOM #5	7.8 Hz	5.6
ATCOM #6	8.5 Hz	3.2

APPENDIX 3

TEST WAVEFORMS

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Mon Feb 12 96 10:21	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	Temp 60 Deg C	IMPACT POINT	: CORNER 235
TEST ITEM	: ATCOM2	DROP HEIGHT	: 914 mm

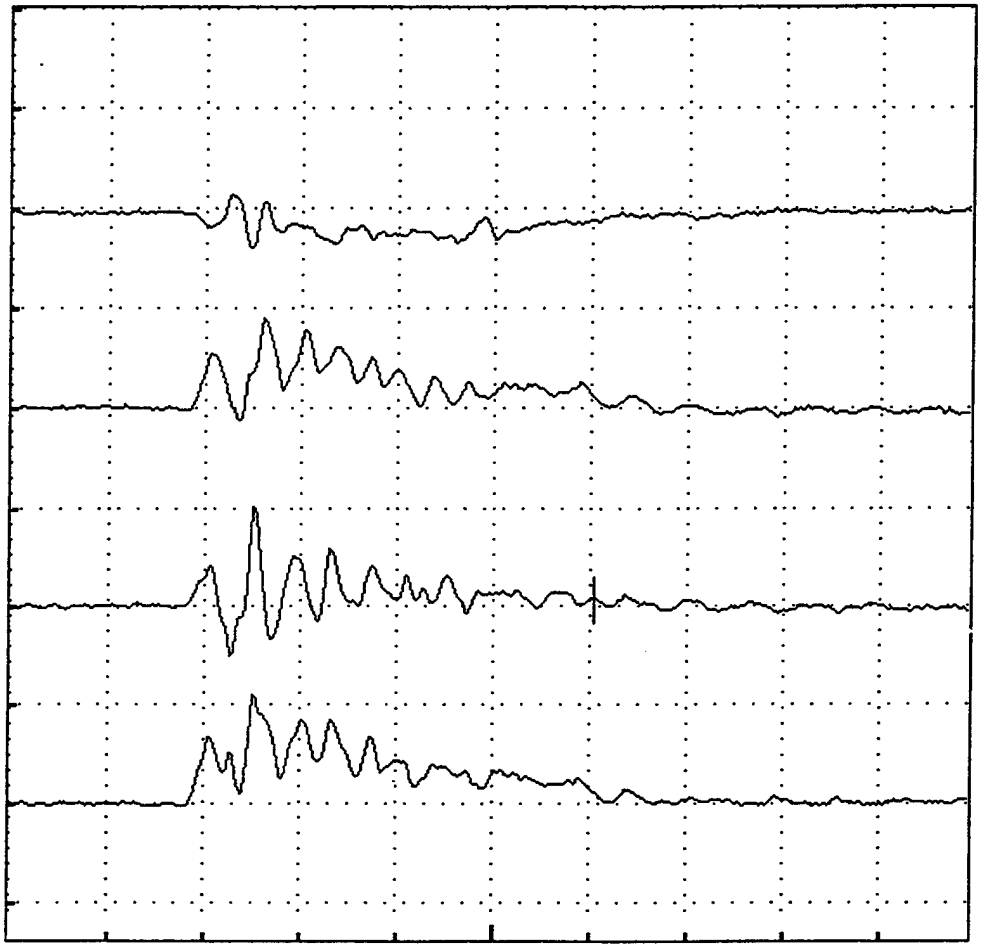
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.49 g's	-7.00 g's	-62.45 In/s		12.8 mS
2	77.31 mS	2.19 g's	18.18 g's	130.09 In/s		12.8 mS
■ 3	77.31 mS	1.25 g's	20.03 g's	53.05 In/s		12.8 mS
R	77.31 mS	2.93 g's	22.45 g's	153.75 In/s		12.8 mS

Remarks:

Ch-1, X, Longitudinal Axis
Ch-2, Y, Vertical Axis
Ch-3, X, Transverse Axis
Ch-4, R, Resultant

FED-STD-101C
METHOD 5005.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Mon Feb 12 96 10:15
ROTATIONAL DROP TEMP 60 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT POINT : CORNER 346
DROP HEIGHT : 914 mm

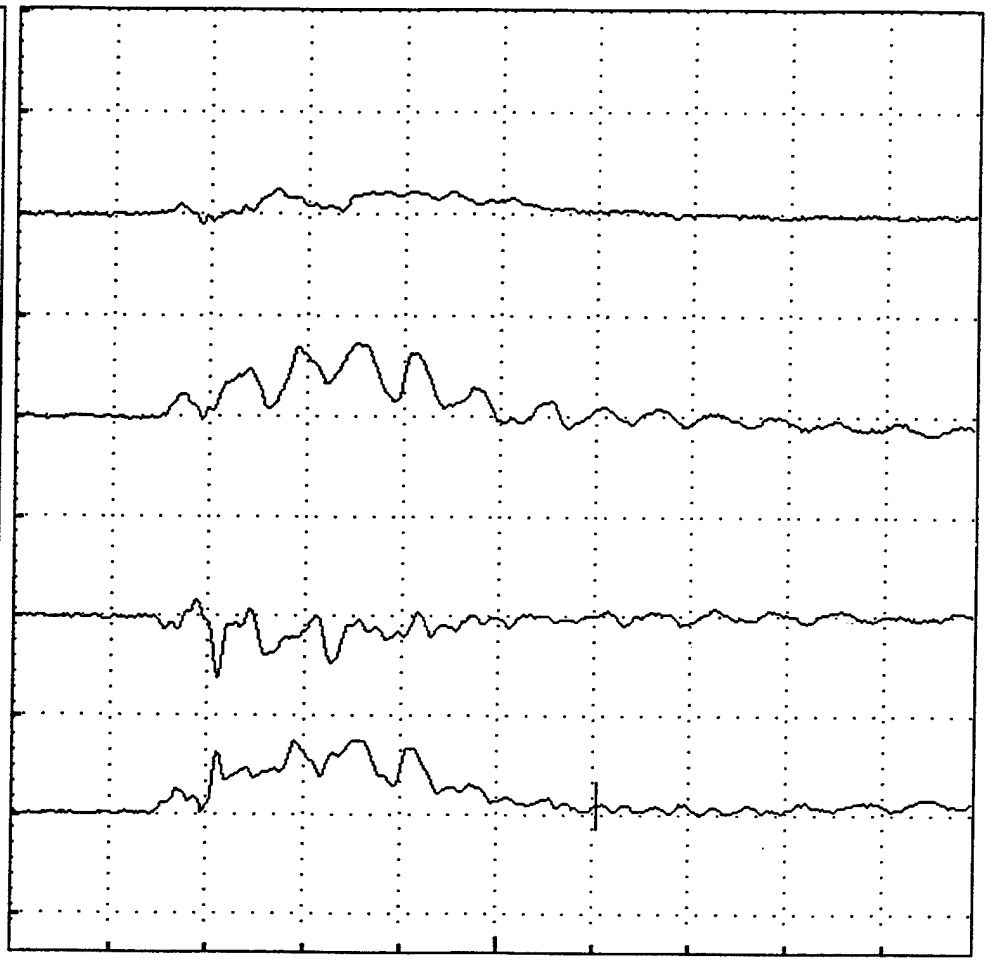
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	0.85 g's	5.10 g's	52.44 In/s		12.8 mS
2	77.31 mS	1.78 g's	14.58 g's	112.01 In/s		12.8 mS
3	77.31 mS	0.35 g's	-12.15 g's	-49.52 In/s		12.8 mS
■ R	77.31 mS	2.00 g's	15.09 g's	133.22 In/s		12.8 mS

Remarks:

Ch-1, X, Longitudinal Axis
Ch-2, Y, Virtical Axis
Ch-3, Z, Transverse Axis
Ch-4, R, Resultant

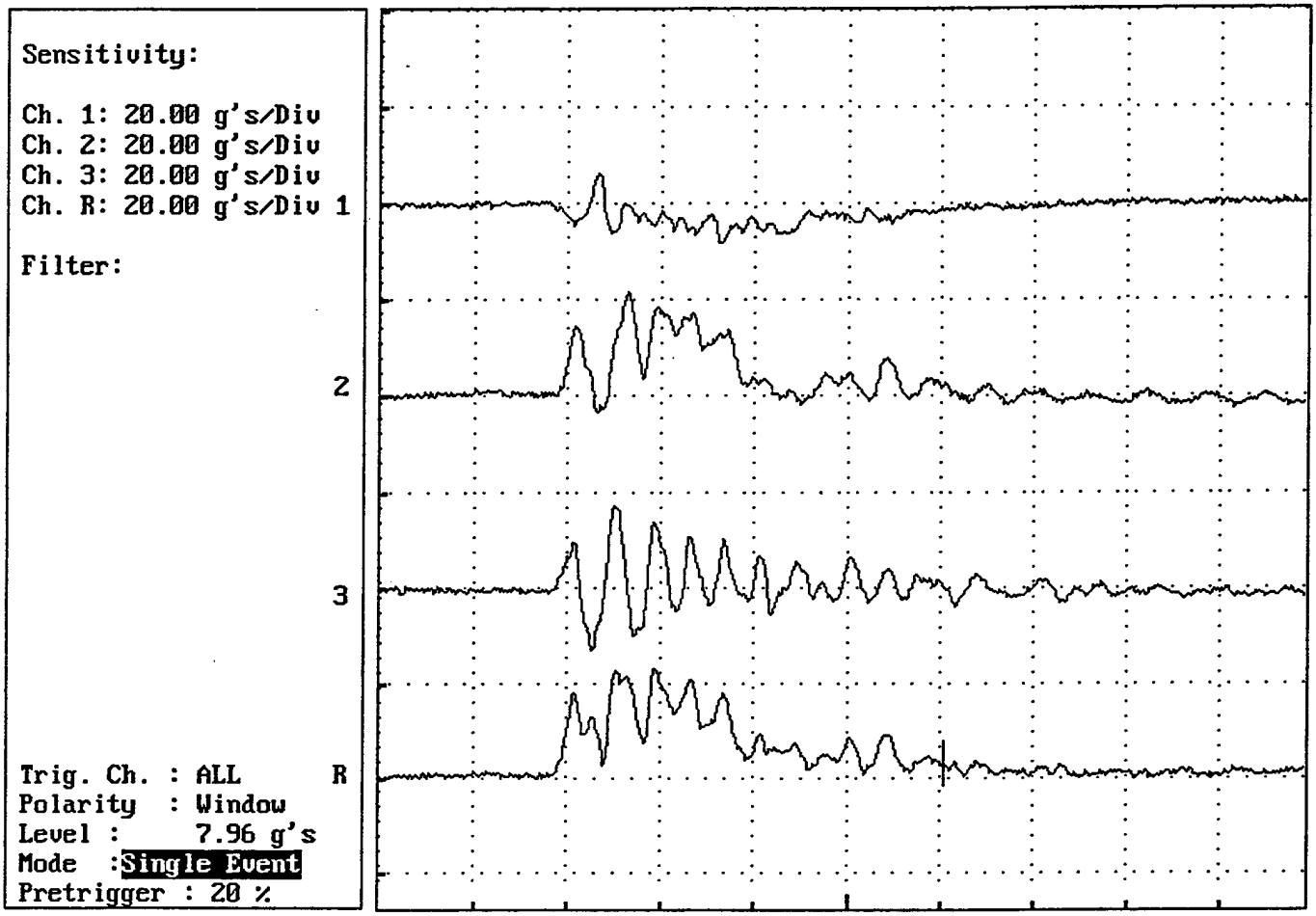
FED-STD-101C
METHOD 5005.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Mon Feb 12 96 10:24
ROTATIONAL DROP Temp 60 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT POINT : EDGE 35
DROP HEIGHT : 914 mm



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.04 g's	-8.61 g's	-59.91 In/s		12.8 mS
2	77.31 mS	2.98 g's	22.22 g's	139.15 In/s		12.8 mS
3	77.31 mS	0.47 g's	19.08 g's	39.66 In/s		12.8 mS
■ R	77.31 mS	3.19 g's	23.23 g's	156.60 In/s		12.8 mS

Remarks:

Ch-1, X, Longitudinal Axis
Ch-2, Y, Vertical Axis
Ch-3, Z, Transverse Axis
Ch-4, R, Resultant

FED-STD-101C
Method 5008.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Mon Feb 12 96 10:30
ROTATIONAL DROP Temp 60 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT POINT : EDGE 34
DROP HEIGHT : 483 mm (Balance Pt)

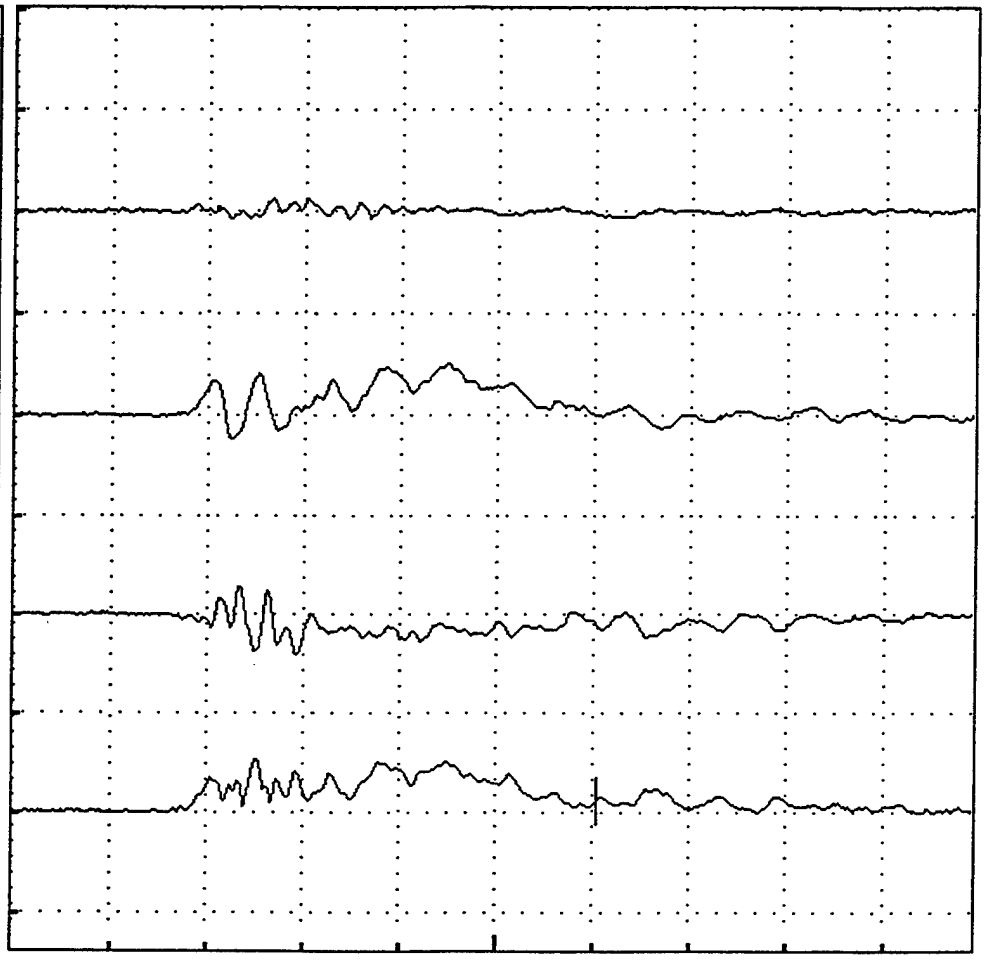
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-0.82 g's	2.16 g's	-2.22 In/s		12.8 mS
2	77.31 mS	0.09 g's	10.20 g's	84.01 In/s		12.8 mS
3	77.31 mS	-2.54 g's	-8.03 g's	-54.82 In/s		12.8 mS
■ R	77.31 mS	2.67 g's	10.74 g's	100.34 In/s		12.8 mS

Remarks:

Ch-1, Y, Longitudinal Axis
Ch-2, Y, Vertical Axis
Ch-3, Z, Transverse
Ch-4, R, Resultant

FED-STD-101C
Method 5008.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Tue Feb 13 96 11:32 TEST ENGINEER : FILSINGER
PENDULUM IMPACT Temp 60 Deg C IMPACT FACE : 4
TEST ITEM : ATCOM2 IMPACT VELOCITY 2.13 m/sec

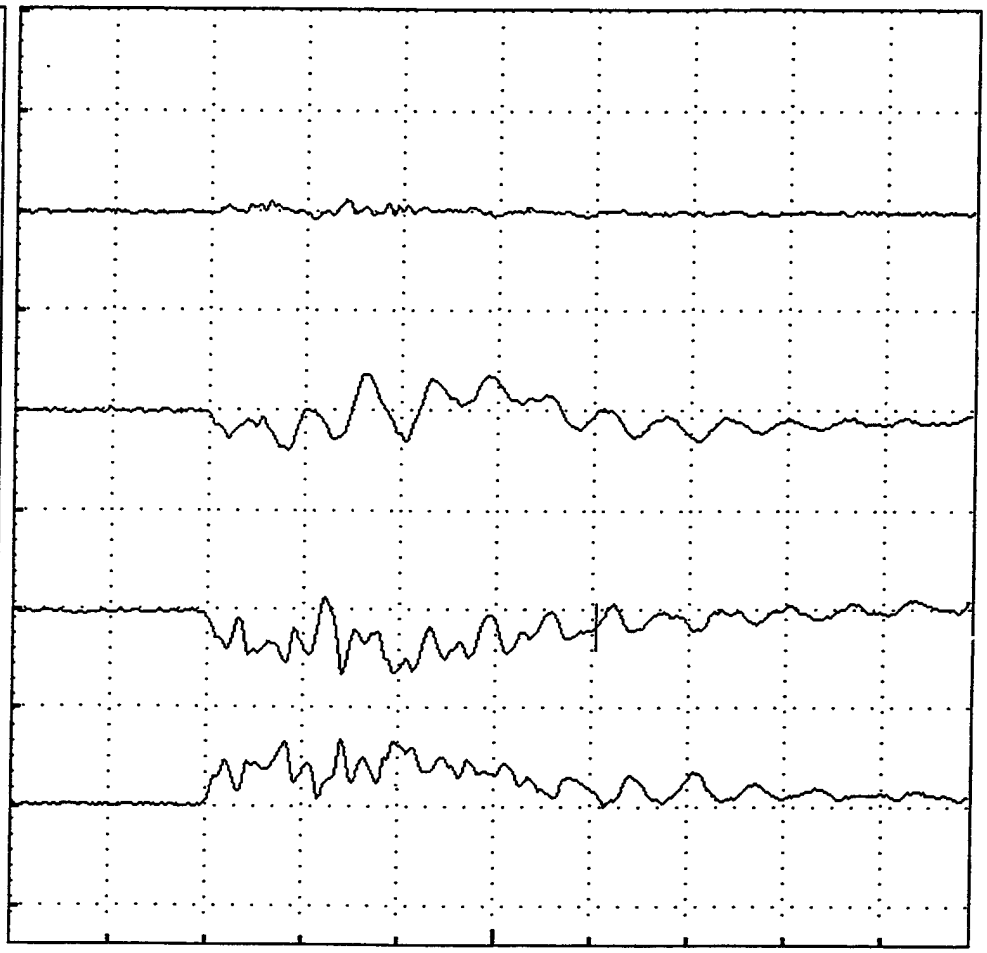
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	0.25 g's	2.37 g's	3.74 In/s		12.8 mS
2	77.31 mS	0.36 g's	-7.92 g's	-1.82 In/s		12.8 mS
■ 3	77.31 mS	-3.14 g's	-12.54 g's	-116.50 In/s		12.8 mS
R	77.31 mS	3.17 g's	13.51 g's	116.57 In/s		12.8 mS

Remarks:

Ch-1, X, Longitudinal Axis
Ch-2, Y, Vertical Axis
Ch-3, Z, Transverse Axis
Ch-4, R, Resultant

FED-STD-101C
Method 5012

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Tue Feb 13 96 11:34
PENDULUM IMPACT Temp 60 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT FACE : 5
IMPACT VELOCITY 2.13 m/sec

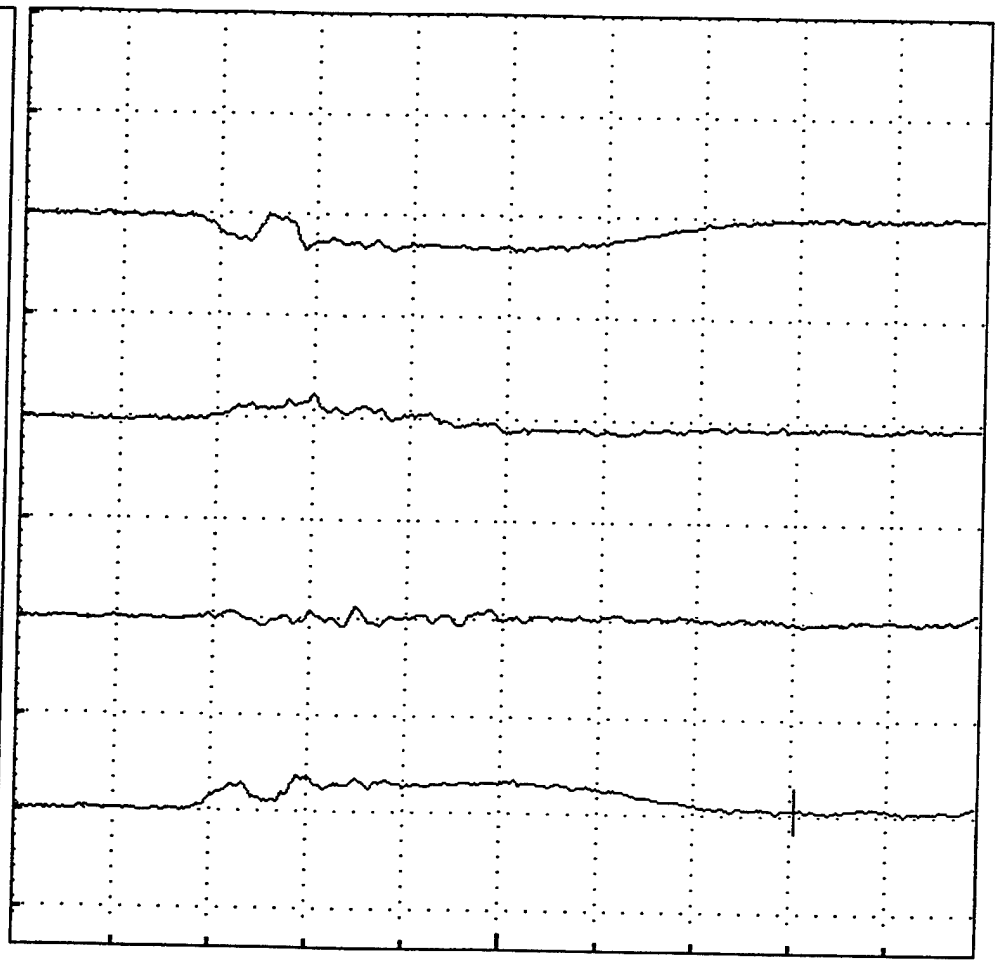
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-0.01 g's	-6.84 g's	-125.26 In/s		12.8 mS
2	102.91 mS	-1.28 g's	5.16 g's	-6.31 In/s		12.8 mS
3	102.91 mS	-0.28 g's	2.21 g's	6.99 In/s		12.8 mS
▪ R	102.91 mS	1.31 g's	7.60 g's	125.61 In/s		12.8 mS

Remarks:

Ch-1, X, Longitudinal Axis
Ch-2, Y, Vertical Axis
Ch-3, Z, Transverse Axis
Ch-4, R, Resultant

FED-STD-101C
Method 5012

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Fri Feb 16 96 15:14	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	Temp -28.8 Deg C	IMPACT POINT	: Corner 345
TEST ITEM	: ATCOM2	DROP HEIGHT	: 914mm

Sensitivity:

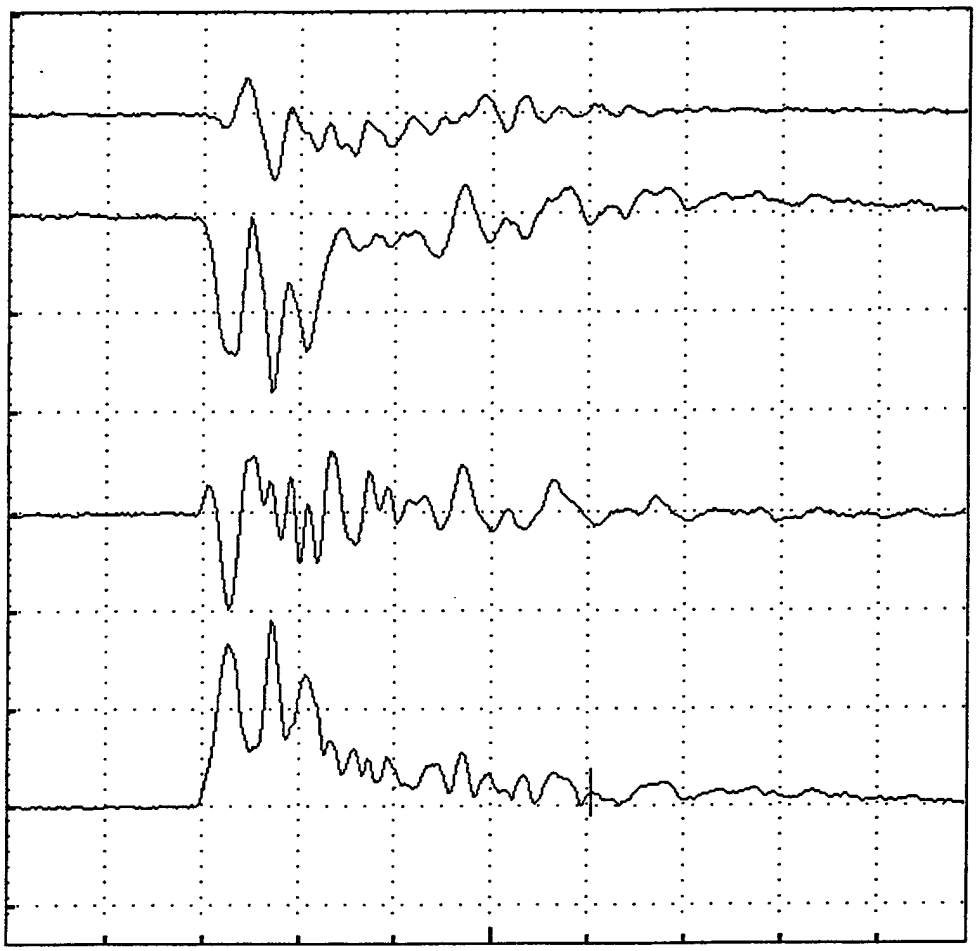
Ch. 1: 20.00 g's/Div 1
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div 2

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

3

Trig. Ch. : ALL R
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	1.50 g's	-13.17 g's	-39.51 In/s		12.8 mS
2	77.31 mS	-1.79 g's	-35.56 g's	-152.33 In/s		12.8 mS
3	77.31 mS	-2.21 g's	-19.25 g's	15.30 In/s		12.8 mS
■ R	77.31 mS	3.22 g's	38.31 g's	158.11 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

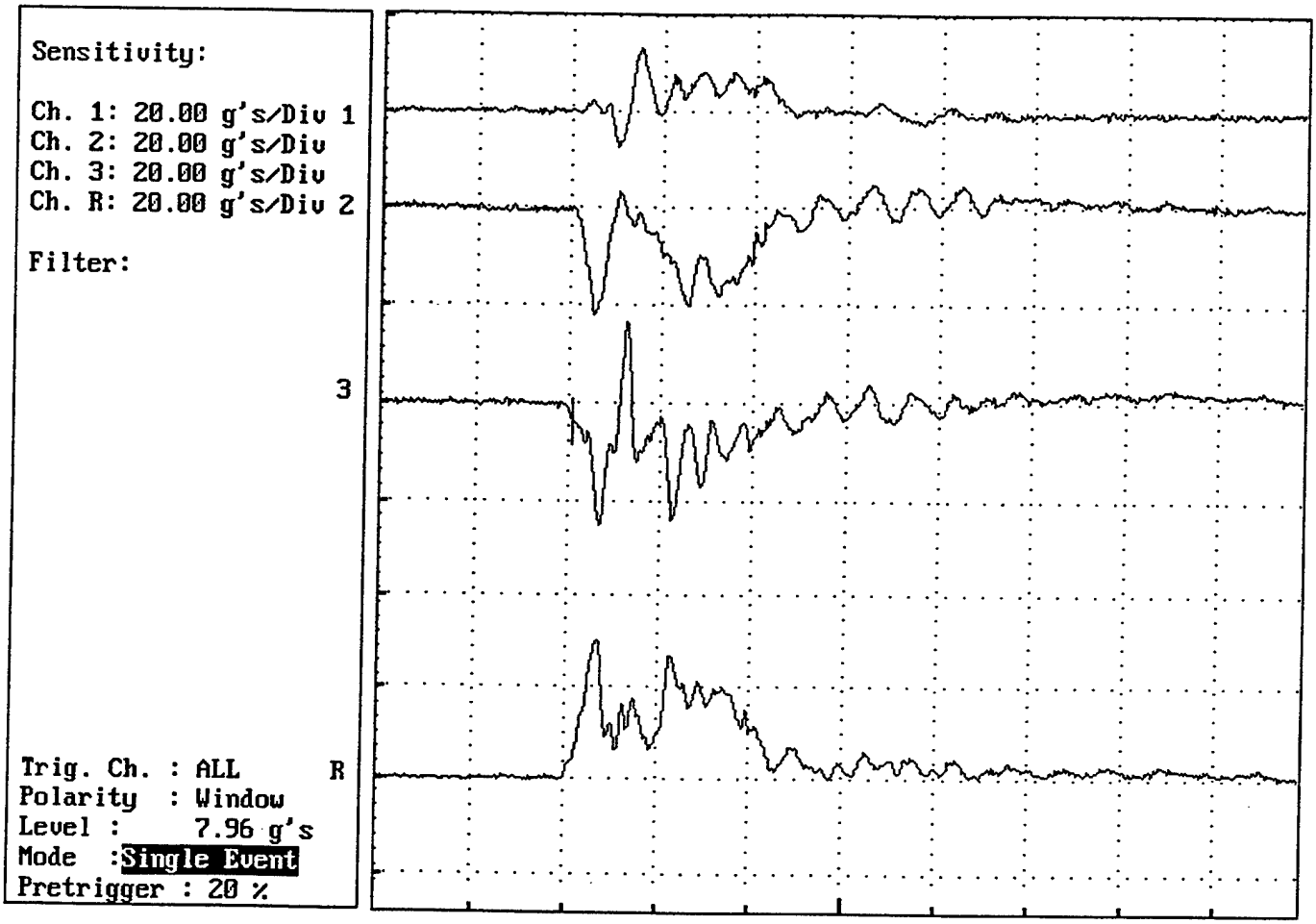
FED-STD-101C
Method 5005.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Feb 16 96 15:18
ROTATIONAL DROP Temp -28.8 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT POINT : Corner 236
DROP HEIGHT : 914 mm



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	26.11 mS	0.01 g's	-1.41 g's	0.489 In/s		12.8 mS
2	26.11 mS	-0.11 g's	-1.62 g's	-1.34 In/s		12.8 mS
■ 3	26.11 mS	-3.74 g's	-4.37 g's	-1.35 In/s		12.8 mS
R	26.11 mS	3.74 g's	3.74 g's	1.97 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

FED-STE-101C
Method 5005.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Fri Feb 16 96 15:22	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	Temp -28.8 Deg C	IMPACT POINT	: Edge 36
TEST ITEM	: ATCOM2	DROP HEIGHT	: 914 mm

Sensitivity:

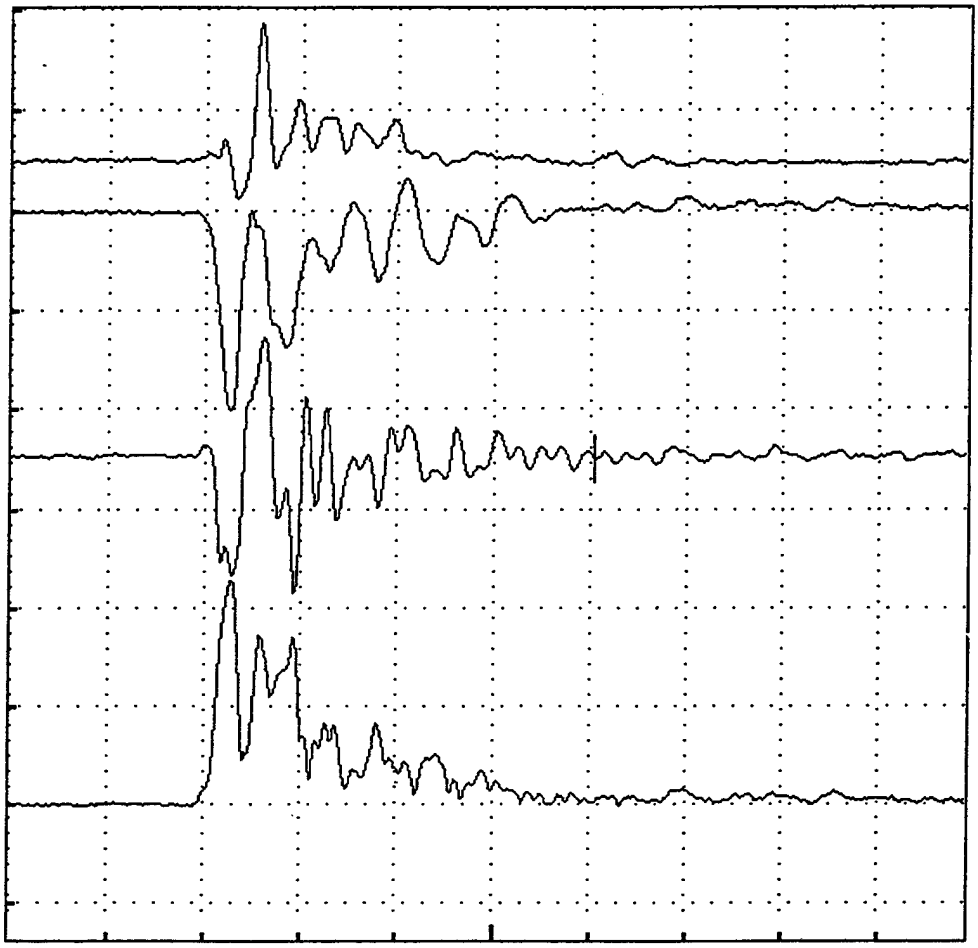
Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div 1
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div 2

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

3

Trig. Ch. : ALL R
Polarity : Window
Level : 7.96 g's
Mode :Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	0.16 g's	27.16 g's	54.79 In/s		12.8 mS
2	77.31 mS	1.03 g's	-39.55 g's	-125.08 In/s		12.8 mS
■ 3	77.31 mS	-0.46 g's	-27.25 g's	-24.70 In/s		12.8 mS
R	77.31 mS	1.14 g's	46.00 g's	138.77 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

FED-STD-101C
Method 5008.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Feb 16 96 15:26
ROTATIONAL DROP Temp -28.8 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT POINT : Edge 32
DROP HEIGHT : 470 mm (Balance Pt)

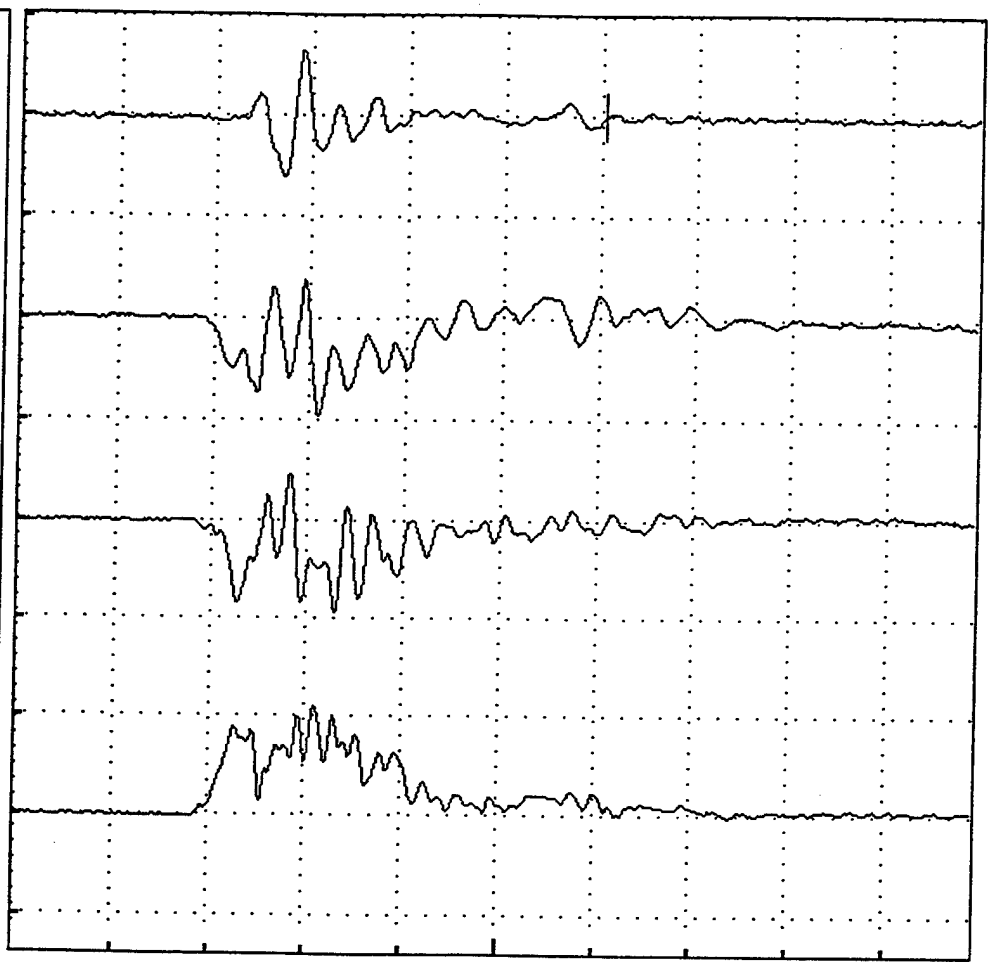
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
■ 1	77.31 mS	0.51 g's	13.54 g's	-0.874 In/s		12.8 mS
2	77.31 mS	3.74 g's	-19.33 g's	-71.81 In/s		12.8 mS
3	77.31 mS	-2.07 g's	-18.36 g's	-80.55 In/s		12.8 mS
R	77.31 mS	4.30 g's	22.35 g's	107.91 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

FED-STD-101C
Method 5008.1
Level A

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Feb 21 96 15:02
PENDULUM IMPACT Temp -53.9 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT FACE : 2
IMPACT VELOCITY 2.13 m/sec

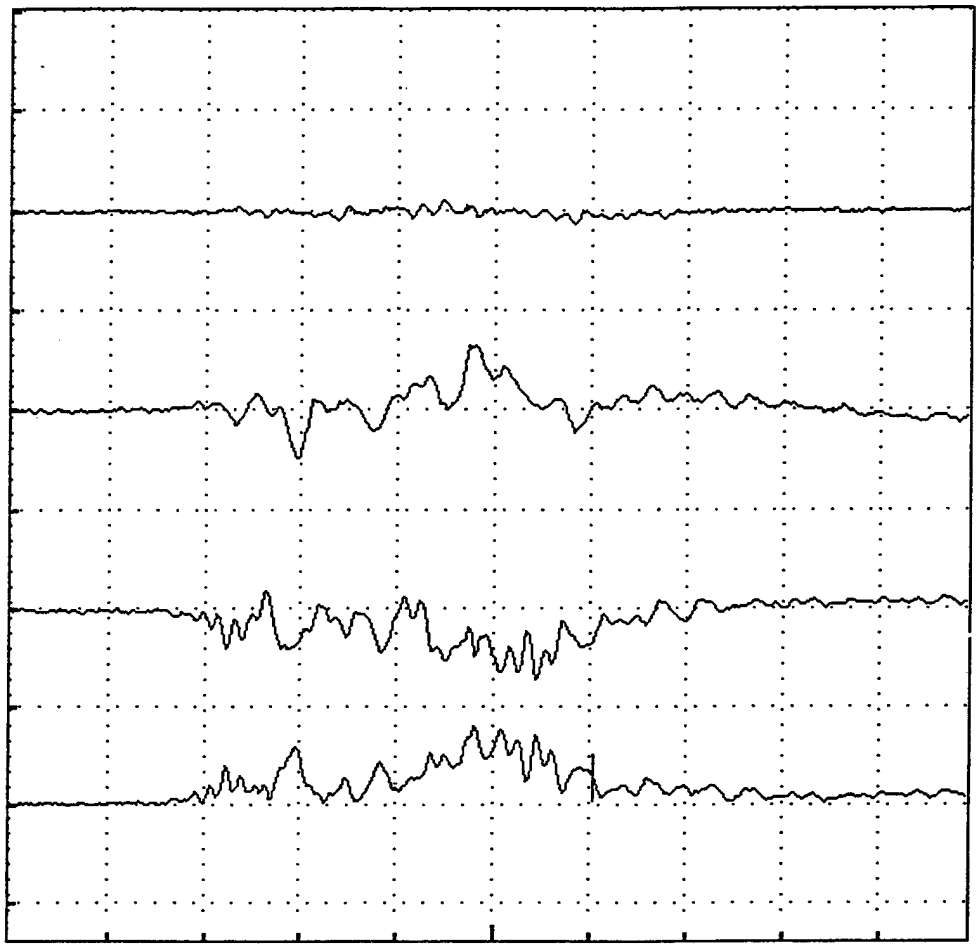
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.03 g's	-2.51 g's	-4.97 In/s		12.8 mS
2	77.31 mS	1.72 g's	13.44 g's	41.01 In/s		12.8 mS
3	77.31 mS	-5.32 g's	-14.09 g's	-99.27 In/s		12.8 mS
■ R	77.31 mS	5.69 g's	16.36 g's	107.52 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

FED-STD-101C
Method 5012

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Feb 21 96 14:58
PENDULUM IMPACT Temp -53.9 Deg C
TEST ITEM : ATCOM2

TEST ENGINEER : FILSINGER
IMPACT FACE : 6
IMPACT VELOCITY 2.13 m/sec

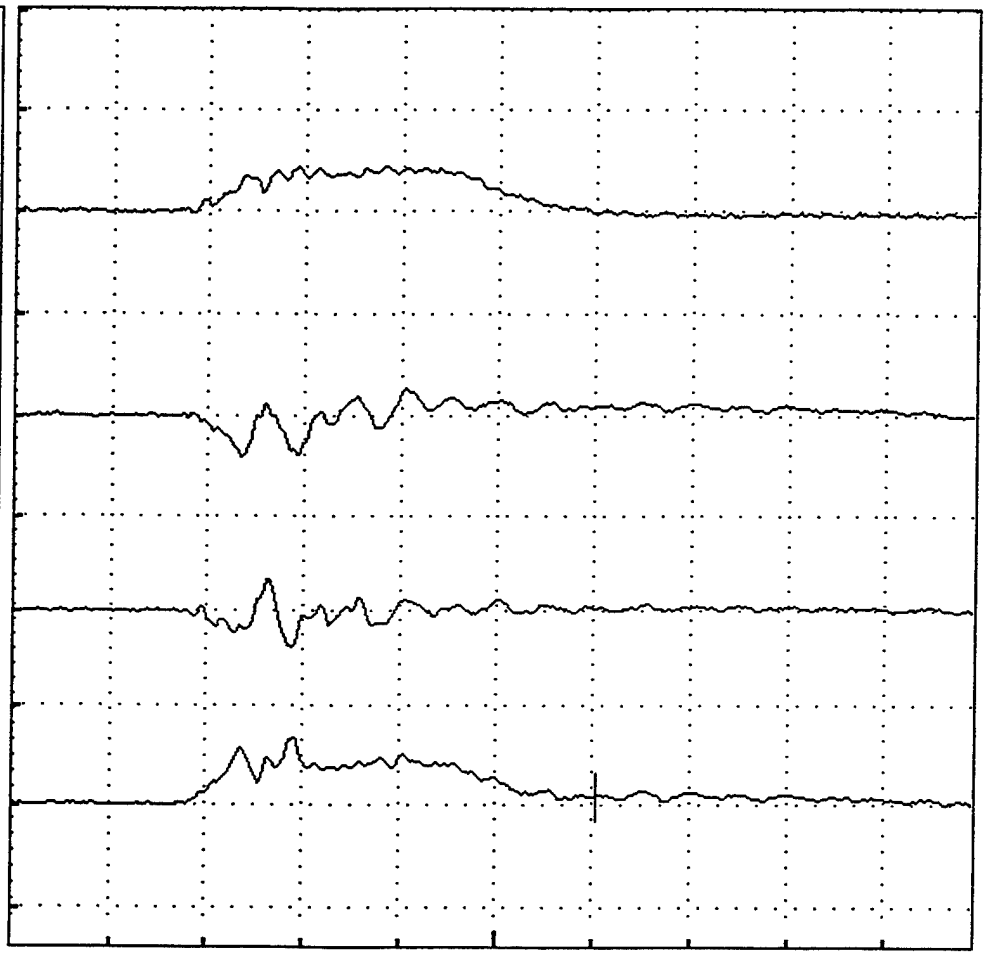
Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Ch. 1: 600 Hz
Ch. 2: 600 Hz
Ch. 3: 600 Hz
Ch. 4: 600 Hz

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



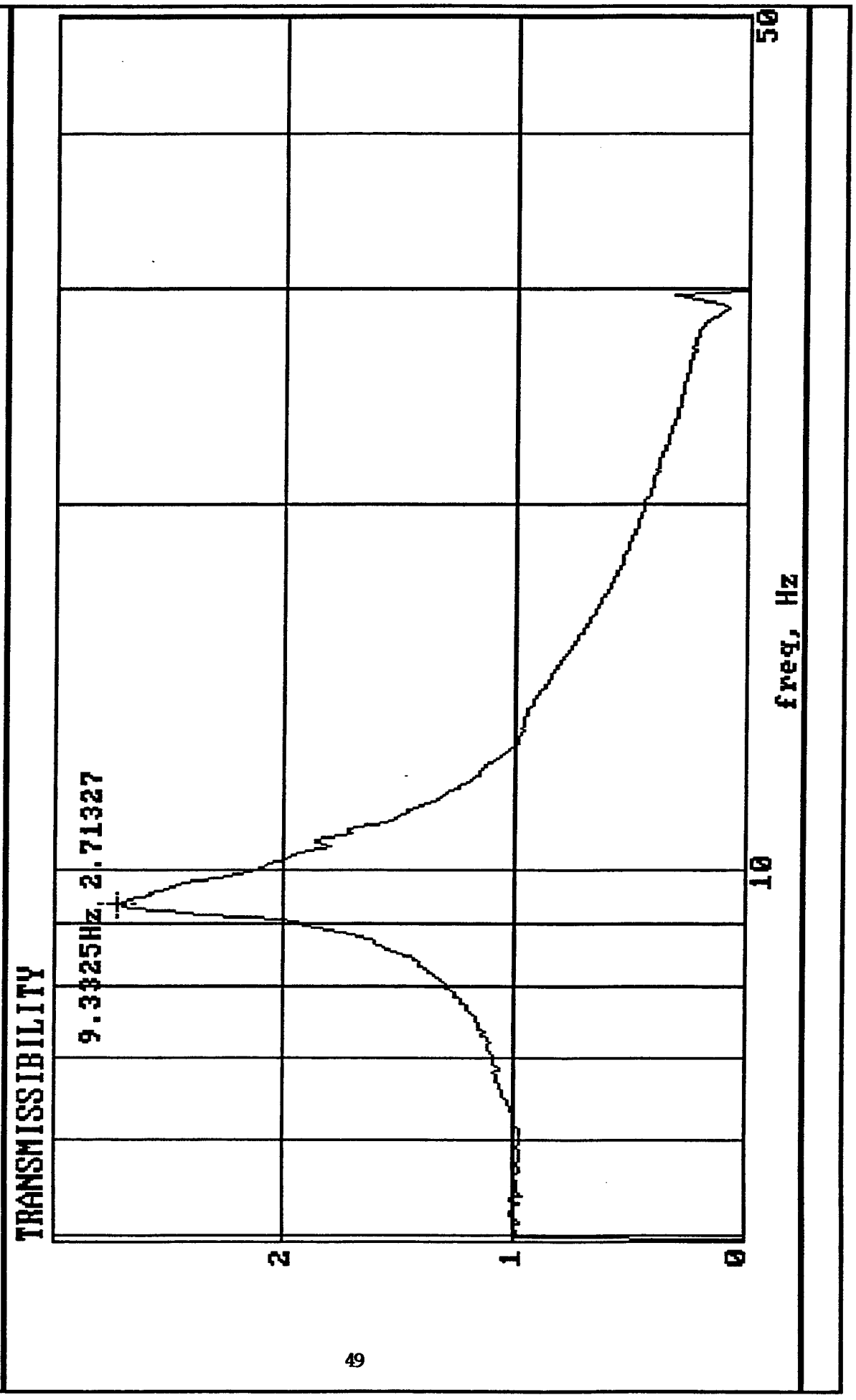
CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-0.14 g's	8.92 g's	109.41 In/s		12.8 mS
2	77.31 mS	1.76 g's	-8.37 g's	3.30 In/s		12.8 mS
3	77.31 mS	0.57 g's	-7.73 g's	-8.63 In/s		12.8 mS
■ R	77.31 mS	1.85 g's	13.38 g's	109.80 In/s		12.8 mS

Remarks:

Ch 1, X, Longitudinal Axis
Ch 2, Y, Vertical Axis
Ch 3, Z, Transverse Axis
Ch 4, R, Resultant

FED-STD-101C
Method 5012

FREQUENCY SWEEP
ATCOM2, 13MAR96

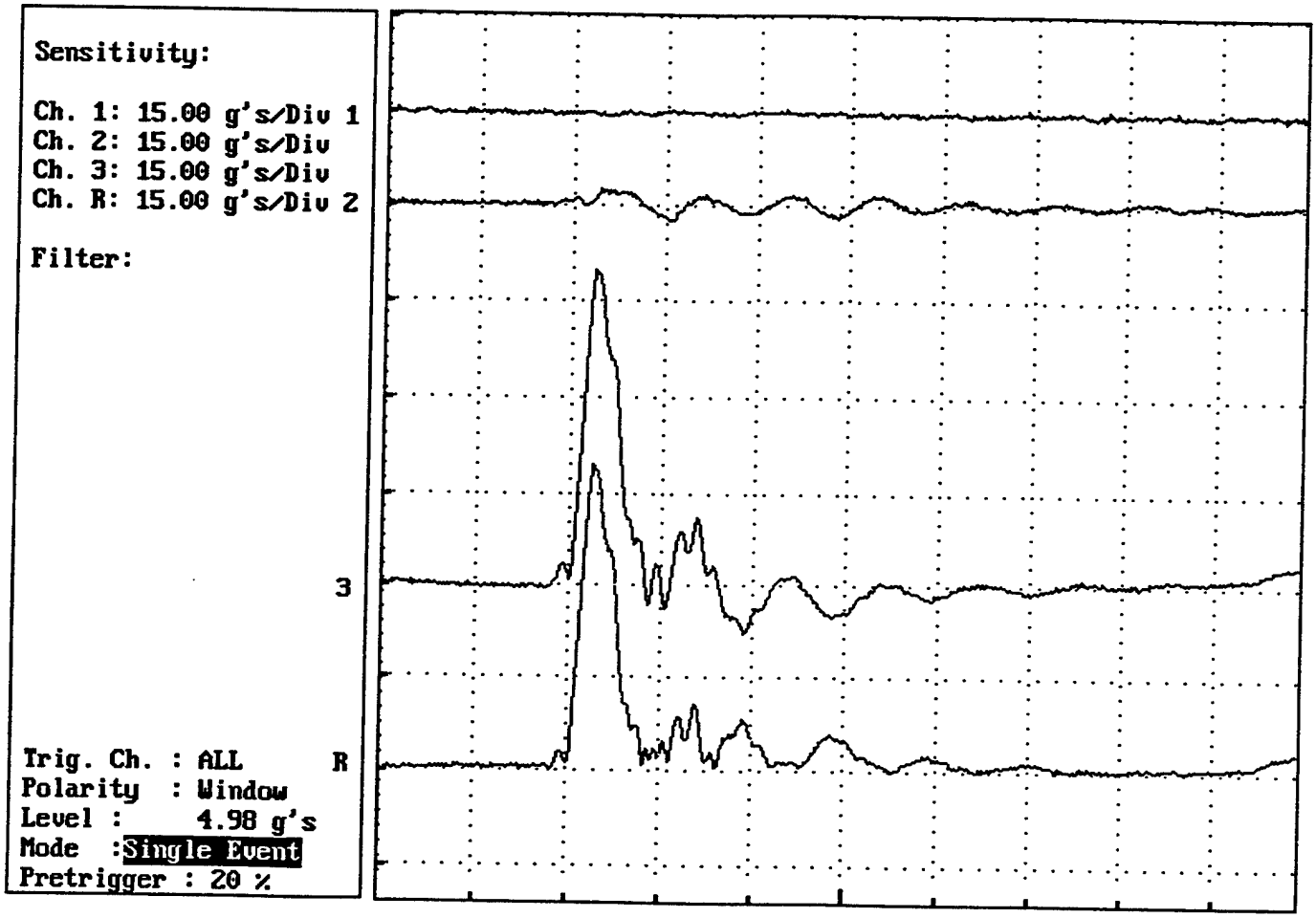


Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Aug 07 96 02:23
Rotational Drop -28.9DEG C(-20DEG F)
Test Item : ATCOM3

Test Engineer : FILSINGER
Impact Point : EDGE 32
Drop Height : 610mm (24in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	128.51 mS	-0.32 g's	-0.94 g's	-5.19 In/s		12.8 mS
■ 2	128.51 mS	0.05 g's	-3.03 g's	1.65 In/s		12.8 mS
3	128.51 mS	3.24 g's	50.15 g's	84.97 In/s		12.8 mS
R	128.51 mS	3.26 g's	49.52 g's	85.14 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Wed Aug 07 96 02:29	Test Engineer	: FILSINGER
Rotational Drop	-28.9DEG C(-20DEG F)	Impact Point	: CORNER 236
Test Item	: ATCOM3	Drop Height	: 610mm (24in)

Sensitivity:

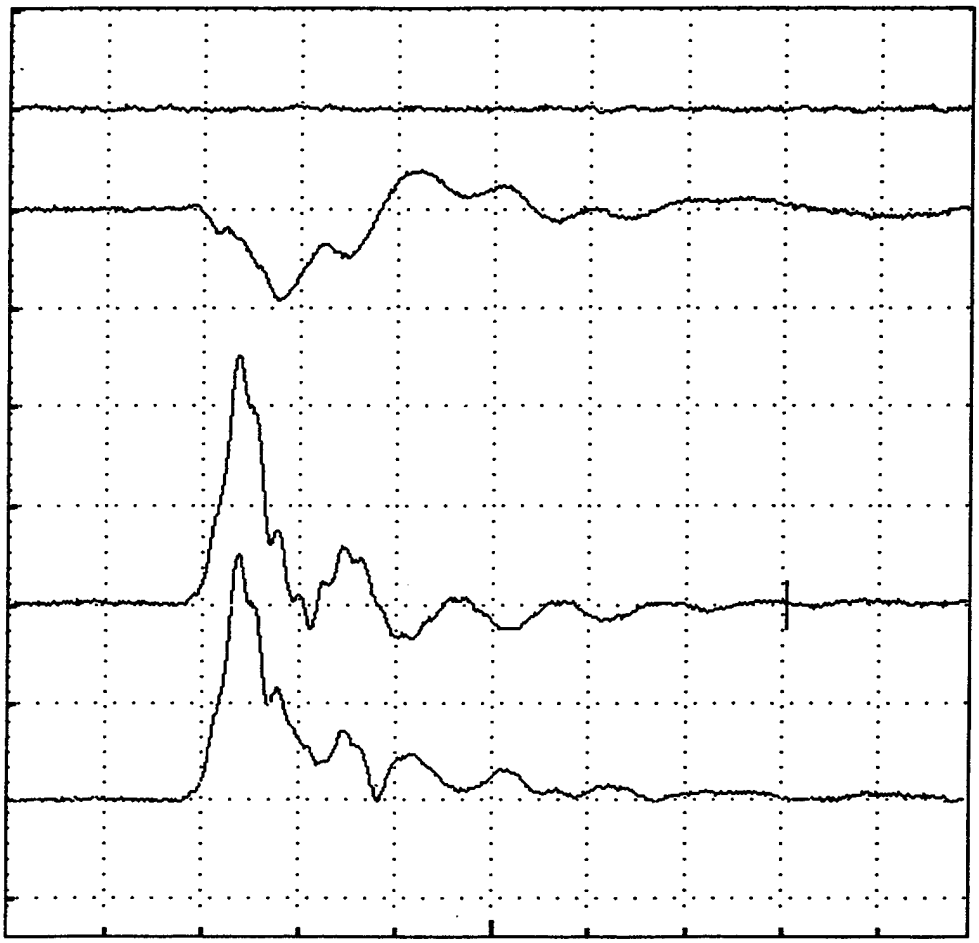
Ch. 1: 15.00 g's/Div 1
Ch. 2: 15.00 g's/Div
Ch. 3: 15.00 g's/Div
Ch. R: 15.00 g's/Div 2

Filter:

3

R

Trig. Ch. : ALL
Polarity : Window
Level : 4.98 g's
Mode :Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-0.04 g's	-0.95 g's	-1.51 In/s		12.8 mS
2	102.91 mS	0.72 g's	-14.22 g's	-35.12 In/s		12.8 mS
■ 3	102.91 mS	-0.05 g's	38.25 g's	74.05 In/s		12.8 mS
R	102.91 mS	0.72 g's	37.94 g's	81.97 In/s		12.8 mS

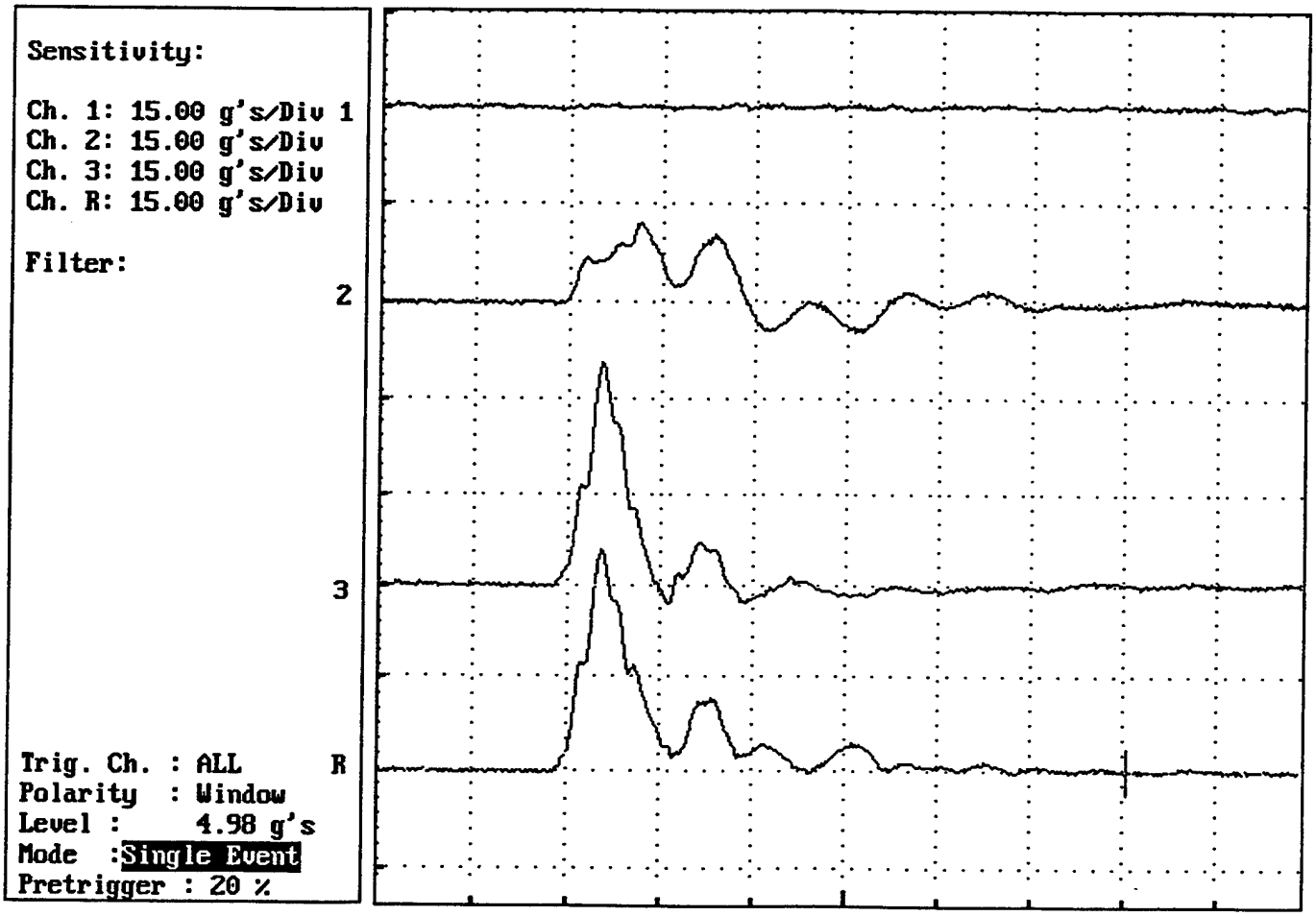
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Wed Aug 07 96 02:36	Test Engineer	: FILSINGER
Rotational Drop	-28.9DEG C(-20DEG F)	Impact Point	: CORNER 435
Test Item	: ATCOM3	Drop Height	: 610mm (24in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	0.03 g's	0.91 g's	1.45 In/s		12.8 mS
2	102.91 mS	-0.37 g's	12.60 g's	46.09 In/s		12.8 mS
3	102.91 mS	0.19 g's	35.82 g's	81.38 In/s		12.8 mS
■ R	102.91 mS	0.41 g's	36.25 g's	93.54 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Aug 07 96 02:40
Rotational Drop -28.9DEG C(-20DEG F)
Test Item : ATCOM3

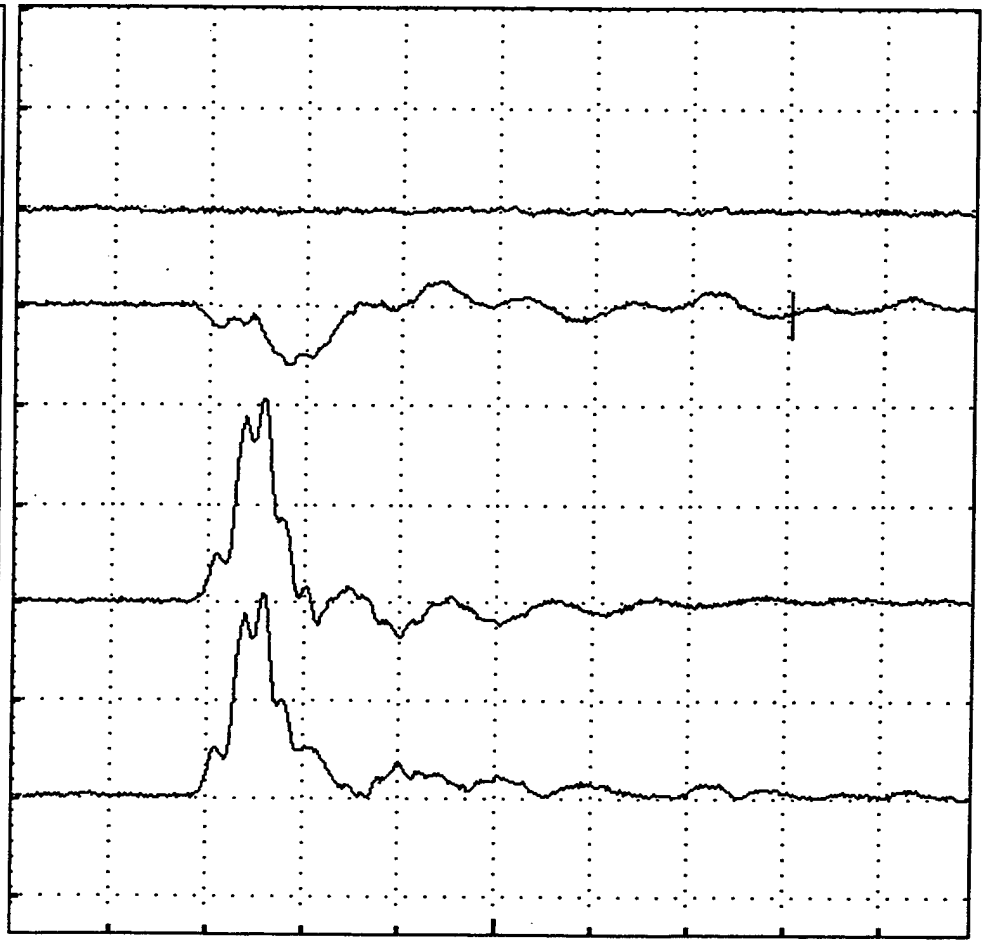
Test Engineer : FILSINGER
Impact Point : EDGE 36
Drop Height : 432mm (17in) bal pt

Sensitivity:

Ch. 1: 15.00 g's/Div
Ch. 2: 15.00 g's/Div
Ch. 3: 15.00 g's/Div
Ch. R: 15.00 g's/Div

Filter:

Trig. Ch. : ALL
Polarity : Window
Level : 4.98 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	0.49 g's	1.23 g's	12.56 In/s		12.8 mS
■ 2	102.91 mS	-1.08 g's	-9.47 g's	-24.36 In/s		12.8 mS
3	102.91 mS	0.23 g's	31.65 g's	49.24 In/s		12.8 mS
R	102.91 mS	1.21 g's	31.29 g's	56.36 In/s		12.8 mS

Remarks:

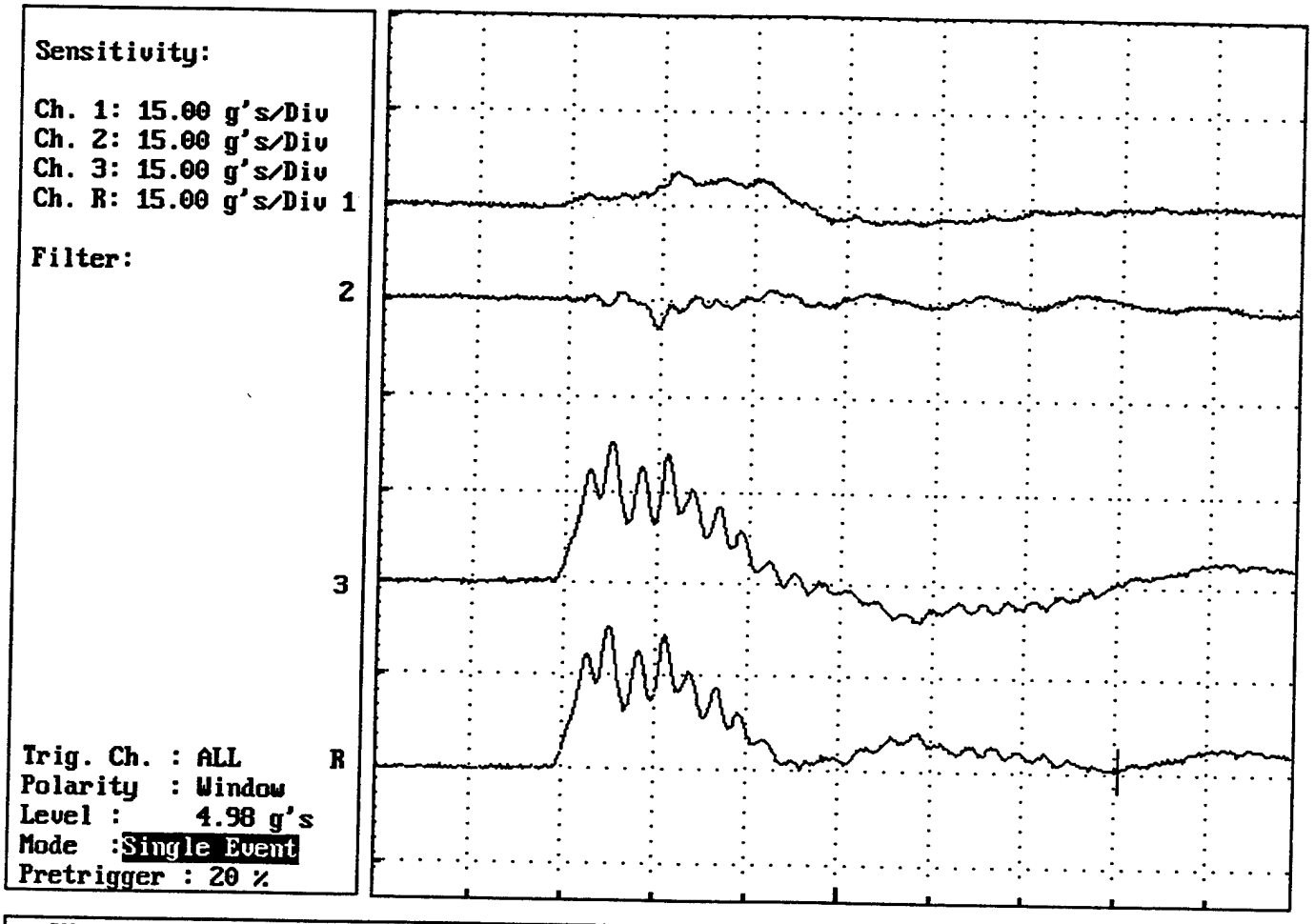
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Aug 09 96 13:09
Rotational Drop 60 DEG C (140 DEG F)
Test Item : ATCOM3

Test Engineer : FILSINGER
Impact Point : EDGE 34
Drop Height : 24 INCHES



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	0.31 g's	5.73 g's	13.03 In/s		12.8 mS
2	102.91 mS	0.45 g's	-4.82 g's	0.522 In/s		12.8 mS
3	102.91 mS	0.76 g's	23.50 g's	91.29 In/s		12.8 mS
■ R	102.91 mS	0.94 g's	23.09 g's	92.21 In/s		12.8 mS

Remarks:

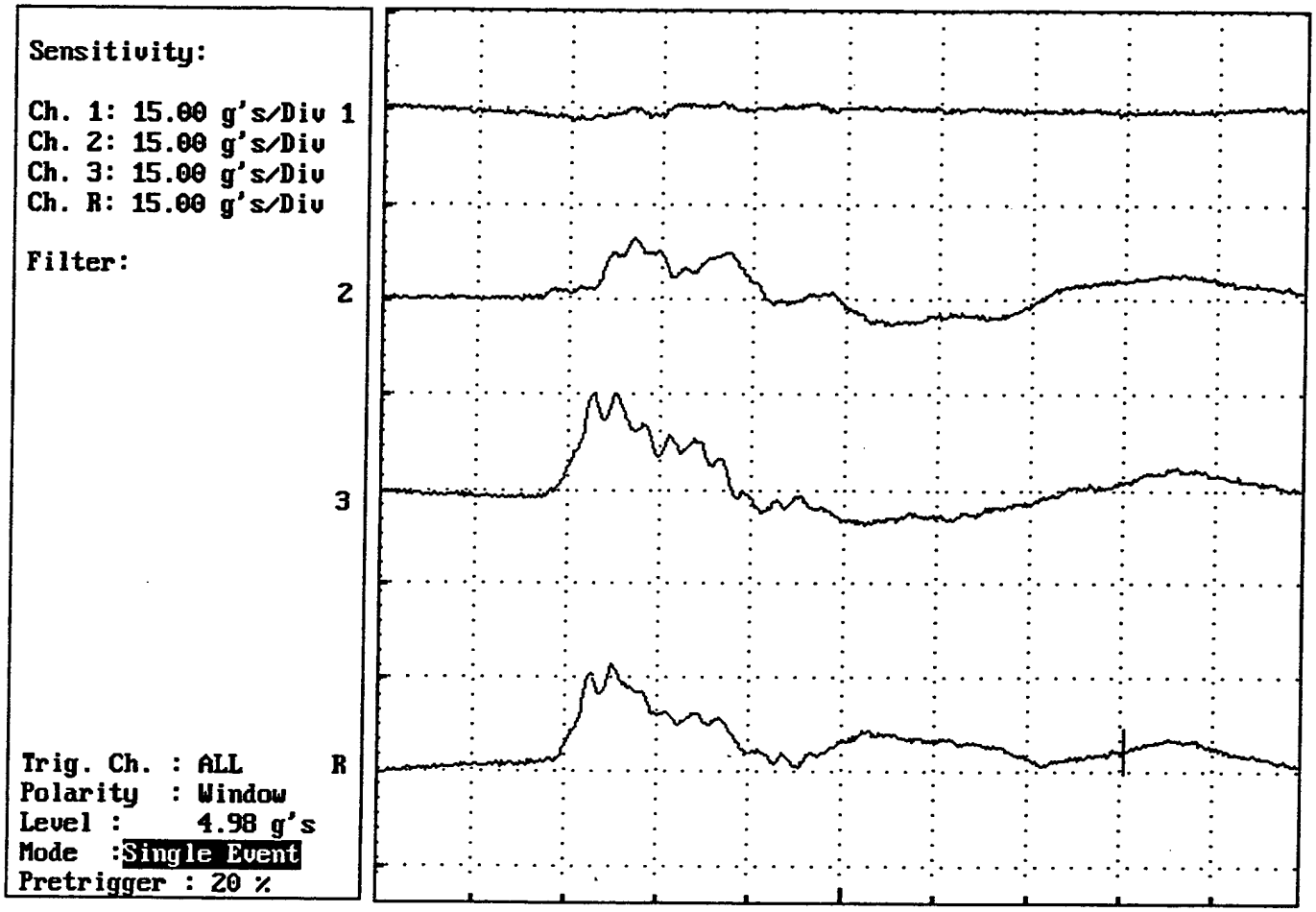
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Aug 09 96 13:17
Rotational Drop 60 DEG C (140 DEG F)
Test Item : ATCOM3

Test Engineer : FILSINGER
Impact Point : EDGE 35
Drop Height : 432mm (17in) bal pt



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-0.67 g's	-2.50 g's	-20.98 In/s		12.8 mS
2	102.91 mS	2.66 g's	9.73 g's	33.11 In/s		12.8 mS
3	102.91 mS	1.71 g's	15.77 g's	22.23 In/s		12.8 mS
▪ R	102.91 mS	3.23 g's	17.00 g's	45.06 In/s		12.8 mS

Remarks:

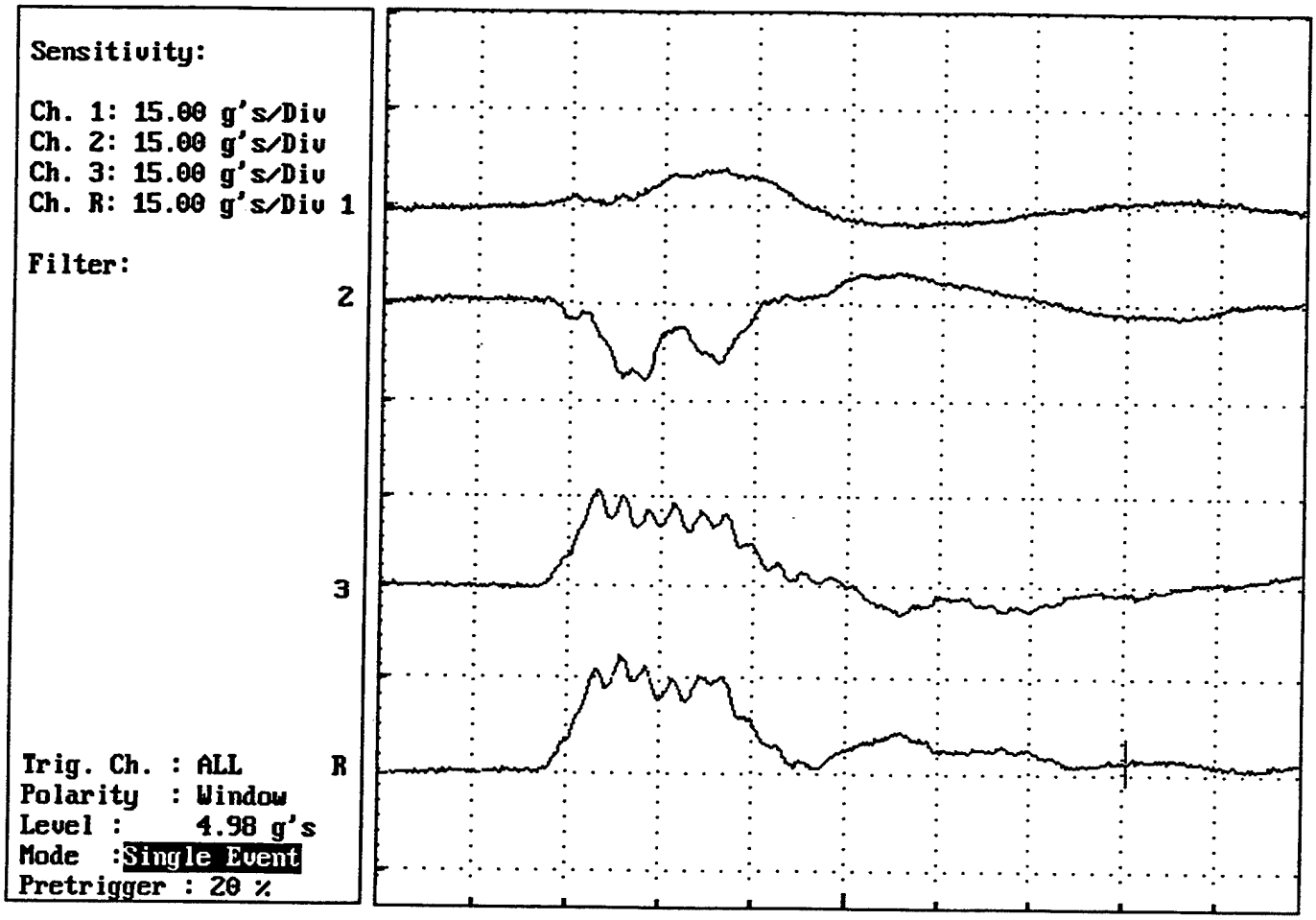
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Aug 09 96 13:06
Rotational Drop 60 DEG C (140 DEG F)
Test Item : ATCOM3

Test Engineer : FILSINGER
Impact Point : CORNER 436
Drop Height : 610mm (24in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	1.16 g's	6.43 g's	33.51 In/s		12.8 mS
2	102.91 mS	-1.71 g's	-12.00 g's	-27.30 In/s		12.8 mS
3	102.91 mS	-1.46 g's	15.98 g's	78.32 In/s		12.8 mS
■ R	102.91 mS	2.53 g's	18.76 g's	89.46 In/s		12.8 mS

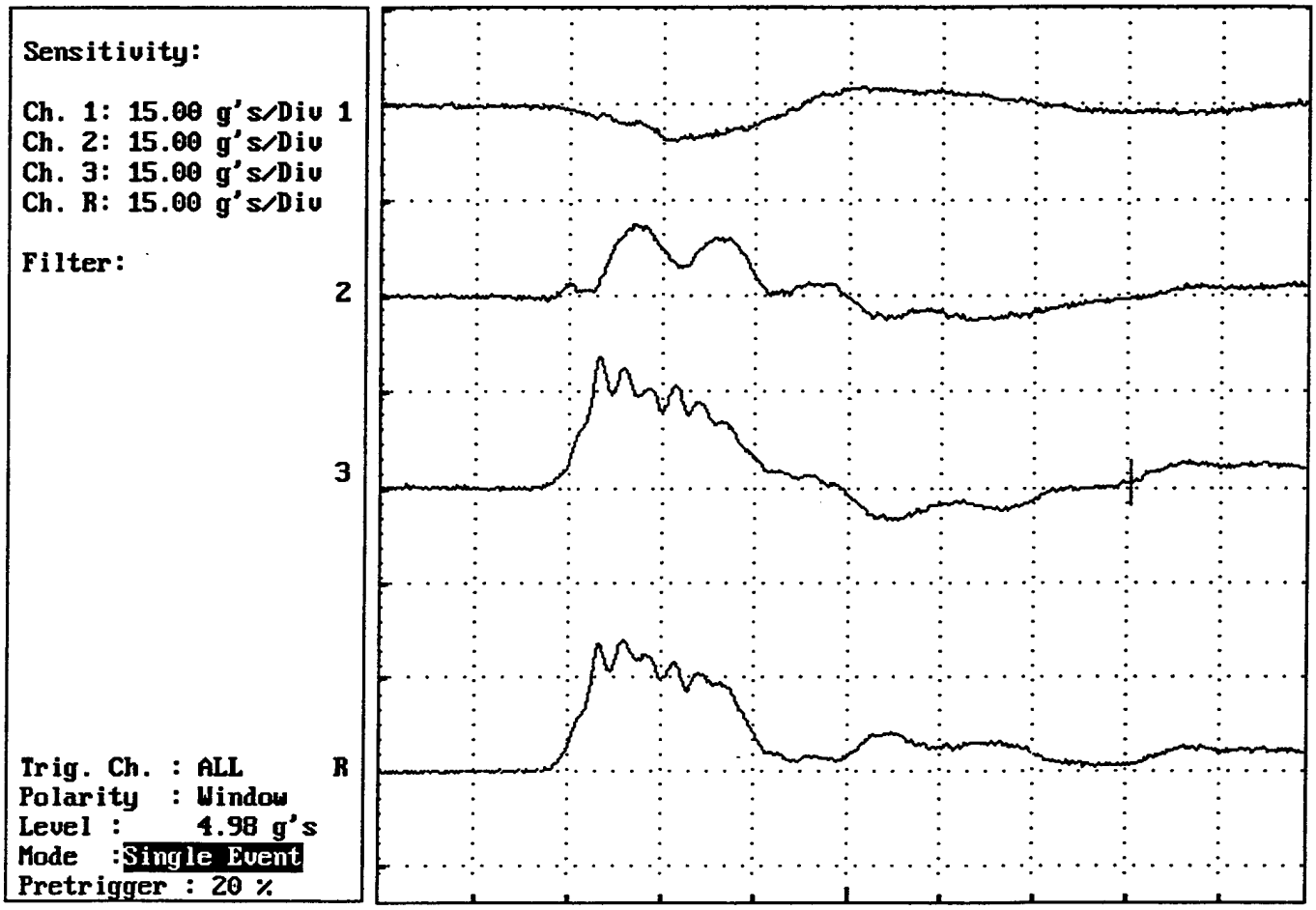
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Fri Aug 09 96 13:14	Test Engineer	: FILSINGER
Rotational Drop	60 DEG C (140 DEG F)	Impact Point	: CORNER 235
Test Item	: ATCOM3	Drop Height	: 24 INCHES



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-1.27 g's	-6.04 g's	-26.14 In/s		12.8 mS
2	102.91 mS	-0.16 g's	11.59 g's	35.98 In/s		12.8 mS
■ 3	102.91 mS	0.67 g's	20.89 g's	98.76 In/s		12.8 mS
R	102.91 mS	1.45 g's	21.11 g's	108.31 In/s		12.8 mS

Remarks:

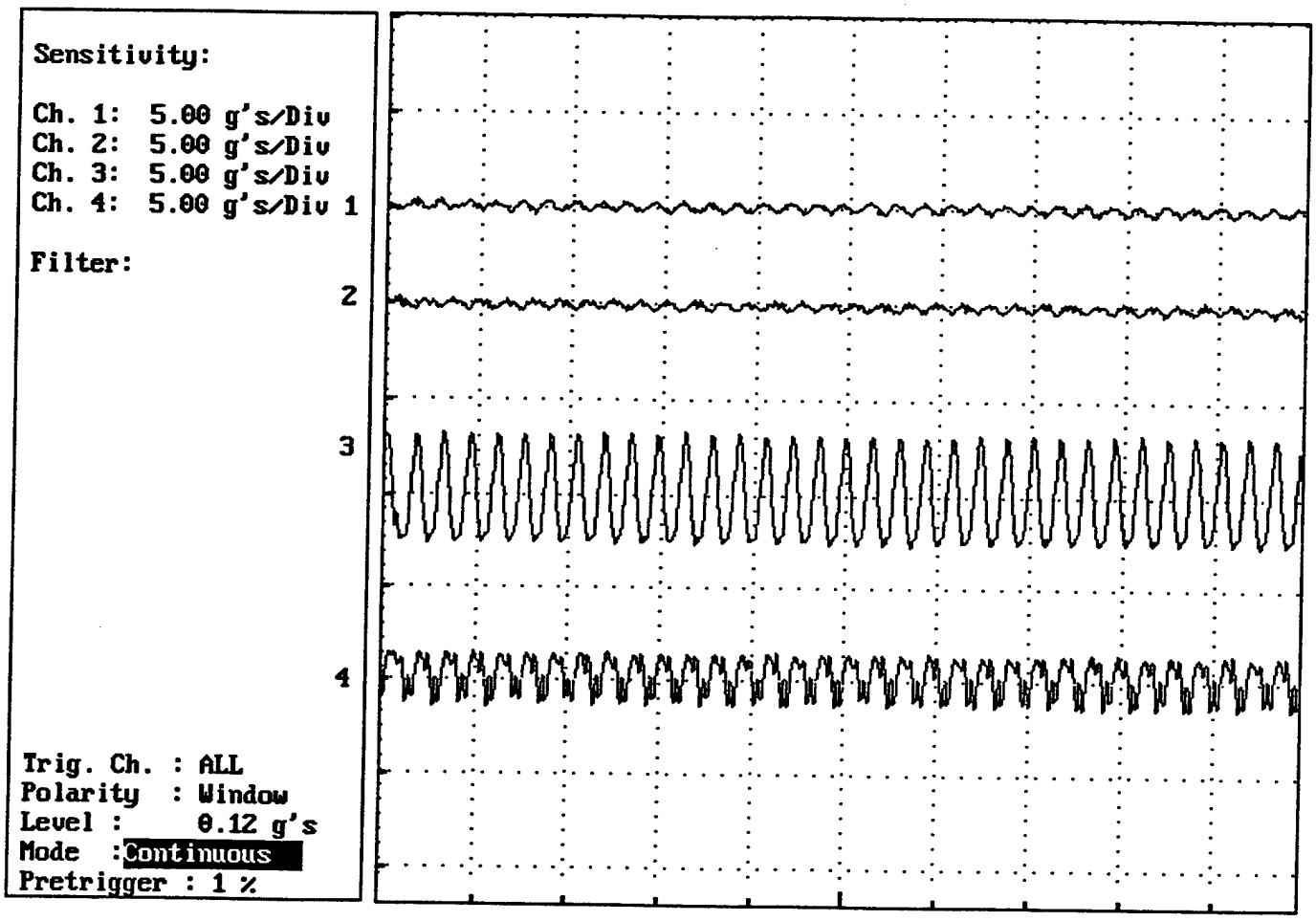
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Tue Aug 13 96 14:14
RESONANCE DWELL
TEST ITEM : ATCOM3

TEST ENGINEER : FILSINGER
FREQUENCY : 13.4 HZ
TEST TEMP. : 79 DEG F



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	2.59 S	0.10 g's	-0.50 g's	-47.81 In/s		256 mS
2	2.59 S	0.06 g's	0.50 g's	39.94 In/s		256 mS
3	2.59 S	-5.53 g's	-5.94 g's	-3292.16 In/s		256 mS
■ 4	2.59 S	-0.40 g's	2.43 g's	1007.30 In/s		256 mS

Remarks:

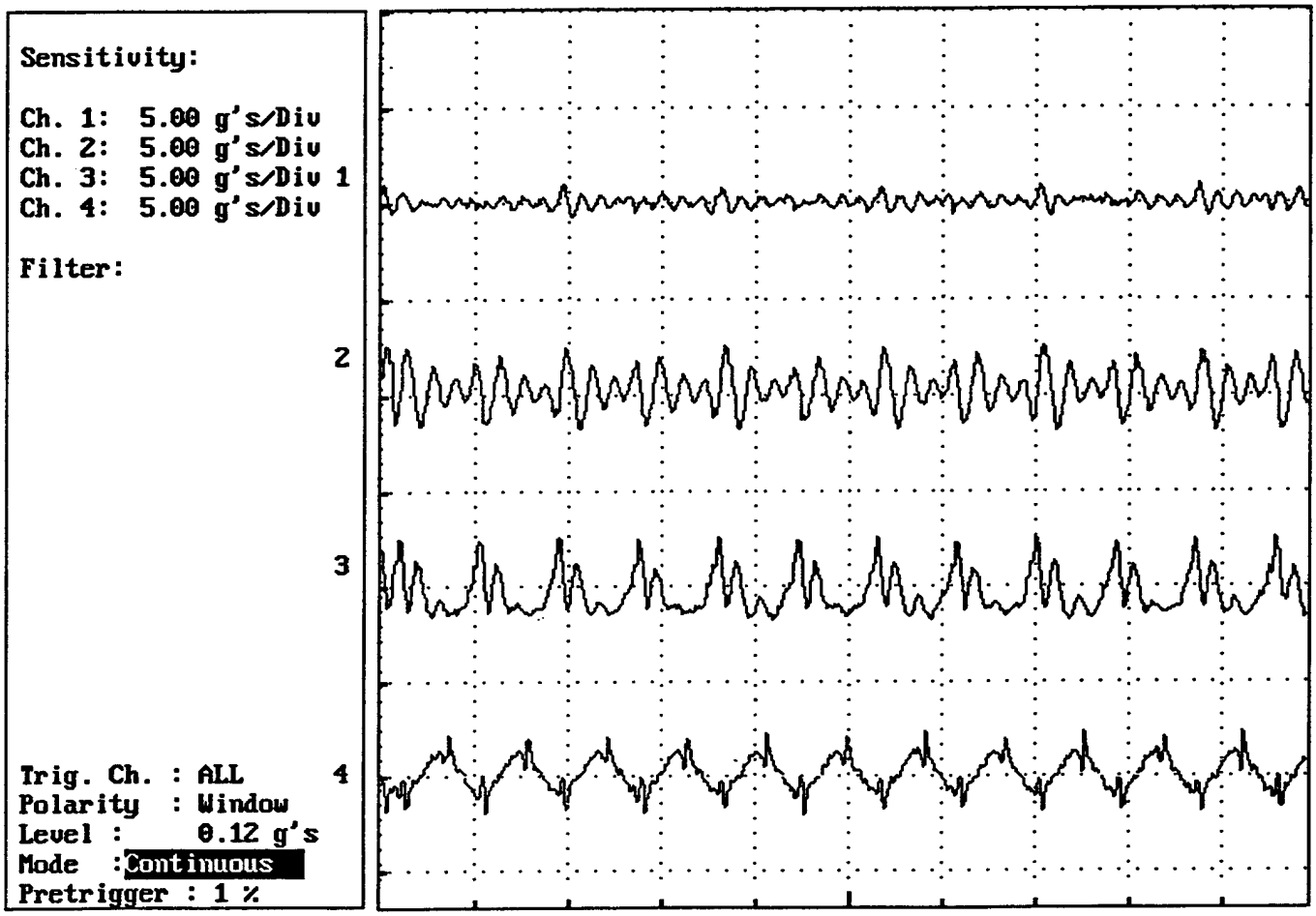
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 TABLE MOTION

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Aug 14 96 10:07
REPETITIVE SHCK
TEST ITEM : ATCOM3

TEST ENGINEER : FILSINGER
FREQUENCY (Hz): 4.6
TEST TIME(min): 115



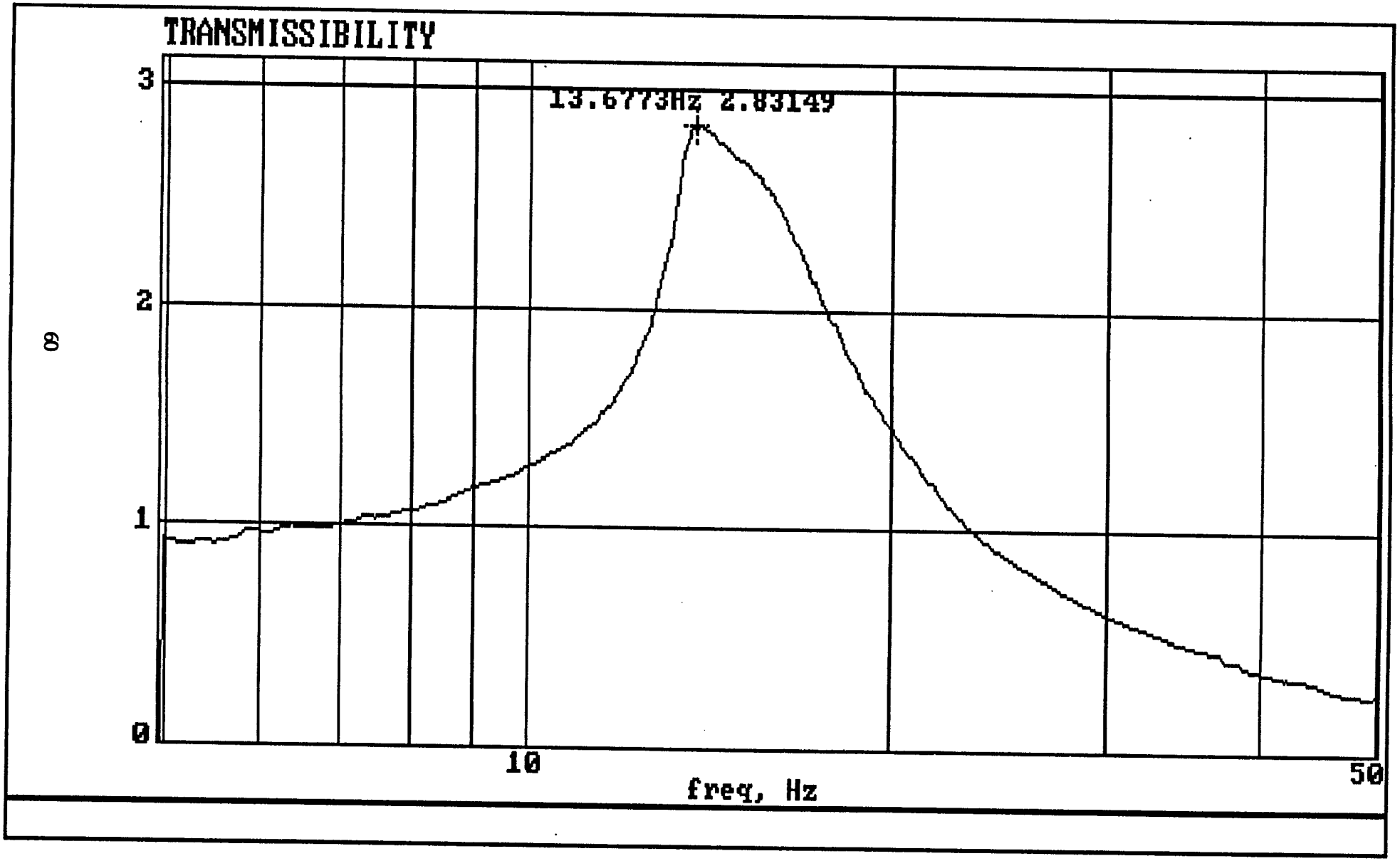
CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	2.59 S	-0.73 g's	-1.48 g's	-627.49 In/s		256 mS
▪ 2	2.59 S	-1.26 g's	-3.30 g's	-911.54 In/s		256 mS
3	2.59 S	-3.07 g's	-3.59 g's	-2100.70 In/s		256 mS
4	2.59 S	1.45 g's	2.88 g's	508.07 In/s		256 mS

Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 TABLE MOTION

FREQUENCY SWEEP
ATCOM3 CONTAINER - 13 AUG 96

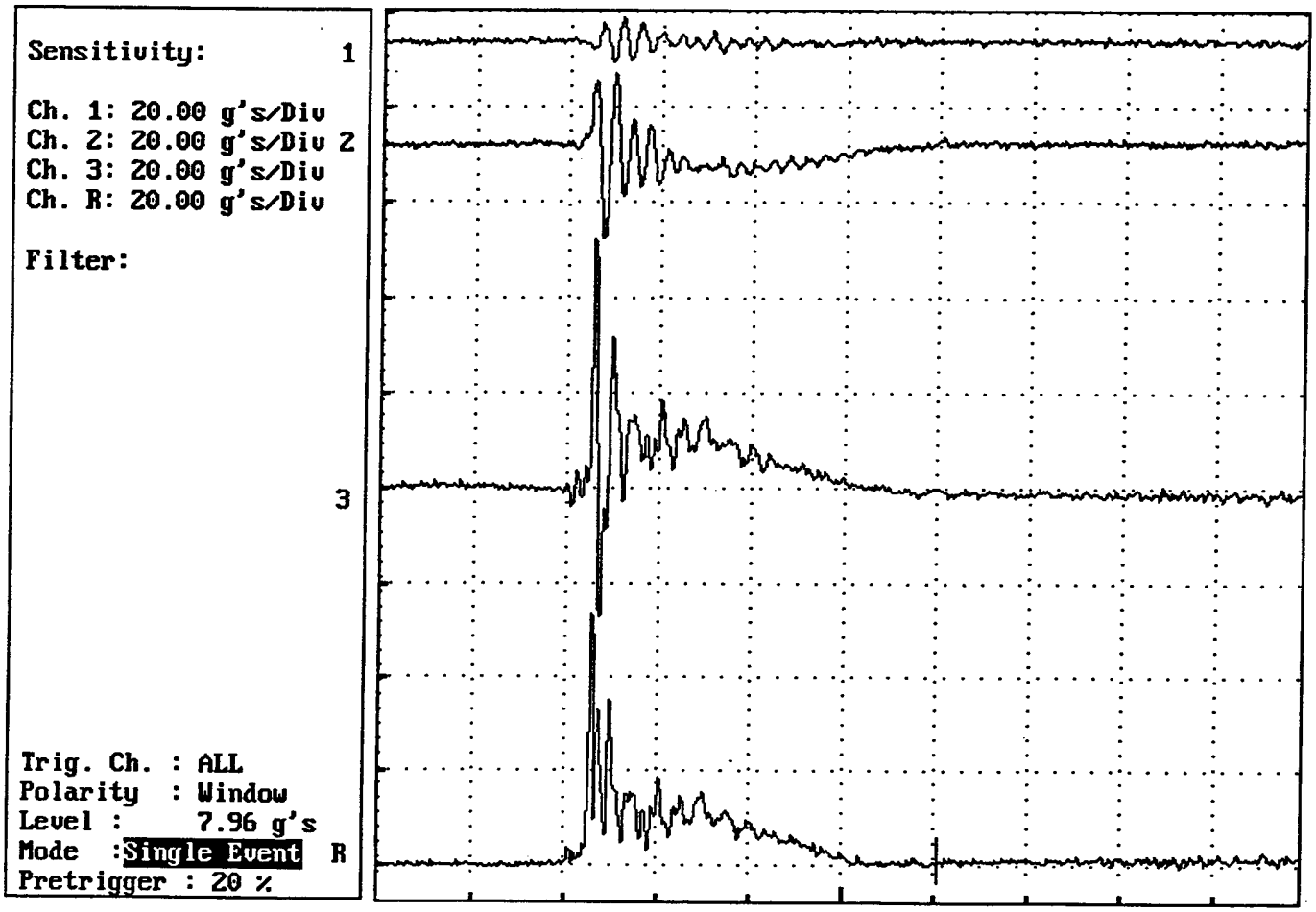
02/14/97, 07:52:41



Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Thu Apr 04 96 14:46	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	-28.9DegC (-20DegF)	IMPACT POINT	: 35
TEST ITEM	: ATCOM5	DROP HEIGHT	: 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	0.06 g's	5.53 g's	-3.52 In/s		12.8 mS
2	77.31 mS	1.83 g's	-20.63 g's	-43.56 In/s		12.8 mS
3	77.31 mS	-0.43 g's	56.41 g's	102.58 In/s		12.8 mS
■ R	77.31 mS	1.88 g's	53.81 g's	111.51 In/s		12.8 mS

Remarks:

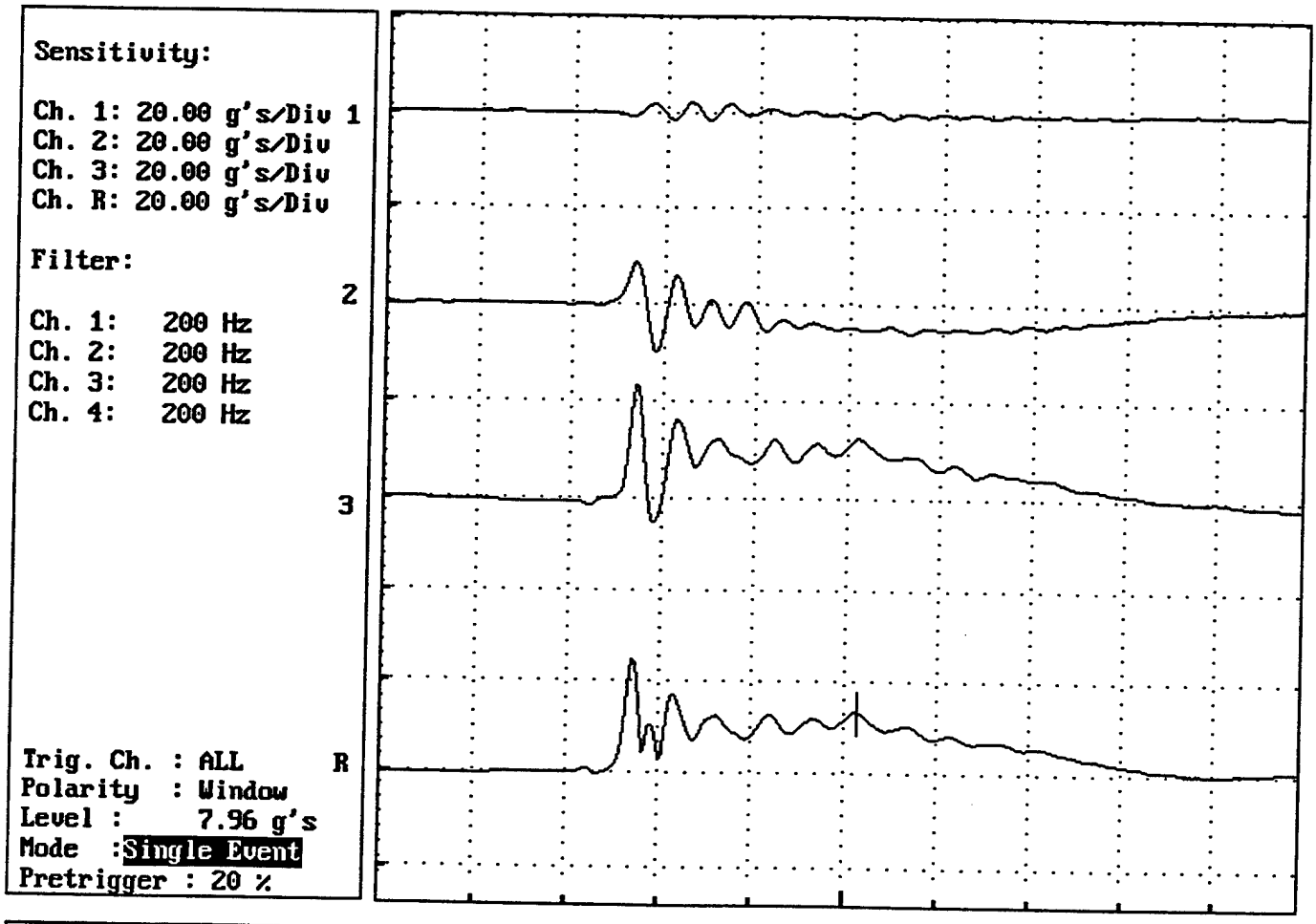
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu Apr 04 96 14:46
ROTATIONAL DROP -28.9DegC (-20DegF)
TEST ITEM : ATCOM 5

TEST ENGINEER : FILSINGER
IMPACT POINT : 35
DROP HEIGHT : 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	44.42 mS	-0.23 g's	2.14 g's	0.0229 In/s		6.4 mS
2	44.42 mS	-4.66 g's	-9.49 g's	-10.99 In/s		6.4 mS
3	44.42 mS	12.85 g's	23.79 g's	61.94 In/s		6.4 mS
■ R	44.42 mS	13.67 g's	25.25 g's	62.91 In/s		6.4 mS

Remarks:

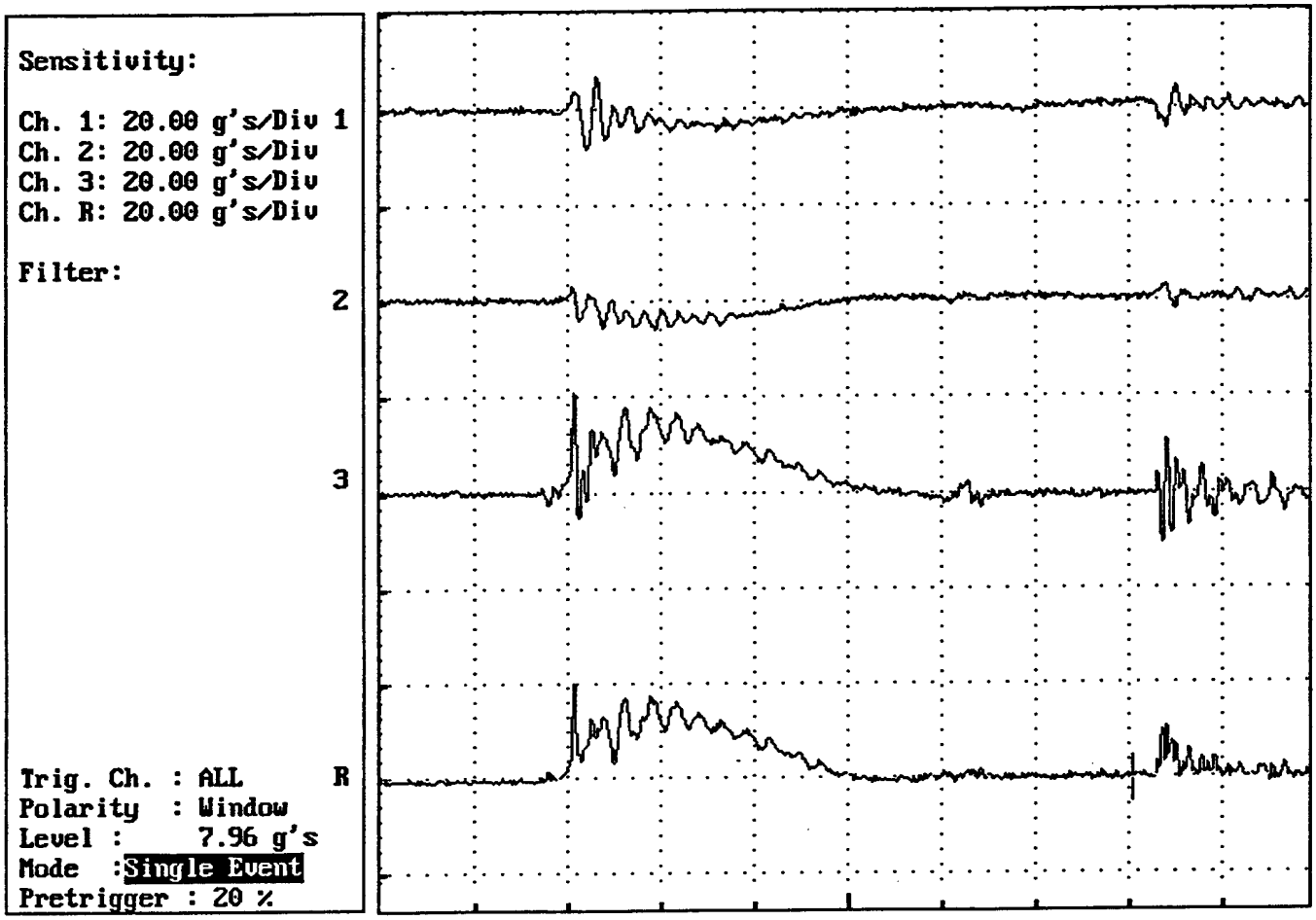
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu Apr 04 96 14:42
ROTATIONAL DROP -28.9DegC (-20DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT POINT : CORNER 435
DROP HEIGHT : 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	1.09 g's	-8.77 g's	-27.57 In/s		12.8 mS
2	102.91 mS	0.20 g's	-6.40 g's	-27.48 In/s		12.8 mS
3	102.91 mS	-0.22 g's	21.41 g's	124.65 In/s		12.8 mS
■ R	102.91 mS	1.13 g's	21.42 g's	130.58 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Thu Apr 04 96 14:52	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	: -28.9DegC (-20DegF)	IMPACT POINT	: CORNER 236
TEST ITEM	: ATCOM5	DROP HEIGHT	: 812.9mm (32in)

Sensitivity:

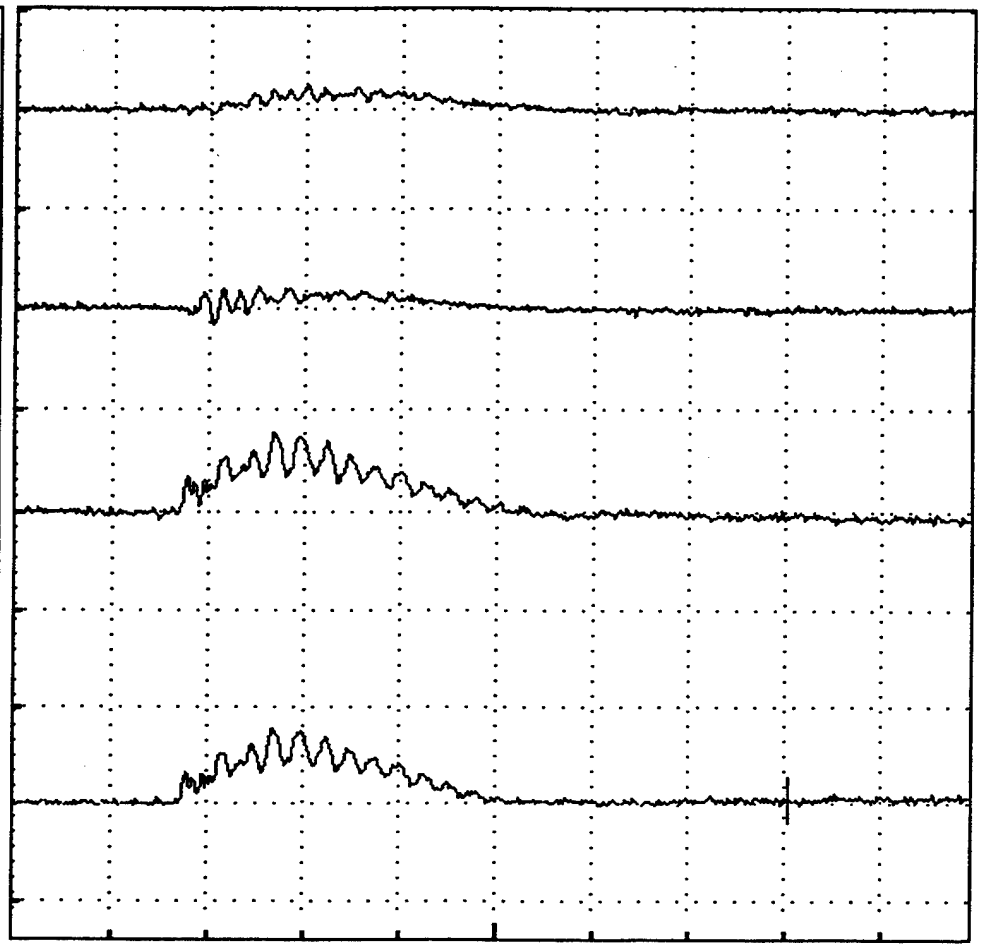
Ch. 1: 20.00 g's/Div 1
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

2

3

Trig. Ch. : ALL R
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	0.40 g's	5.38 g's	42.32 In/s		12.8 mS
2	102.91 mS	-0.58 g's	4.65 g's	19.09 In/s		12.8 mS
3	102.91 mS	-1.37 g's	16.75 g's	99.75 In/s		12.8 mS
■ R	102.91 mS	1.54 g's	15.85 g's	110.03 In/s		12.8 mS

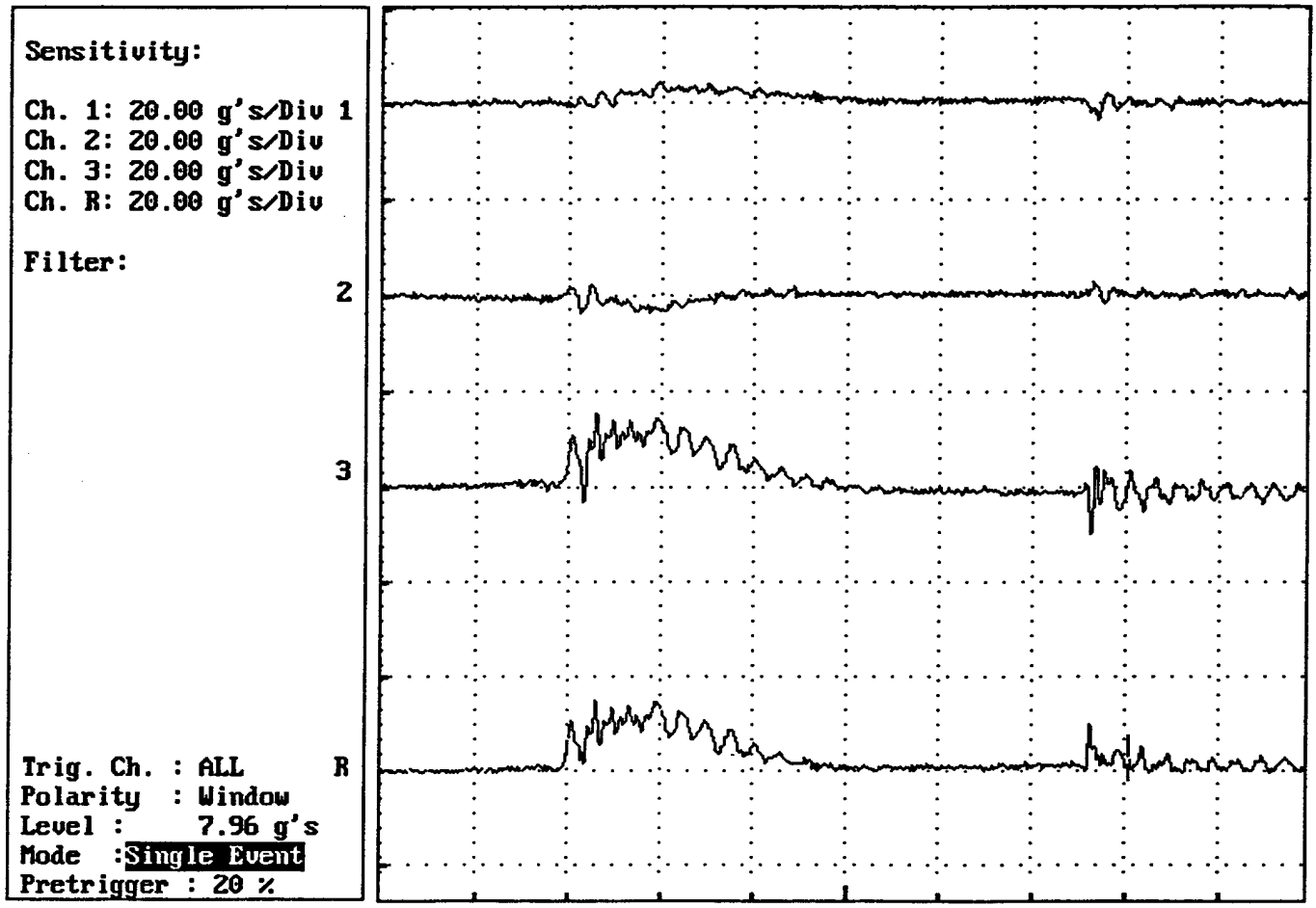
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Thu Apr 04 96 14:56	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	-28.9DegC (-20DegF)	IMPACT POINT	: EDGE 32
TEST ITEM	: ATCOM5	DROP HEIGHT	: 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-0.21 g's	5.46 g's	40.86 In/s		12.8 mS
2	102.91 mS	0.02 g's	-3.98 g's	-2.34 In/s		12.8 mS
3	102.91 mS	3.15 g's	15.21 g's	80.60 In/s		12.8 mS
■ R	102.91 mS	3.16 g's	15.31 g's	90.39 In/s		12.8 mS

Remarks:

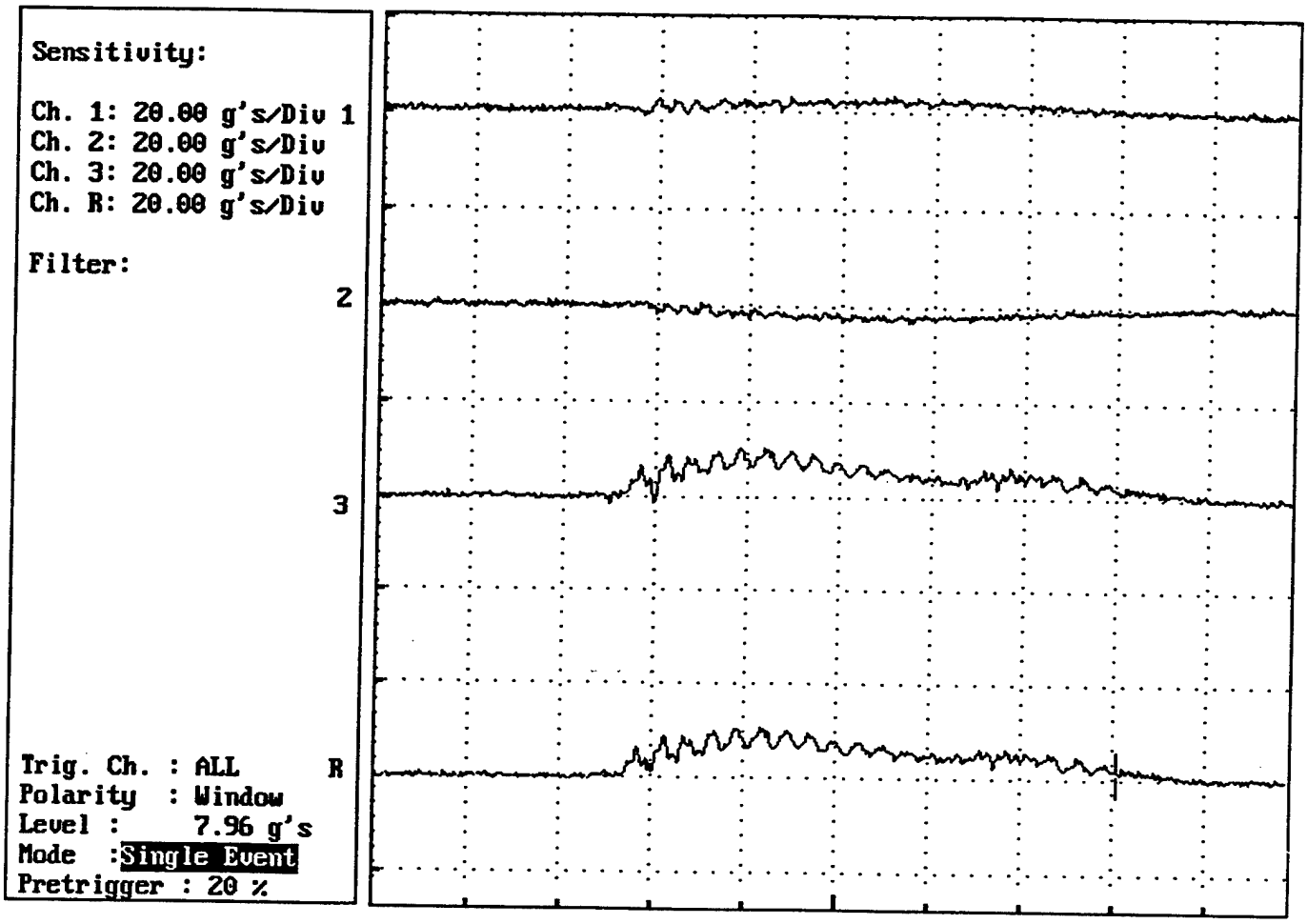
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Apr 10 96 12:51
ROTATIONAL DROP 60DegC (140DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT POINT : CORNER 235
DROP HEIGHT : 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-0.01 g's	3.22 g's	35.93 In/s		12.8 mS
2	102.91 mS	-1.25 g's	-3.94 g's	-50.18 In/s		12.8 mS
3	102.91 mS	1.50 g's	11.61 g's	149.00 In/s		12.8 mS
■ R	102.91 mS	1.95 g's	11.08 g's	161.27 In/s		12.8 mS

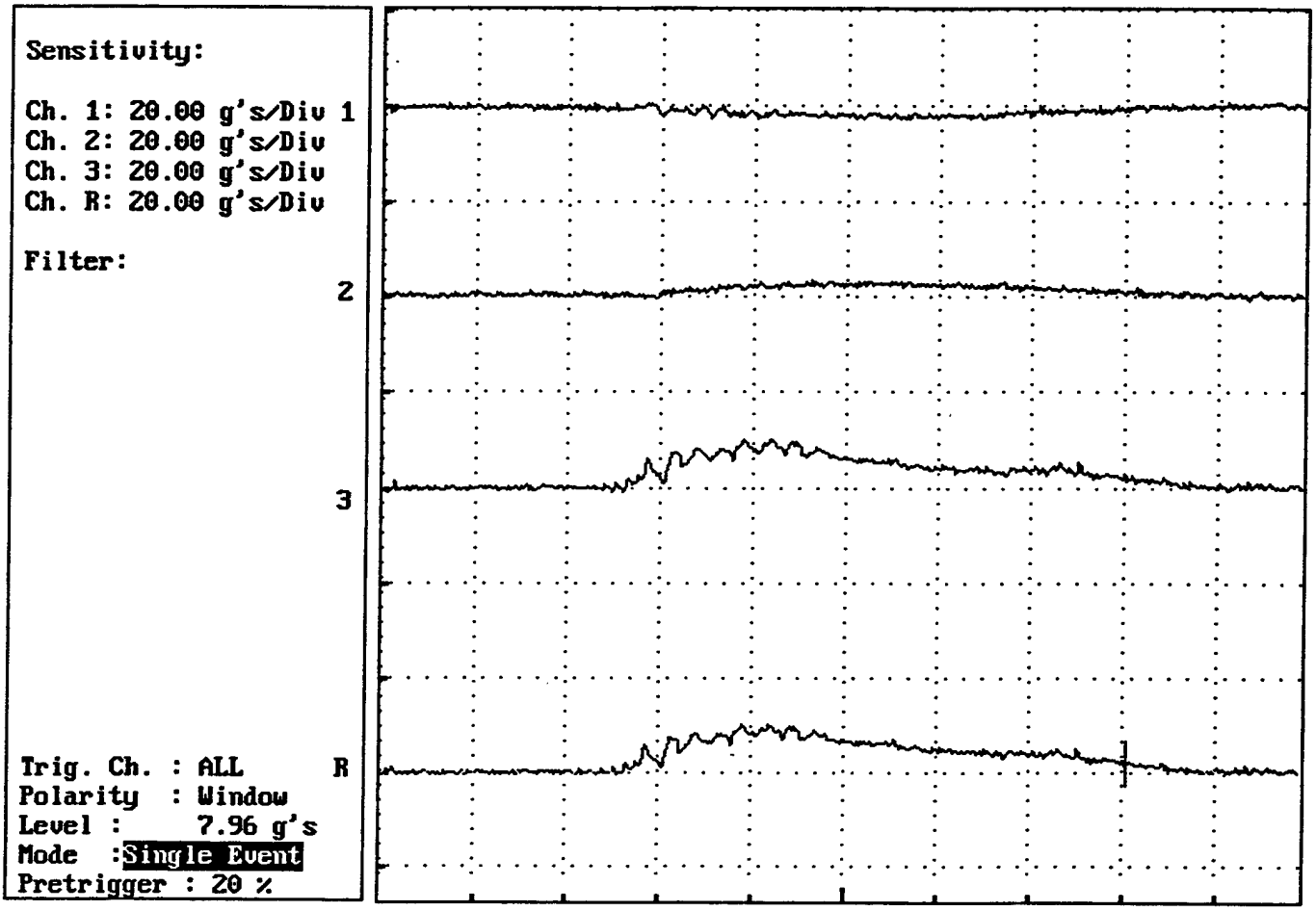
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Wed Apr 10 96 12:57	TEST ENGINEER	: FILSINGER
ROTATIONAL DROP	60DegC (140DegF)	IMPACT POINT	: CORNER 346
TEST ITEM	: ATCOM5	DROP HEIGHT	: 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	0.18 g's	-3.09 g's	-32.43 In/s		12.8 mS
2	102.91 mS	1.00 g's	4.18 g's	51.33 In/s		12.8 mS
3	102.91 mS	2.29 g's	11.47 g's	153.64 In/s		12.8 mS
■ R	102.91 mS	2.51 g's	10.75 g's	165.20 In/s		12.8 mS

Remarks:

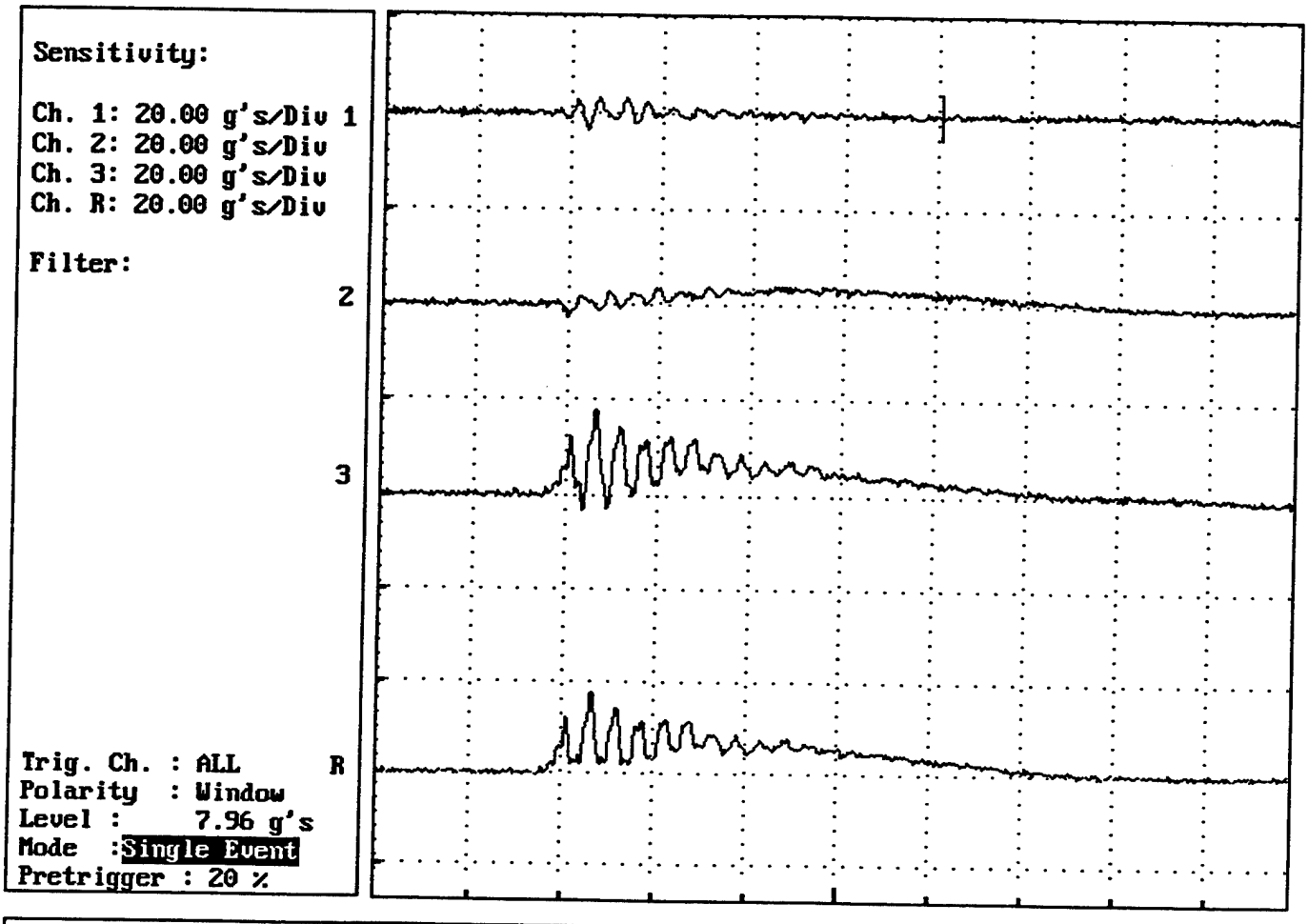
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Apr 10 96 13:03
ROTATIONAL DROP 60DegC (140DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT POINT : EDGE 36
DROP HEIGHT : 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
■ 1	77.31 mS	-0.21 g's	3.85 g's	1.05 In/s		12.8 mS
2	77.31 mS	2.12 g's	4.66 g's	46.49 In/s		12.8 mS
3	77.31 mS	2.86 g's	19.36 g's	120.85 In/s		12.8 mS
R	77.31 mS	3.56 g's	18.29 g's	129.49 In/s		12.8 mS

Remarks:

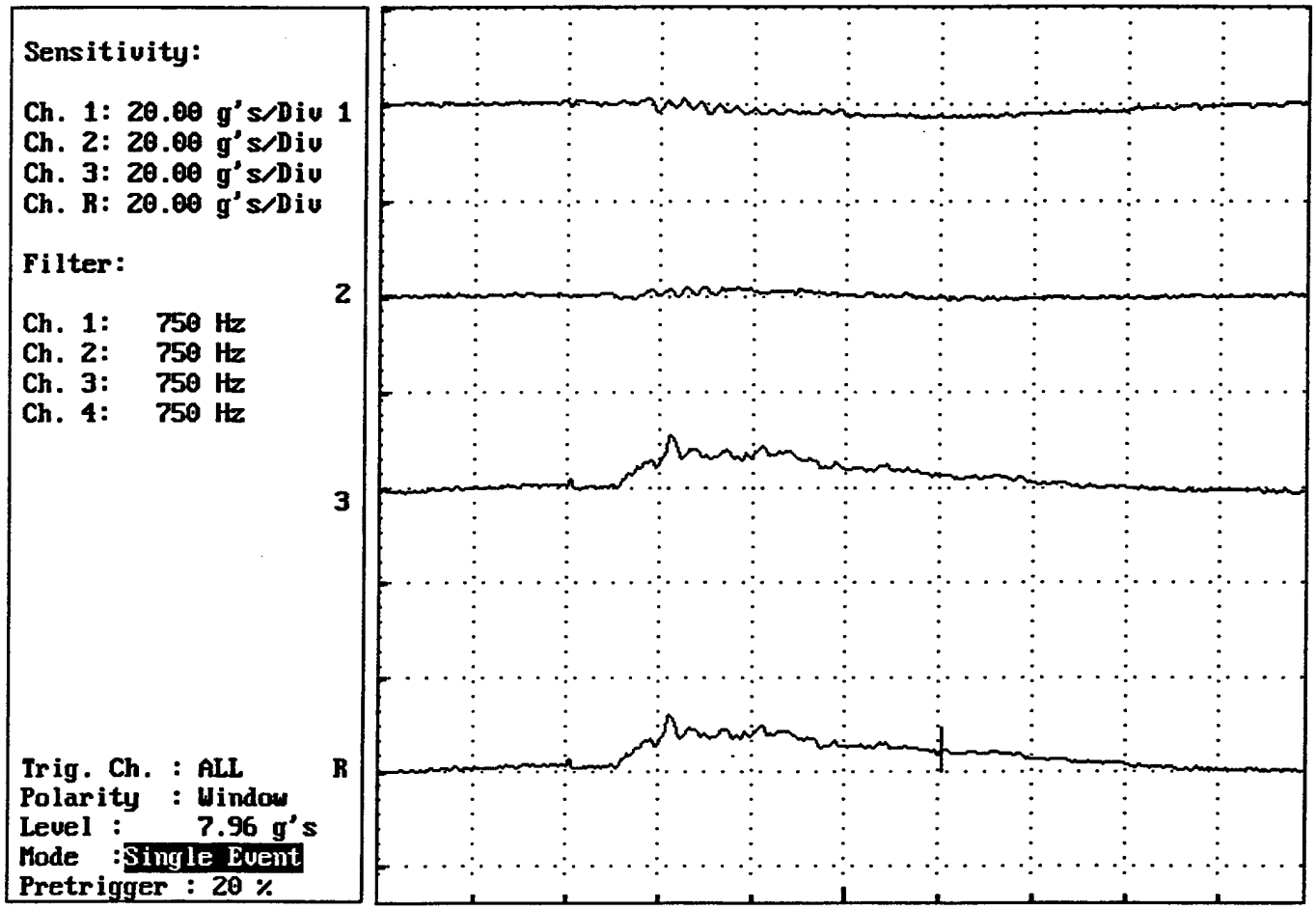
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Apr 10 96 13:07
ROTATIONAL DROP 60DegC (140DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT POINT : EDGE 34
DROP HEIGHT : 812.8mm (32in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-2.88 g's	-3.03 g's	-28.44 In/s		12.8 mS
2	77.31 mS	-0.12 g's	1.88 g's	12.92 In/s		12.8 mS
3	77.31 mS	3.70 g's	12.12 g's	123.45 In/s		12.8 mS
■ R	77.31 mS	4.69 g's	12.23 g's	127.34 In/s		12.8 mS

Remarks:

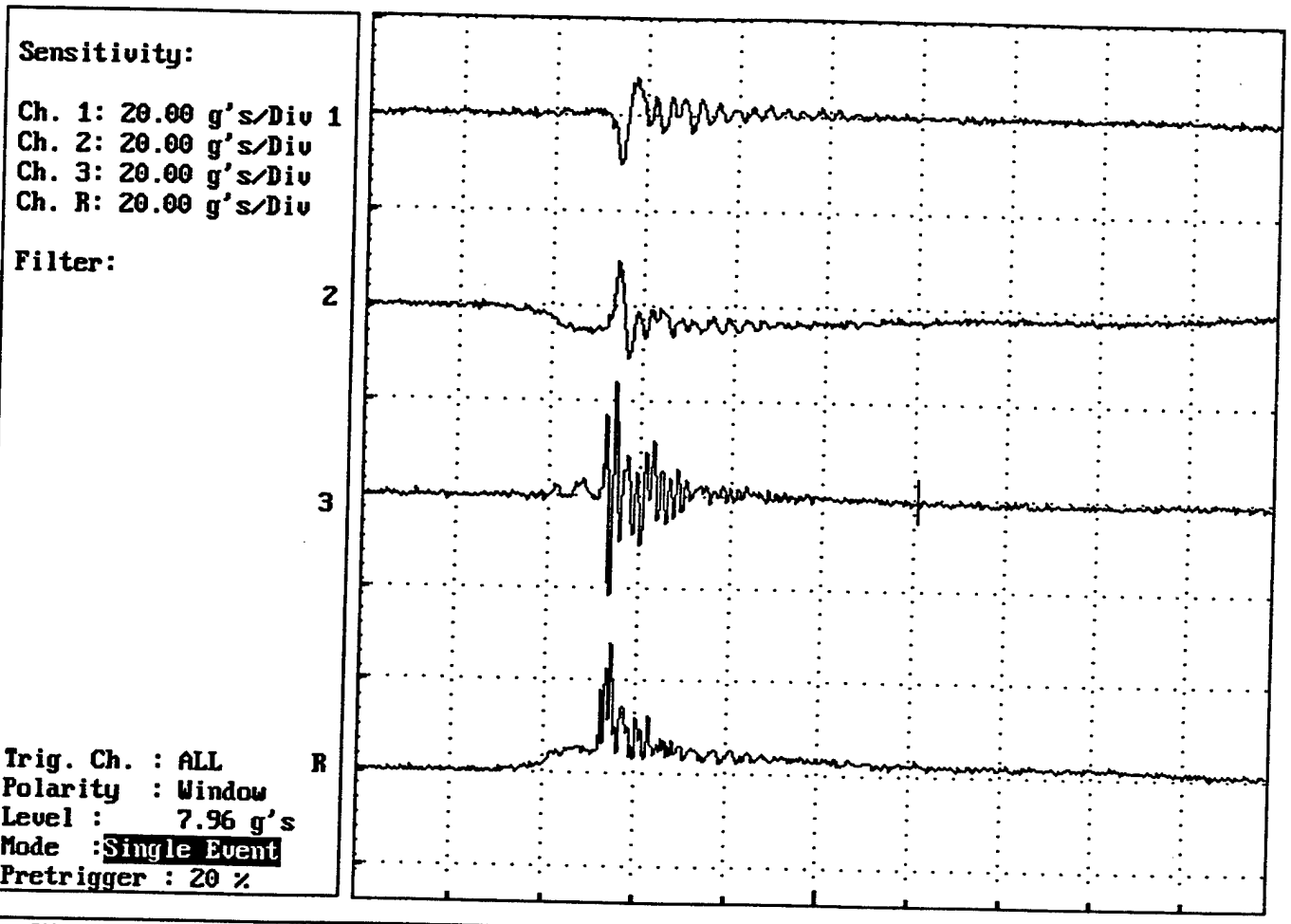
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu Apr 11 96 08:41
PENDULUM IMPACT 73.9DegC (165DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT FACE : 5
IMPACT VELOCITY 2.13m/sec (7ft/sec)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	0.11 g's	-11.71 g's	5.26 In/s		12.8 mS
2	77.31 mS	-2.51 g's	-11.88 g's	-65.56 In/s		12.8 mS
■ 3	77.31 mS	-0.23 g's	26.14 g's	11.18 In/s		12.8 mS
R	77.31 mS	2.52 g's	28.12 g's	66.71 In/s		12.8 mS

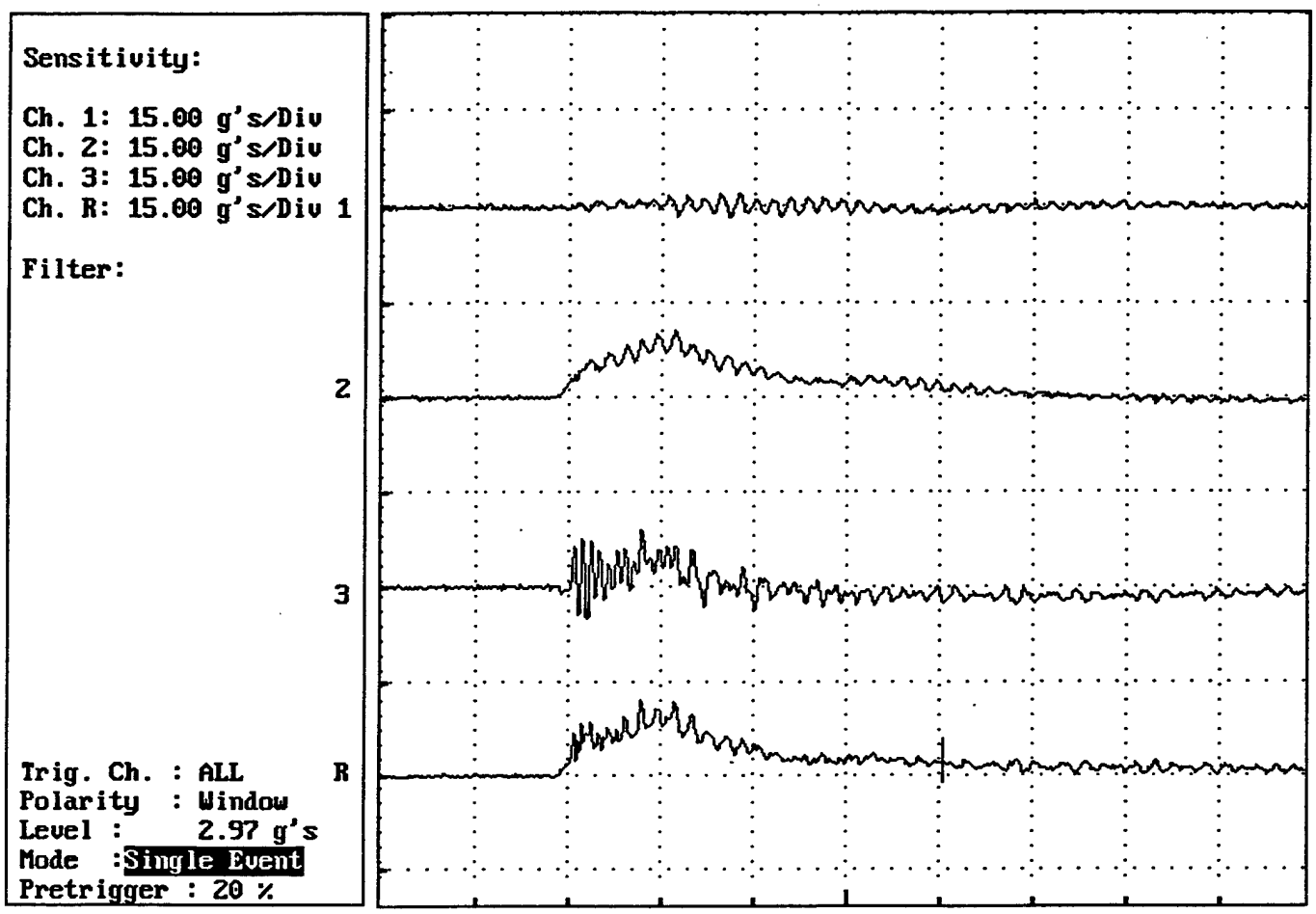
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Apr 12 96 09:35 TEST ENGINEER : FILSINGER
PENDULUM IMPACT -53.9DegC (-65DegF) IMPACT FACE : 6
TEST ITEM : ATCOM5 IMPACT VELOCITY 2.13m/sec (7ft/sec)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-0.79 g's	2.28 g's	-0.483 In/s		12.8 mS
2	77.31 mS	0.89 g's	10.67 g's	87.35 In/s		12.8 mS
3	77.31 mS	-2.66 g's	9.06 g's	9.61 In/s		12.8 mS
■ R	77.31 mS	2.91 g's	12.54 g's	87.88 In/s		12.8 mS

Remarks:

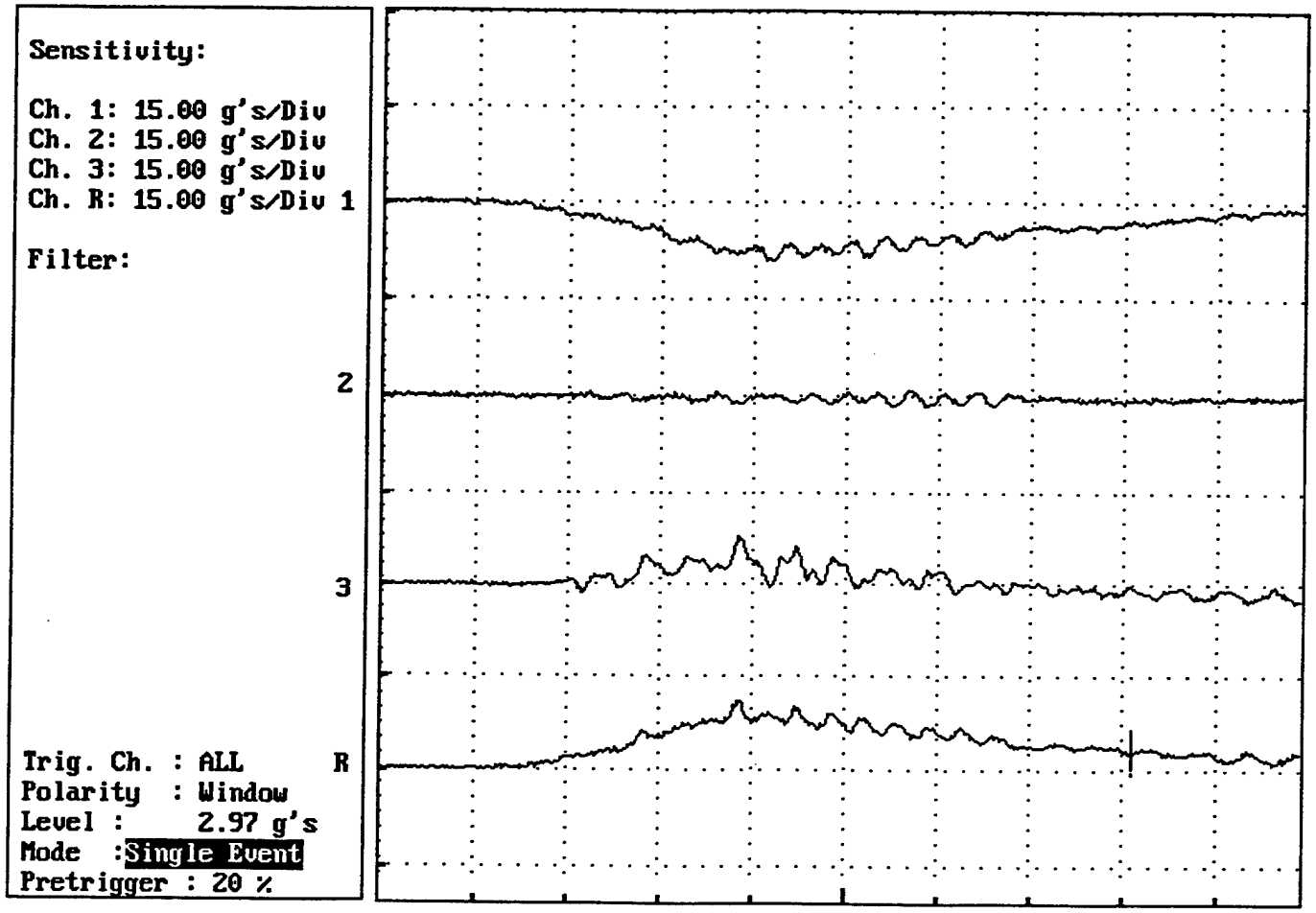
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Apr 12 96 09:38
PENDULUM IMPACT -53.9DegC (-65DegF)
TEST ITEM : ATCOM5

TEST ENGINEER : FILSINGER
IMPACT FACE : 4
IMPACT VELOCITY 2.13m/sec (7ft/sec)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	65.28 mS	-2.98 g's	-9.80 g's	-82.43 In/s		6.4 mS
2	65.28 mS	-0.32 g's	-1.79 g's	-1.55 In/s		6.4 mS
3	65.28 mS	-0.42 g's	8.37 g's	19.67 In/s		6.4 mS
■ R	65.28 mS	3.03 g's	11.07 g's	84.76 In/s		6.4 mS

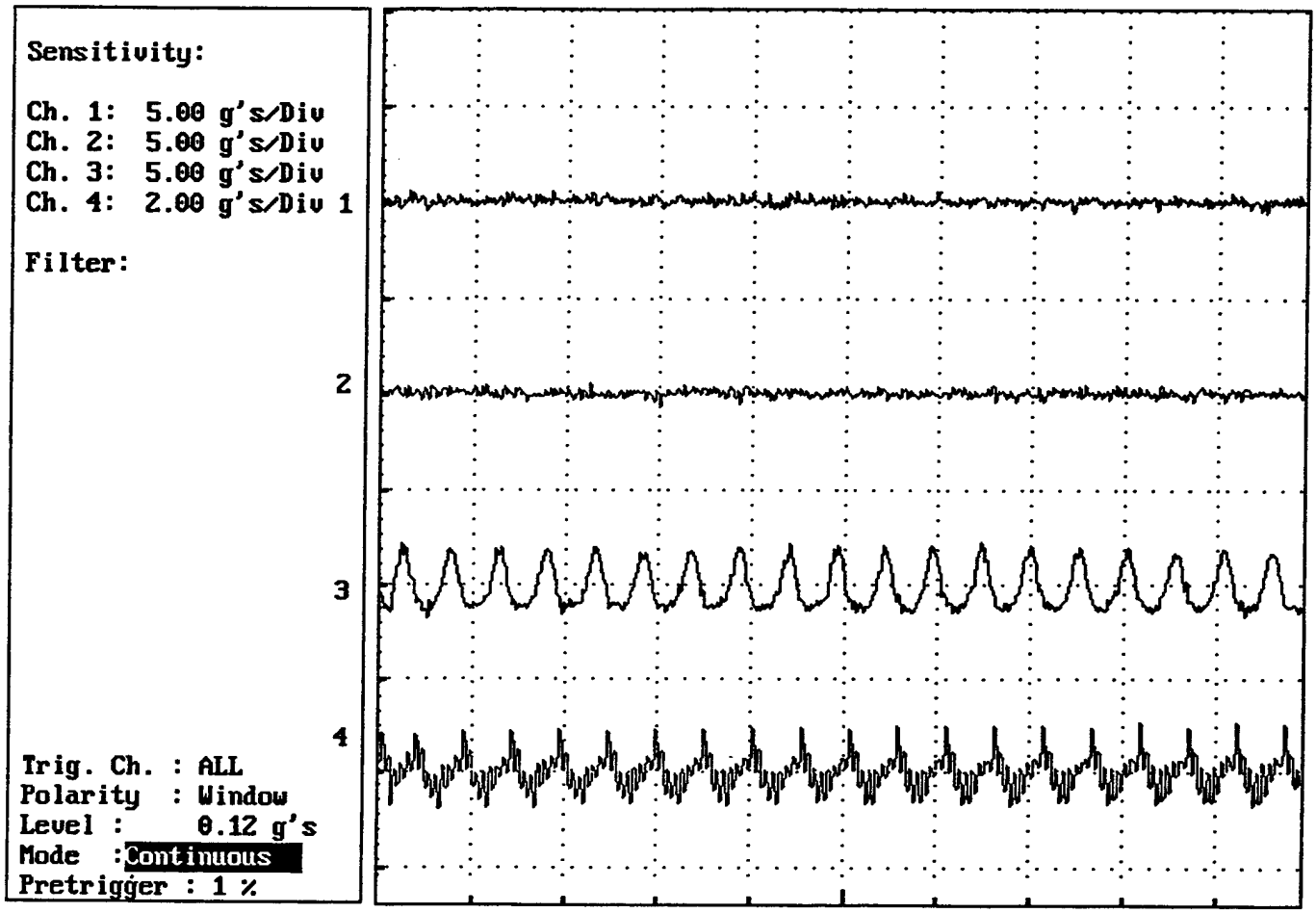
Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed Mar 27 96 14:46 TEST ENGINEER : FILSINGER
RESONANCE DWELL FREQUENCY (Hz): 7.5
TEST ITEM : ATCOM5 TEST TIME(min): 15



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	2.59 S	-0.02 g's	0.79 g's	-8.92 In/s		256 mS
2	2.59 S	-0.11 g's	-0.86 g's	-22.94 In/s		256 mS
■ 3	2.59 S	2.54 g's	3.17 g's	501.65 In/s		256 mS
4	2.59 S	-0.42 g's	-1.11 g's	-262.65 In/s		256 mS

Remarks:

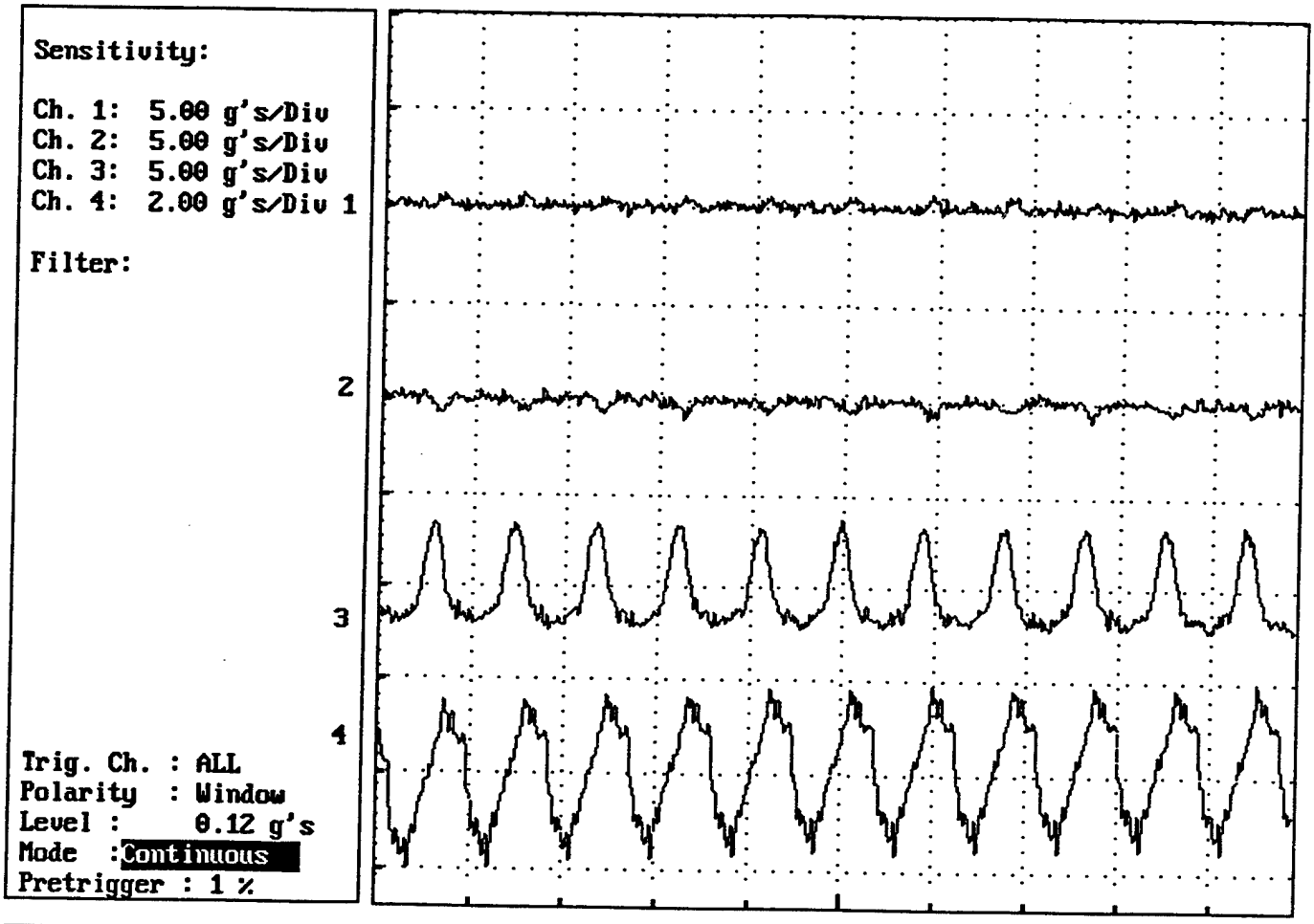
CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 TABLE MOTION

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri Mar 29 96 15:26
REPETITIVE SHCK
TEST ITEM : ATCOM5

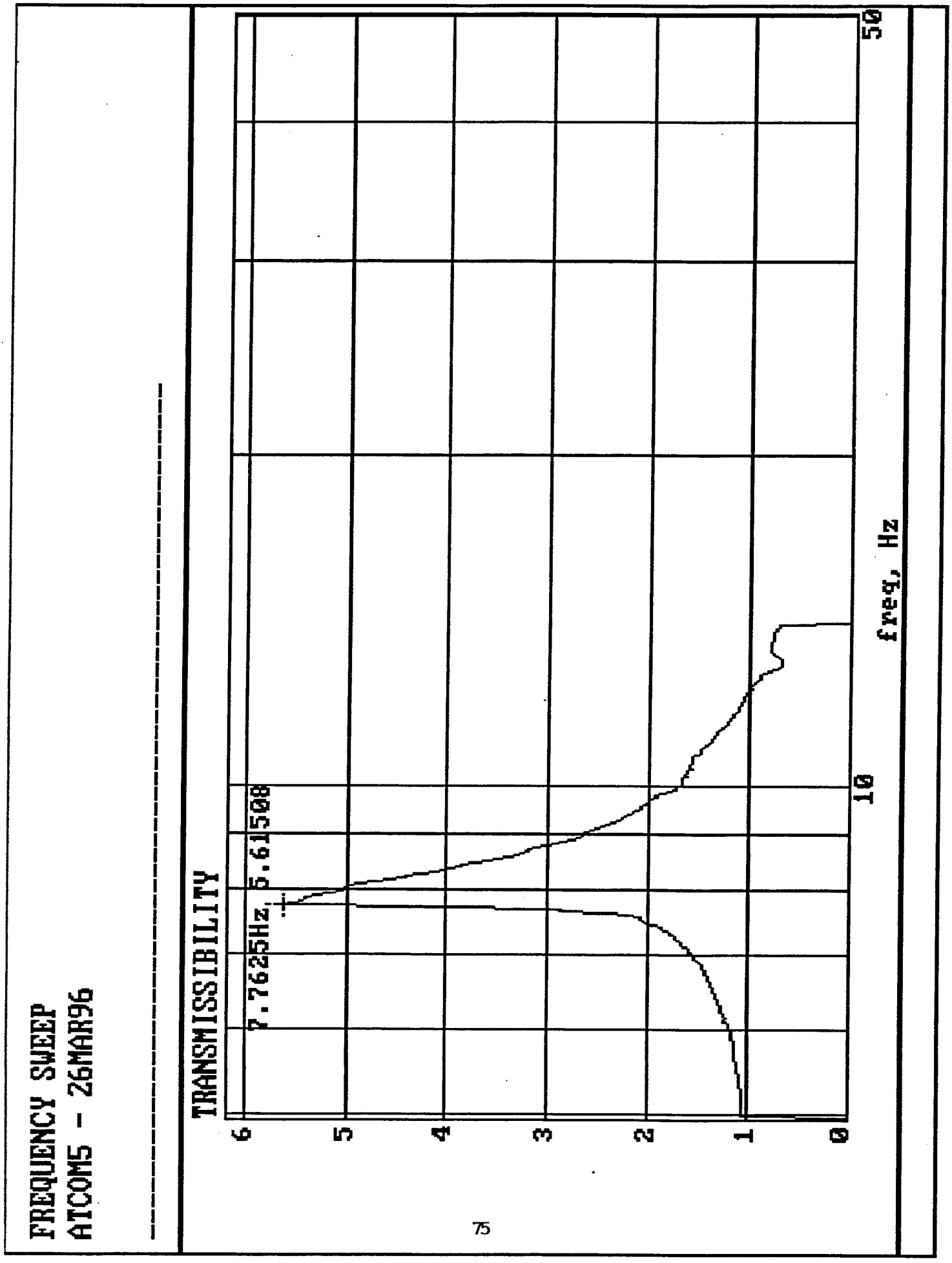
TEST ENGINEER : FILSINGER
FREQUENCY (Hz): 4.4
TEST TIME(min): 70



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	2.59 S	0.07 g's	1.09 g's	111.60 In/s		256 mS
2	2.59 S	0.01 g's	-1.27 g's	-177.39 In/s		256 mS
3	2.59 S	1.19 g's	5.19 g's	880.33 In/s		256 mS
■ 4	2.59 S	-1.24 g's	-2.92 g's	-779.10 In/s		256 mS

Remarks:

CH 1 X-AXIS (LONGITUDINAL MOTION RELATIVE TO DESICANT PORT)
CH 2 Y-AXIS (TRANSVERSE MOTION)
CH 3 Z-AXIS (VERTICAL MOTION)
CH 4 TABLE MOTION

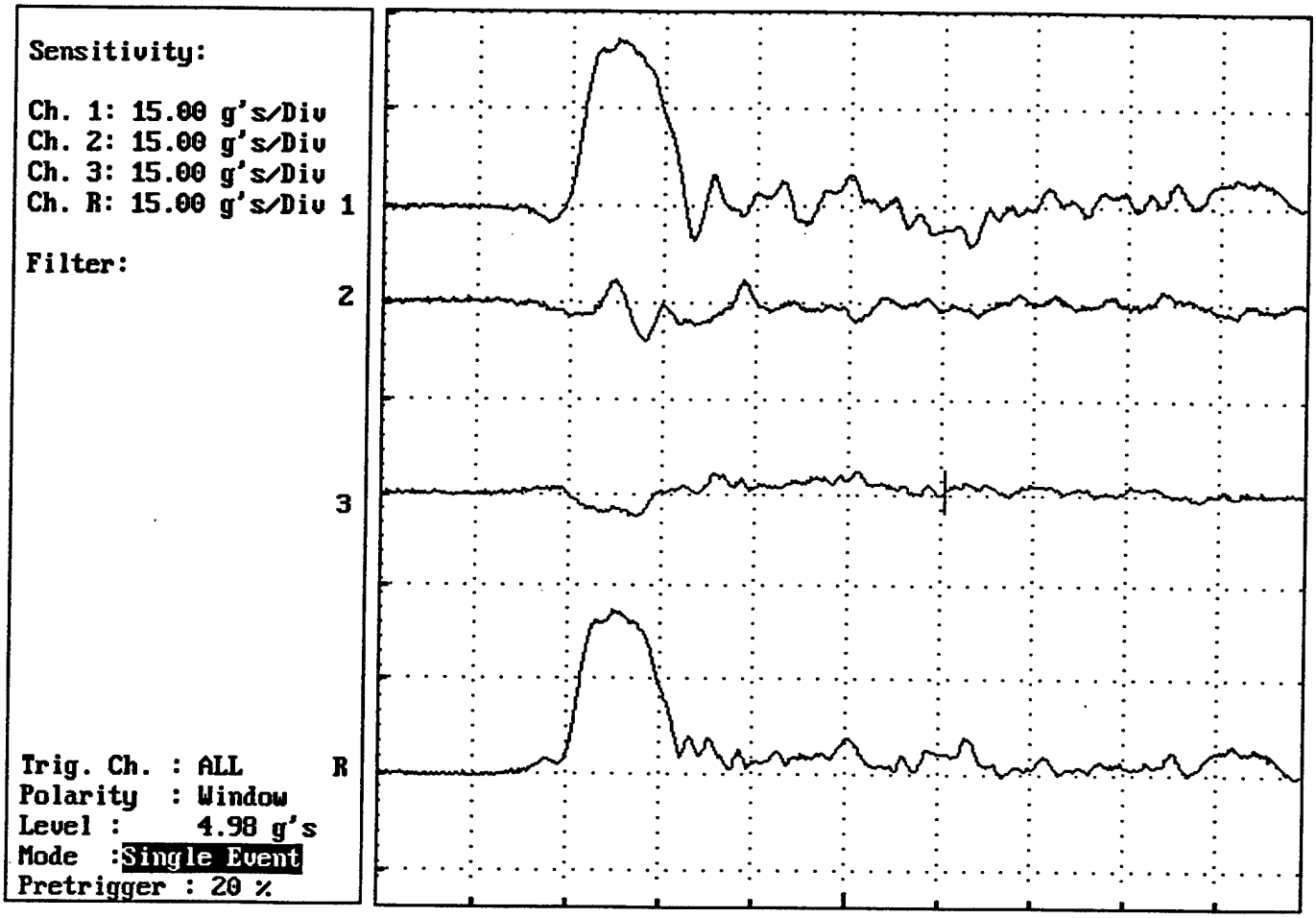

FREQUENCY SWEEP
ATCOMS - 26MAR96
TRANSMISSIBILITY
7.7625Hz, 5.61508
0
1
2
3
4
5
6
10
50
freq, Hz

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu May 02 96 14:51
Rotational Drop 60Deg C (140Deg F)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact Point : 325
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-3.45 g's	26.25 g's	109.73 In/s		12.8 mS
2	77.31 mS	-1.15 g's	-6.46 g's	-26.15 In/s		12.8 mS
■ 3	77.31 mS	0.37 g's	-4.14 g's	13.07 In/s		12.8 mS
R	77.31 mS	3.66 g's	26.13 g's	113.55 In/s		12.8 mS

Remarks:

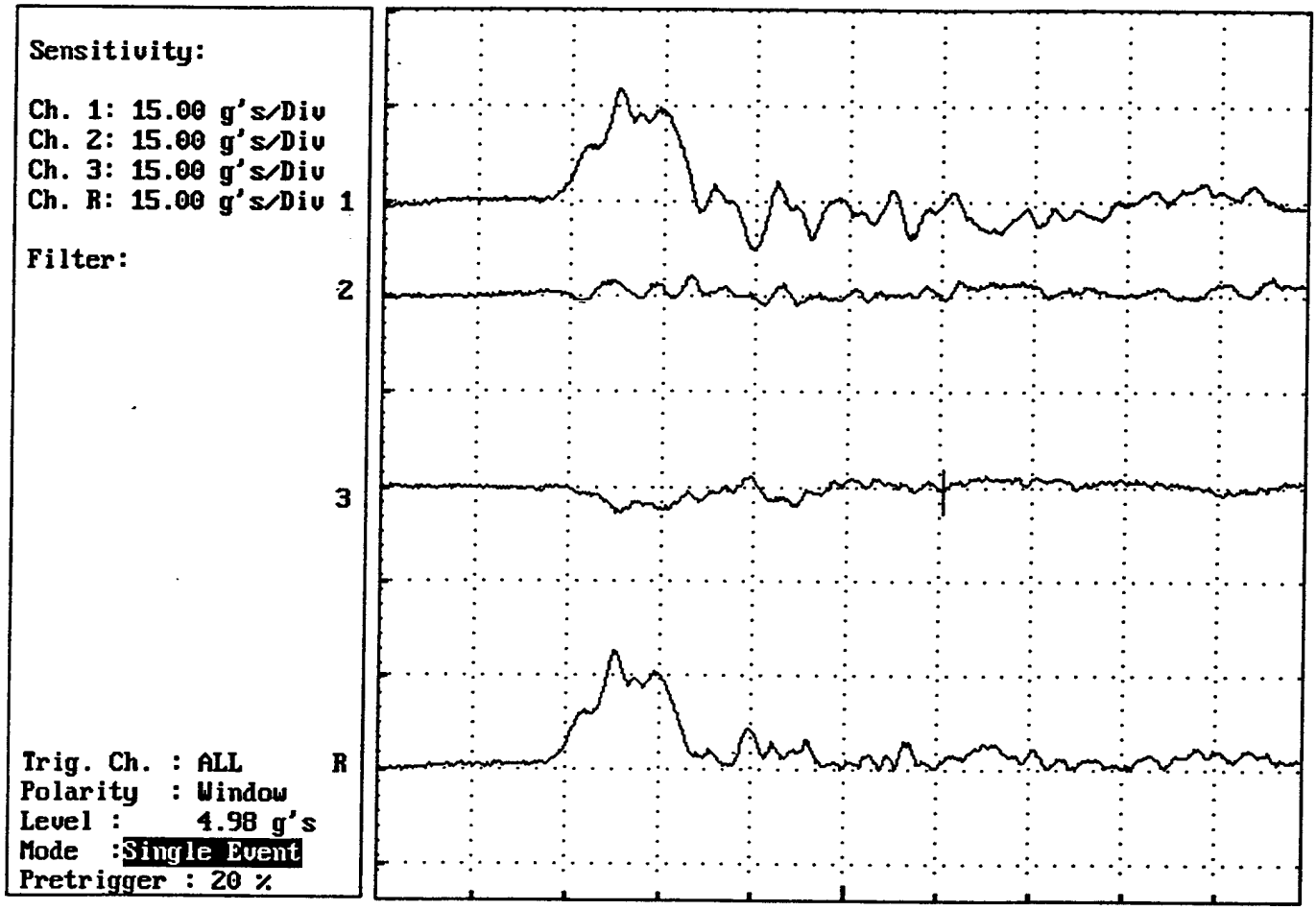
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu May 02 96 15:04
Rotational Drop 60Deg C (140Deg F)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact Point : 346
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	1.28 g's	19.00 g's	76.21 In/s		12.8 mS
2	77.31 mS	-0.76 g's	3.49 g's	7.38 In/s		12.8 mS
■ 3	77.31 mS	-0.98 g's	-4.75 g's	-29.66 In/s		12.8 mS
R	77.31 mS	1.78 g's	19.13 g's	82.11 In/s		12.8 mS

Remarks:

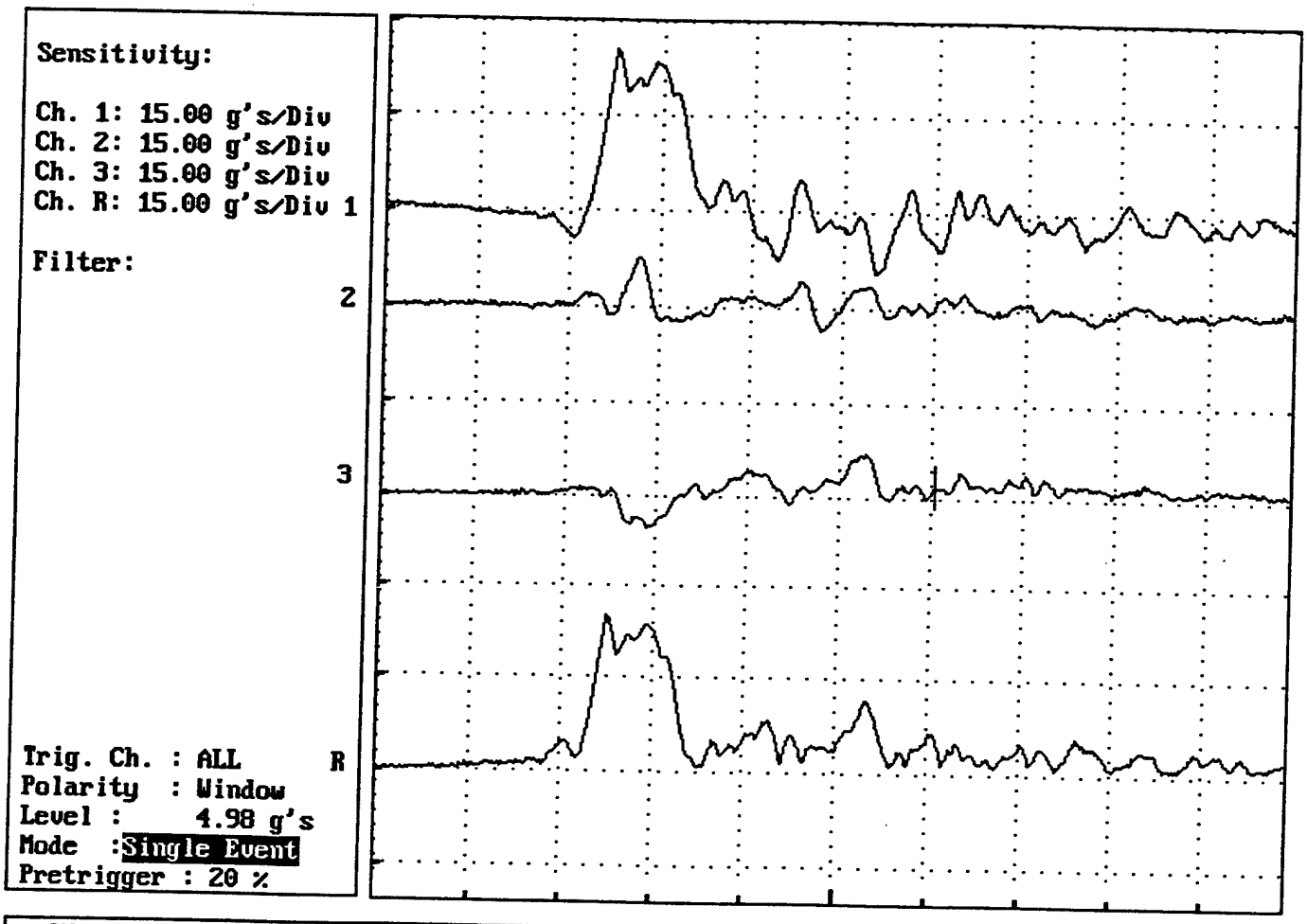
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu May 02 96 14:57
Rotational Drop 60Deg C (140Deg F)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact Point : 32
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-5.99 g's	25.47 g's	61.34 In/s		12.8 mS
2	77.31 mS	1.48 g's	8.00 g's	18.85 In/s		12.8 mS
■ 3	77.31 mS	1.82 g's	7.46 g's	19.65 In/s		12.8 mS
R	77.31 mS	6.43 g's	25.03 g's	67.11 In/s		12.8 mS

Remarks:

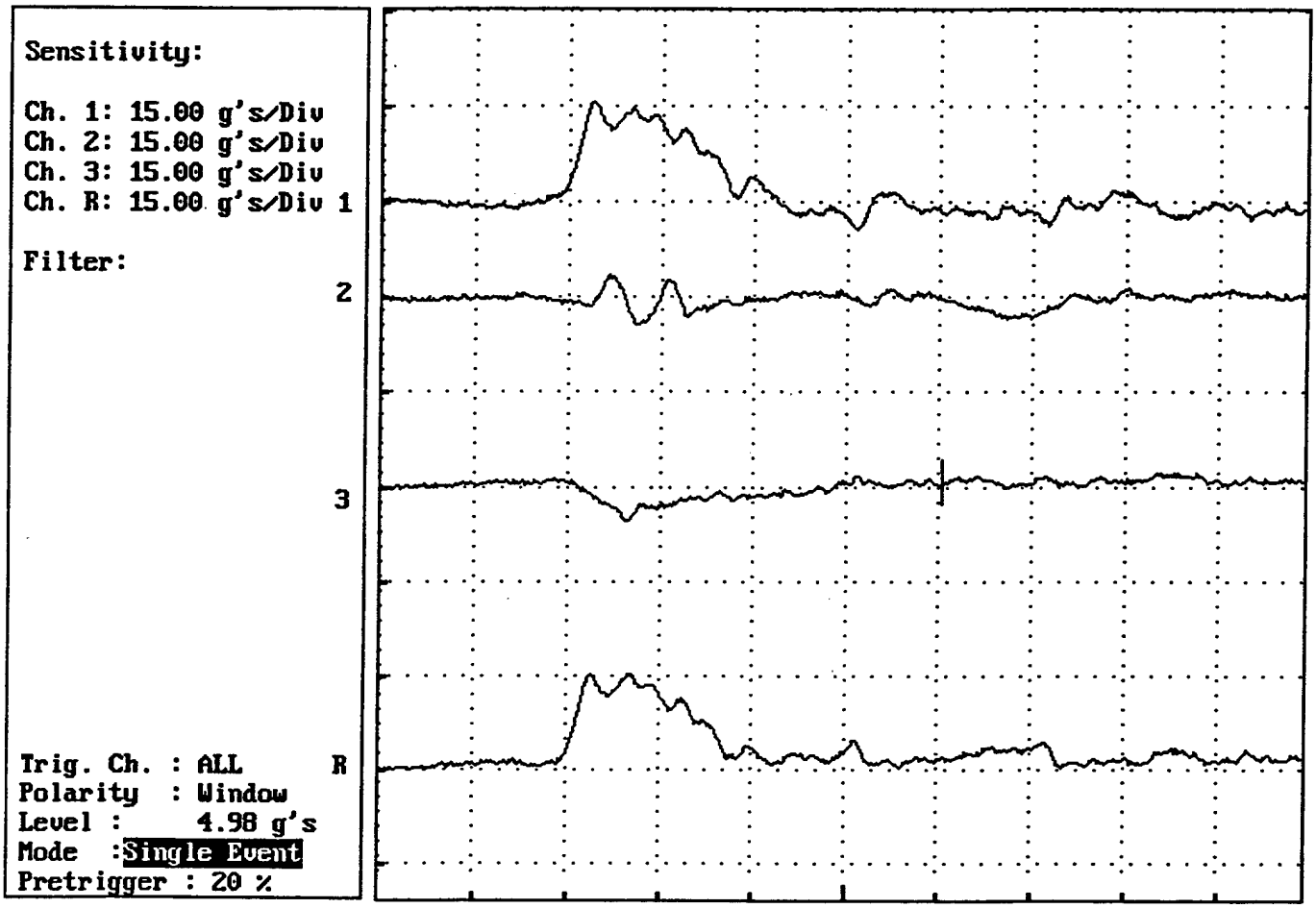
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIT (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Thu May 02 96 15:11
Rotational Drop 60Deg C (140Deg F)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact Point : 35
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.92 g's	15.73 g's	75.92 In/s		12.8 mS
2	77.31 mS	-0.03 g's	-4.35 g's	-0.834 In/s		12.8 mS
■ 3	77.31 mS	0.64 g's	-5.77 g's	-17.82 In/s		12.8 mS
R	77.31 mS	2.02 g's	15.45 g's	77.99 In/s		12.8 mS

Remarks:

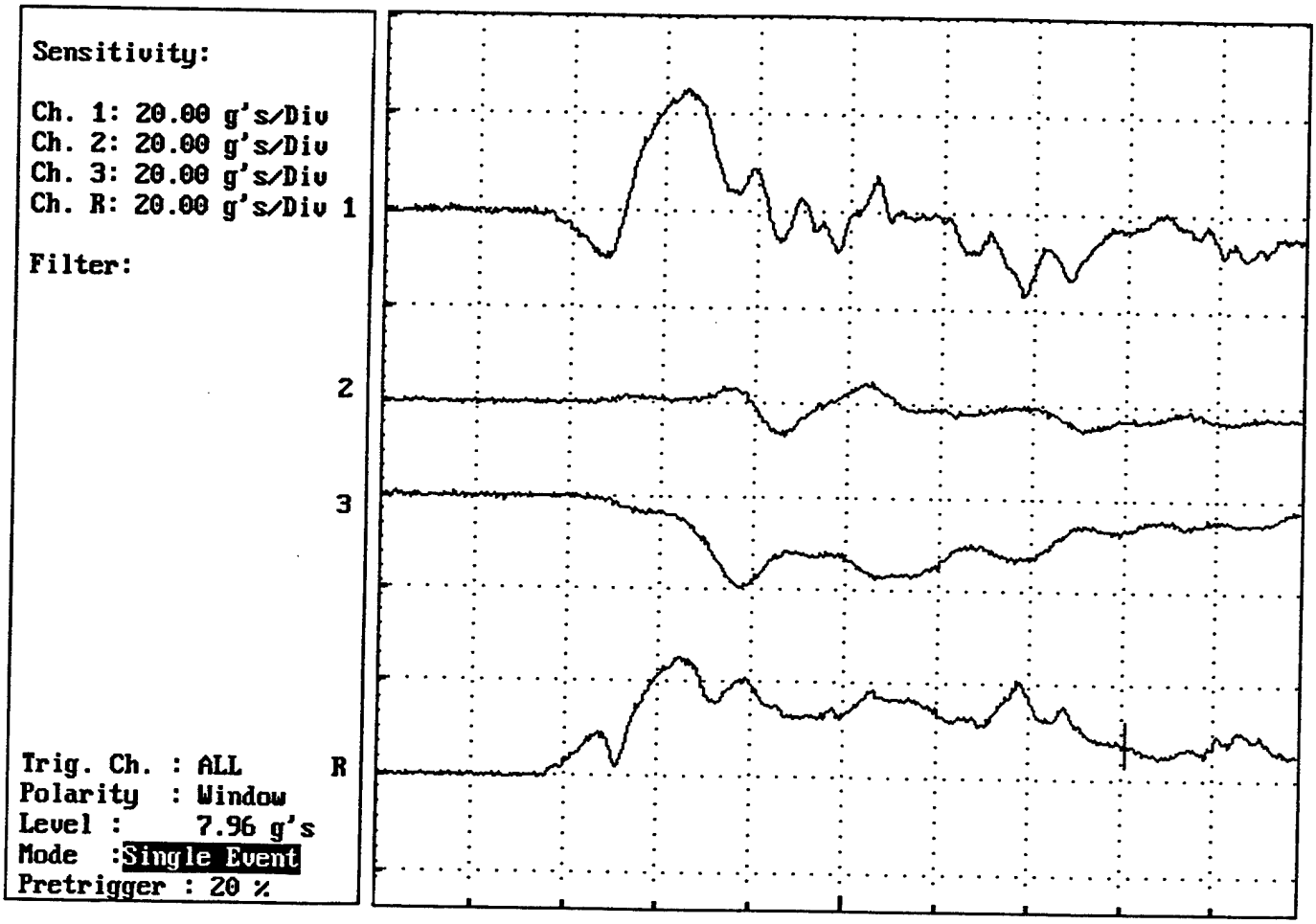
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri May 03 96 08:39
PENDULUM IMPACT 73.9DegC (165DegF)
TEST ITEM : ATCOM6

TEST ENGINEER : FILSINGER
IMPACT FACE : 4
IMPACT VELOCITY 2.13m/sec (7ft/sec)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	-2.81 g's	26.48 g's	2.63 In/s		12.8 mS
2	102.91 mS	-2.83 g's	-7.03 g's	-16.32 In/s		12.8 mS
3	102.91 mS	-6.82 g's	-20.10 g's	-311.24 In/s		12.8 mS
■ R	102.91 mS	7.90 g's	25.77 g's	311.68 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Fri May 03 96 08:42
PENDULUM IMPACT 73.9DegC (165DegF)
TEST ITEM : ATCOM6

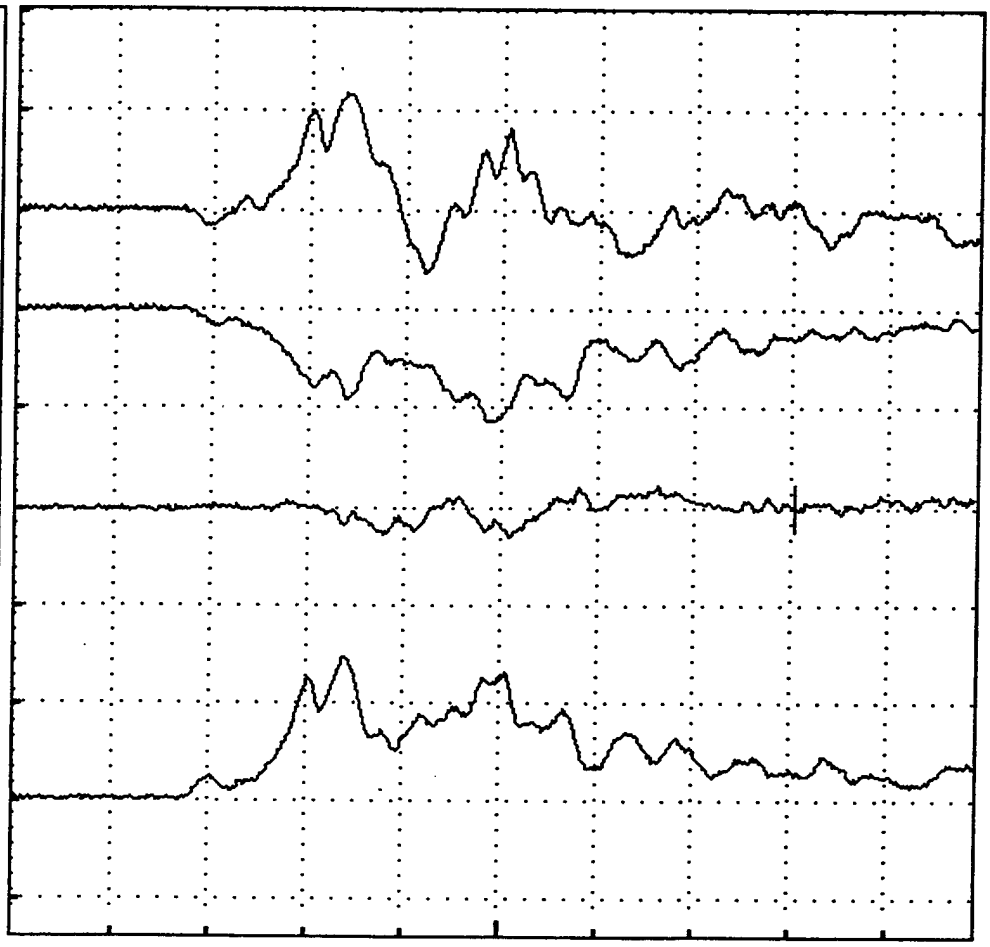
TEST ENGINEER : FILSINGER
IMPACT FACE : 5
IMPACT VELOCITY 2.13m/sec (7ft/sec)

Sensitivity:

Ch. 1: 20.00 g's/Div
Ch. 2: 20.00 g's/Div
Ch. 3: 20.00 g's/Div
Ch. R: 20.00 g's/Div

Filter:

Trig. Ch. : ALL
Polarity : Window
Level : 7.96 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	102.91 mS	1.53 g's	23.94 g's	65.98 In/s		12.8 mS
2	102.91 mS	-5.89 g's	-23.86 g's	-332.68 In/s		12.8 mS
■ 3	102.91 mS	0.09 g's	-6.06 g's	-4.12 In/s		12.8 mS
R	102.91 mS	6.09 g's	29.64 g's	339.18 In/s		12.8 mS

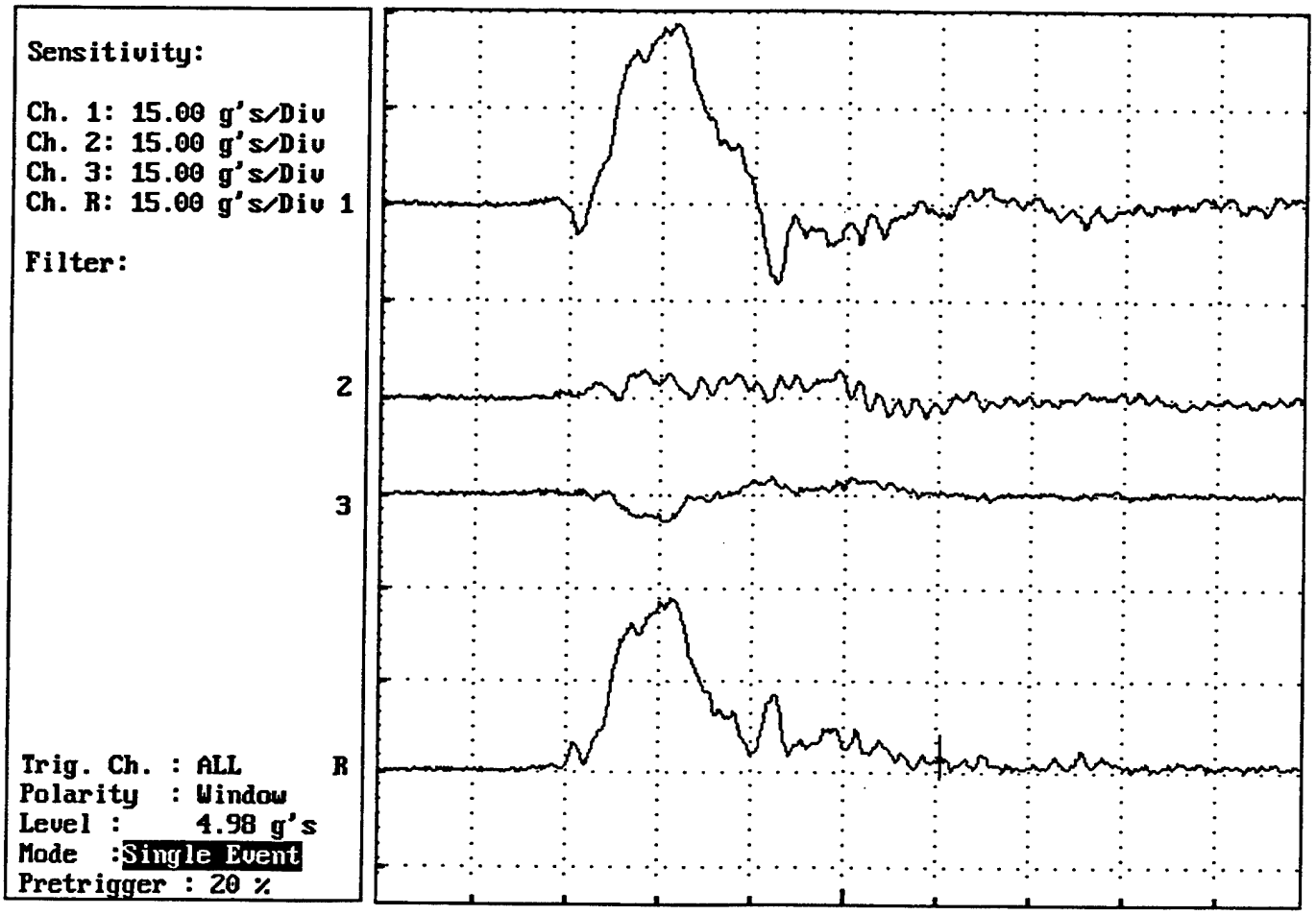
Remarks:

CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date	: Wed May 01 96 09:14	Test Engineer	: Filsinger
Rotational Drop	: -28.9DegC (-20DegF)	Impact Point	: 326
Test Item	: ATCOM6	Drop Height	: 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.49 g's	28.61 g's	100.14 In/s		12.8 mS
2	77.31 mS	-2.09 g's	4.65 g's	25.25 In/s		12.8 mS
3	77.31 mS	0.66 g's	-4.54 g's	8.56 In/s		12.8 mS
■ R	77.31 mS	2.65 g's	28.54 g's	103.63 In/s		12.8 mS

Remarks:

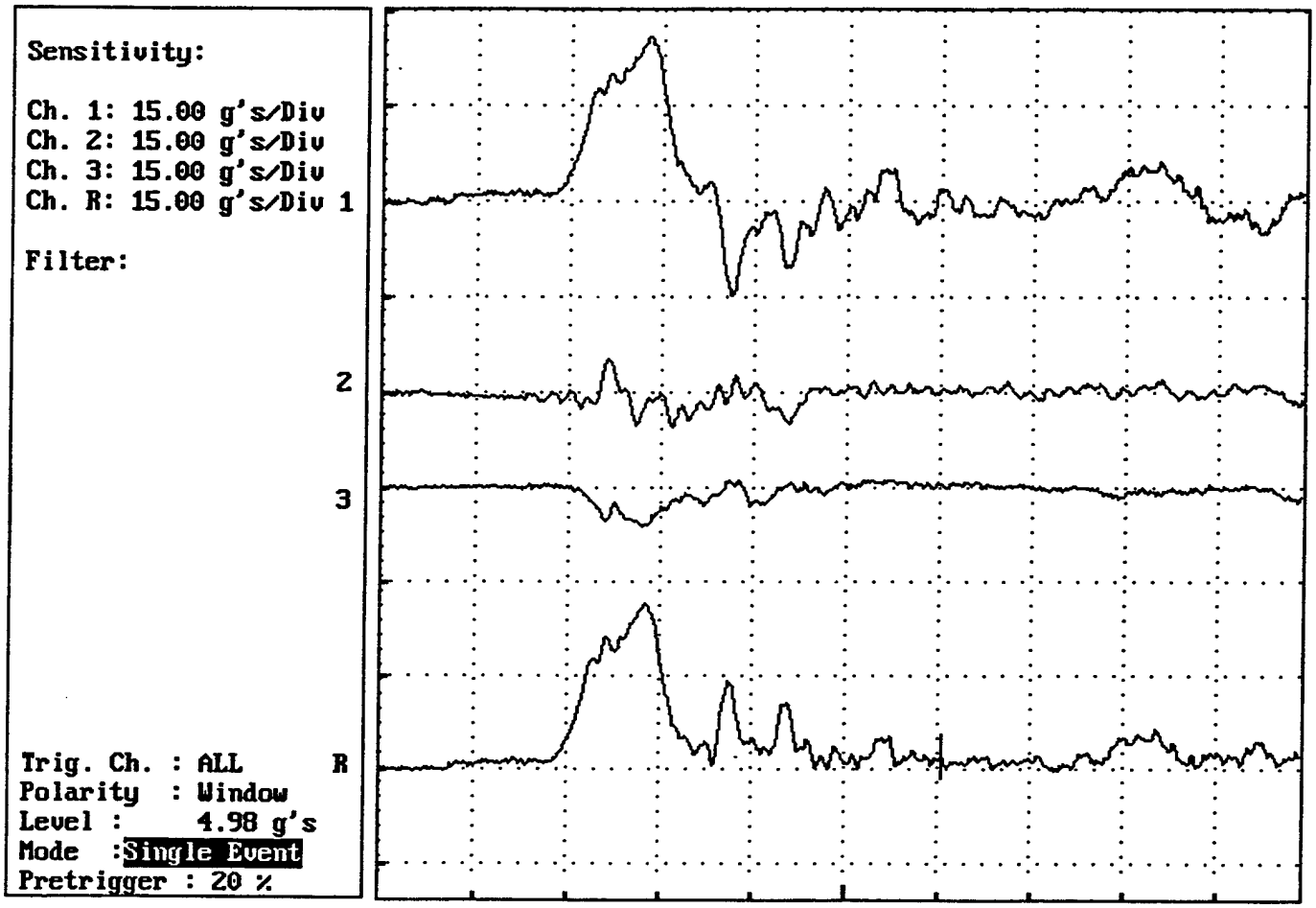
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed May 01 96 09:23
Rotational Drop -28.9DegC (-20DegF)
Test Item : ATCOM6

Test Engineer : Filsinger
Impact Point : 345
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	2.17 g's	26.56 g's	88.17 In/s		12.8 mS
2	77.31 mS	0.92 g's	5.94 g's	-12.05 In/s		12.8 mS
3	77.31 mS	0.50 g's	-6.34 g's	-19.22 In/s		12.8 mS
■ R	77.31 mS	2.41 g's	26.90 g's	91.04 In/s		12.8 mS

Remarks:

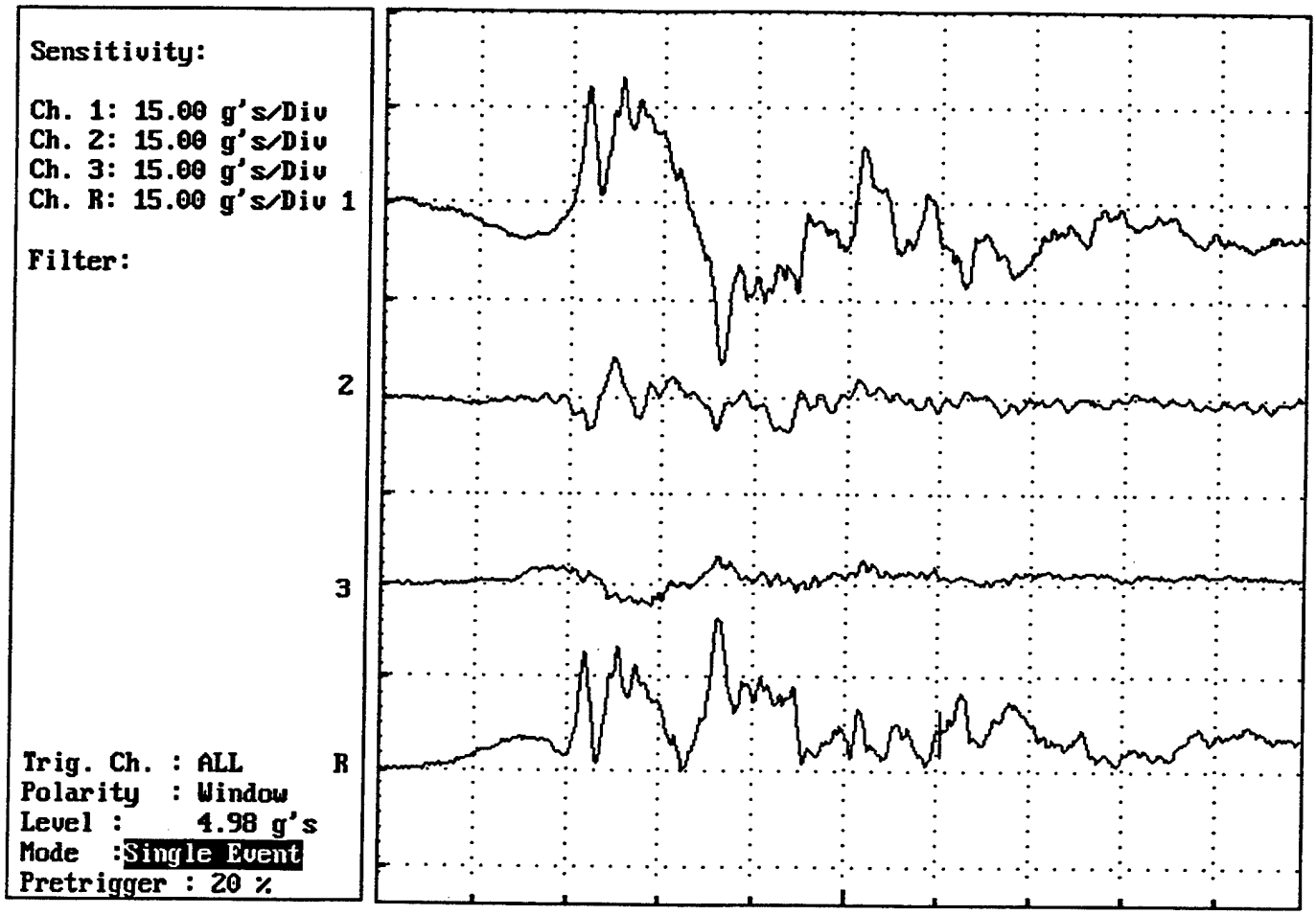
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Wed May 01 96 09:32
Rotational Drop -28.9DegC (-20DegF)
Test Item : ATCOM6

Test Engineer : Filsinger
Impact Point : 34
Drop Height : 711.2mm (28in)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-6.22 g's	-24.71 g's	-49.03 In/s		12.8 mS
2	77.31 mS	-0.41 g's	6.47 g's	-18.24 In/s		12.8 mS
3	77.31 mS	1.28 g's	4.76 g's	23.31 In/s		12.8 mS
■ R	77.31 mS	6.36 g's	24.87 g's	57.27 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

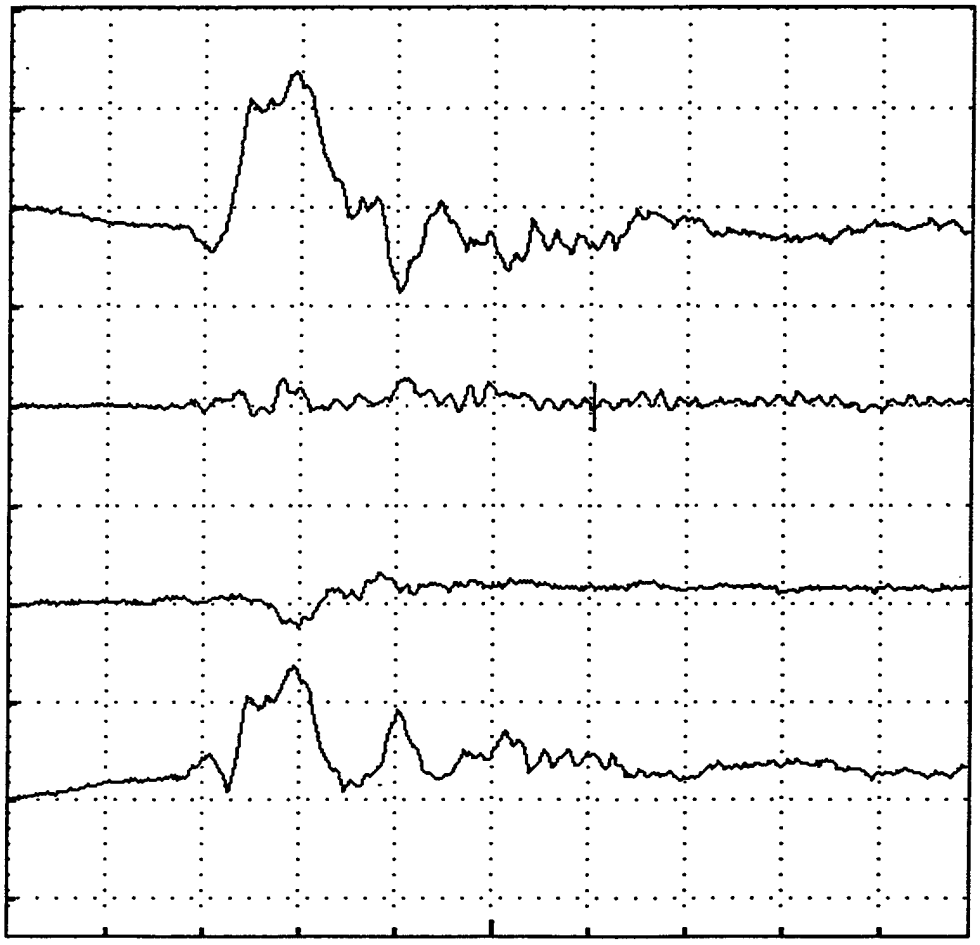
Date	: Wed May 01 96 09:40	Test Engineer	: Filsinger
Rotational Drop	-28.9DegC (-20DegF)	Impact Point	: 36
Test Item	: ATCOM6	Drop Height	: 711.2mm (28in)

Sensitivity:

Ch. 1: 15.00 g's/Div
Ch. 2: 15.00 g's/Div
Ch. 3: 15.00 g's/Div
Ch. R: 15.00 g's/Div

Filter:

Trig. Ch. : ALL
Polarity : Window
Level : 4.98 g's
Mode : Single Event
Pretrigger : 20 %



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-6.54 g's	20.56 g's	-20.42 In/s		12.8 mS
■ 2	77.31 mS	-0.17 g's	4.70 g's	23.85 In/s		12.8 mS
3	77.31 mS	2.88 g's	5.40 g's	48.74 In/s		12.8 mS
R	77.31 mS	7.15 g's	20.54 g's	57.98 In/s		12.8 mS

Remarks:

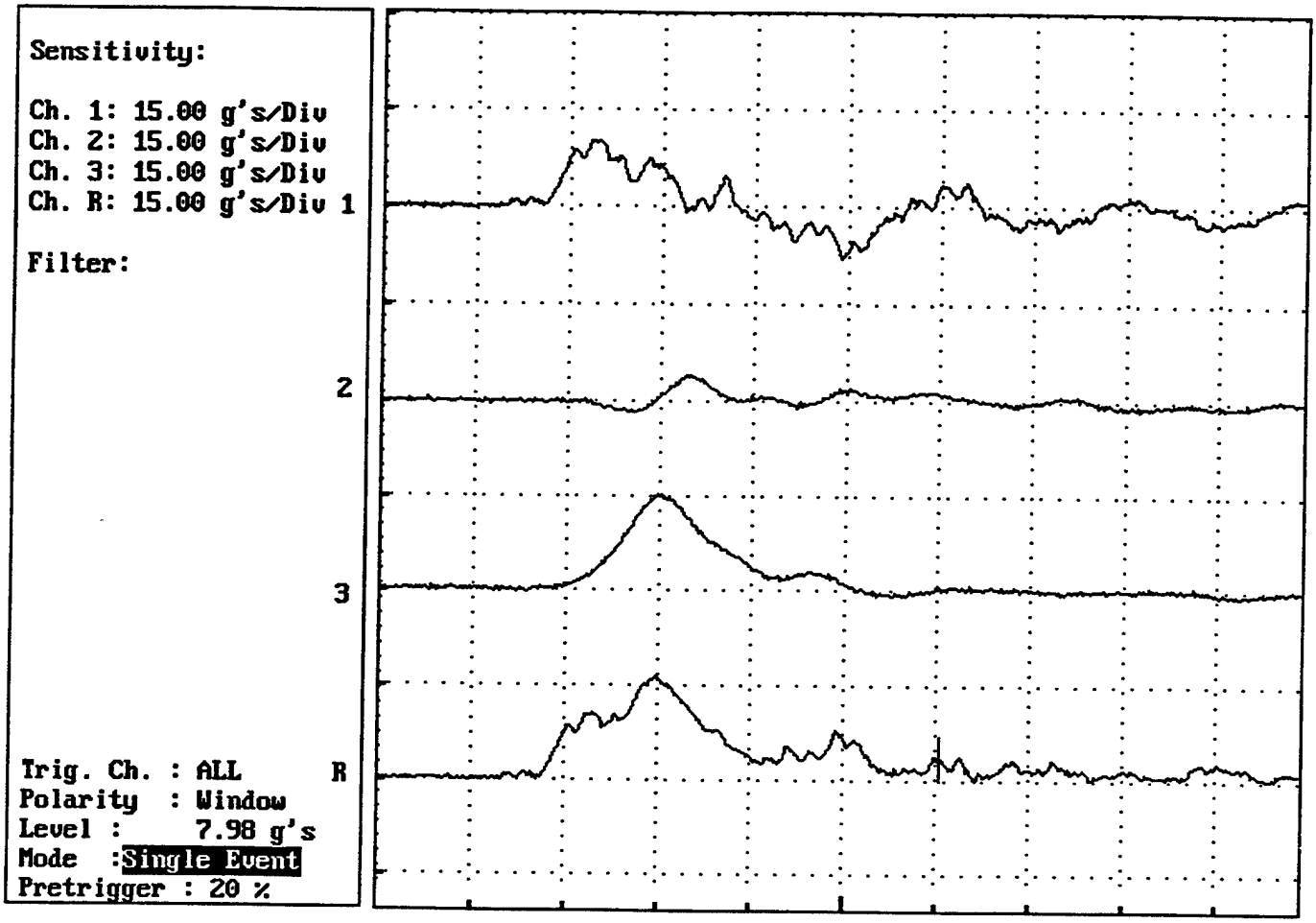
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Tue Apr 30 96 11:19
Pendulum Impact -53.9DegC (-65DegF)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact face : 2
Impact Velocity 2.13m/sec (7ft/sec)



CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	3.52 g's	10.77 g's	26.58 In/s		12.8 mS
2	77.31 mS	1.16 g's	4.31 g's	14.20 In/s		12.8 mS
3	77.31 mS	-0.05 g's	15.36 g's	87.48 In/s		12.8 mS
■ R	77.31 mS	3.70 g's	16.45 g's	92.53 In/s		12.8 mS

Remarks:

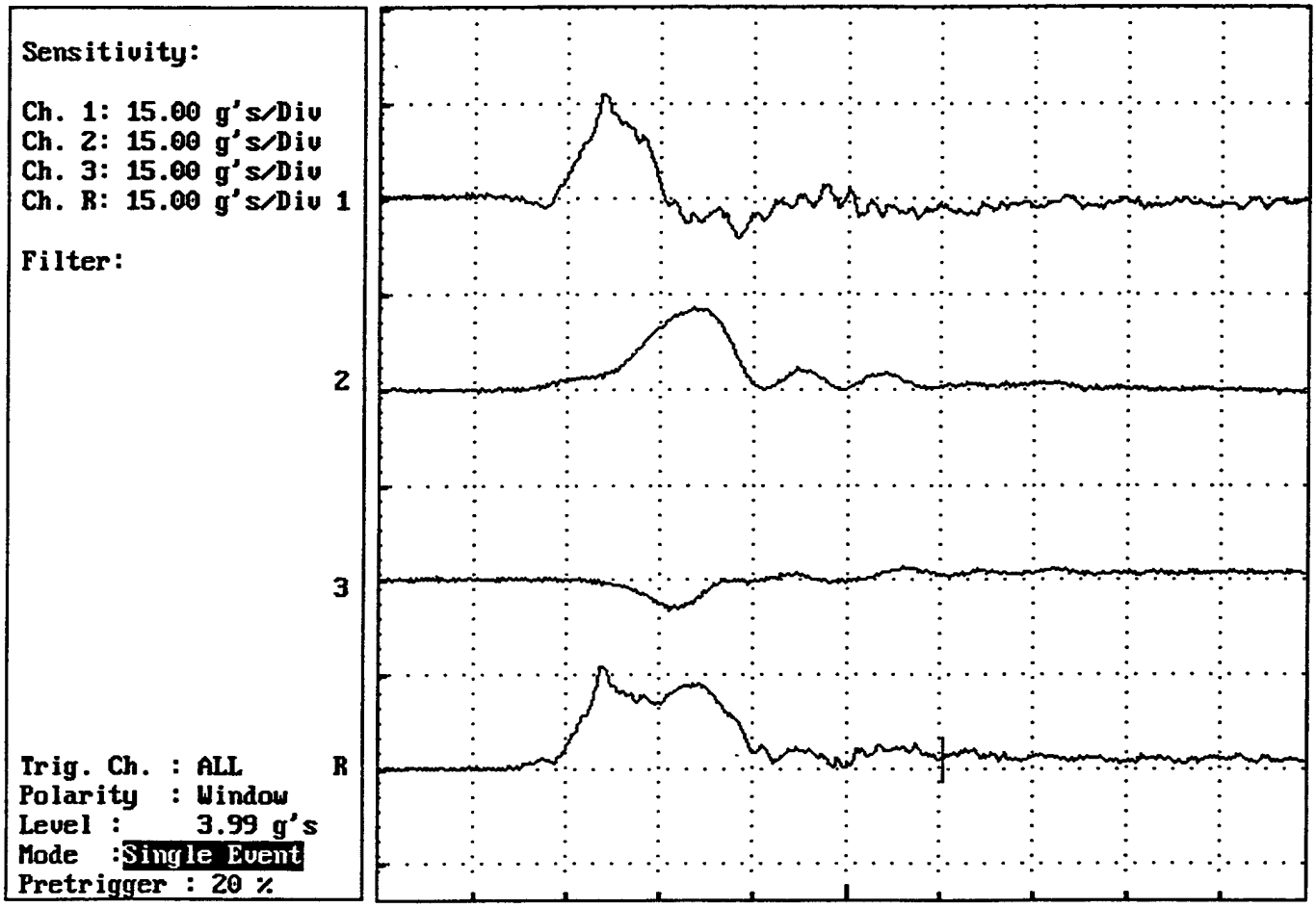
CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

Waveform Test Report

GHI SYSTEMS, INC. CAT SYSTEM

Date : Tue Apr 30 96 11:24
Pendulum Impact -53.9DegC (-65DegF)
Test Item : ATCOM6

Test Engineer : FILSINGER
Impact Face : 6
Impact Velocity 2.13m/sec (7ft/sec)



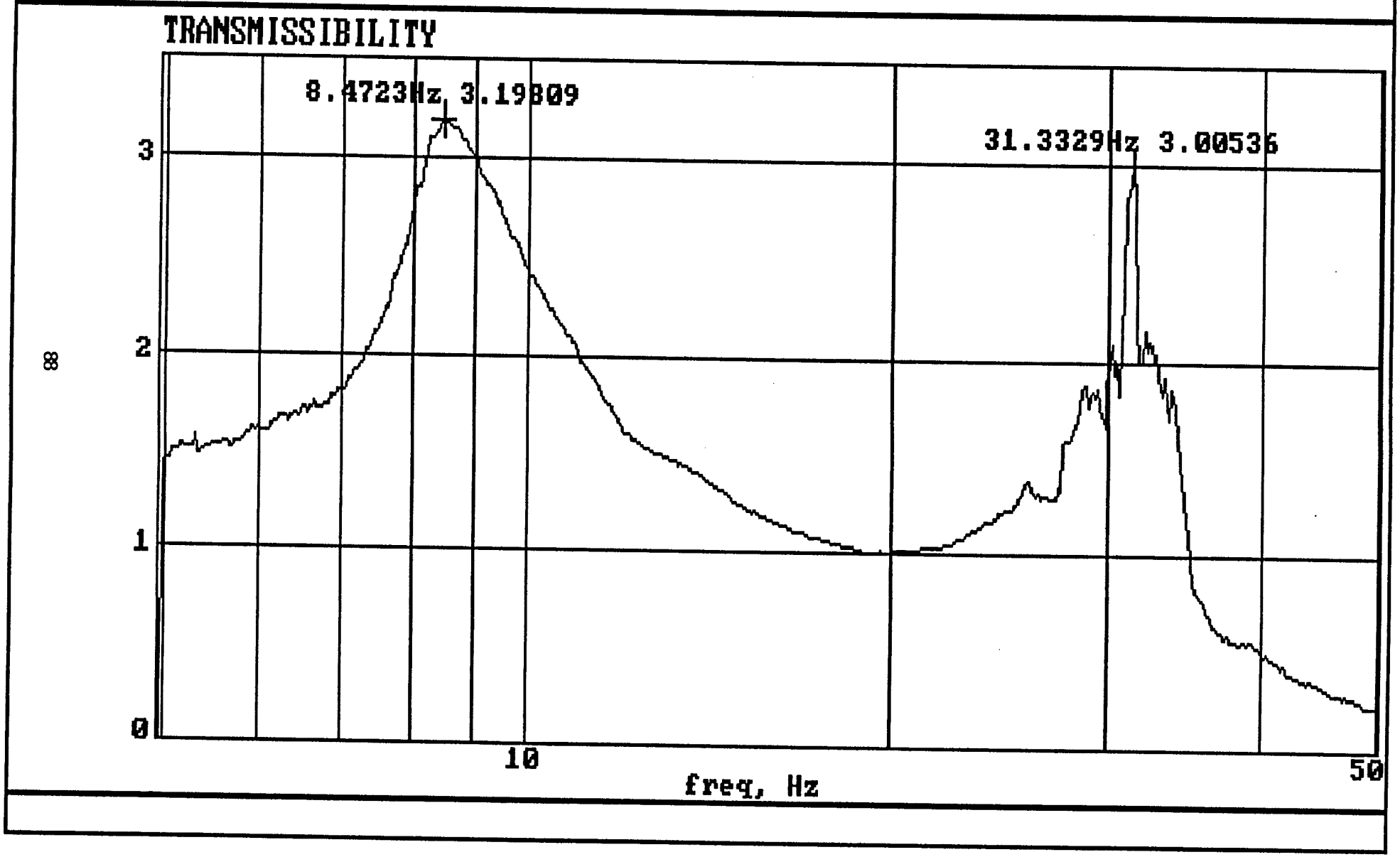
CH	TIME	CUR AMP	PEAK AMP	1ST INT	2ND INT	TIME/DIV
1	77.31 mS	-1.29 g's	16.58 g's	15.02 In/s		12.8 mS
2	77.31 mS	0.58 g's	13.14 g's	81.17 In/s		12.8 mS
3	77.31 mS	1.01 g's	-4.96 g's	-8.22 In/s		12.8 mS
■ R	77.31 mS	1.74 g's	16.37 g's	82.96 In/s		12.8 mS

Remarks:

CH 1 X-AXIS (VERTICAL MOTION)
CH 2 Y-AXIS (TRANSVERSE MOTION RELATIVE TO DESICANT PORT)
CH 3 Z-AXIS (LONGITUDINAL MOTION)
CH 4 RESULTANT

FREQUENCY SWEEP
atcom6 15 may 96

02/14/97, 07:40:26



APPENDIX 4

PHOTOGRAPHS

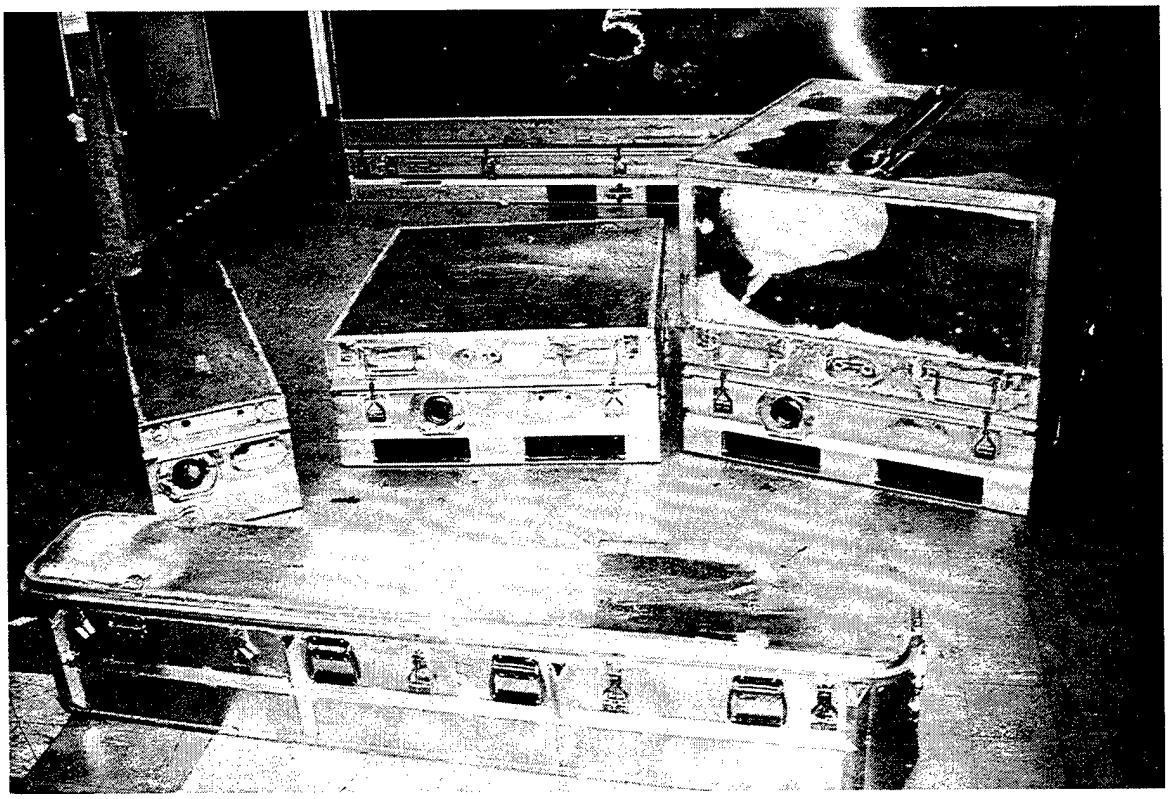


Figure 1. Containers #2, #3, #5 and #6.

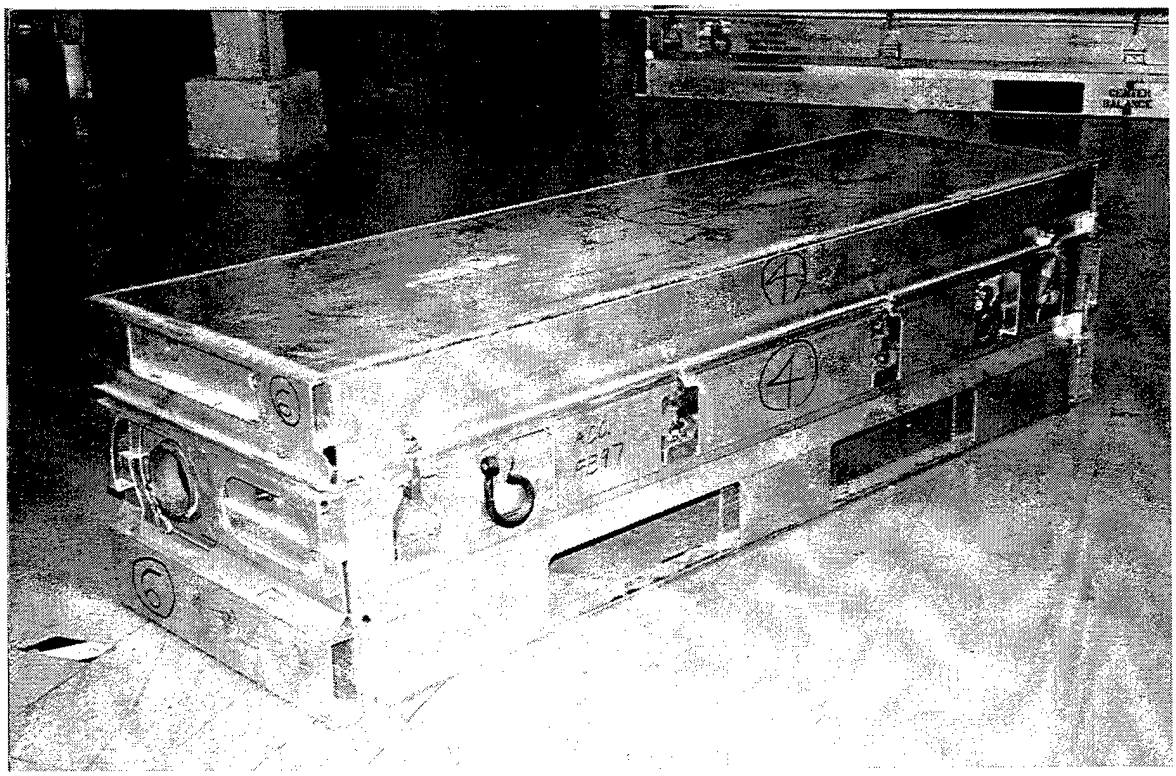


Figure 2. Container #2 with face designations shown.

Figure 3. Container #5.

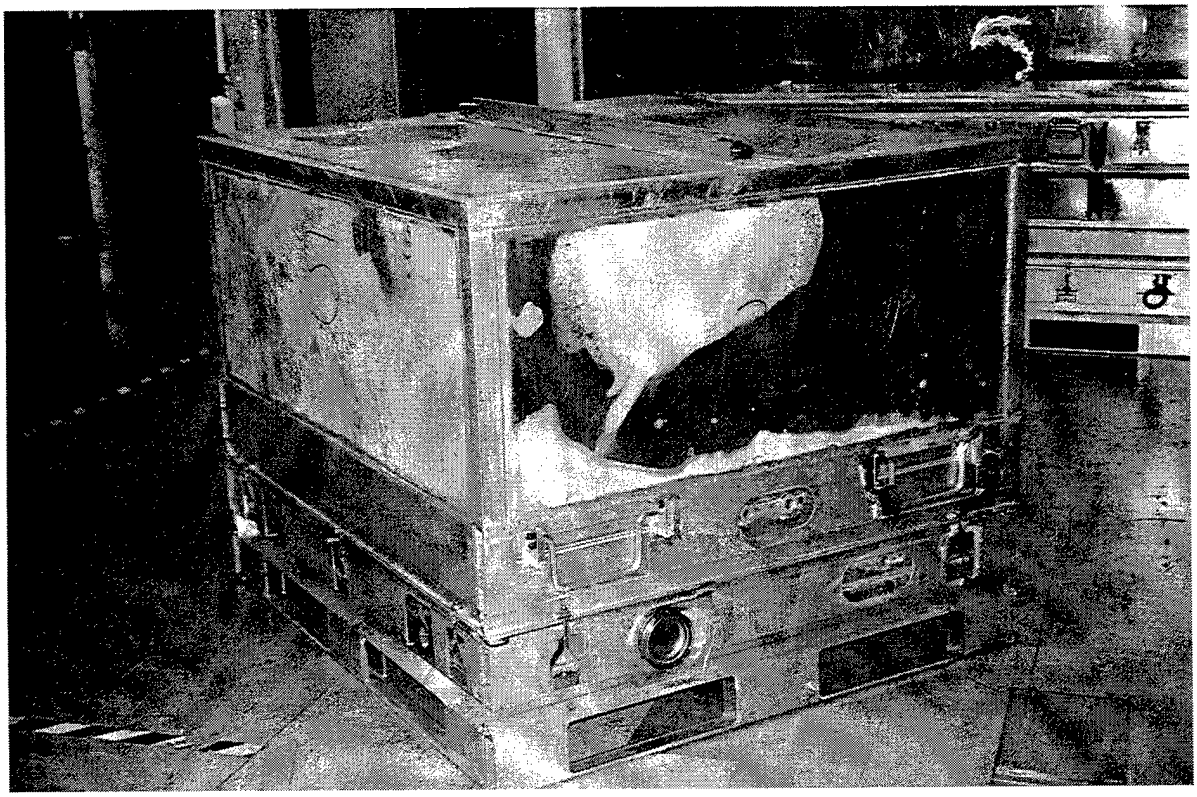


Figure 4. Container #6.

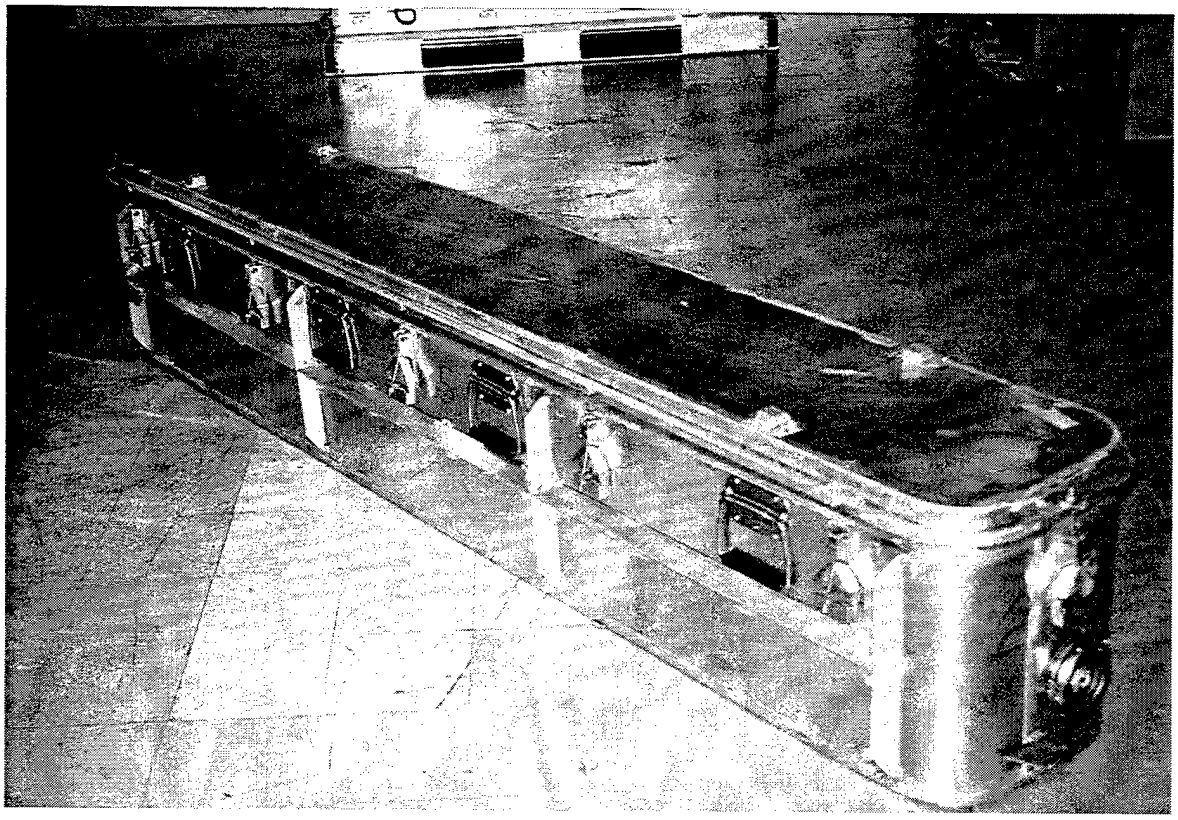


Figure 5. Container #3.

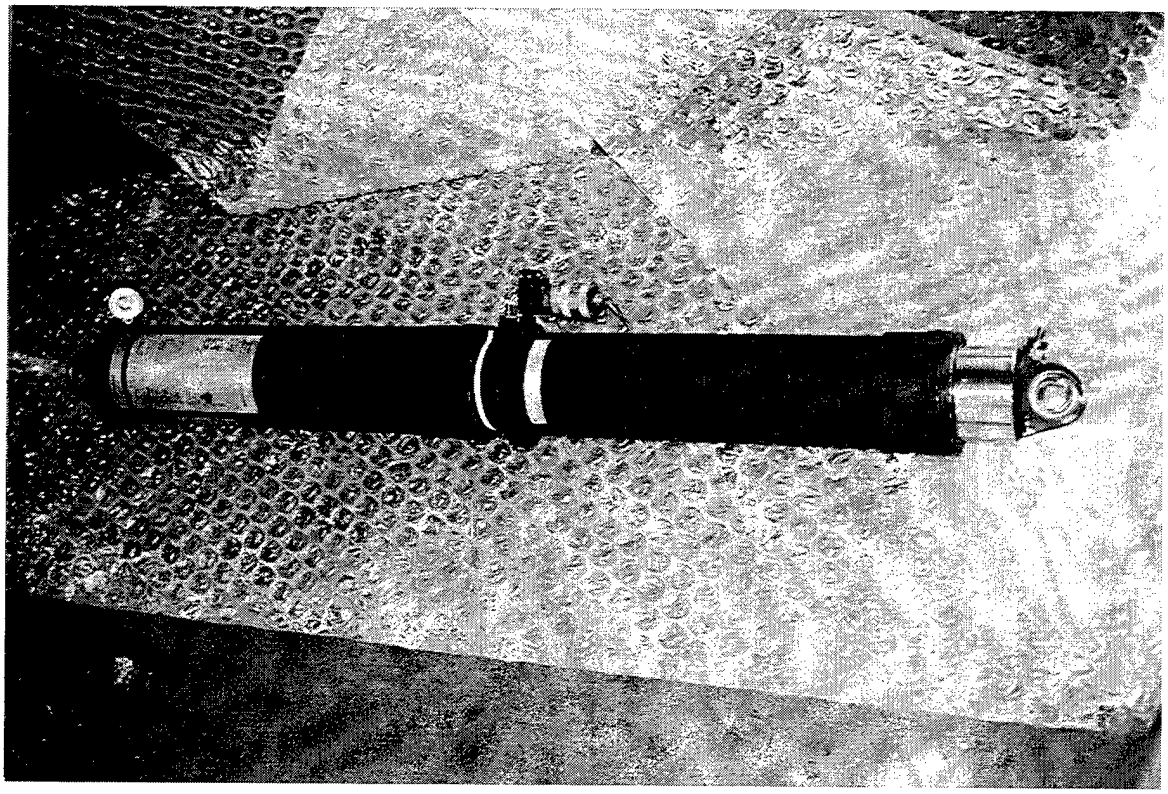


Figure 6. Fixed Landing Gear item for Container #2.

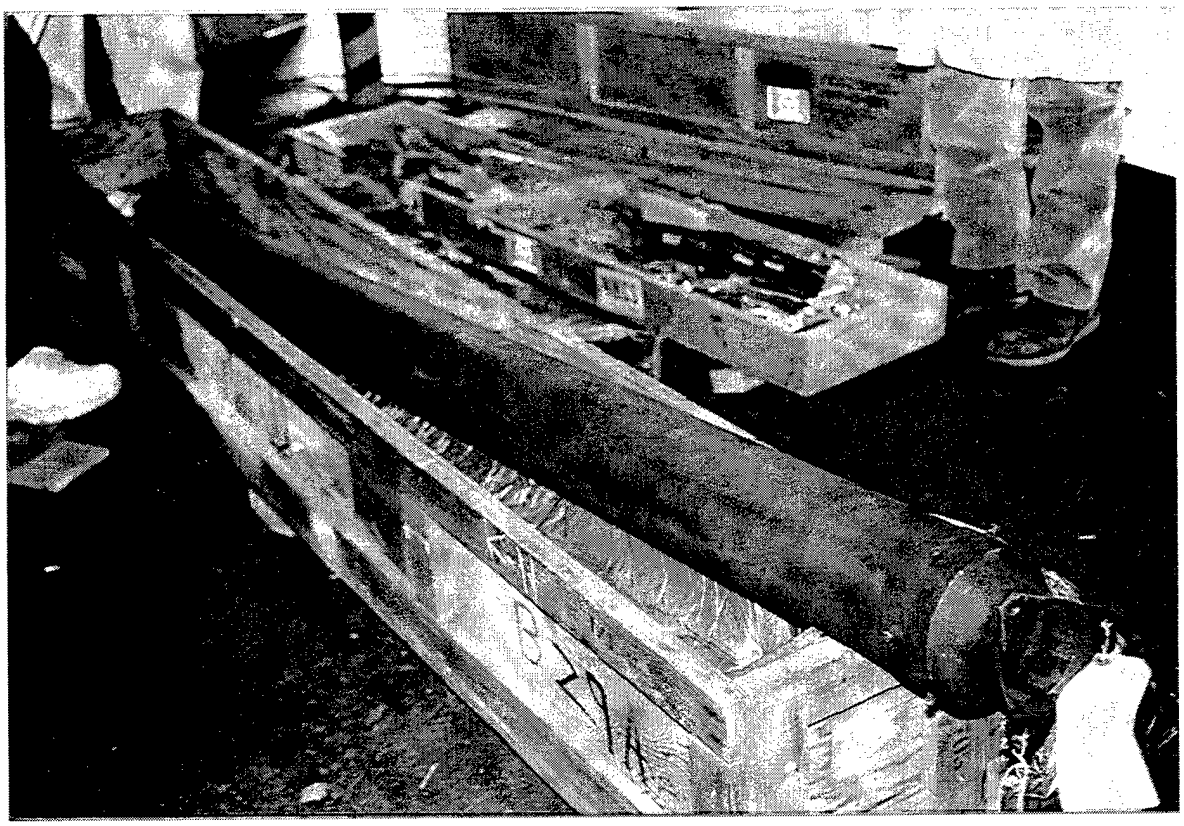


Figure 7. Shaft Assembly item for Container #3.

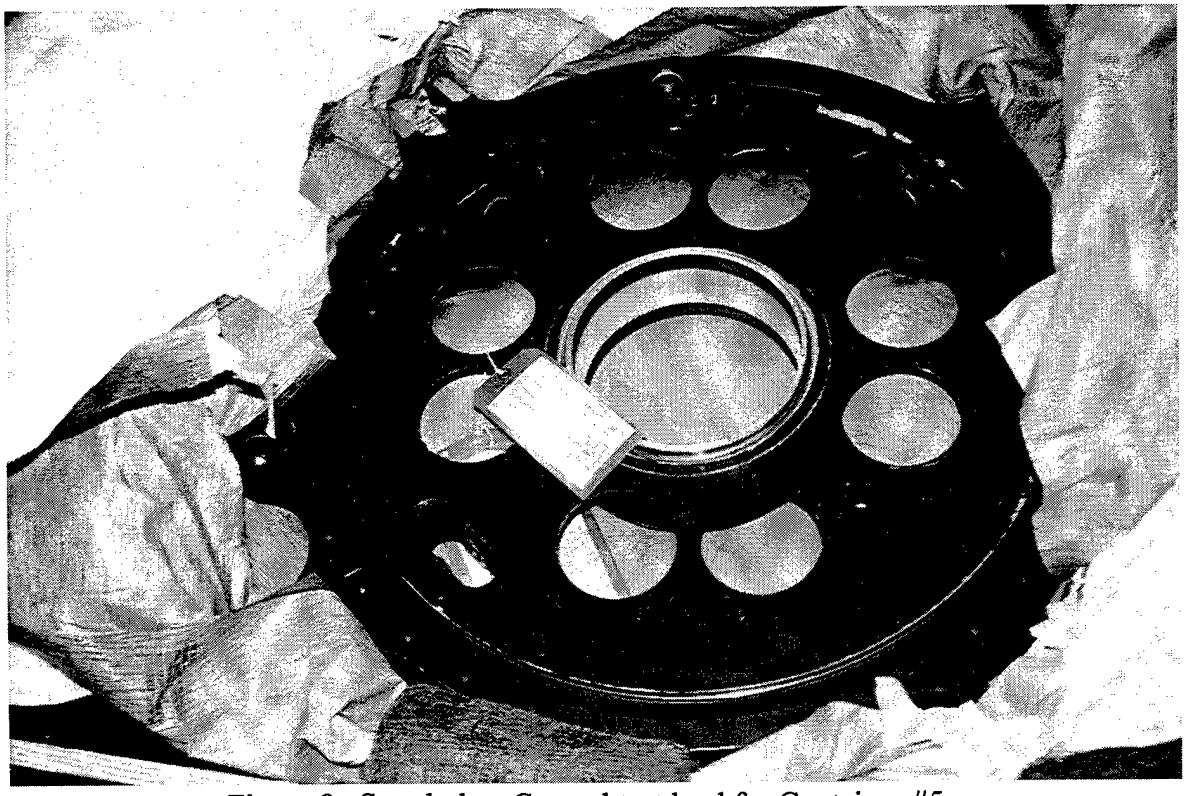


Figure 8. Swashplate Control test load for Container #5.

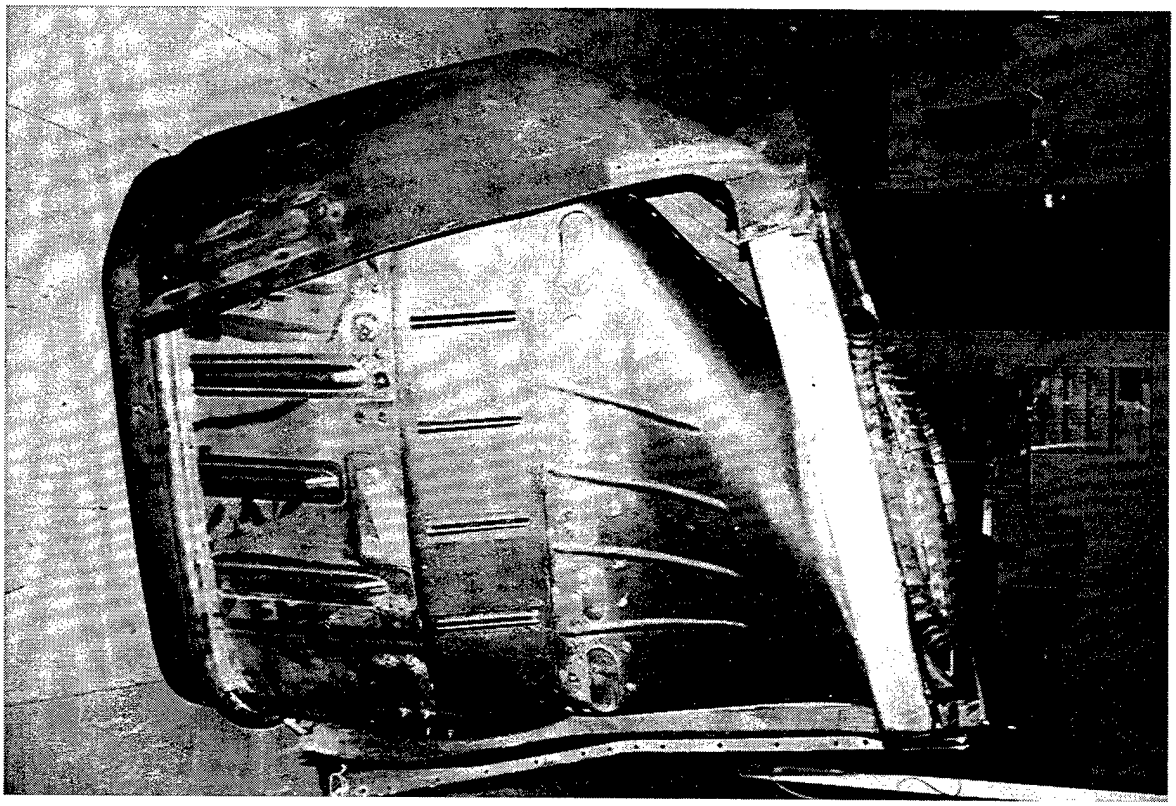


Figure 9. Support Structure test load for Container #6.

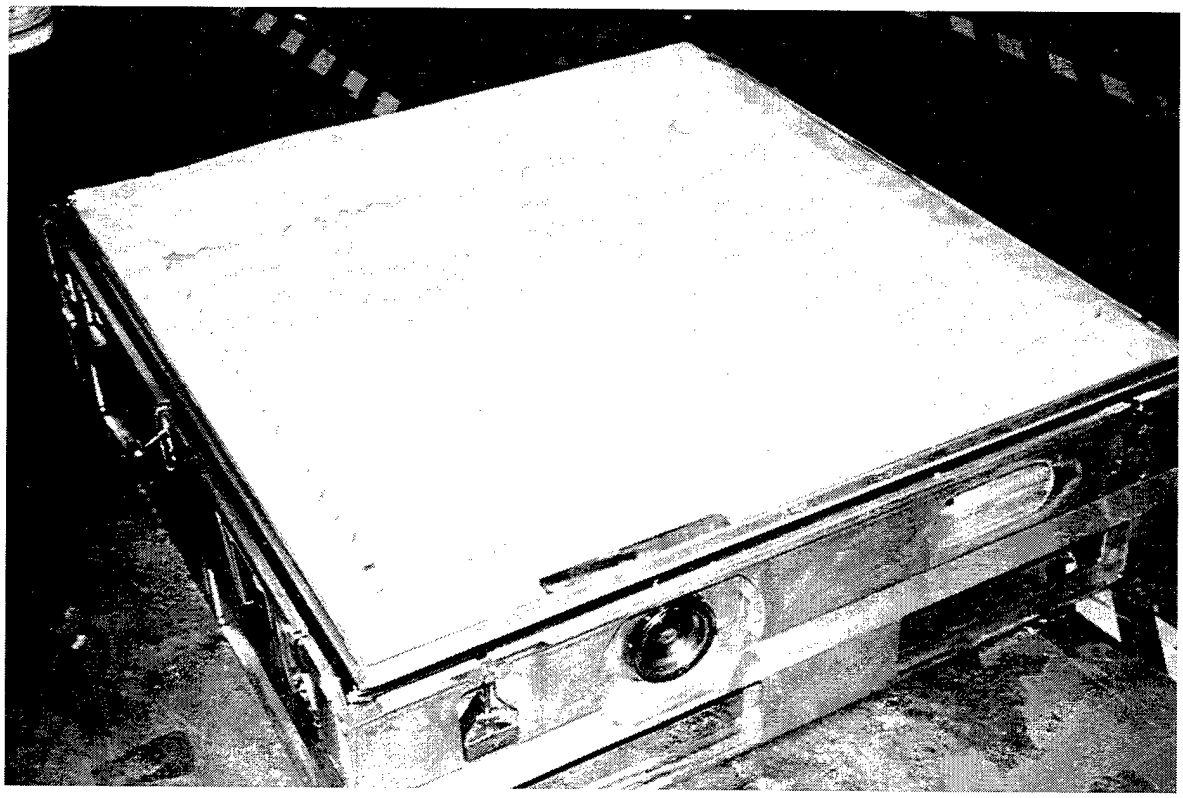


Figure 10. .Polyurethane foam cushioning.

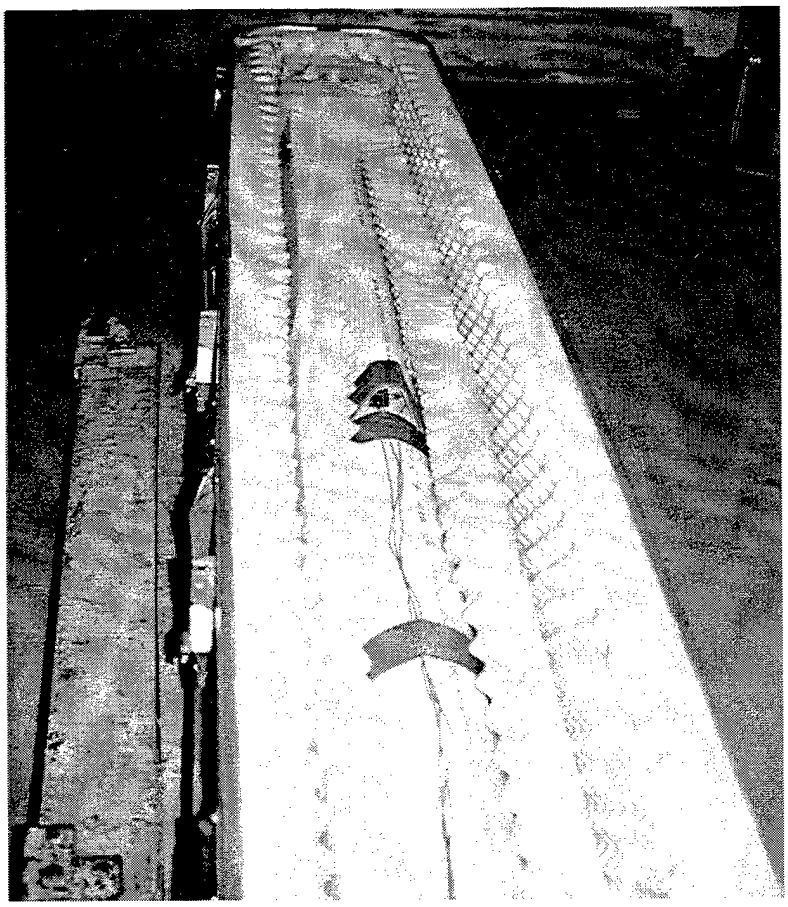


Figure 11. Container #3 with dummy load and accelerometer mounted.

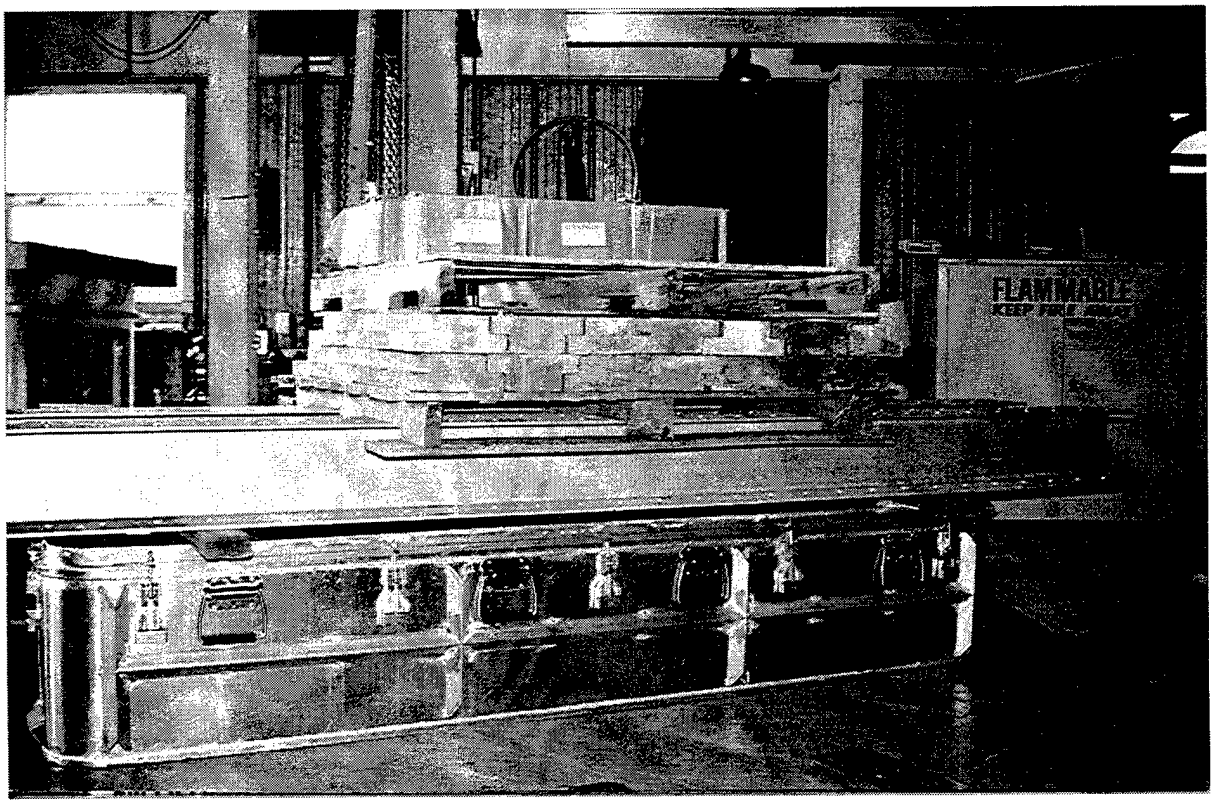


Figure 12. Superimposed Load test on Container #3.

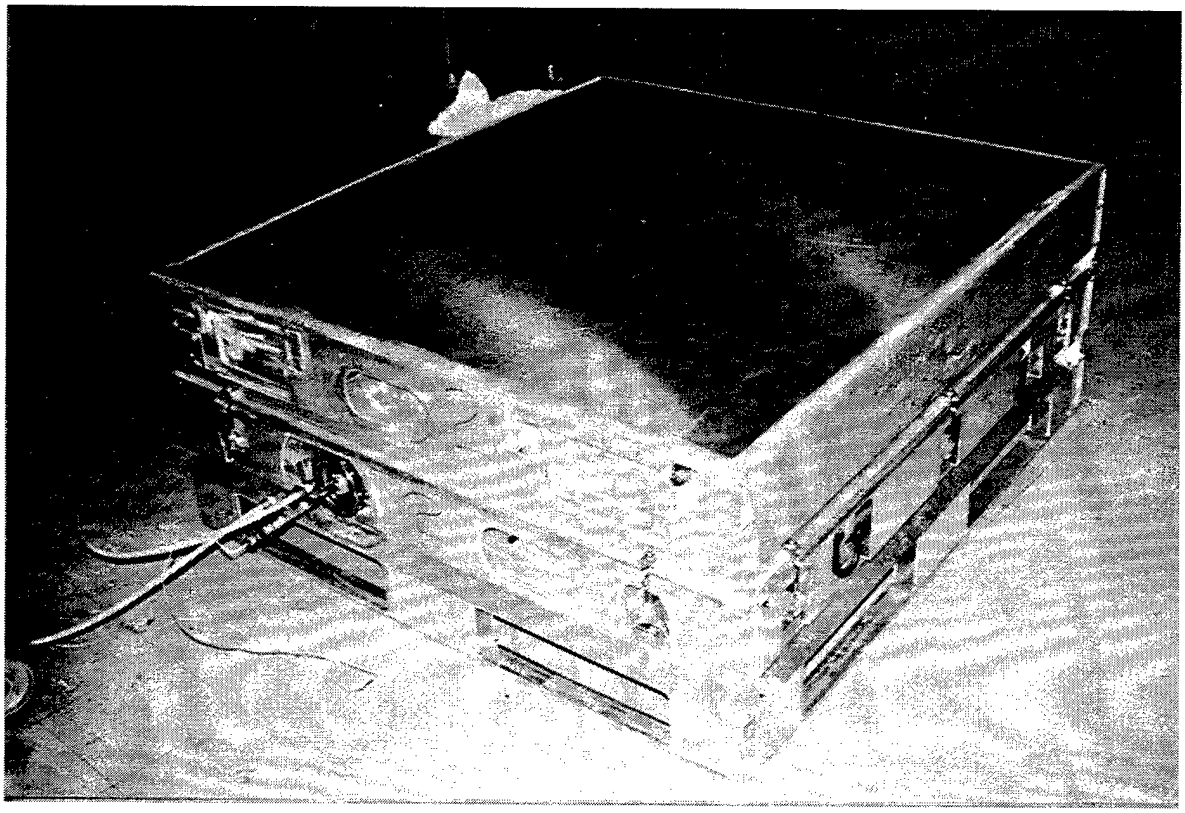


Figure 13. Pressurized Leak test on Container #5.

APPENDIX 5

STATEMENT OF WORK

Statement of Work
For
Aviation Spare Parts Family of Containers
10 July 1995

1. Introduction. The Air Force Packaging Technology and Engineering Facility will design a family of four (4) aluminum, reusable, long-life, multi-application containers for the storage and transportation of a pre-determined group of Aviation Spare Parts. These containers will protect the items during world-wide transportation and storage.

2. Scope. The Family of Containers will consist of four different containers. Three of the designs will require mechanical handling operations. The fourth will be a one or two person carry. The proposed internal/external sizes (in inches) of the containers are as follows:

Container #2	ID	54 X 11 X 6
	OD	63 X 20 X 17
Container #5	ID	39 X 30 X 9
	OD	48 X 48 X 20
Container #6	ID	42 X 42 X 29
	OD	50 X 50 X 40
Container #3-4	ID	85 X 9 X 9
	OD	94 X 20 X 16

3. Specification of Design. The Family of Aviation Spare Parts Containers will be designed in accordance with SAE ARP 1967, with the following modifications:

A. Par. 3.2.1 Cadmium plated parts shall not be used in the interior of the container.
B. Par. 3.2.2 N/A
C. Par. 3.3.1.1 N/A.
D. Par. 3.3.1.3 Vibration and shock isolation will be accomplished using complete foam encapsulation of the item.
E. Par. 3.3.1.4 N/A
F. Par. 3.3.2 Any container surface or cavity that may collect water will be either convex to allow run-off or have drainage holes in accordance with the provided drawing package.
G. Par. 3.3.3.2.1 Wide handle, cam-over-center latches requiring no use of tools to open or close and meeting arctic glove requirements shall be used.
H. Par. 3.3.3.2.2 Container will be designed and testing for a 1.0/1.0 PSIG pressure vacuum.
I. Par. 3.3.4.2 Tiedown provisions will be provided, no special towing provisions will be incorporated.
J. Par. 3.3.5.1 A desiccant port with cover shall be provided as well as a confined space using foam or aluminum for desiccant storage, a desiccant receptacle will not be used.
K. Par. 3.3.5.6 N/A

L. Par. 3.3.5.8 N/A
M. Par. 3.3.5.9 N/A
N. Par. 3.4.3 Interrupted or tack welds will be used when a continuous seal weld is not required. No caulking will be used on these types of welds.
O. Par. 3.7 Finish, for production containers only not prototype containers.
    a. Cleaning and surface treatment in accordance with MIL-T-704.
    b. Priming, one coat, in accordance with TT-P-1757.
    c. Painting, two coats, conforming to TT-E-515, TT-E-516 or TT-E-485 using color olive drab, No. 34087 or FED-STD-595.
P. Par. 3.9, Section c N/A
Q. Par. 3.9, Section j N/A
R. Par. 3.9, Section m N/A
S. Par. 3.9, Section n N/A
T. Par. 3.10 One name plate on cover with the following information:
    "Container, Shipping & Storage, Repairable Aviation Part"
    NSN
    Bar Code
    Part Number
    Serial Number (If required)
    Contract Number
    Manufacturer
    Tare Weight, Dimensions, and Cube
    Design Activity
    "Property of the US Air Army"
U. Par. 3.10.1 N/A
V. Par. 3.11 N/A
W. Par. 4. N/A
X. Par. 4.3 Instrumentation for shock readings will be placed on top of the dummy load at the intersection of the X and Y axes of the Center of Gravity (CG) and not the true CG.
Y. Par. 4.5.2.1 and 4.5.2.2 Container will be designed and tested at 1.0/1.0 PSIG.
Z. Par. 4.5.3 Rotational or Free Fall drop tests will be performed according to container size and weight.
AA. Par. 4.5.4 N/A

APPENDIX 6

DISTRIBUTION LIST

DISTRIBUTION LIST

DTIC/FDAC 1
CAMERON STATION
ALEXANDRIA VA 22304-6145

HQ AFMC/LG 1
4375 CHIDLAW ROAD SUITE 6
WRIGHT-PATTERSON AFB OH 45433-5006

HQ AFMC/LGT 1
4375 CHIDLAW ROAD SUITE 6
WRIGHT-PATTERSON AFB OH 45433-5006

AFMC LSO/LO 1
4375 CHIDLAW ROAD SUITE 6
WRIGHT-PATTERSON AFB OH 45433-5006

AFMC LSO/LOP (LIBRARY) 3
5215 THURLOW ST
WRIGHT-PATTERSON AFB OH 45433-5540

HQ USAF/INT 1
1030 AIR FORCE PENTAGON
RM 4B322
WASHINGTON DC 20330-1030

72 ABW/LGTP 1
7516 SENTRY BLVD SUITE 201
TINKER AFB OK 73145-8912

75 ABW/LGTP 1
7520 WARDLEIGH RD
HILL AFB UT 84056-5733

76 ABW/LGTP 1
410 NORTH LUCK RD
SUITE 289
KELLY AFB TX 78241-5312

77 ABW/LGTP 1
1961 IDZOREK ST
BLDG. 7830
MCCLELLAN AFB CA 95652-1620

DISTRIBUTION LIST (Cont'd)

78 ABW/LGTP 455 BYRON ST BLDG 376 SUITE 1150 ROBINS AFB GA 31098-1860	1
COMMANDER NAVAL INVENTORY CONTROL POINT ATTN: E. H. BRIGGS (CODE 0512) 700 ROBBINS AVENUE PHILADELPHIA PA 19111-5098	1
COMMANDER NAVAL INVENTORY CONTROL POINT ATTN: F SECHRIST (CODE 054X) 5450 CARLISLE PIKE MECHANICSBURG PA 17055-0788	1
DLSIE/AMXMC-D US ARMY LOGISTICS MGT COLLEGE FT LEE VA 23801-5000	1
US ARMY ARDEC/SMCAR-AEP ATTN: Mike Ivankoe DOVER NJ 07801-5001	1
DEFENSE LOGISTICS AGENCY ATTN: MMDOO MR. JOE MALONEY 8725 JOHN KINGMAN RD SUITE 2533 FORT BELVOIR VA 22060-6221	1
AMARC/LGT 6805 E. IRVINGTON RD DAVIS MONTHAN AFB AZ 85707-4341	1
HQ PACAF/LGTR 25 E. STREET BLDG 1102 STE I326 HICKAM AFB HI 96853-5426	1

DISTRIBUTION LIST (Cont'd)

HQ USAFE/LGT 1
UNIT 3050 BOX 105
APO AE 09094-0105

HQ ACC/LGTT 1
130 DOUGLAS ST STE 210
LANGLEY AFB VA 23665-2791

HQ AF SPACECOM/LGT 1
150 VANDENBURG ST.
STE 1105
PETERSON AFB CO 80914-4540

HQ AETC/LGT 1
1850 FIRST ST WEST
BLDG 903
RANDOLPH AFB TX 78150-4308

HQ AFSA/SEW 1
ATTN: ARLIE ADAMS
9700 AVENUE G STE 263
KIRTLAND AFB NM 87117-5670

US TRANSCOM/JTCC 1
ATTN: S. OWENBY
203 W LOSEY
SCOTT AFB IL 62225-5219

DEAN 1
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