

**REPORT NUMBER: 8708-SLEDNCAP-28**

**CHILD RESTRAINT SYSTEM IN  
DYNAMIC SLED TEST  
BRITAX STARRISER COMFY WITH A HYIII THREE YEAR OLD  
BRITAX STARRISER COMFY WITH A HYIII SIX YEAR OLD**

**TEST NUMBER: 08-3-29**

**PREPARED BY:  
VERIDIAN ENGINEERING  
4455 GENESEE STREET  
BUFFALO, NEW YORK 14225**



**AUGUST 13<sup>TH</sup>, 2003**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
OFFICE OF CRASHWORTHINESS STANDARDS  
400 SEVENTH STREET, SW, ROOM 5311  
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-32005

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
David P. Roberts, Project Engineer

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_  
David P. Roberts, Head of Occupant  
Protection and Safety Research

FINAL REPORT ACCEPTED BY:

\_\_\_\_\_  
Manager, New Car Assessment Program

\_\_\_\_\_  
Date of Acceptance

\_\_\_\_\_  
COTR, NCAP Dynamic Sled Test Program

\_\_\_\_\_  
Date of Acceptance

## TECHNICAL REPORT STANDARD TITLE PAGE

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                                                                   |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------|-----------|
| 1. Report No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2. Government Accession No.                              | 3. Recipient's Catalog No.                                                        |           |
| 4. Title and Subtitle<br>Child Restraint Systems in Dynamic Sled Test<br>P3 – Britax StarRiser Comfy with a HYIII 3 year old<br>P4 – Britax StarRiser Comfy with a HYIII 6 year old                                                                                                                                                                                                                                                                                               |                                                          | 5. Report Date<br>August 13 <sup>th</sup> , 2003                                  |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | 6. Performing Organization Code                                                   |           |
| 7. Author<br>David P. Roberts                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          | 8. Performing Organization Report No.<br>8708-SLEDNCAP-28                         |           |
| 9. Performing Organization Name and Address<br>Veridian Engineering<br>4455 Genesee Street<br>Buffalo, NY 14225                                                                                                                                                                                                                                                                                                                                                                   |                                                          | 10. Work Unit No.                                                                 |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | 11. Contract or Grant No.<br>DTNH22-01-D-32005                                    |           |
| 12. Sponsoring Agency Name and Address<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>400 Seventh St , S.W.<br>Washington, DC 20590                                                                                                                                                                                                                                                                                                    |                                                          | 13. Type of Report and Period Covered<br>Final Report<br>July 2003 – January 2004 |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | 14. Sponsoring Agency Code                                                        |           |
| 15. Supplementary Notes<br><div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div>           Reviewed by: _____<br/>           Approved by: _____         </div> <div>           Program Manager<br/>           Head, Occupant Protection &amp; Safety Research Section,<br/>           Transportation Sciences Center         </div> </div>                                                                                                         |                                                          |                                                                                   |           |
| 16. Abstract<br><p>This report contains the results of tests performed in accordance with FMVSS 213 Final Rule Published June 24th, 2003 for FMVSS 213 Child Restraint Systems.</p> <p>Two (2) seats were tested during this run. Position 3 was a Britax StarRiser Comfy Child Restraint System. This seat was tested with a HYIII 3 year old ATD.</p> <p>Position 4 was a Britax StarRiser Comfy Child Restraint System. . This seat was tested with a HYIII 6 year old ATD</p> |                                                          |                                                                                   |           |
| 17. Key Words<br>FMVSS 213<br>Child Restraint Systems<br>Indicant Compliance Testing                                                                                                                                                                                                                                                                                                                                                                                              |                                                          | 18. Distribution Statement                                                        |           |
| 19. Security Classif. (of this report)<br><br>UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                                                        | 20. Security Classif. (of this page)<br><br>UNCLASSIFIED | 21. No. of Pages                                                                  | 22. Price |

## TABLE OF CONTENTS

| <u>Section</u> |                                                           | <u>Page No.</u> |
|----------------|-----------------------------------------------------------|-----------------|
| 1              | Purpose and Test Procedure                                | 1               |
| 2              | Child Restraint Information                               | 2               |
| 3              | Post-Test Observations                                    | 3               |
| 4              | Hybrid III 3 Year Old ATD Injury Criteria and Sensor Data | 4               |
| 5              | Sled Test Set-Up                                          | 8               |
| 6              | Camera Location                                           | 9               |
| 7              | Photographs                                               | 10              |
| 8              | Data Plots                                                | 16              |
| 9              | Compression – Deflection Resistance Test                  | 39              |
| 10             | Child Dummy Calibration Data Traces and Tables            | 49              |
| 11             | Test Equipment and Instrumentation Calibration            | 58              |
| 12             | Link to High Speed Movies                                 | 60              |

## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

#### **1.1 PURPOSE**

This dynamic sled testing is part of the FY' 03 New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract Number DTNH22-01-D-32005. The purpose of this test is to obtain child seat research data for frontal dynamic testing.

#### **1.2 TEST PROCEDURE**

This frontal dynamic sled test was conducted in accordance with the child restraint test procedure provided by the FMVSS No. 213 Final Rule published June 24<sup>th</sup>, 2003. Any reference to FMVSS No. 213 in this document refers to the Final Rule published June 24<sup>th</sup>, 2003, for FMVSS No. 213 Child Restraint Systems.

The test was conducted at Veridian Engineering on August 13<sup>th</sup>, 2003 at a speed of 45.5 kph ( 28.3 mph). The FMVSS No. 213 sled pulse was used as a crash pulse. The requirements specified in the FMVSS No. 213 were also followed.

The bench seat contained one anthropomorphic test device (ATD). One (1) Hybrid III 3 Year Old ATD, Serial Number 142, was instrumented with head, chest, and pelvic tri-axial accelerometers. This ATD was also instrumented with upper and lower neck load cells. This dummy was placed in a Britax StarRiser Comfy child seat and the seat was located in Position 3 – Right Rear Passenger. Post-test inspection of this seat indicated that the right seat back tab and locking wedge released during the test. Please see Photo 5 – Post-Test Position 3 view.

One (1) Hybrid III 6 Year Old ATD, Serial Number 144, was instrumented with head, chest, and pelvic tri-axial accelerometers. This ATD was also instrumented with a upper neck load cell. This dummy was placed in a Britax StarRiser Comfy child seat and the seat was located in Position 4 – Left Rear Passenger. Post-test inspection of this seat indicated that both locking wedges released during the test. Please see Photo 5 – Post-Test Position 4 view.

Position 4 – Pelvic X was intermittent and did not record accurately.

The child ATD was positioned according to the child seat manufacturer's instructions. The data was digitally sampled at 20,000 samples per second and processed per Section IP11 of the Laboratory Test Procedure.

## SECTION 2

### CHILD RESTRAINT INFORMATION

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

#### **POSITION 3**

|                                                                    |                          |
|--------------------------------------------------------------------|--------------------------|
| Child Restraint Type<br>(forward-facing, rearward facing, booster) | FORWARD FACING           |
| LATCH or NON-LATCH                                                 | NON-LATCH                |
| Harness Type                                                       | BELT POSITIONING BOOSTER |
| Child Restraint Manufacturer                                       | BRITAX                   |
| Child Restraint Model                                              | STARRISER                |
| Model Number                                                       | E900317                  |
| Date of Manufacture                                                | 2/04/2003                |
| Child Restraint Height Limits (mm)                                 | 838 - 1346               |
| Child Restraint Weight Limits (kg)                                 | 13.6 – 36.3              |
| Weight of Child Restraint (kg)                                     | 4.1                      |

#### **POSITION 4**

|                                                                    |                          |
|--------------------------------------------------------------------|--------------------------|
| Child Restraint Type<br>(forward-facing, rearward facing, booster) | FORWARD FACING           |
| LATCH or NON-LATCH                                                 | NON-LATCH                |
| Harness Type                                                       | BELT POSITIONING BOOSTER |
| Child Restraint Manufacturer                                       | BRITAX                   |
| Child Restraint Model                                              | STARRISER                |
| Model Number                                                       | E900316                  |
| Date of Manufacture                                                | 5/28/2003                |
| Child Restraint Height Limits (mm)                                 | 838 - 1346               |
| Child Restraint Weight Limits (kg)                                 | 13.6 – 36.3              |
| Weight of Child Restraint (kg)                                     | 4.2                      |

### SECTION 3

#### POST-TEST OBSERVATIONS

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

#### **POSITION 3**

|                          |                        |
|--------------------------|------------------------|
| Child Seat               | BRITAX STARRISER COMFY |
| Belt Fraying             | NONE                   |
| Stress Marks             | NONE                   |
| Cracks                   | SEE INTRODUCTION       |
| Buckle Stress            | NONE                   |
| Latch Hooks              | NONE                   |
| Max. Head Excursion (mm) | 483                    |
| Max. Knee Excursion (mm) | 483                    |
| Velocity (kph)           | 45.5                   |
| Acceleration (G's)       | 22.8                   |

#### **POSITION 4**

|                          |                        |
|--------------------------|------------------------|
| Child Seat               | BRITAX STARRISER COMFY |
| Belt Fraying             | NONE                   |
| Stress Marks             | NONE                   |
| Cracks                   | SEE INTRODUCTION       |
| Buckle Stress            | NONE                   |
| Latch Hooks              | NONE                   |
| Max. Head Excursion (mm) | 516                    |
| Max. Knee Excursion (mm) | 549                    |
| Velocity (kph)           | 45.5                   |
| Acceleration (G's)       | 22.8                   |

## SECTION 4

### POSITION 3 - HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

#### HEAD PRIMARY PEAK ACCELERATIONS

| Location          | Axis | Units | P3 (Right) Rear Passenger |       |       |       |
|-------------------|------|-------|---------------------------|-------|-------|-------|
|                   |      |       | Max                       | Time  | Min   | Time  |
| Head CG           | X    | G's   | 9.8                       | 215.3 | -28.9 | 84.2  |
| Head CG           | Y    | G's   | 31.0                      | 85.3  | -2.6  | 104.0 |
| Head CG           | Z    | G's   | 42.7                      | 61.7  | -0.9  | 249.1 |
| Head CG Resultant | N/A  | G's   | 47.7                      | 67.4  |       |       |

#### CHEST PRIMARY PEAK ACCELERATIONS

| Location           | Axis | Units | P3 (Right) Rear Passenger |       |       |       |
|--------------------|------|-------|---------------------------|-------|-------|-------|
|                    |      |       | Max                       | Time  | Min   | Time  |
| Chest CG           | X    | G's   | 4.6                       | 167.2 | -40.2 | 47.8  |
| Chest CG           | Y    | G's   | 11.6                      | 72.6  | -2.4  | 135.8 |
| Chest CG           | Z    | G's   | 8.5                       | 79.3  | -9.2  | 52.6  |
| Chest CG Resultant | N/A  | G's   | 41.5                      | 48.0  |       |       |

#### SEAT BELT SENSOR PEAK VALUES

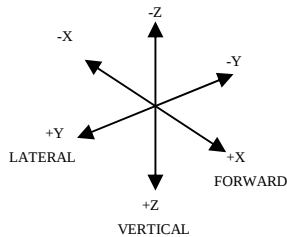
| Location    | Axis | Units   | P3 (Right) Rear Passenger |      |     |      |
|-------------|------|---------|---------------------------|------|-----|------|
|             |      |         | Max                       | Time | Min | Time |
| Tether Belt | N/A  | Newtons | NA                        | NA   |     |      |

#### HEAD INJURY CRITERIA (HIC)

| Location                  | P3 (Right) Rear Passenger |          |                |                |
|---------------------------|---------------------------|----------|----------------|----------------|
|                           | HIC                       | Avg. G's | T <sup>1</sup> | T <sup>2</sup> |
| Head CG Primary (36 msec) | 416.8                     | 42.2     | 41.0           | 77.0           |
| Head CG Primary (15 msec) | 213.5                     | 45.9     | 56.6           | 71.6           |

#### CHEST CLIP (3 MSEC)

| Location         | P3 (Right) Rear Passenger |                |                |
|------------------|---------------------------|----------------|----------------|
|                  | Clip                      | T <sup>1</sup> | T <sup>2</sup> |
| Chest CG Primary | 40.2                      | 39.6           | 42.6           |



# **POSITION 3 - HYBRID III 3 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA...(continued)**

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

## **PELVIC PEAK ACCELERATIONS**

| Location | Axis | Units | P3 (Right) Rear Passenger |       |       |      |
|----------|------|-------|---------------------------|-------|-------|------|
|          |      |       | Max                       | Time  | Min   | Time |
| Pelvis   | X    | G's   | 13.1                      | 106.6 | -42.3 | 44.1 |
| Pelvis   | Y    | G's   | 4.4                       | 106.6 | -9.1  | 55.2 |
| Pelvis   | Z    | G's   | 3.5                       | 129.6 | -31.0 | 49.5 |

## **UPPER NECK PEAK FORCES AND MOMENTS**

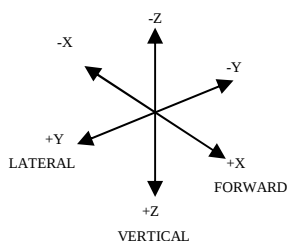
| Location    | Axis | Units   | P3 (Right) Rear Passenger |       |        |       |
|-------------|------|---------|---------------------------|-------|--------|-------|
|             |      |         | Max                       | Time  | Min    | Time  |
| Neck Force  | X    | Newtons | 75.2                      | 216.0 | -728.5 | 80.9  |
| Neck Force  | Y    | Newtons | 400.2                     | 69.3  | -59.2  | 88.9  |
| Neck Force  | Z    | Newtons | 1181.4                    | 67.7  | -1.2   | -20.0 |
| Neck Moment | X    | Nm      | 15.9                      | 65.2  | -4.8   | 101.3 |
| Neck Moment | Y    | Nm      | 25.8                      | 76.8  | -22.6  | 44.9  |
| Neck Moment | Z    | Nm      | 7.7                       | 49.0  | -7.3   | 71.2  |

## **LOWER NECK PEAK FORCES AND MOMENTS**

| Location    | Axis | Units   | P3 (Right) Rear Passenger |       |         |       |
|-------------|------|---------|---------------------------|-------|---------|-------|
|             |      |         | Max                       | Time  | Min     | Time  |
| Neck Force  | X    | Newtons | 71.2                      | 216.3 | -1184.5 | 68.8  |
| Neck Force  | Y    | Newtons | 756.2                     | 67.3  | -50.9   | 172.7 |
| Neck Force  | Z    | Newtons | 893.6                     | 45.0  | -253.1  | 85.9  |
| Neck Moment | X    | Nm      | 77.6                      | 68.5  | -7.4    | 216.0 |
| Neck Moment | Y    | Nm      | 118.5                     | 79.6  | -5.2    | 217.7 |
| Neck Moment | Z    | Nm      | 19.0                      | 65.9  | -1.4    | 114.0 |

## **CHEST PEAK DISPLACEMENTS**

| Location | Axis | Units | P3 (Right) Rear Passenger |       |       |      |
|----------|------|-------|---------------------------|-------|-------|------|
|          |      |       | Max                       | Time  | Min   | Time |
| Chest CG | X    | mm    | 0.0                       | -20.0 | -42.6 | 72.2 |



## SECTION 4

### POSITION 4 - HYBRID III 6 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

#### HEAD PRIMARY PEAK ACCELERATIONS

| Location          | Axis | Units | P4 (Left) Rear Passenger |       |       |       |
|-------------------|------|-------|--------------------------|-------|-------|-------|
|                   |      |       | Max                      | Time  | Min   | Time  |
| Head CG           | X    | G's   | 6.4                      | 241.6 | -25.5 | 55.5  |
| Head CG           | Y    | G's   | 1.5                      | 193.2 | -11.4 | 75.8  |
| Head CG           | Z    | G's   | 49.2                     | 55.5  | -0.1  | -15.2 |
| Head CG Resultant | N/A  | G's   | 55.7                     | 55.5  |       |       |

#### CHEST PRIMARY PEAK ACCELERATIONS

| Location           | Axis | Units | P4 (Left) Rear Passenger |       |       |      |
|--------------------|------|-------|--------------------------|-------|-------|------|
|                    |      |       | Max                      | Time  | Min   | Time |
| Chest CG           | X    | G's   | 2.8                      | 202.3 | -47.8 | 48.5 |
| Chest CG           | Y    | G's   | 3.3                      | 140.2 | -9.6  | 62.7 |
| Chest CG           | Z    | G's   | 7.2                      | 77.1  | -8.7  | 54.6 |
| Chest CG Resultant | N/A  | G's   | 48.9                     | 48.6  |       |      |

#### SEAT BELT SENSOR PEAK VALUES

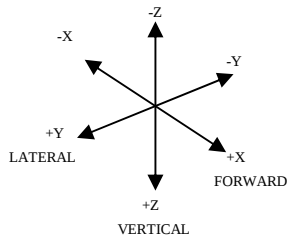
| Location    | Axis | Units   | P4 (Left) Rear Passenger |      |     |      |
|-------------|------|---------|--------------------------|------|-----|------|
|             |      |         | Max                      | Time | Min | Time |
| Tether Belt | N/A  | Newtons | NA                       | NA   |     |      |

#### HEAD INJURY CRITERIA (HIC)

| Location                  | P4 (Left) Rear Passenger |          |                |                |
|---------------------------|--------------------------|----------|----------------|----------------|
|                           | HIC                      | Avg. G's | T <sup>1</sup> | T <sup>2</sup> |
| Head CG Primary (36 msec) | 489.8                    | 45.0     | 45.4           | 81.4           |
| Head CG Primary (15 msec) | 254.0                    | 49.1     | 54.1           | 69.1           |

#### CHEST CLIP (3 MSEC)

| Location         | P4 (Left) Rear Passenger |                |                |
|------------------|--------------------------|----------------|----------------|
|                  | Clip                     | T <sup>1</sup> | T <sup>2</sup> |
| Chest CG Primary | 47.3                     | 47.0           | 50.0           |



**POSITION 4 - HYBRID III 6 YEAR OLD ATD INJURY CRITERIA AND SENSOR DATA...(continued)**

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

**PELVIC PEAK ACCELERATIONS**

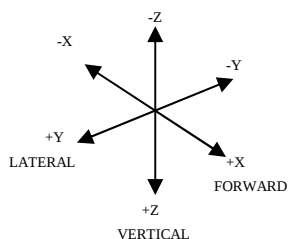
| Location | Axis | Units | P4 (Left) Rear Passenger |       |       |       |
|----------|------|-------|--------------------------|-------|-------|-------|
|          |      |       | Max                      | Time  | Min   | Time  |
| Pelvis   | X    | G's   | N/A                      | N/A   | N/A   | N/A   |
| Pelvis   | Y    | G's   | 10.6                     | 233.4 | -12.1 | 63.6  |
| Pelvis   | Z    | G's   | 19.7                     | 55.7  | -2.9  | 138.2 |

**UPPER NECK PEAK FORCES AND MOMENTS**

| Location    | Axis | Units   | P4 (Left) Rear Passenger |       |        |       |
|-------------|------|---------|--------------------------|-------|--------|-------|
|             |      |         | Max                      | Time  | Min    | Time  |
| Neck Force  | X    | Newtons | 99.8                     | 240.6 | -595.8 | 55.7  |
| Neck Force  | Y    | Newtons | 60.3                     | 108.9 | -329.0 | 75.6  |
| Neck Force  | Z    | Newtons | 1585.1                   | 55.5  | -2.0   | -17.4 |
| Neck Moment | X    | Nm      | 5.8                      | 118.1 | -13.3  | 83.1  |
| Neck Moment | Y    | Nm      | 24.3                     | 100.0 | -34.3  | 51.2  |
| Neck Moment | Z    | Nm      | 11.0                     | 81.7  | -10.6  | 55.4  |

**CHEST PEAK DISPLACEMENTS**

| Location | Axis | Units | P4 (Left) Rear Passenger |       |       |      |
|----------|------|-------|--------------------------|-------|-------|------|
|          |      |       | Max                      | Time  | Min   | Time |
| Chest CG | X    | mm    | 0.0                      | -15.3 | -46.2 | 63.8 |



## SECTION 5

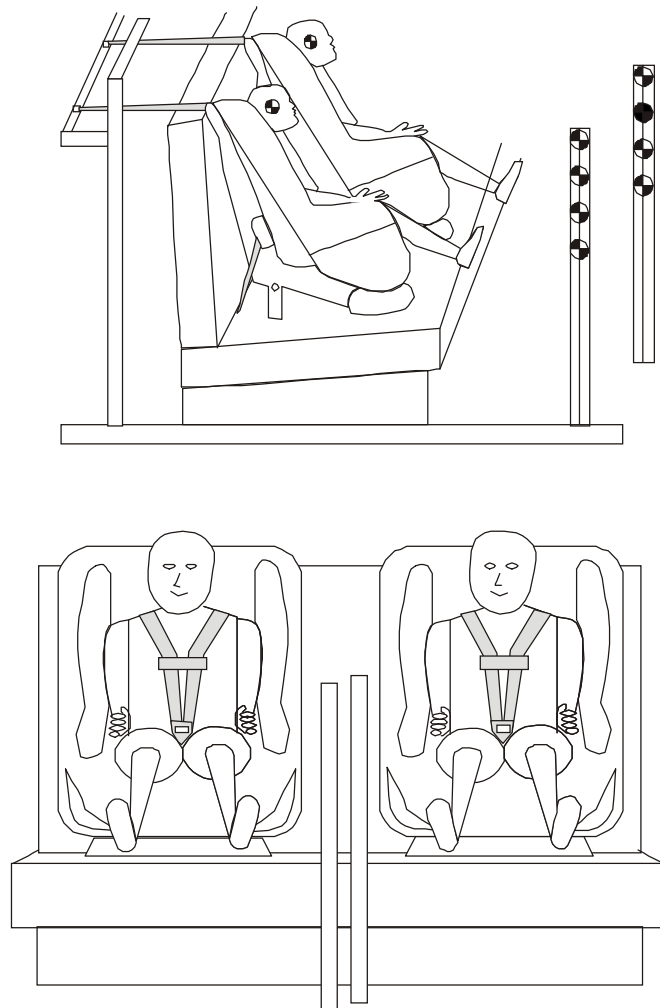
### SLED TEST SET-UP

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

An FMVSS 213 test bench was fastened on the sled in order to simulate a frontal impact. Two child seats were placed on the bench and fastened in a manner suggested in the owner's manual of the child seat. Stadia poles were set up to measure dummy head and knee excursions.

Pre-test Infant and Car Seat Positions

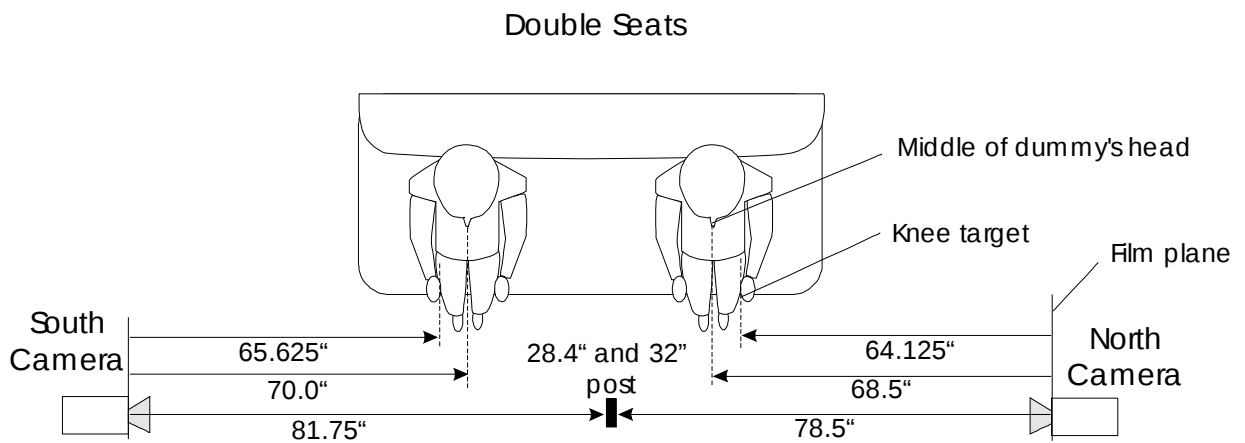


**SECTION 6**  
**CAMERA LOCATION**

Test No.: 08-3-29

Test Date: August 13<sup>th</sup>, 2003

There were two cameras mounted onto the sled carriage for views of the left and right side of the child seat.



**SECTION 7**  
**PHOTOGRAPHS**

TABLE OF PHOTOGRAPHS

| <u>Photographs</u>                                                | <u>Page No.</u> |
|-------------------------------------------------------------------|-----------------|
| Photo 1 – Pre-Test and Post-Test Right Side View                  | 11              |
| Photo 2 – Pre-Test and Post-Test Right Front View                 | 12              |
| Photo 3 – Pre-Test and Post-Test Left Front View                  | 13              |
| Photo 4 – Pre-Test and Post-Test Left Side View                   | 14              |
| Photo 5 – Post-Test Position 3 View and Post-Test Position 4 View | 15              |



Pre Test Right Side View



Post Test Right Side View



Pre Test Right Front View



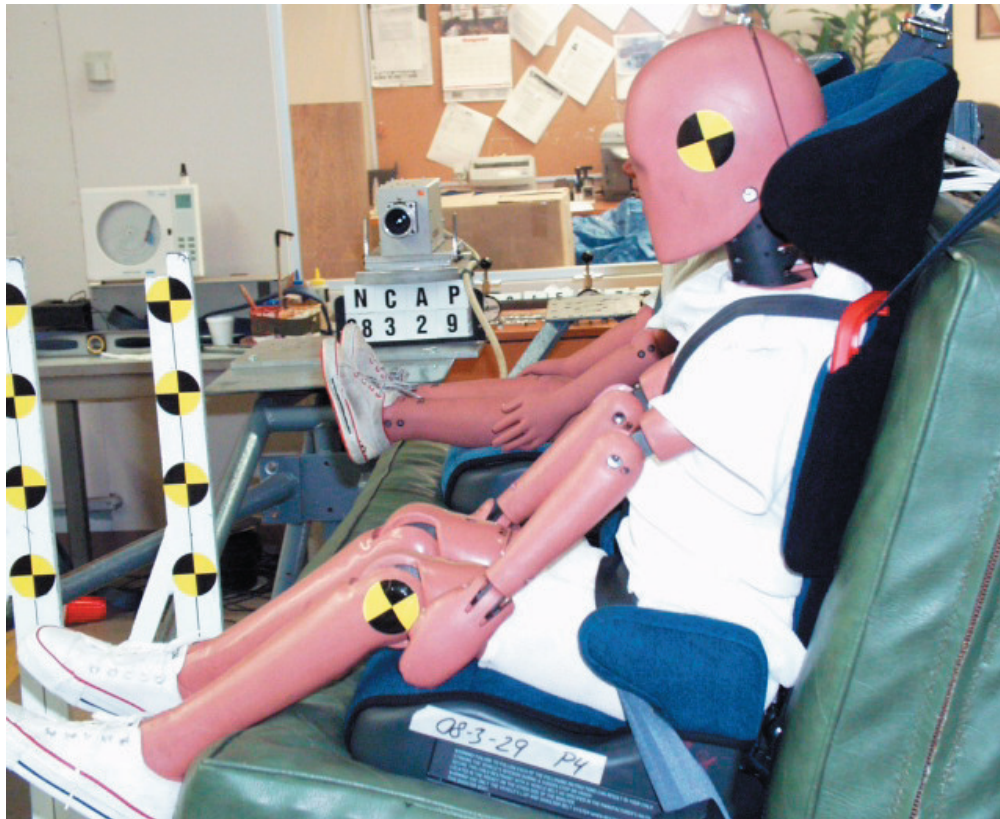
Post Test Right Front View



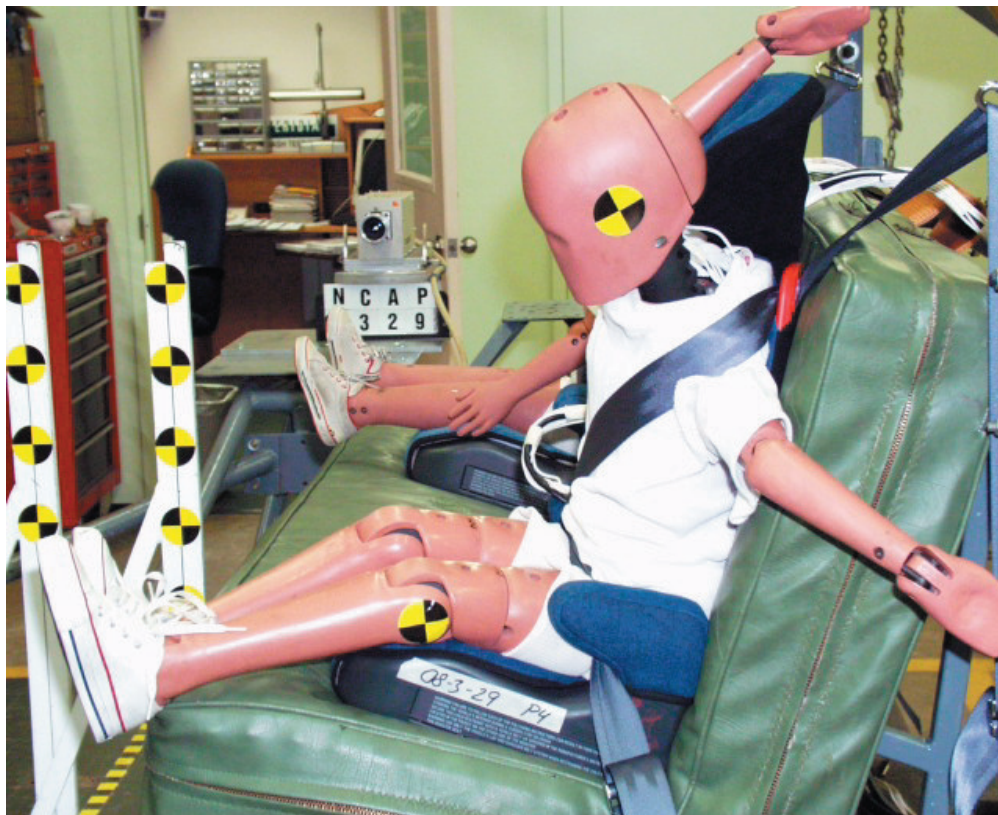
Pre Test Left Front View



Post Test Left Front View



Pre Test Left Side View



Post Test Left Side View



Post Test Position 3 View



Post Test Position 4 View

## **SECTION 8**

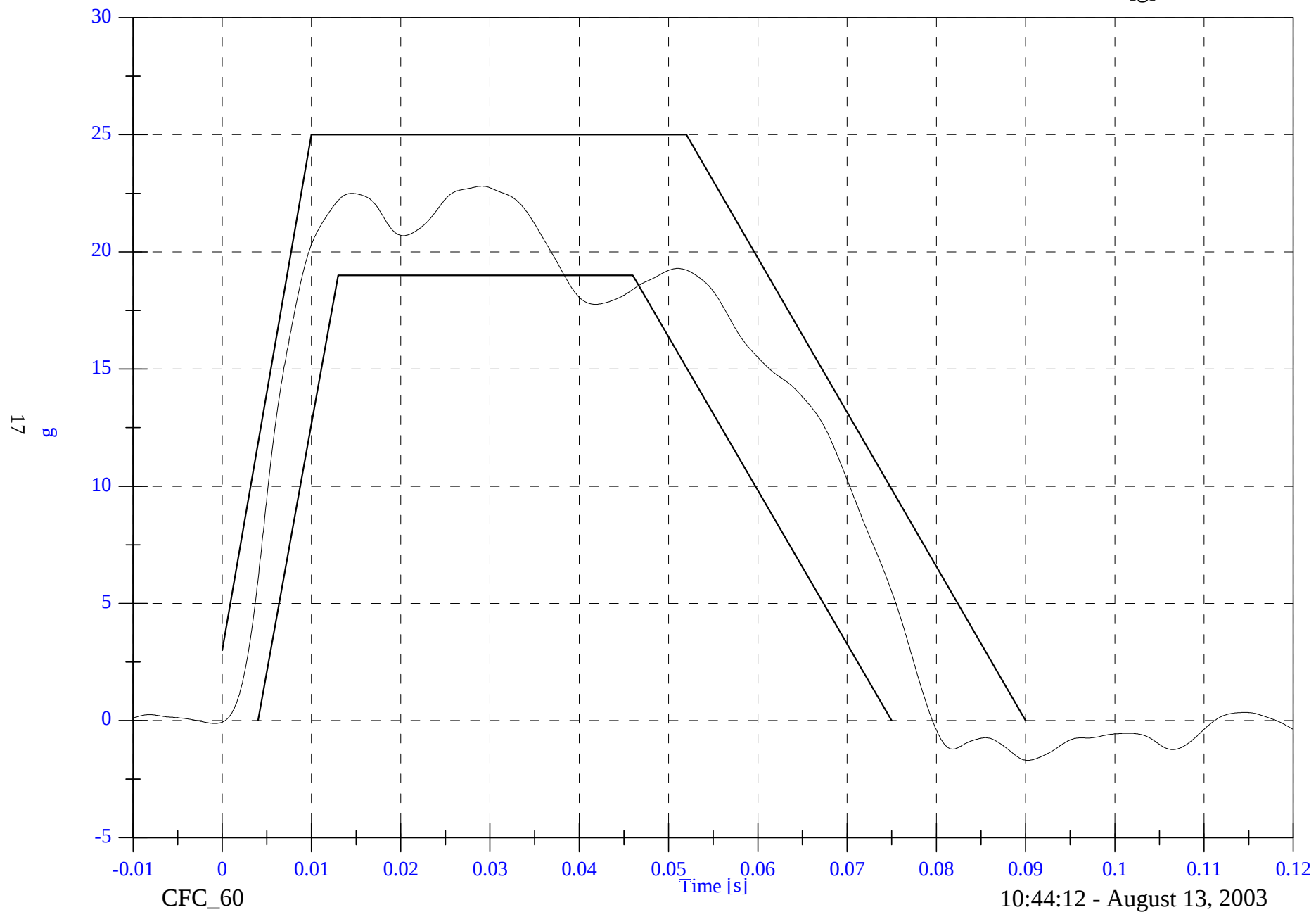
### **Data Plots**

Sled Test NCAP SLED 08-3-29

Sled Pulse Corridor

Max: 22.8 [g] at 0.029 [s]

Min: -1.7 [g] at 0.090 [s]



FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

| CHN | NAME                           | Unit | Max    | msec  | Min     | msec  | Filt     | Comment |
|-----|--------------------------------|------|--------|-------|---------|-------|----------|---------|
| 42  | Sled Acceleration              | g    | 22.8   | 29.1  | -1.7    | 90.2  | CFC_60   |         |
| 43  | Sled Acceleration Velocity     | kph  | 45.5   | 79.6  | -0.0    | -10.3 | CFC_180  |         |
| 44  | Sled Acceleration Displacement | mm   | 2595.3 | 249.9 | -0.0    | -2.1  | CFC_180  |         |
| 45  | P3 Head x                      | g    | 9.8    | 215.3 | -28.9   | 84.2  | CFC_1000 |         |
| 46  | P3 Head y                      | g    | 31.0   | 85.3  | -2.6    | 104.0 | CFC_1000 |         |
| 47  | P3 Head z                      | g    | 42.7   | 61.7  | -0.9    | 249.1 | CFC_1000 |         |
| 48  | P3 Head Resultant              | g    | 47.7   | 67.4  | 0.0     | -12.8 | CFC_1000 |         |
| 49  | P3 Upper Neck Fx               | N    | 75.2   | 216.0 | -728.5  | 80.9  | CFC_1000 |         |
| 50  | P3 Upper Neck Fy               | N    | 400.2  | 69.3  | -59.2   | 88.9  | CFC_1000 |         |
| 51  | P3 Upper Neck Fz               | N    | 1181.4 | 67.7  | -1.2    | -20.0 | CFC_1000 |         |
| 52  | P3 Upper Neck F Resultant      | N    | 1350.6 | 68.0  | 0.0     | -11.7 | CFC_1000 |         |
| 53  | P3 Upper Neck Mx               | N-m  | 15.9   | 65.2  | -4.8    | 101.3 | CFC_600  |         |
| 54  | P3 Upper Neck My               | N-m  | 25.8   | 76.8  | -22.6   | 44.9  | CFC_600  |         |
| 55  | P3 Upper Neck Mz               | N-m  | 7.7    | 49.0  | -7.3    | 71.2  | CFC_600  |         |
| 56  | P3 Upper Neck M Resultant      | N-m  | 27.4   | 76.5  | 0.0     | -8.5  | CFC_600  |         |
| 57  | P3 Lower Neck Fx               | N    | 71.2   | 216.3 | -1184.5 | 68.8  | CFC_1000 |         |
| 58  | P3 Lower Neck Fy               | N    | 756.2  | 67.3  | -50.9   | 172.7 | CFC_1000 |         |
| 59  | P3 Lower Neck Fz               | N    | 893.6  | 45.0  | -253.1  | 85.9  | CFC_1000 |         |
| 60  | P3 Lower Neck F Resultant      | N    | 1451.2 | 67.6  | 0.1     | -8.6  | CFC_1000 |         |
| 61  | P3 Lower Neck Mx               | N-m  | 77.6   | 68.5  | -7.4    | 216.0 | CFC_600  |         |
| 62  | P3 Lower Neck My               | N-m  | 118.5  | 79.6  | -5.2    | 217.7 | CFC_600  |         |
| 63  | P3 Lower Neck Mz               | N-m  | 19.0   | 65.9  | -1.4    | 114.0 | CFC_600  |         |
| 64  | P3 Lower Neck M Resultant      | N-m  | 130.7  | 78.2  | 0.0     | -11.1 | CFC_600  |         |
| 65  | P3 Chest x                     | g    | 4.6    | 167.2 | -40.2   | 47.8  | CFC_180  |         |
| 66  | P3 Chest y                     | g    | 11.6   | 72.6  | -2.4    | 135.8 | CFC_180  |         |
| 67  | P3 Chest z                     | g    | 8.5    | 79.3  | -9.2    | 52.6  | CFC_180  |         |
| 68  | P3 Chest Resultant             | g    | 41.5   | 48.0  | 0.0     | -10.6 | CFC_180  |         |
| 69  | P3 Pelvic x                    | g    | 13.1   | 106.6 | -42.3   | 44.1  | CFC_1000 |         |
| 70  | P3 Pelvic y                    | g    | 4.4    | 106.6 | -9.1    | 55.2  | CFC_1000 |         |
| 71  | P3 Pelvic z                    | g    | 3.5    | 129.6 | -31.0   | 49.5  | CFC_1000 |         |
| 72  | P3 Pelvic Resultant            | g    | 48.6   | 49.4  | 0.0     | -12.9 | CFC_1000 |         |
| 73  | P3 Head Red z                  | g    | 52.8   | 71.8  | -4.2    | 226.8 | CFC_1000 |         |
| 74  | P3 Chest Compression           | mm   | 0.0    | -20.0 | -42.6   | 72.2  | CFC_600  |         |
| 75  | P3 Upper Neck Mocv             | N-m  | 25.8   | 76.8  | -22.6   | 44.9  | CFC_600  |         |

FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

| CHN | NAME                      | Unit | Max    | msec  | Min    | msec  | Filt     | Comment |
|-----|---------------------------|------|--------|-------|--------|-------|----------|---------|
| 76  | P4 Head x                 | g    | 6.4    | 241.6 | -25.5  | 55.5  | CFC_1000 |         |
| 77  | P4 Head y                 | g    | 1.5    | 193.2 | -11.4  | 75.8  | CFC_1000 |         |
| 78  | P4 Head z                 | g    | 49.2   | 55.5  | -0.1   | -15.2 | CFC_1000 |         |
| 79  | P4 Head Resultant         | g    | 55.7   | 55.5  | 0.0    | -19.6 | CFC_1000 |         |
| 80  | P4 Upper Neck Fx          | N    | 99.8   | 240.6 | -595.8 | 55.7  | CFC_1000 |         |
| 81  | P4 Upper Neck Fy          | N    | 60.3   | 108.9 | -329.0 | 75.6  | CFC_1000 |         |
| 82  | P4 Upper Neck Fz          | N    | 1585.1 | 55.5  | -2.0   | -17.4 | CFC_1000 |         |
| 83  | P4 Upper Neck F Resultant | N    | 1699.6 | 55.6  | 0.2    | -6.3  | CFC_1000 |         |
| 84  | P4 Upper Neck Mx          | N-m  | 5.8    | 118.1 | -13.3  | 83.1  | CFC_600  |         |
| 85  | P4 Upper Neck My          | N-m  | 24.3   | 100.0 | -34.3  | 51.2  | CFC_600  |         |
| 86  | P4 Upper Neck Mz          | N-m  | 11.0   | 81.7  | -10.6  | 55.4  | CFC_600  |         |
| 87  | P4 Upper Neck M Resultant | N-m  | 35.7   | 51.2  | 0.0    | -7.6  | CFC_600  |         |
| 88  | P4 Chest x                | g    | 2.8    | 202.3 | -47.8  | 48.5  | CFC_180  |         |
| 89  | P4 Chest y                | g    | 3.3    | 140.2 | -9.6   | 62.7  | CFC_180  |         |
| 90  | P4 Chest z                | g    | 7.2    | 77.1  | -8.7   | 54.6  | CFC_180  |         |
| 91  | P4 Chest Resultant        | g    | 48.9   | 48.6  | 0.0    | -12.1 | CFC_180  |         |
| 92  | P4 Pelvic x               | g    | 51.0   | 138.1 | -172.4 | 58.3  | CFC_1000 |         |
| 93  | P4 Pelvic y               | g    | 10.6   | 233.4 | -12.1  | 63.6  | CFC_1000 |         |
| 94  | P4 Pelvic z               | g    | 19.7   | 55.7  | -2.9   | 138.2 | CFC_1000 |         |
| 95  | P4 Pelvic Resultant       | g    | 172.9  | 58.3  | 0.2    | -16.1 | CFC_1000 |         |
| 96  | P4 Chest Compression      | mm   | 0.0    | -15.3 | -46.2  | 63.8  | CFC_600  |         |
| 97  | P4 Upper Neck Mocy        | N-m  | 30.0   | 99.8  | -24.8  | 50.5  | CFC_600  |         |

FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

Version 5.00

=====

P3 HIC(36 ms): 416.8

t1: 41.0 msec

t2: 77.0 msec

Duration: 36.0 msec

Average Acceleration: 42.2 g

Input channels: P3 Head x (2) CFC\_1000

P3 Head y (3) CFC\_1000

P3 Head z (4) CFC\_1000

P3 UP NECK Fx: Max: 75.2 N 216.0 msec

Min: -728.5 N 80.9 msec

Input channel: P3 Upper Neck Fx (6) CFC\_1000

P3 UP NECK Fz: Max: 1181.4 N 67.7 msec

Min: -1.2 N -20.0 msec

Input channel: P3 Upper Neck Fz (8) CFC\_1000

P3 UP NECK MocY (3Y0 Child OOP)

Max: 25.8 N-m 76.8 msec

Min: -22.6 N-m 44.9 msec

Input channels: P3 Upper Neck Fx (6) CFC\_600

P3 Upper Neck My (10) CFC\_600

Docy: 0

P3 UP NECK Nij (3Y0 Child OOP)

Ntf: 0.83 Nij 74.8 msec CVt: 2120 CVf: 68

Nte: 1.23 Nij 44.8 msec CVt: 2120 Cve: 27

Ncf: 0.00 Nij -20.0 msec CVc: 2120 CVf: 68

Nce: 0.00 Nij 8.3 msec CVc: 2120 Cve: 27

Input channels: P3 Upper Neck Fz (8) CFC\_600

P3 Upper Neck MocY [N-m, CFC\_600] (84)

FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

Version 5.00

=====

P3 CLIP(3 ms): 40.2 g

t1: 39.6 msec

t2: 42.6 msec

Duration: 3.0 msec

P3 CSI: 257.0

Input channels: P3 Chest x (18) CFC\_180

P3 Chest y (19) CFC\_180

P3 Chest z (20) CFC\_180

P3 CHEST DISP: Max: 0.0 mm -20.0 msec

Min: -42.6 mm 72.2 msec

Input channel: P3 Chest Compression (21) CFC\_600

=====

P3 HIC(15 ms): 213.5

t1: 56.6 msec

t2: 71.6 msec

Duration: 15.0 msec

Average Acceleration: 45.9 g

Input channels: P3 Head x (2) CFC\_1000

P3 Head y (3) CFC\_1000

P3 Head z (4) CFC\_1000

=====

FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

Version 5.00

=====

P4 HIC(36 ms): 489.8

t1: 45.4 msec

t2: 81.4 msec

Duration: 36.0 msec

Average Acceleration: 45.0 g

Input channels: P4 Head x (25) CFC\_1000

P4 Head y (26) CFC\_1000

P4 Head z (27) CFC\_1000

P4 UP NECK Fx: Max: 99.8 N 240.6 msec

Min: -595.8 N 55.7 msec

Input channel: P4 Upper Neck Fx (28) CFC\_1000

P4 UP NECK Fz: Max: 1585.1 N 55.5 msec

Min: -2.0 N -17.4 msec

Input channel: P4 Upper Neck Fz (30) CFC\_1000

P4 UP NECK MocY (6Y0 Child OOP)

Max: 30.0 N-m 99.8 msec

Min: -24.8 N-m 50.5 msec

Input channels: P4 Upper Neck Fx (28) CFC\_600

P4 Upper Neck My (32) CFC\_600

Docy: 0.01778

P4 UP NECK Nij (6Y0 Child OOP)

Ntf: 0.70 Nij 72.9 msec CVt: 2880 CVf: 93

Nte: 1.12 Nij 51.7 msec CVt: 2880 CVe: 37

Ncf: 0.00 Nij -17.5 msec CVc: 2880 CVf: 93

Nce: 0.00 Nij 5.1 msec CVc: 2880 CVe: 37

Input channels: P4 Upper Neck Fz (30) CFC\_600

P4 Upper Neck MocY [N-m, CFC\_600] (90)

FACILITY: HYGE SLED

DATE: August 13, 2003

TEST#: 08-3-29

TITLE: Sled Test NCAP SLED 08-3-29

Version 5.00

=====

P4 CLIP(3 ms): 47.3 g

t1: 47.0 msec

t2: 50.0 msec

Duration: 3.0 msec

P4 CSI: 294.7

Input channels: P4 Chest x (34) CFC\_180

P4 Chest y (35) CFC\_180

P4 Chest z (36) CFC\_180

P4 CHEST DISP: Max: 0.0 mm -15.3 msec

Min: -46.2 mm 63.8 msec

Input channel: P4 Chest Compression (37) CFC\_600

=====

P4 HIC(15 ms): 254.0

t1: 54.1 msec

t2: 69.1 msec

Duration: 15.0 msec

Average Acceleration: 49.1 g

Input channels: P4 Head x (25) CFC\_1000

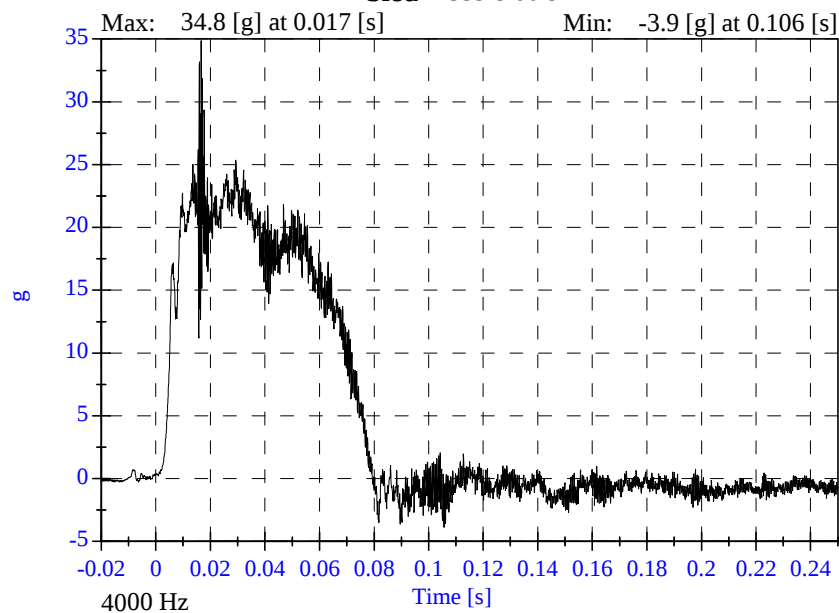
P4 Head y (26) CFC\_1000

P4 Head z (27) CFC\_1000

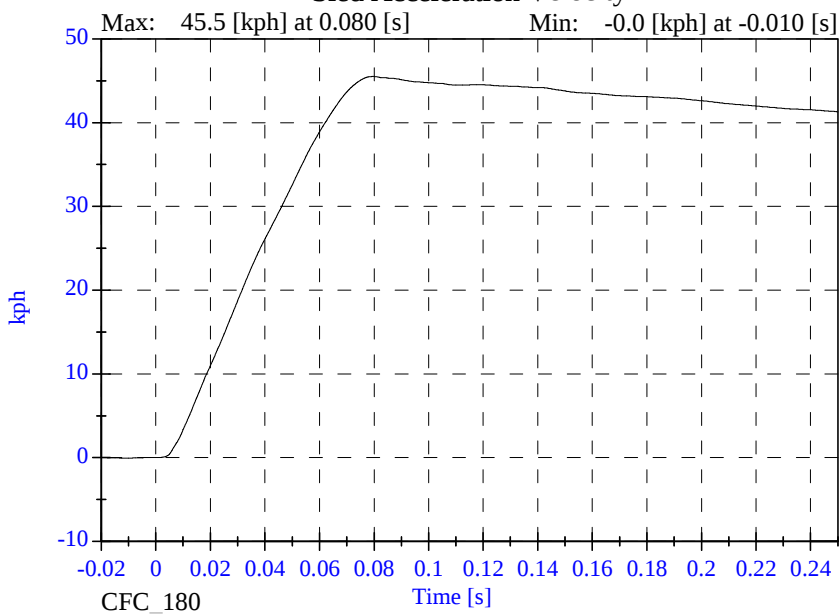
=====

## Sled Test NCAP SLED 08-3-29

Sled Acceleration

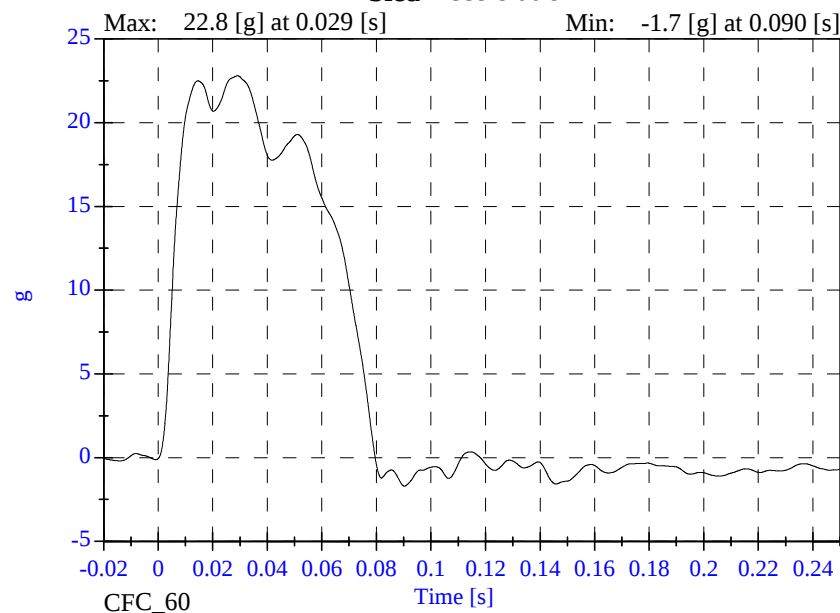


Sled Acceleration Velocity

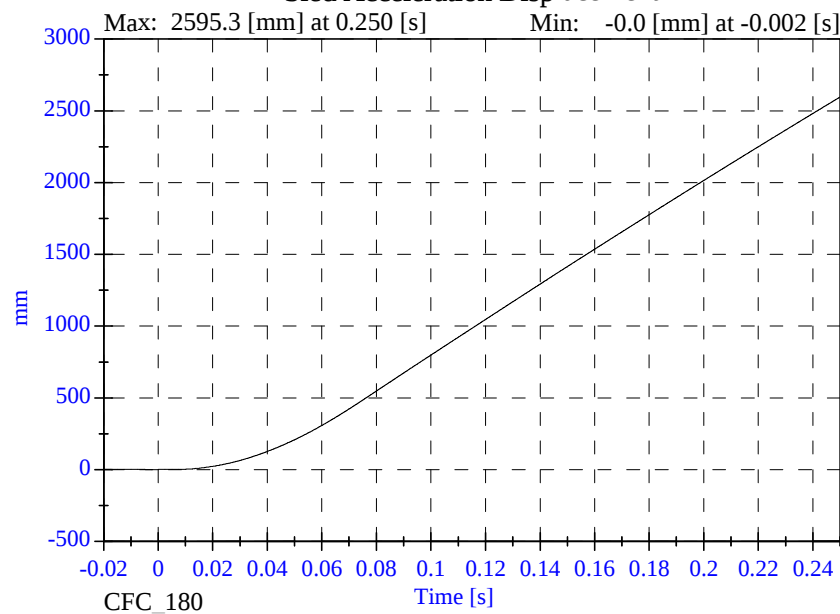


## - August 13, 2003

Sled Acceleration

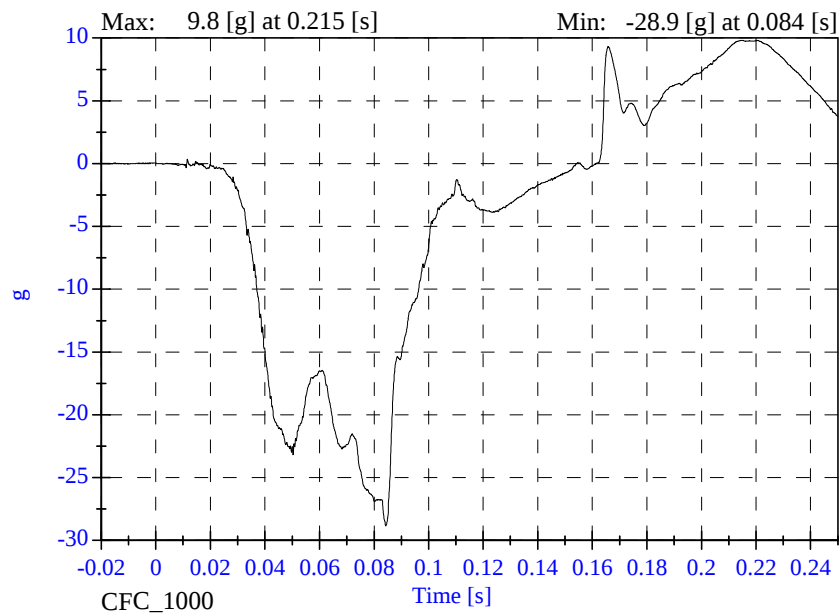


Sled Acceleration Displacement



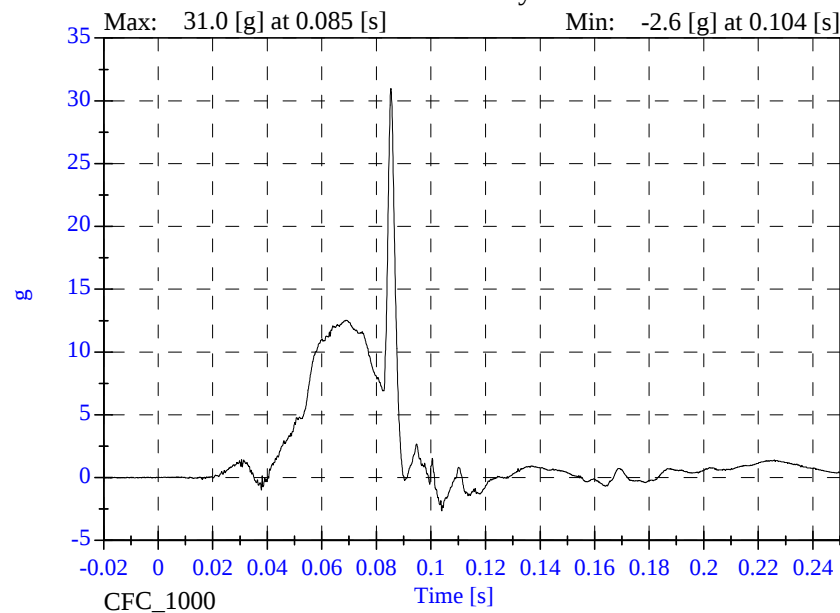
## Sled Test NCAP SLED 08-3-29

P3 Head x

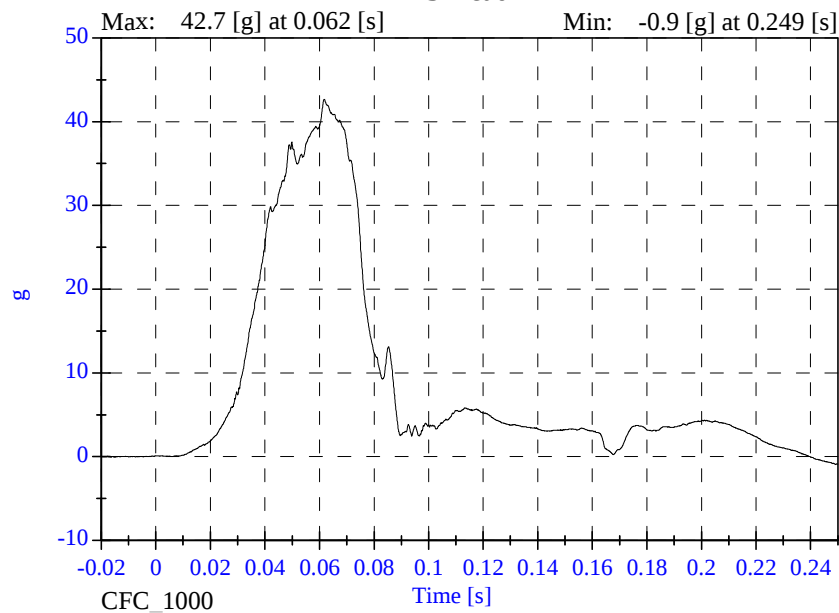


- August 13, 2003

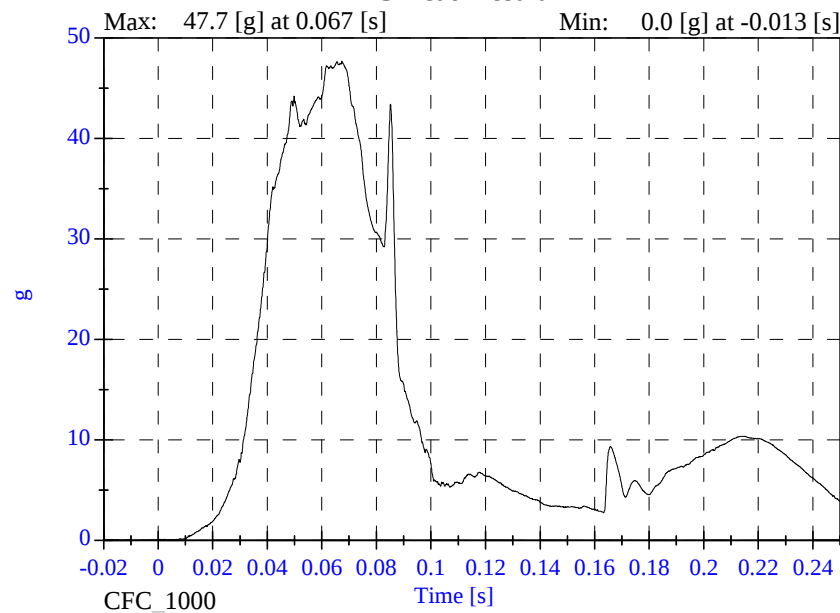
P3 Head y



P3 Head z

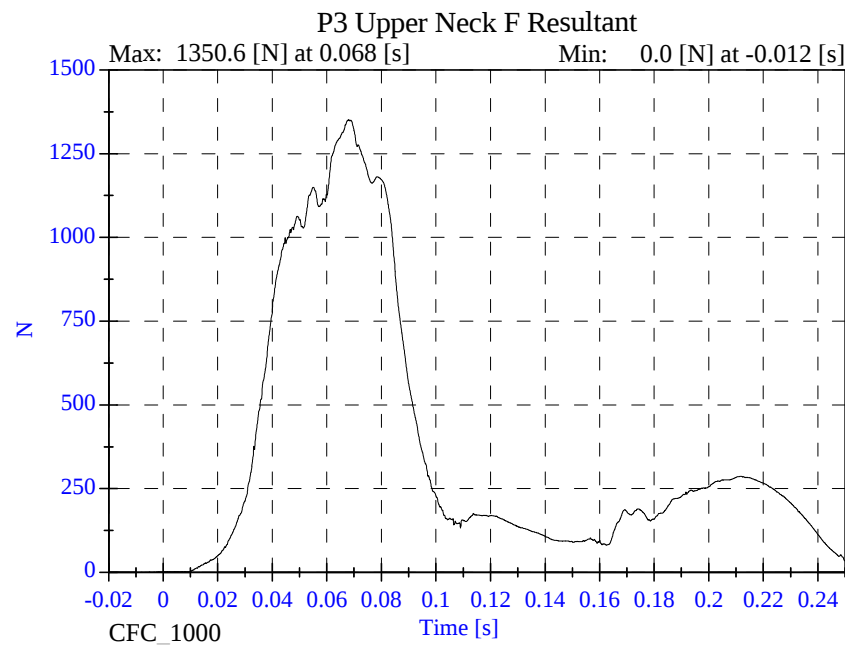
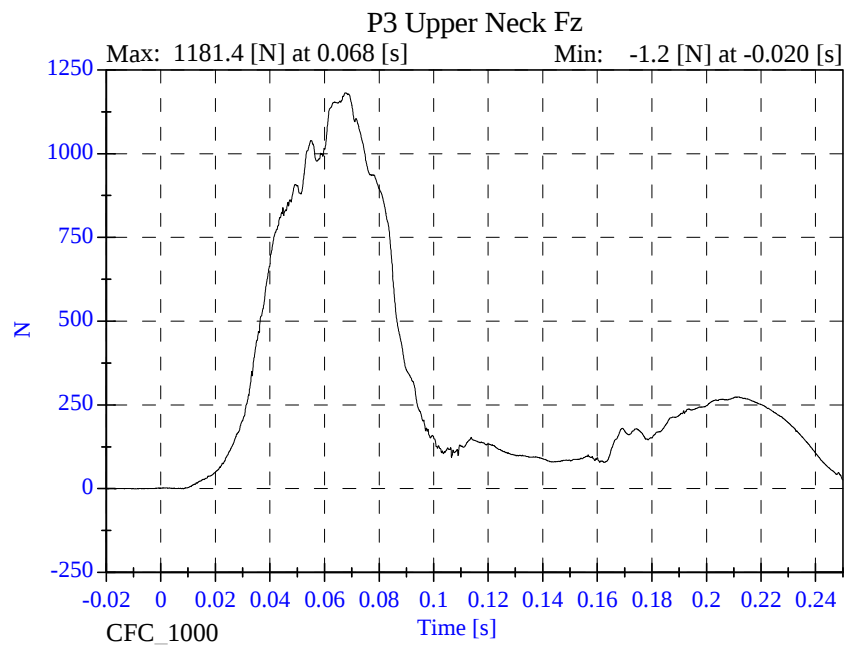
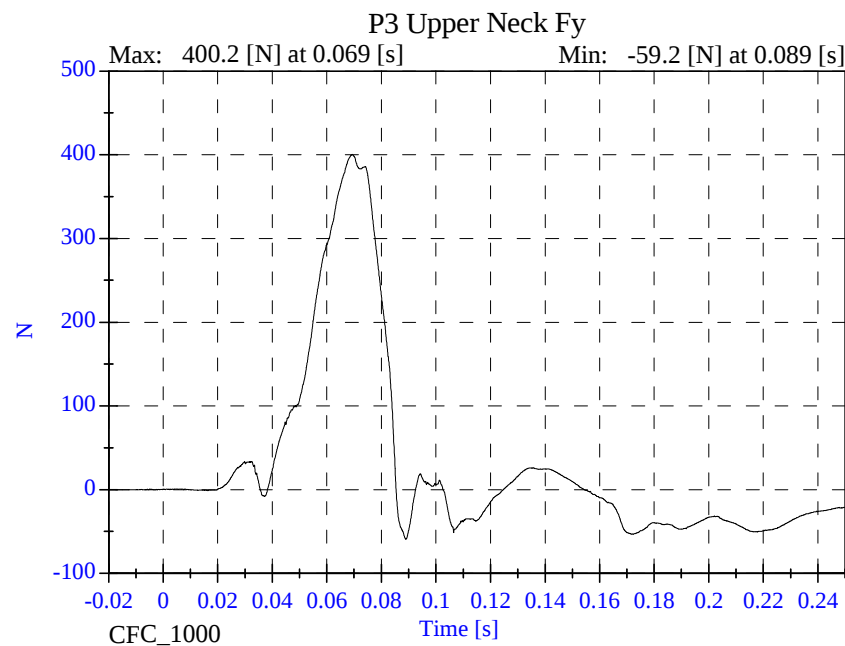
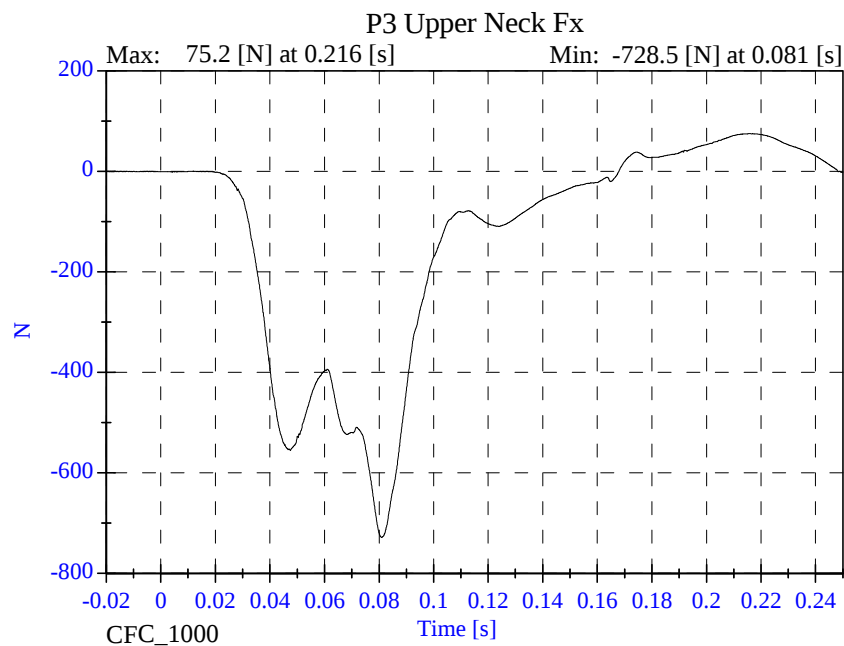


P3 Head Resultant



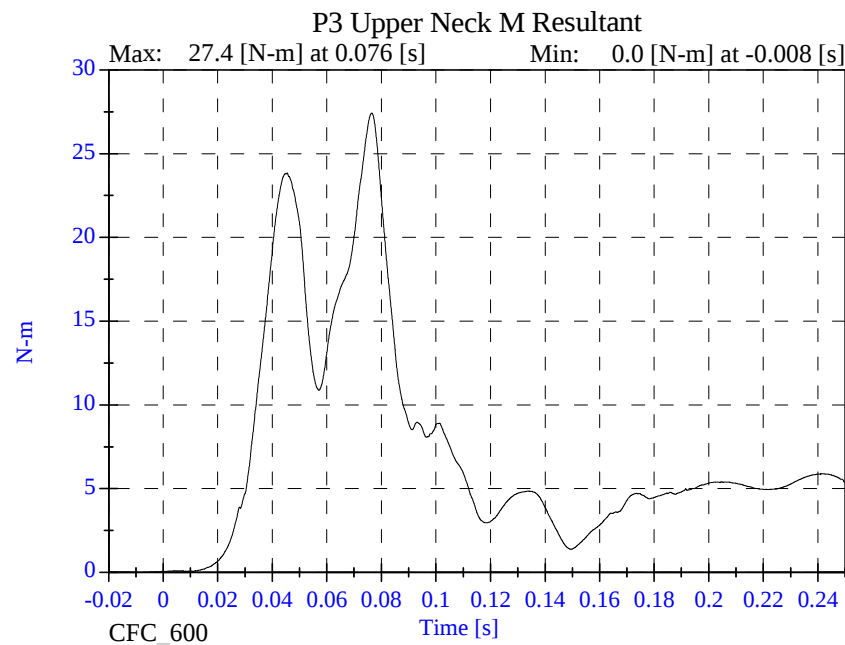
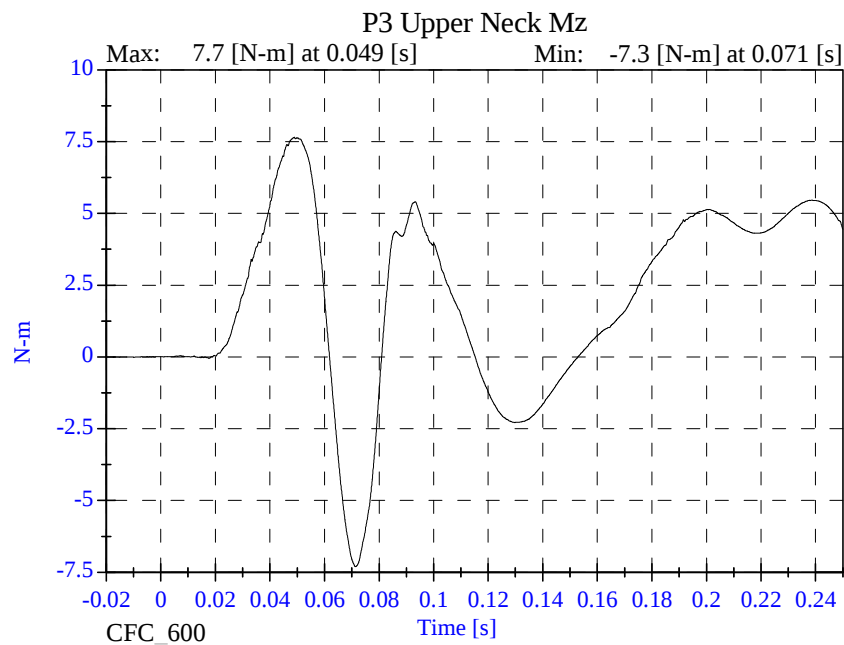
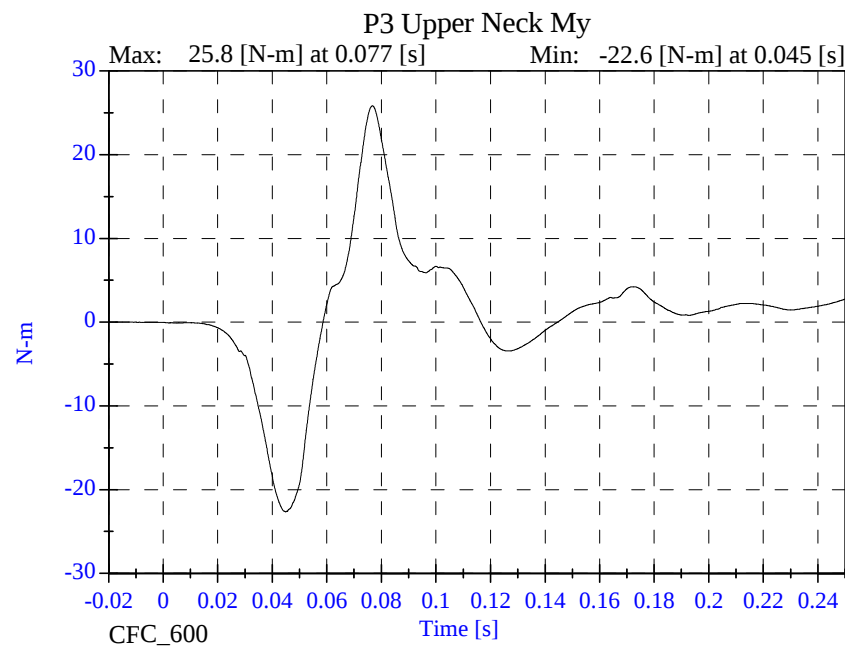
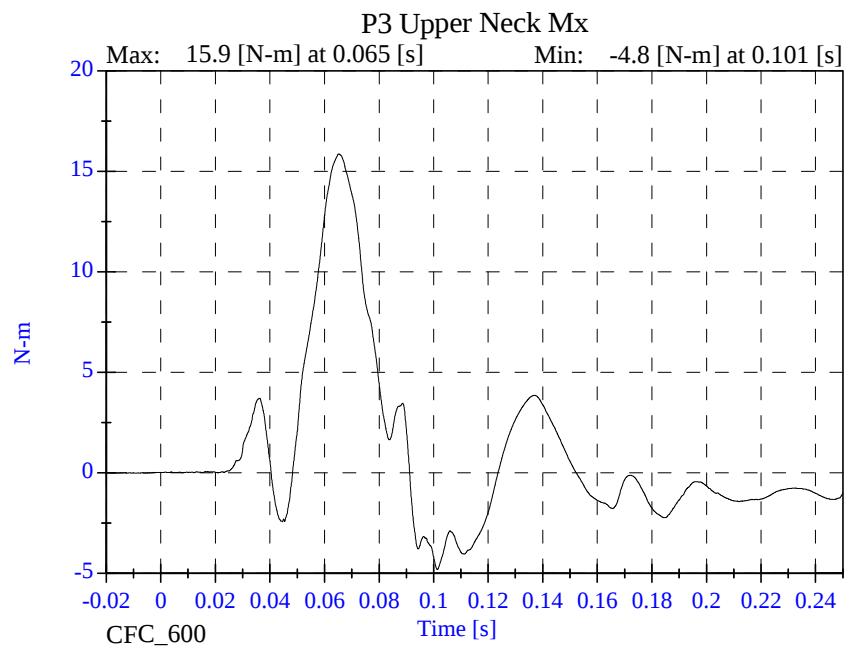
## Sled Test NCAP SLED 08-3-29

- August 13, 2003



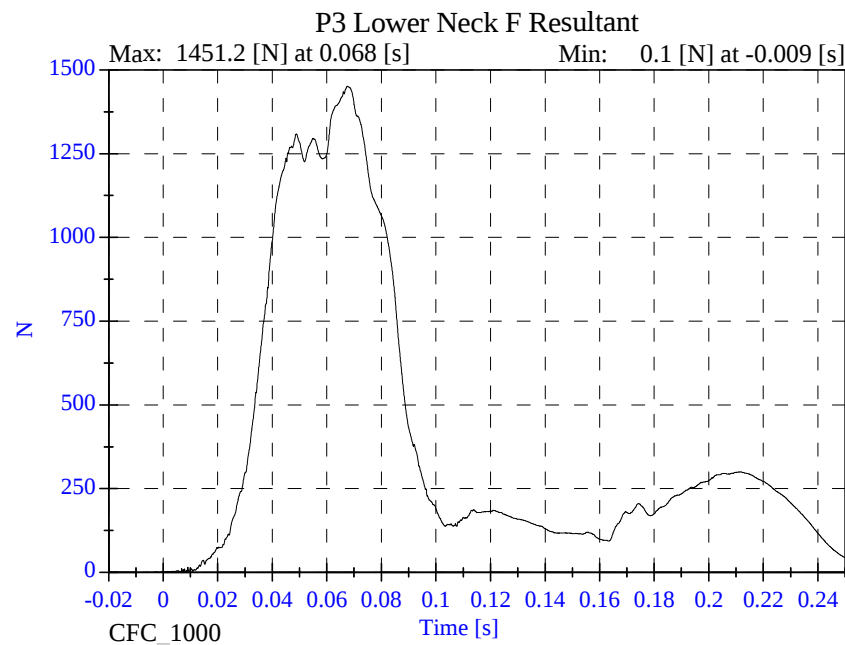
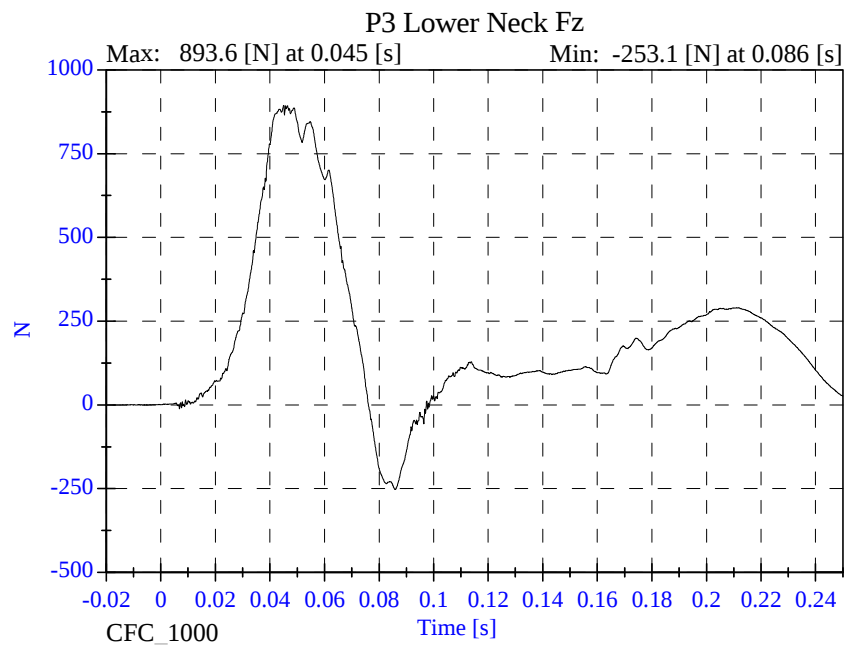
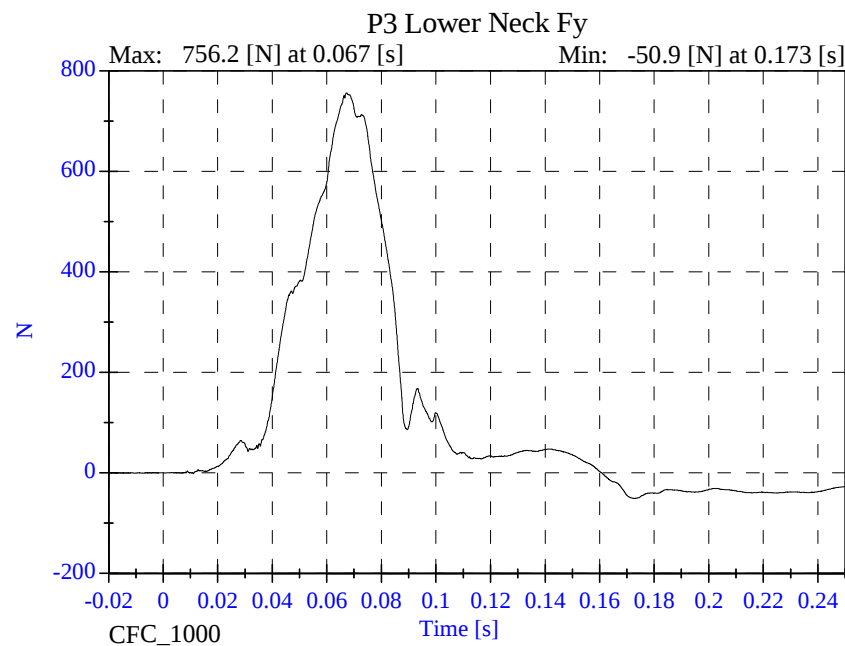
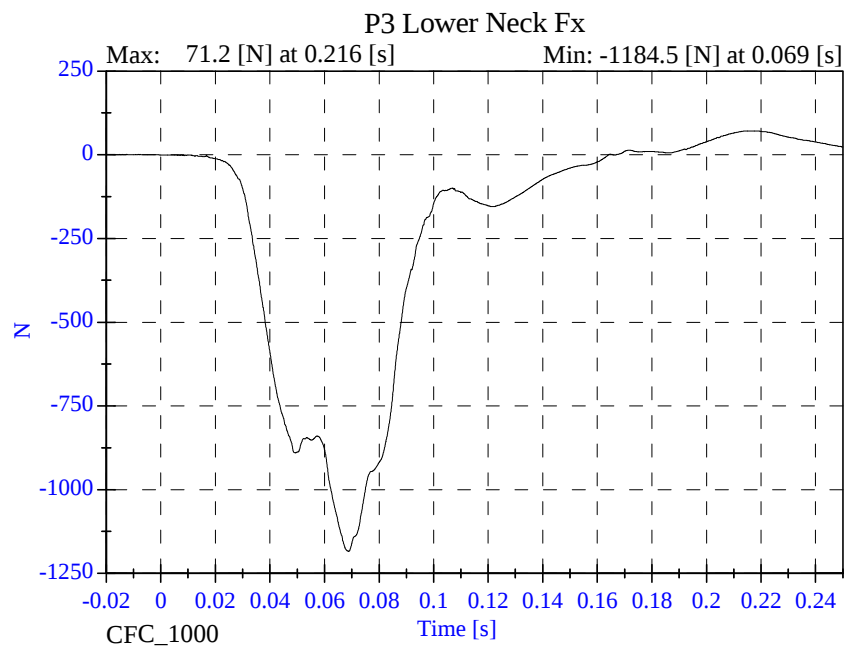
## Sled Test NCAP SLED 08-3-29

- August 13, 2003



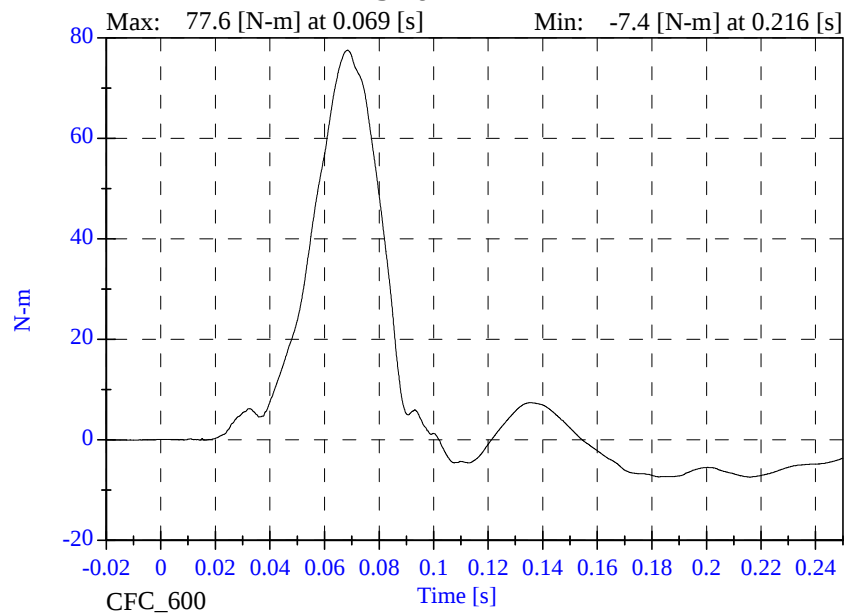
## Sled Test NCAP SLED 08-3-29

- August 13, 2003



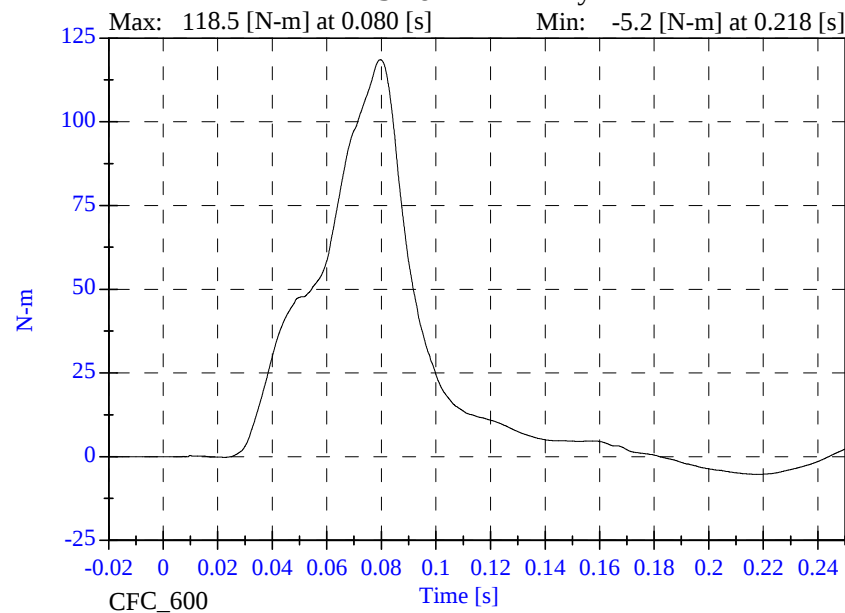
## Sled Test NCAP SLED 08-3-29

P3 Lower Neck Mx

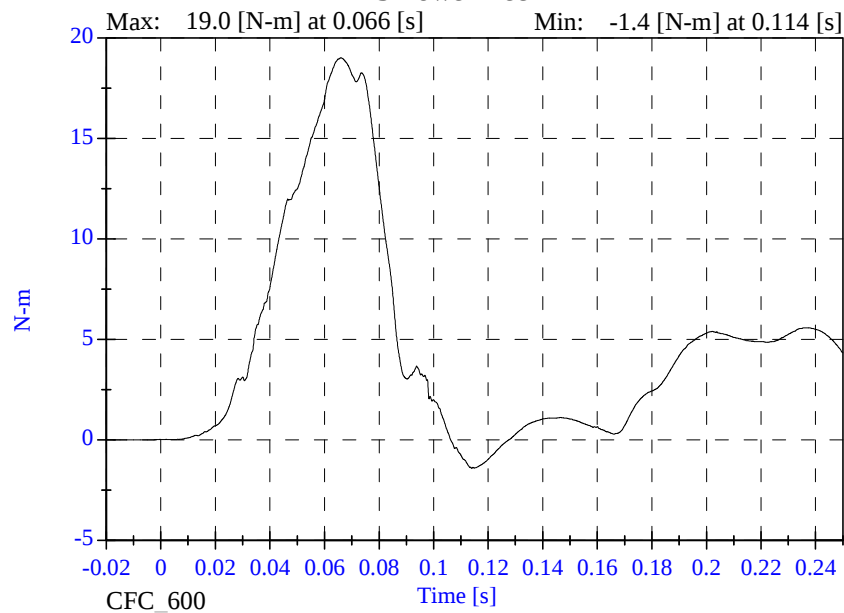


- August 13, 2003

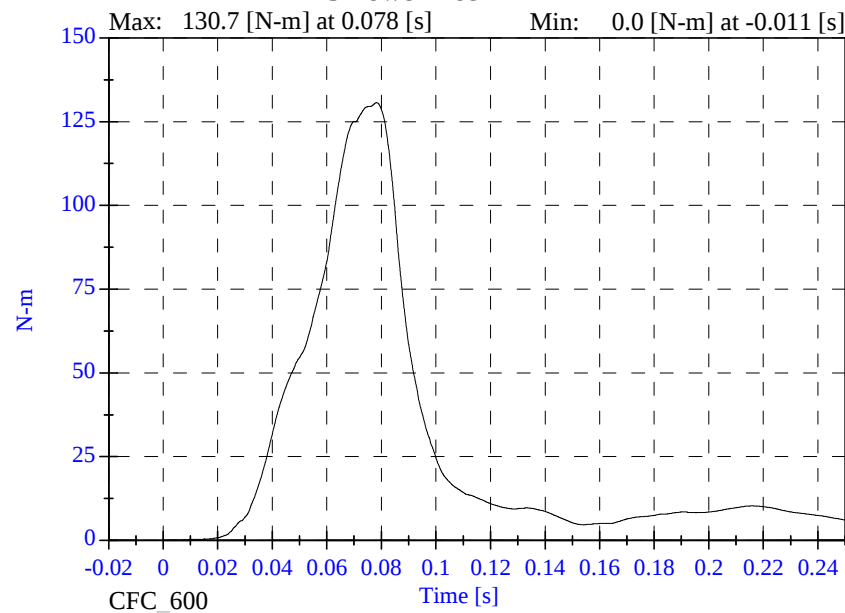
P3 Lower Neck My



P3 Lower Neck Mz

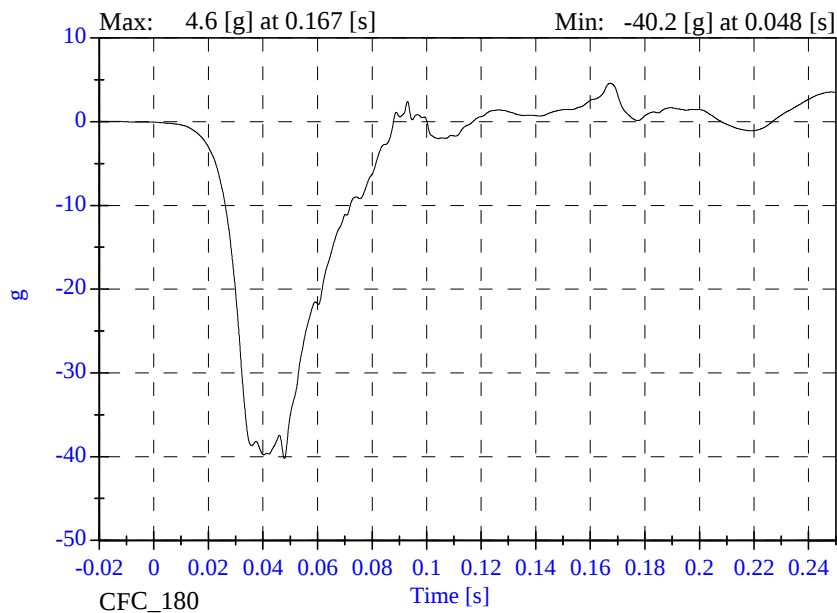


P3 Lower Neck M Resultant



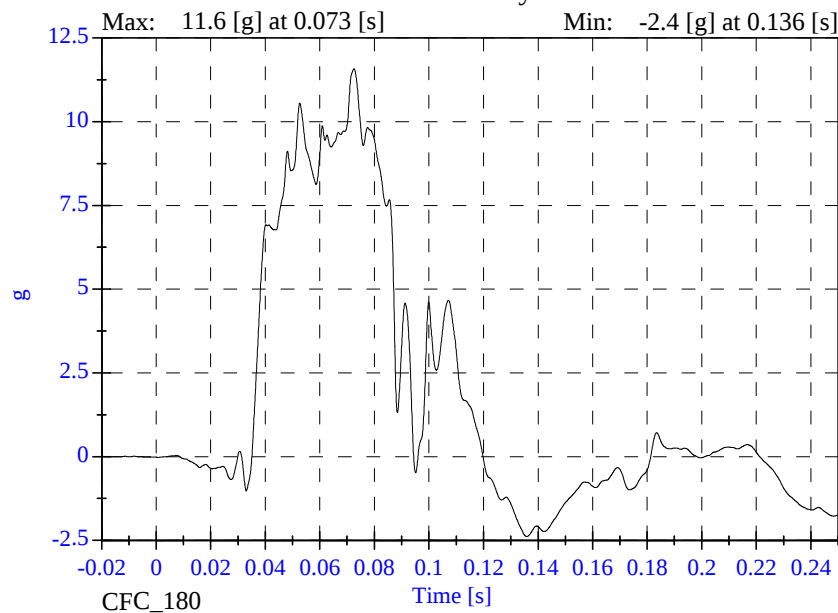
## Sled Test NCAP SLED 08-3-29

P3 Chest x

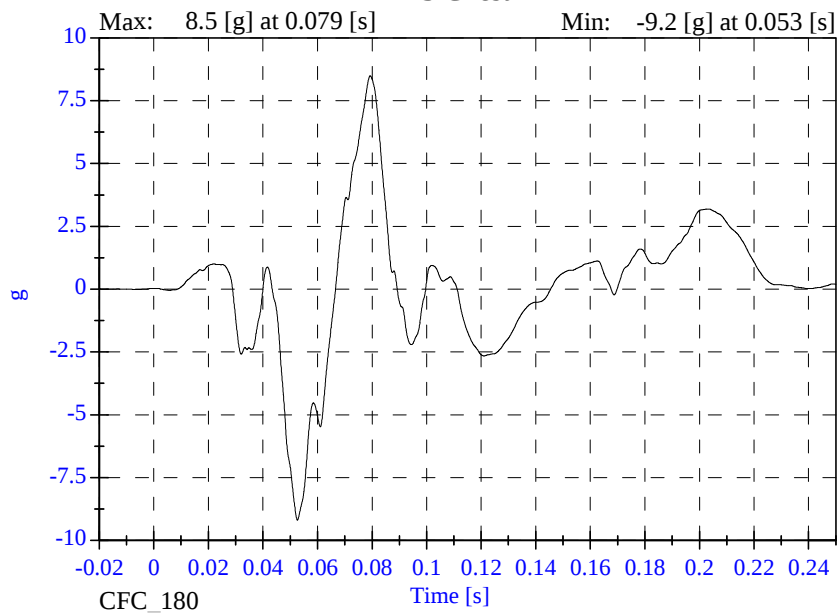


- August 13, 2003

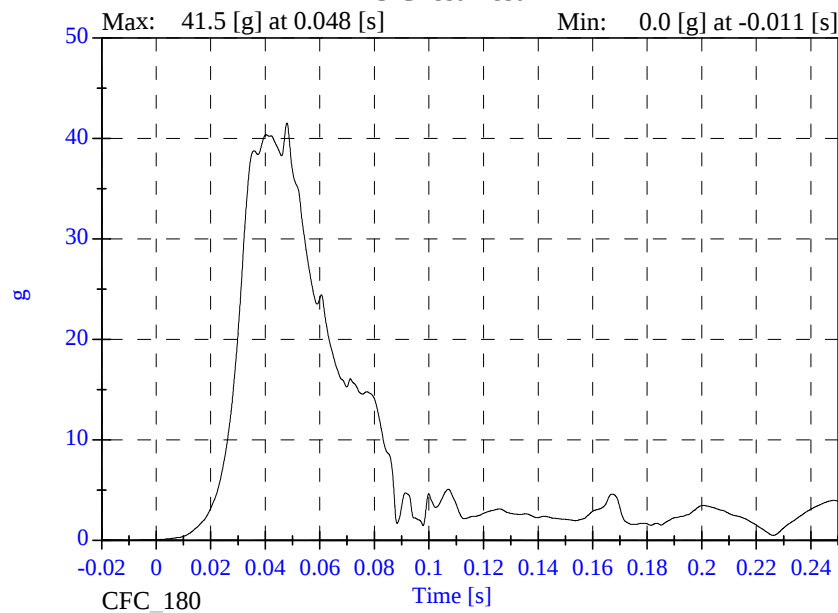
P3 Chest y



P3 Chest z

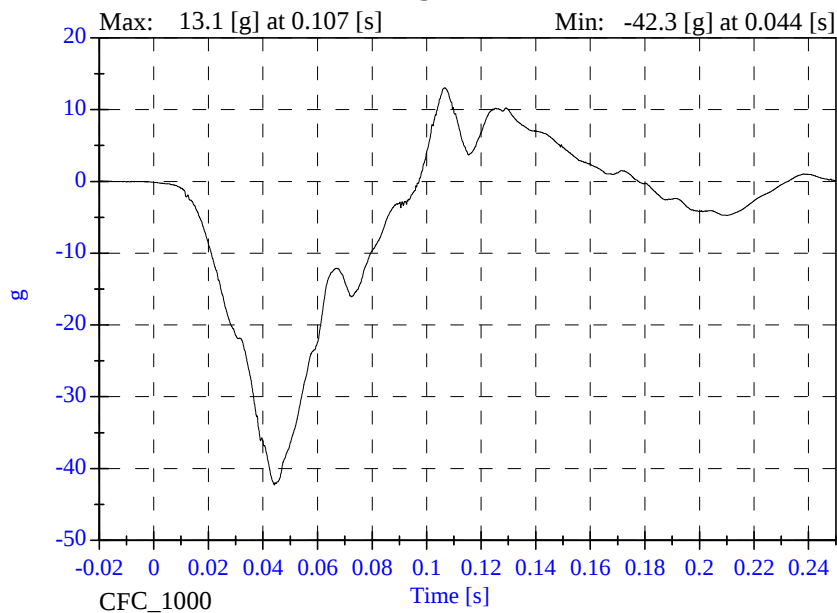


P3 Chest Resultant



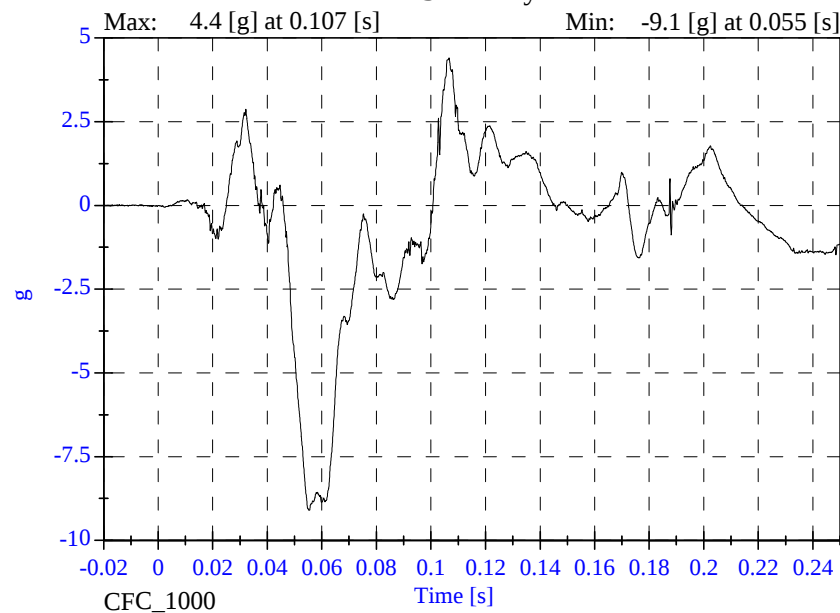
## Sled Test NCAP SLED 08-3-29

P3 Pelvic x

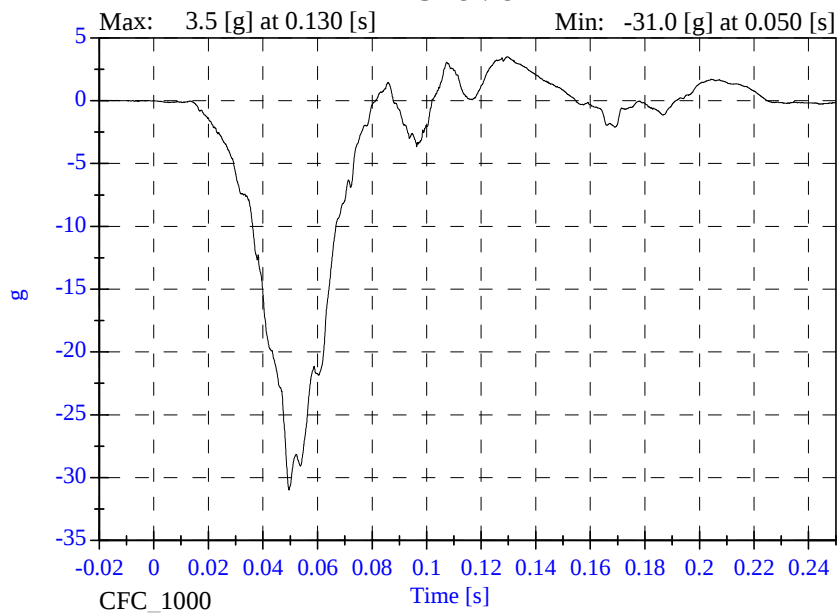


- August 13, 2003

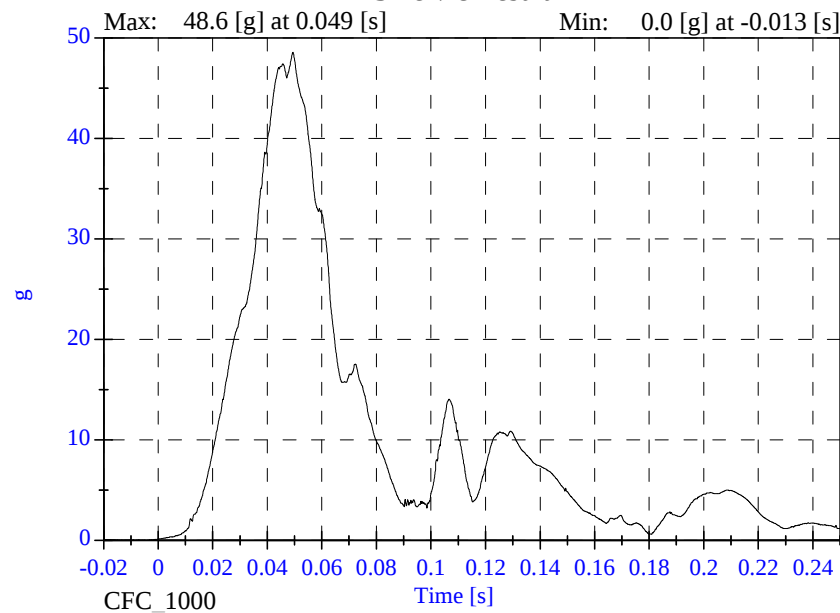
P3 Pelvic y



P3 Pelvic z



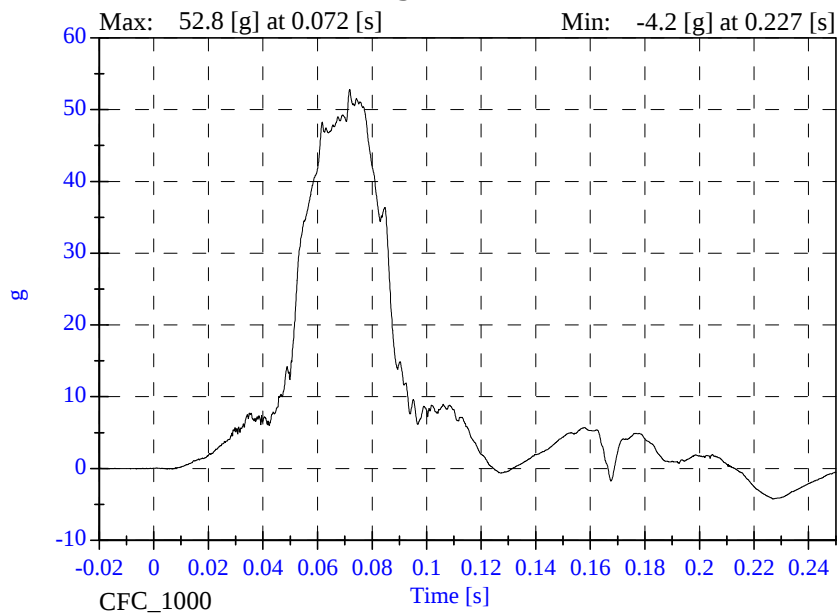
P3 Pelvic Resultant



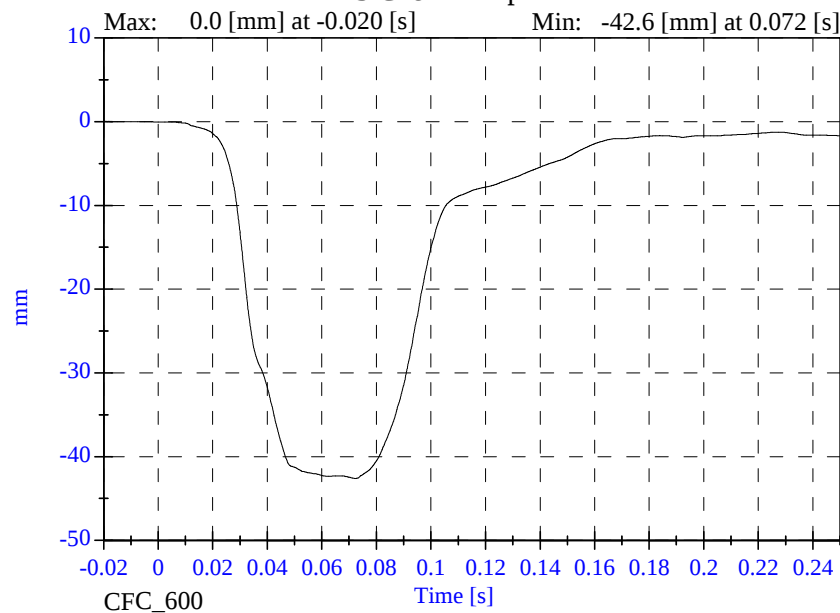
## Sled Test NCAP SLED 08-3-29

- August 13, 2003

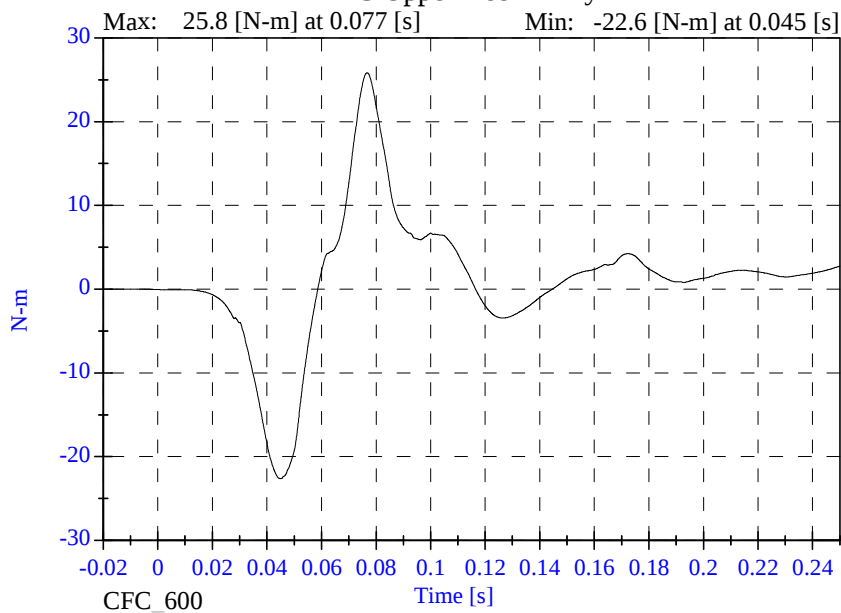
P3 Head Red z



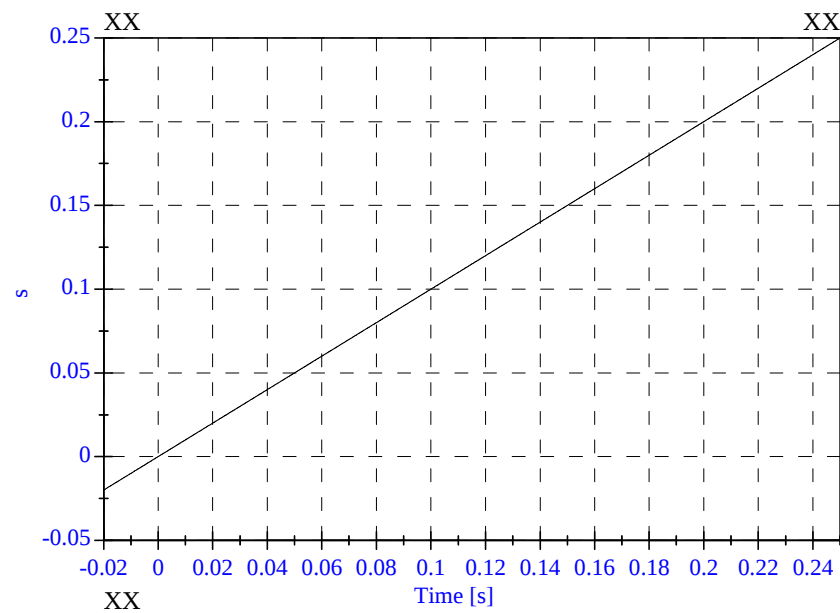
P3 Chest Compression



P3 Upper Neck Mocyc

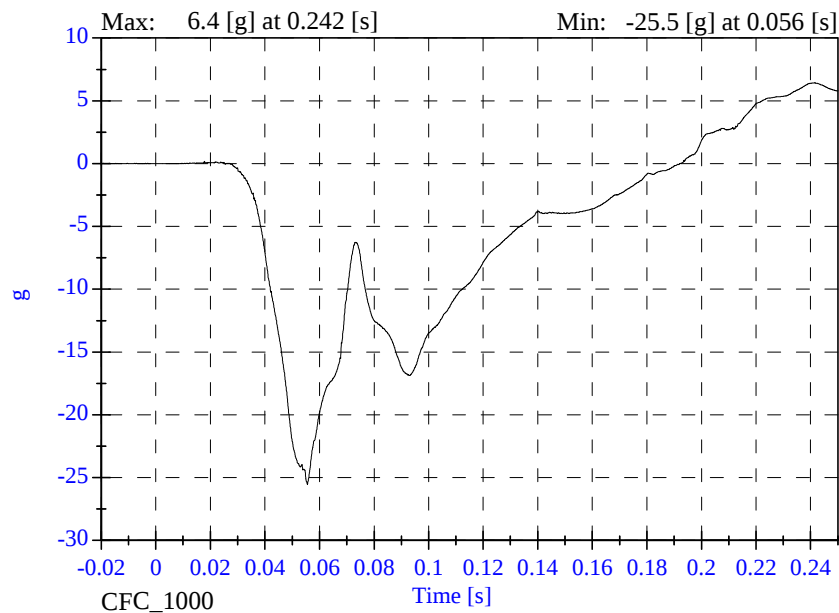


BLANK



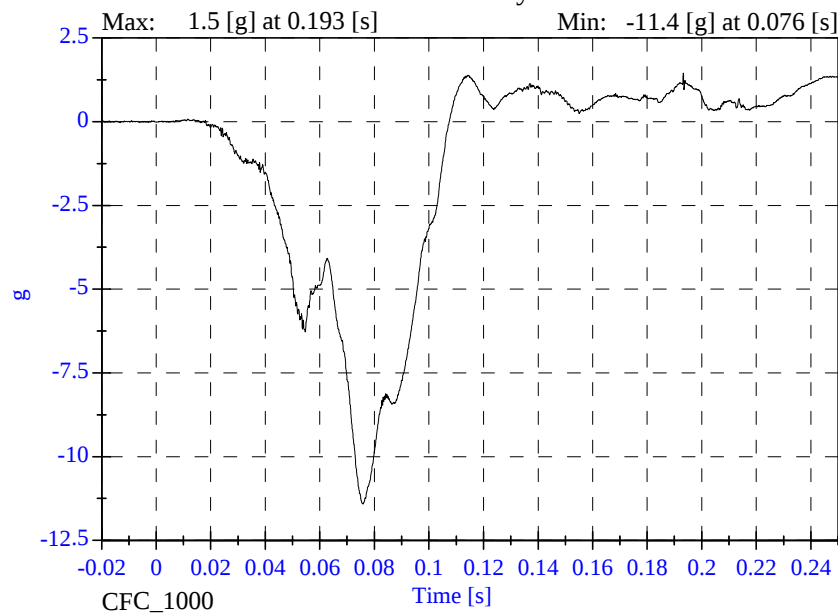
## Sled Test NCAP SLED 08-3-29

P4 Head x

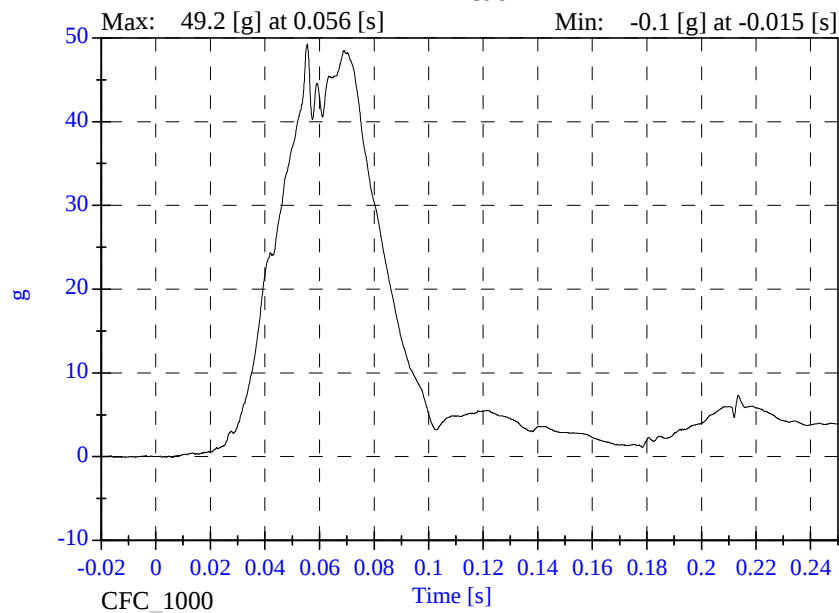


- August 13, 2003

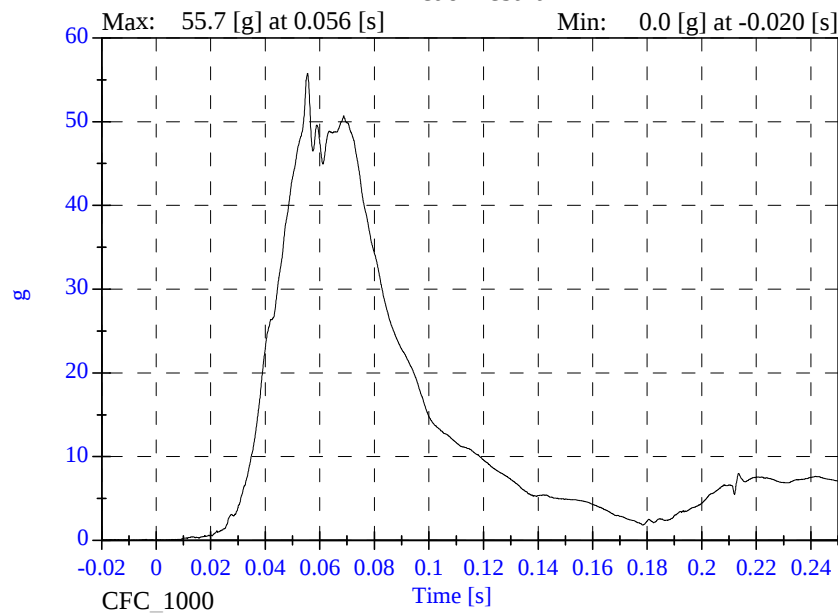
P4 Head y



P4 Head z



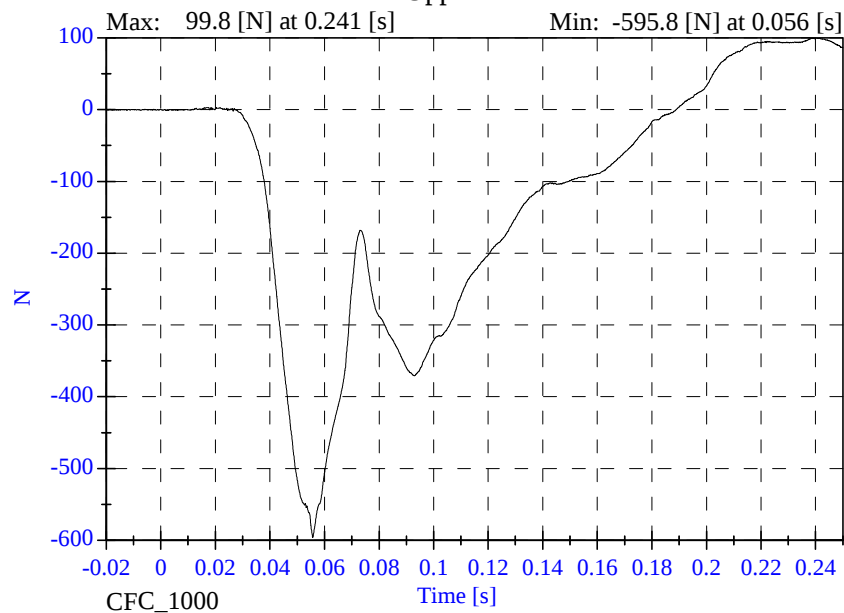
P4 Head Resultant



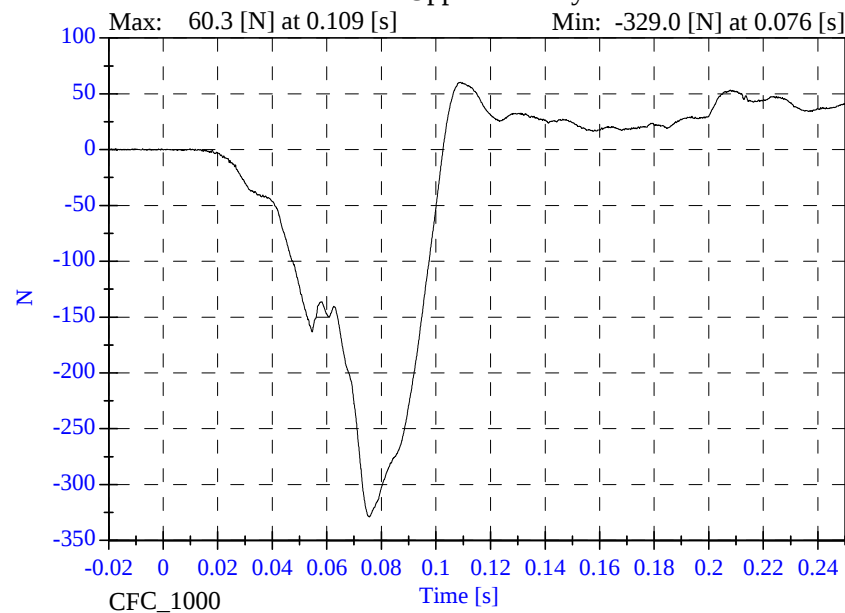
## Sled Test NCAP SLED 08-3-29

- August 13, 2003

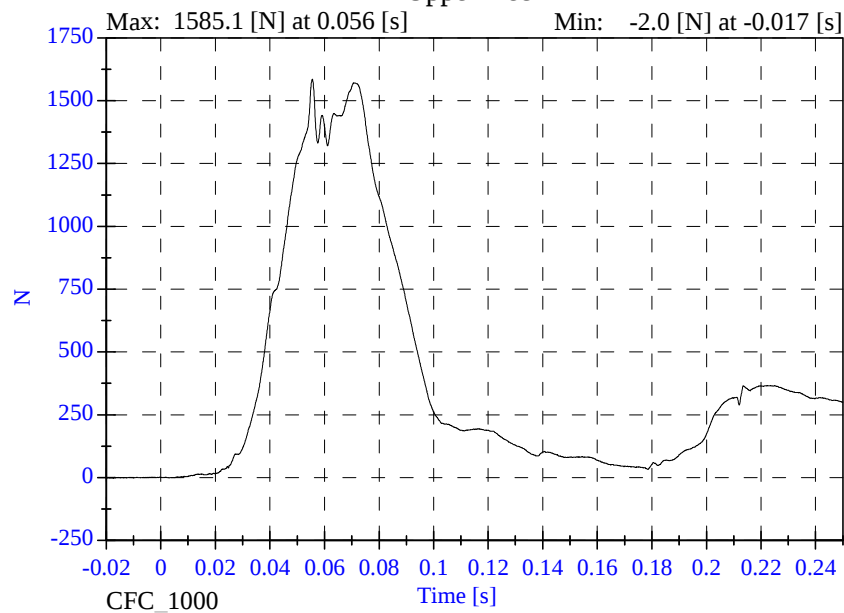
P4 Upper Neck Fx



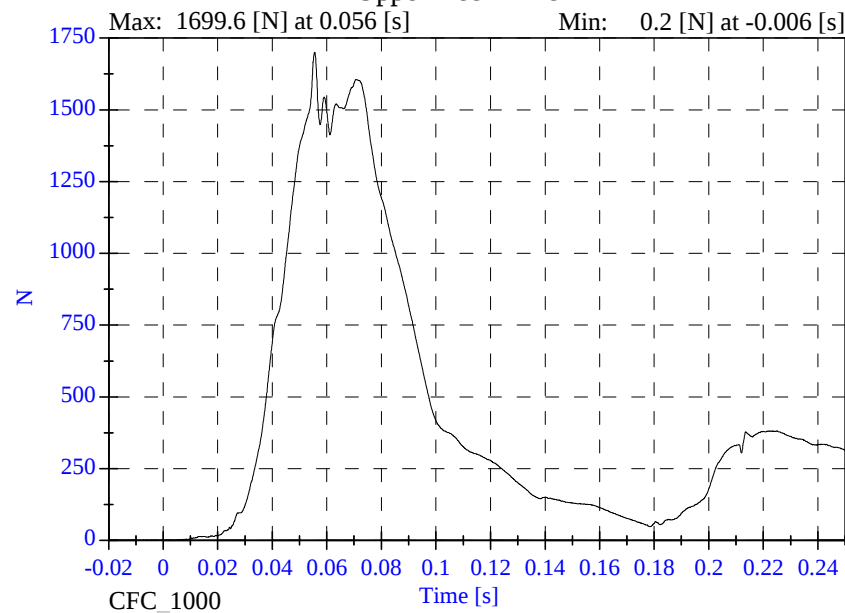
P4 Upper Neck Fy



P4 Upper Neck Fz

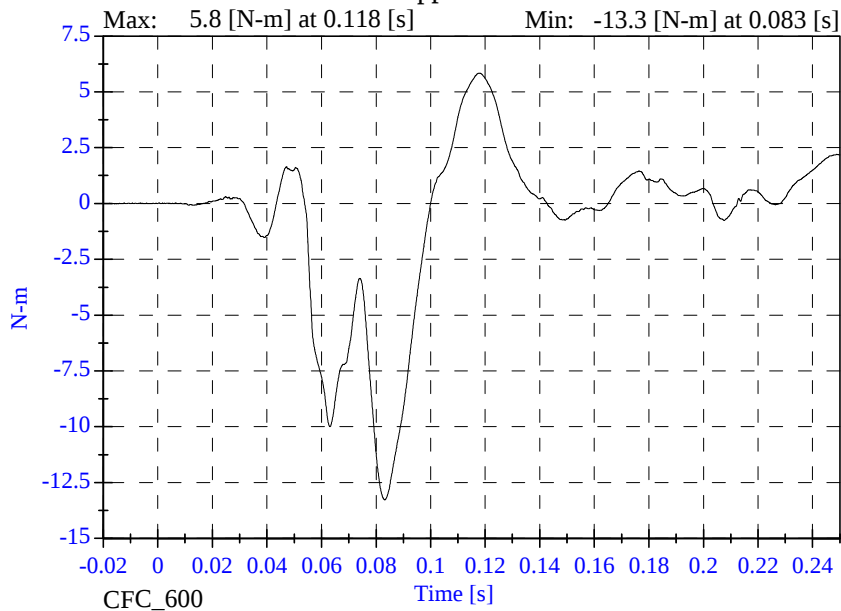


P4 Upper Neck F Resultant



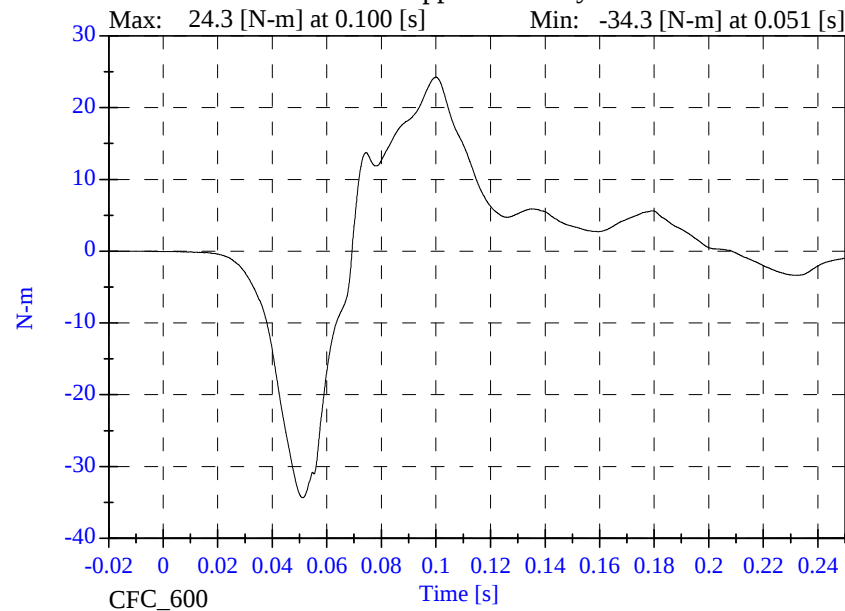
## Sled Test NCAP SLED 08-3-29

P4 Upper Neck Mx

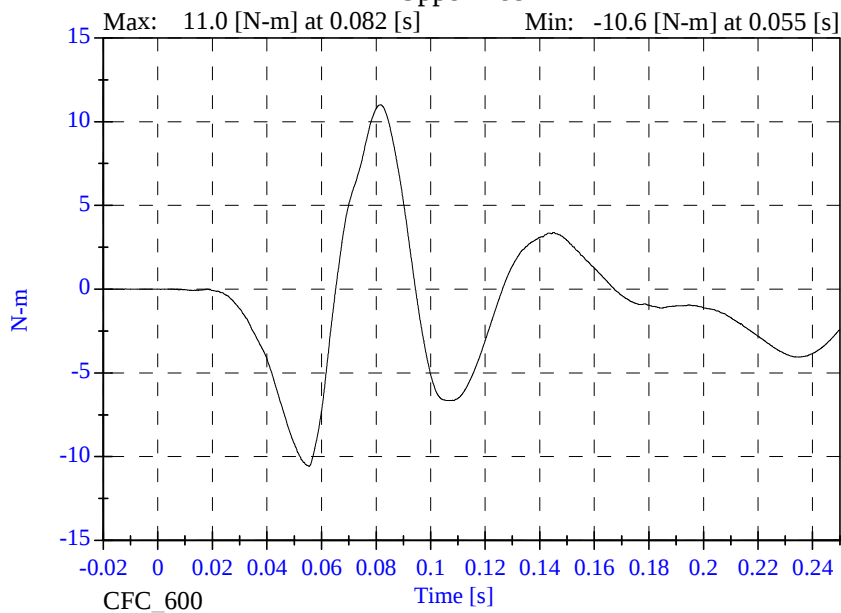


- August 13, 2003

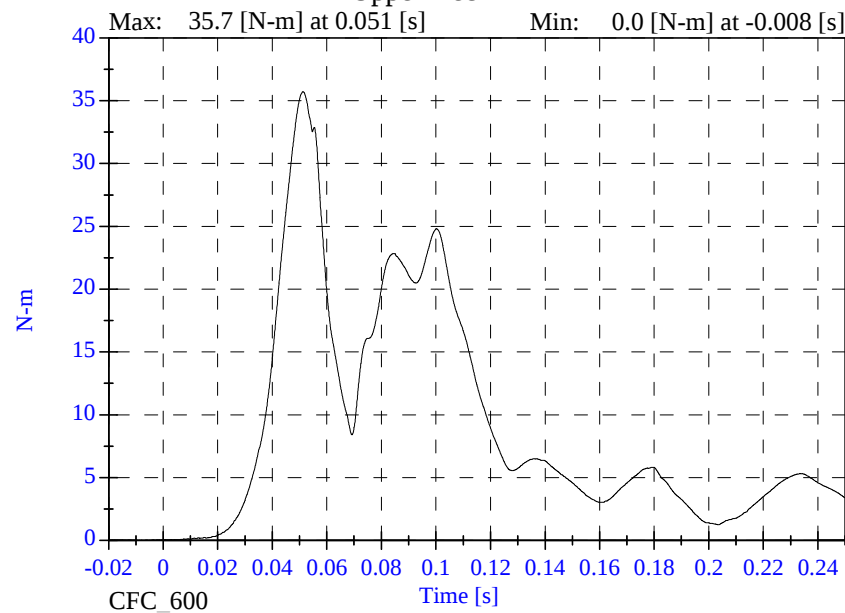
P4 Upper Neck My



P4 Upper Neck Mz



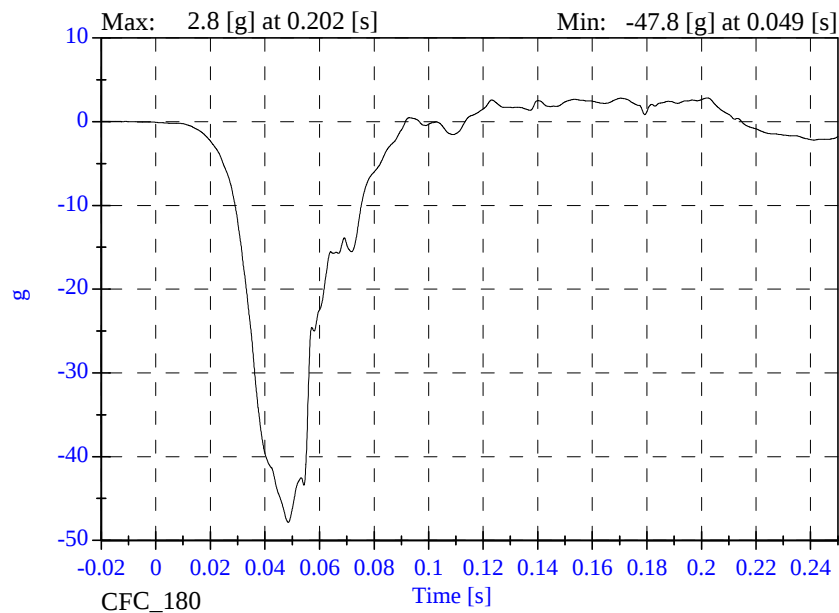
P4 Upper Neck M Resultant



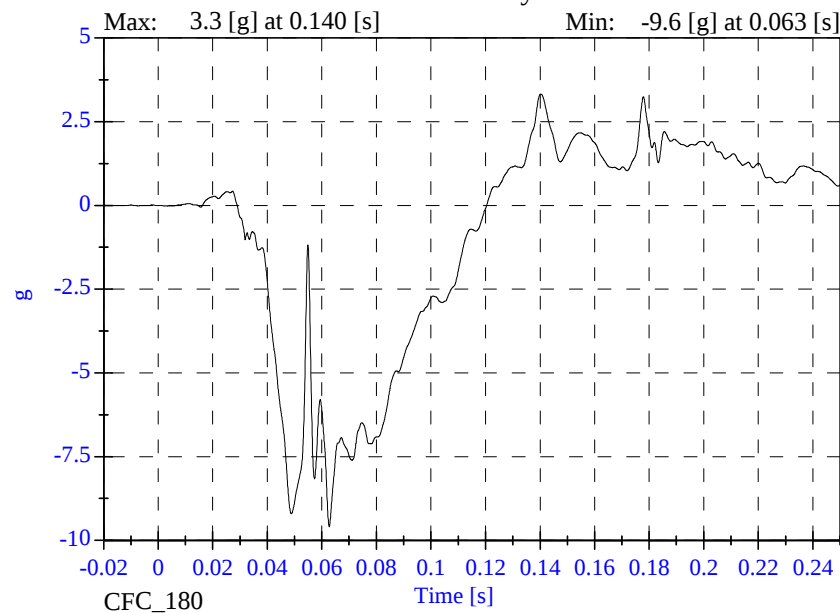
## Sled Test NCAP SLED 08-3-29

- August 13, 2003

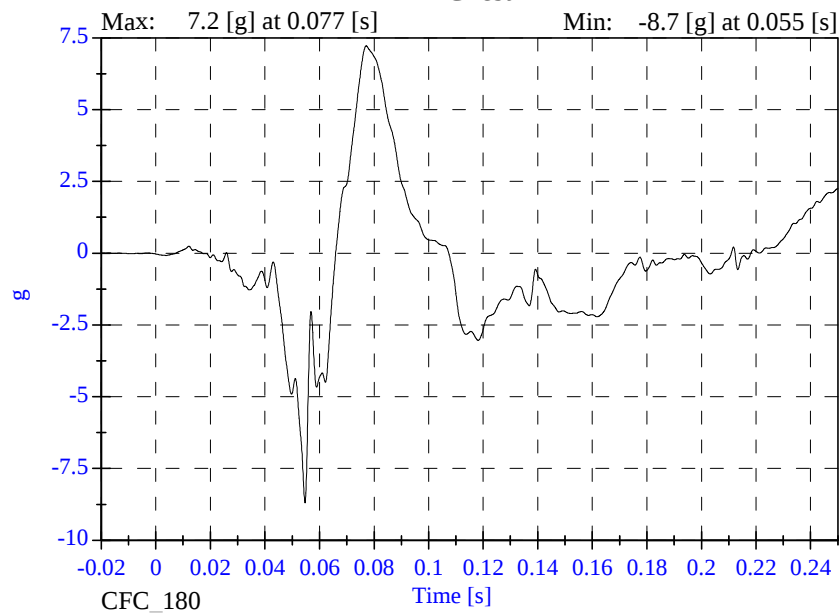
P4 Chest x



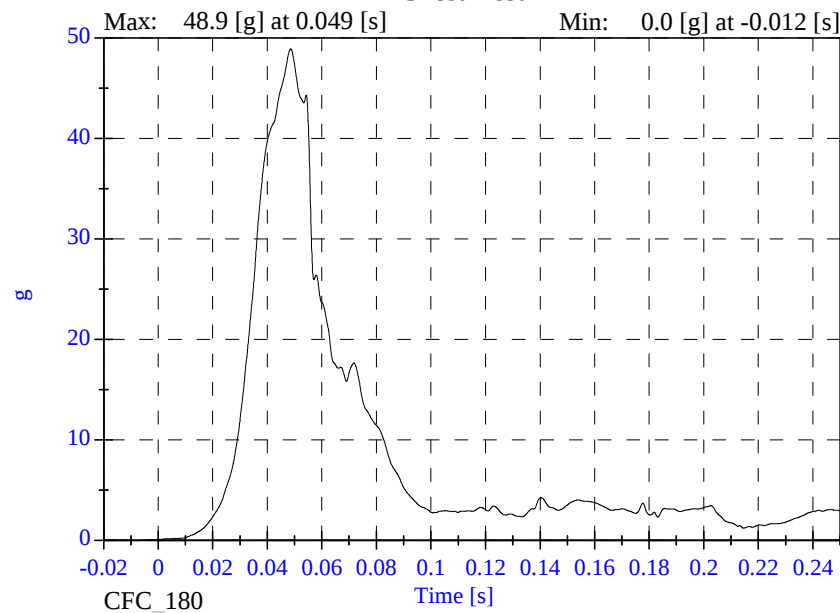
P4 Chest y



P4 Chest z



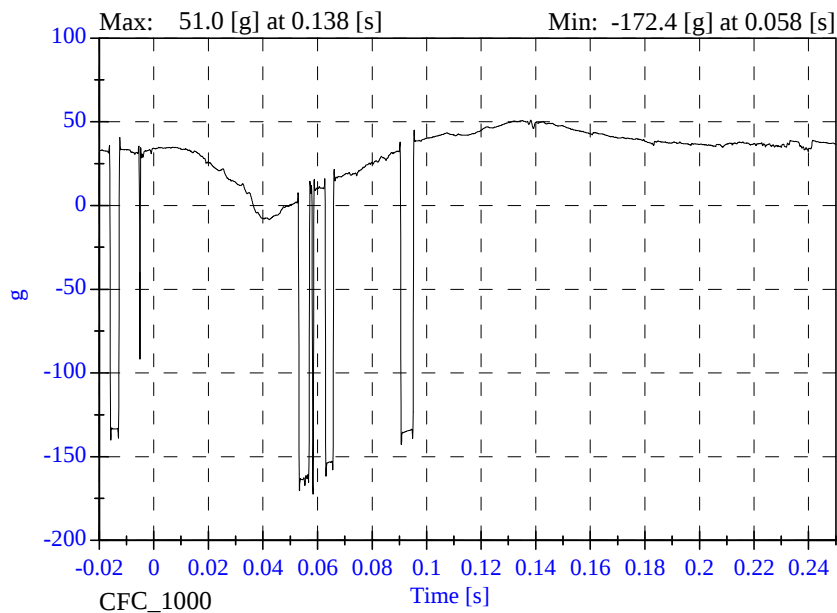
P4 Chest Resultant



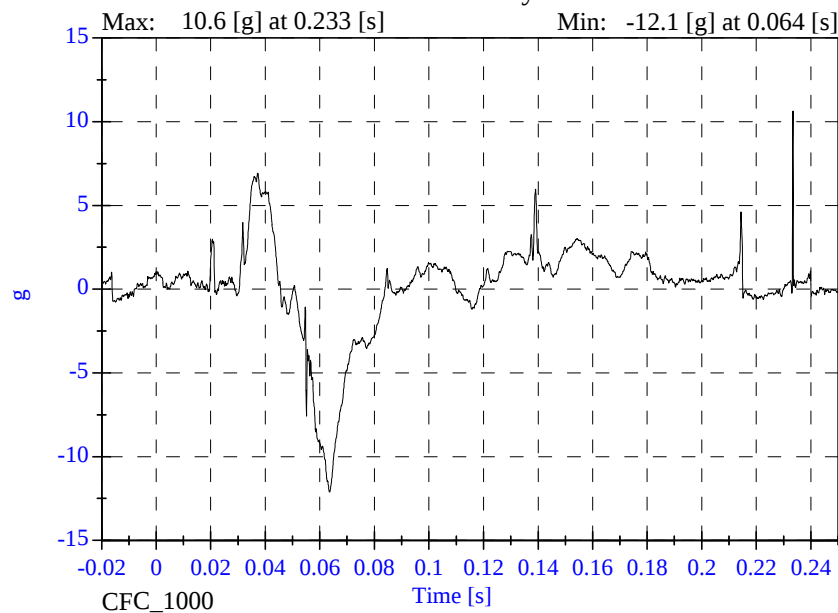
## Sled Test NCAP SLED 08-3-29

- August 13, 2003

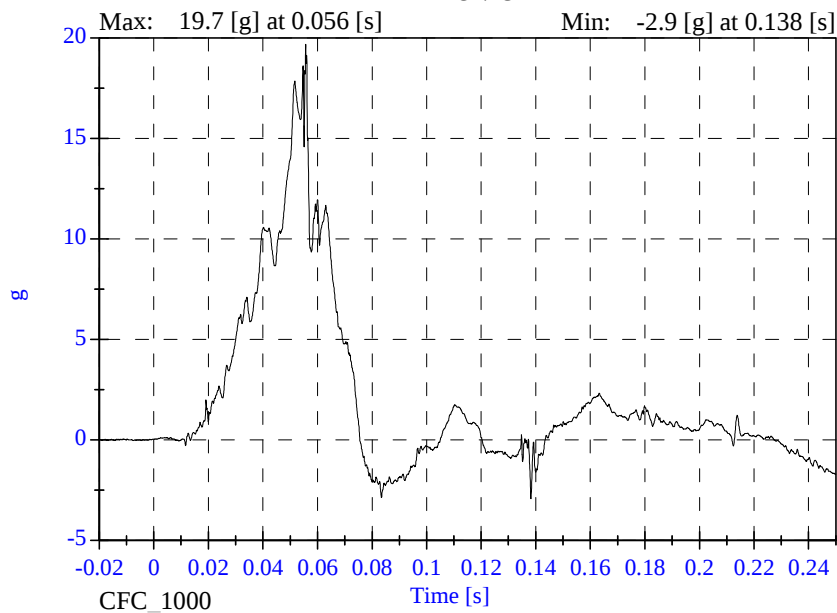
P4 Pelvic x



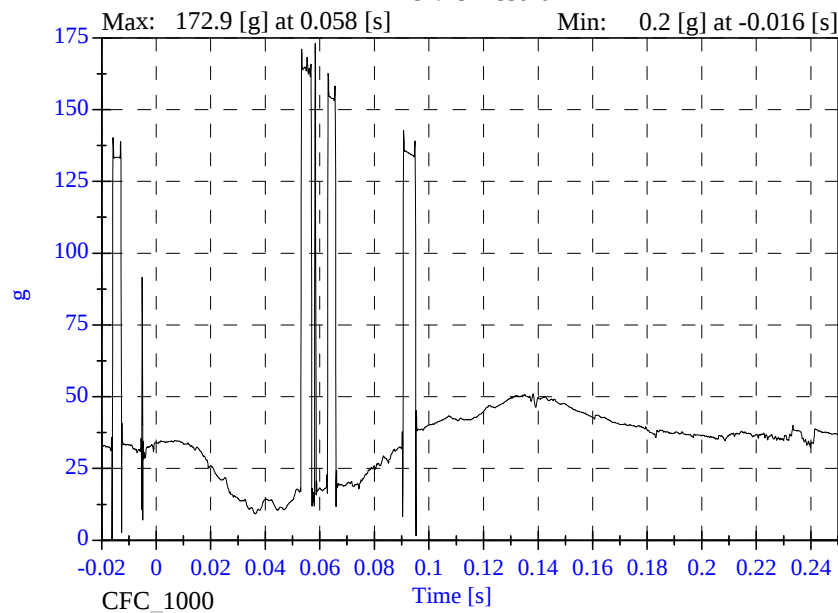
P4 Pelvic y



P4 Pelvic z

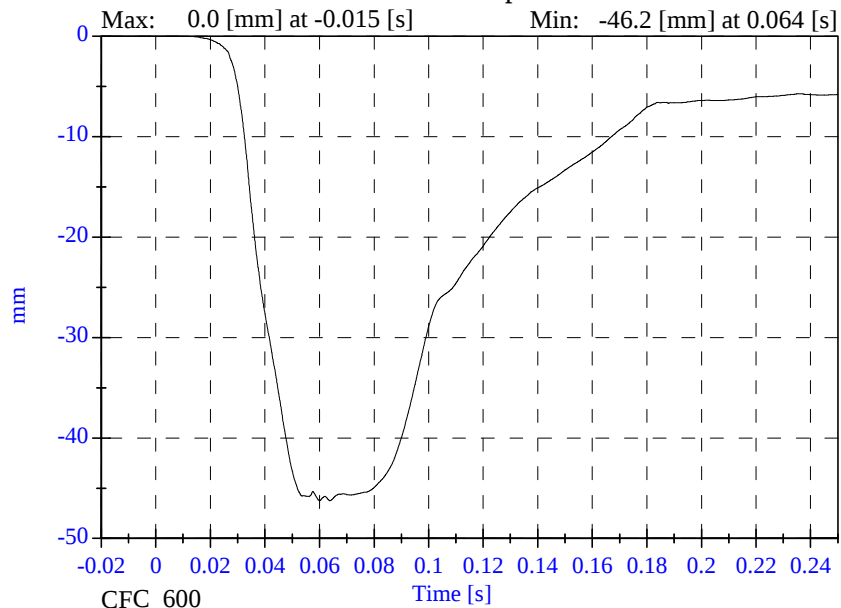


P4 Pelvic Resultant



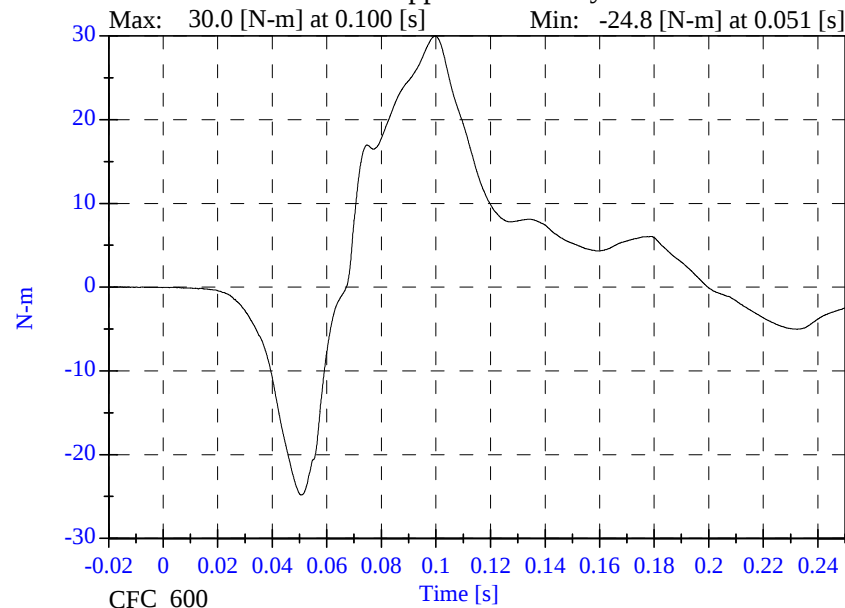
## Sled Test NCAP SLED 08-3-29

P4 Chest Compression

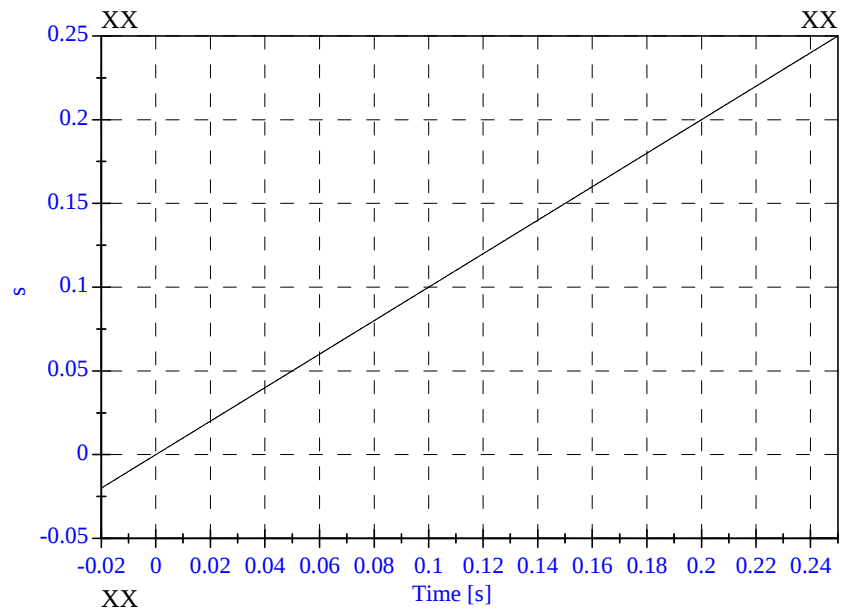


- August 13, 2003

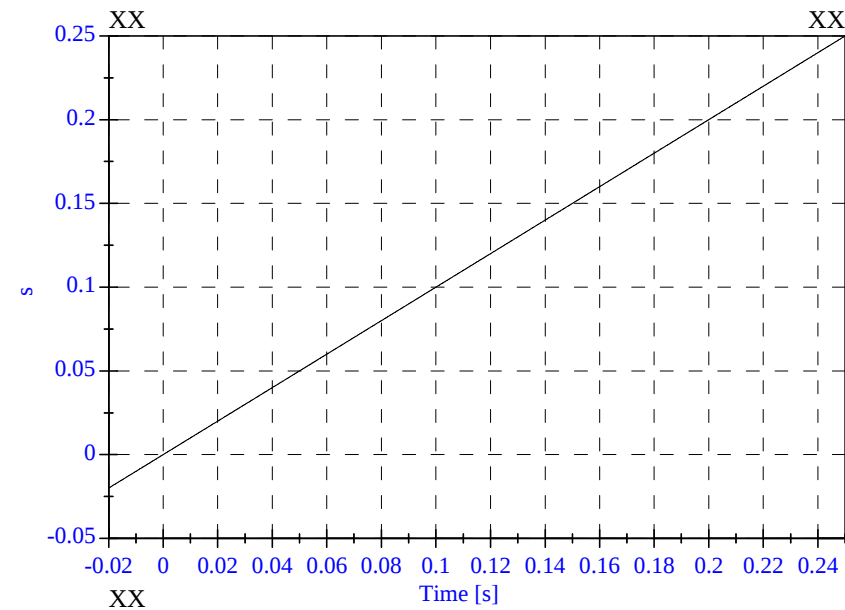
P4 Upper Neck Mocyc



BLANK



BLANK

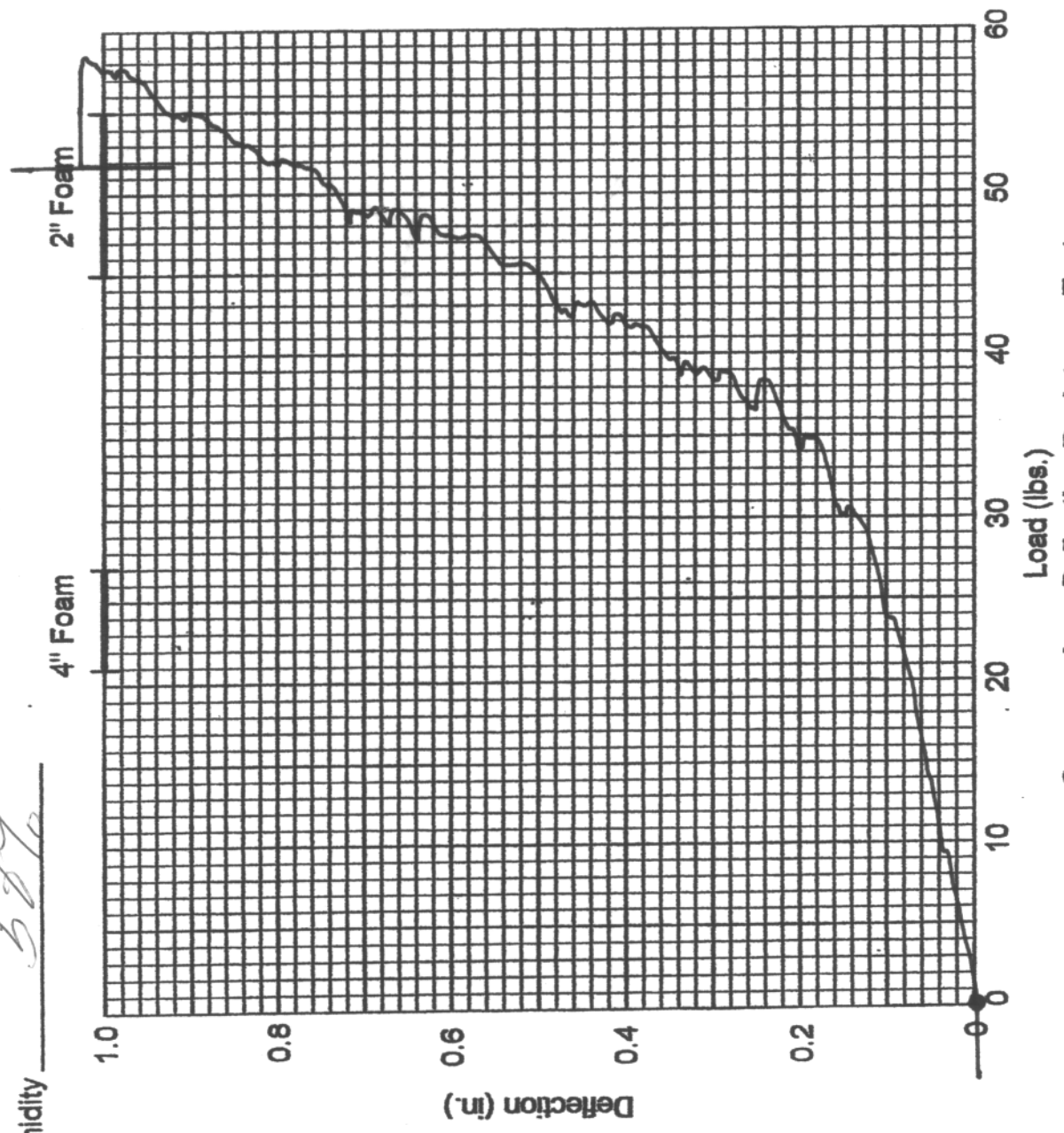


## **SECTION 9**

### **Compression – Deflection Resistance Test**

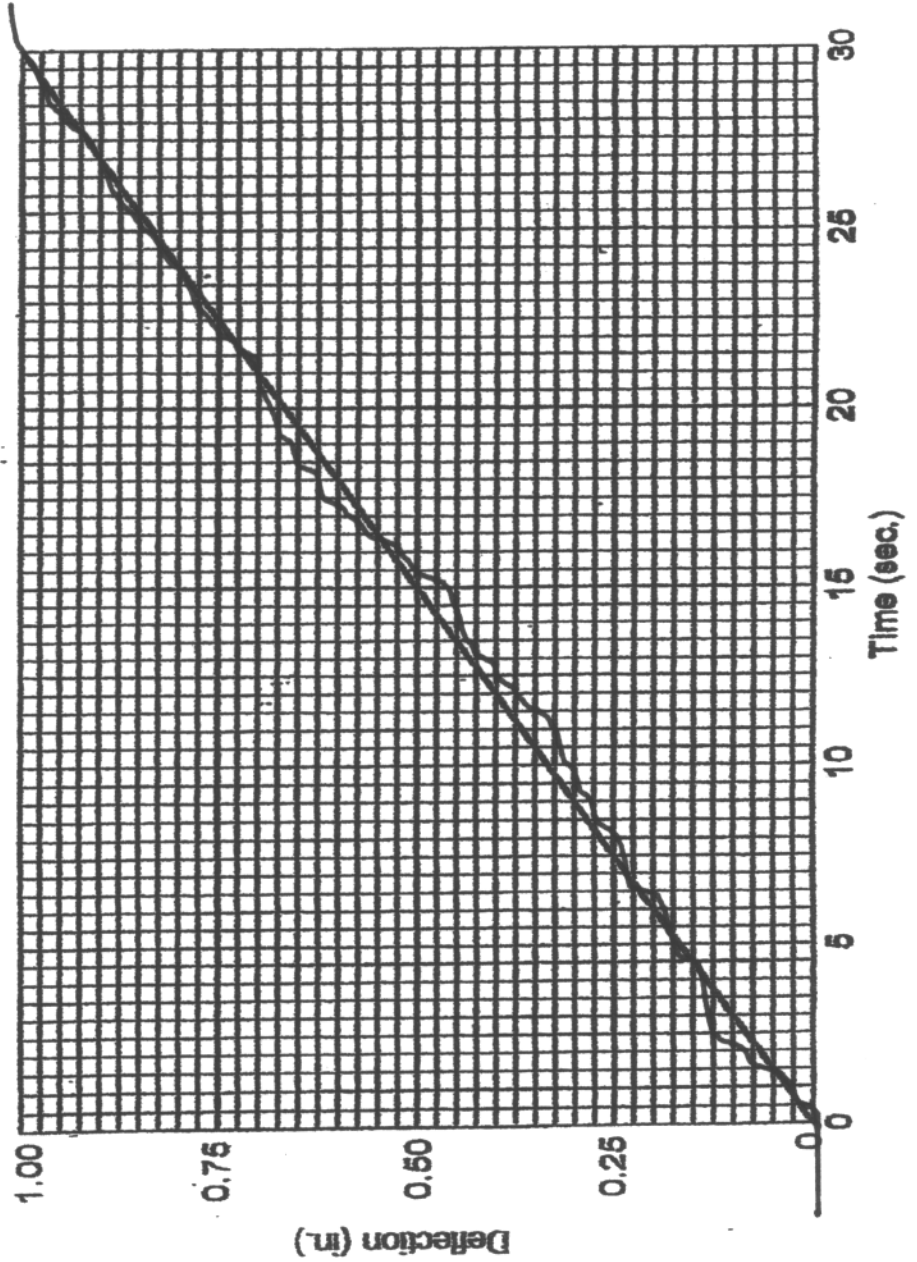
Date 8/13/03  
 Performed By SP  
 Temp. 170°  
 Humidity 50%

Foam No. 2'x20" 2"x21" I 6



Compression - Deflection Resistance Test  
 Child Seat Foam

Date 8/13/05  
 Temp 70°  
 Humidity 50%  
 Foam No. 2" X 20" 2" X 24" IG



Compression - Deflection Resistance Test Child Seat Foam

# SEAT FOAM USAGE LOG

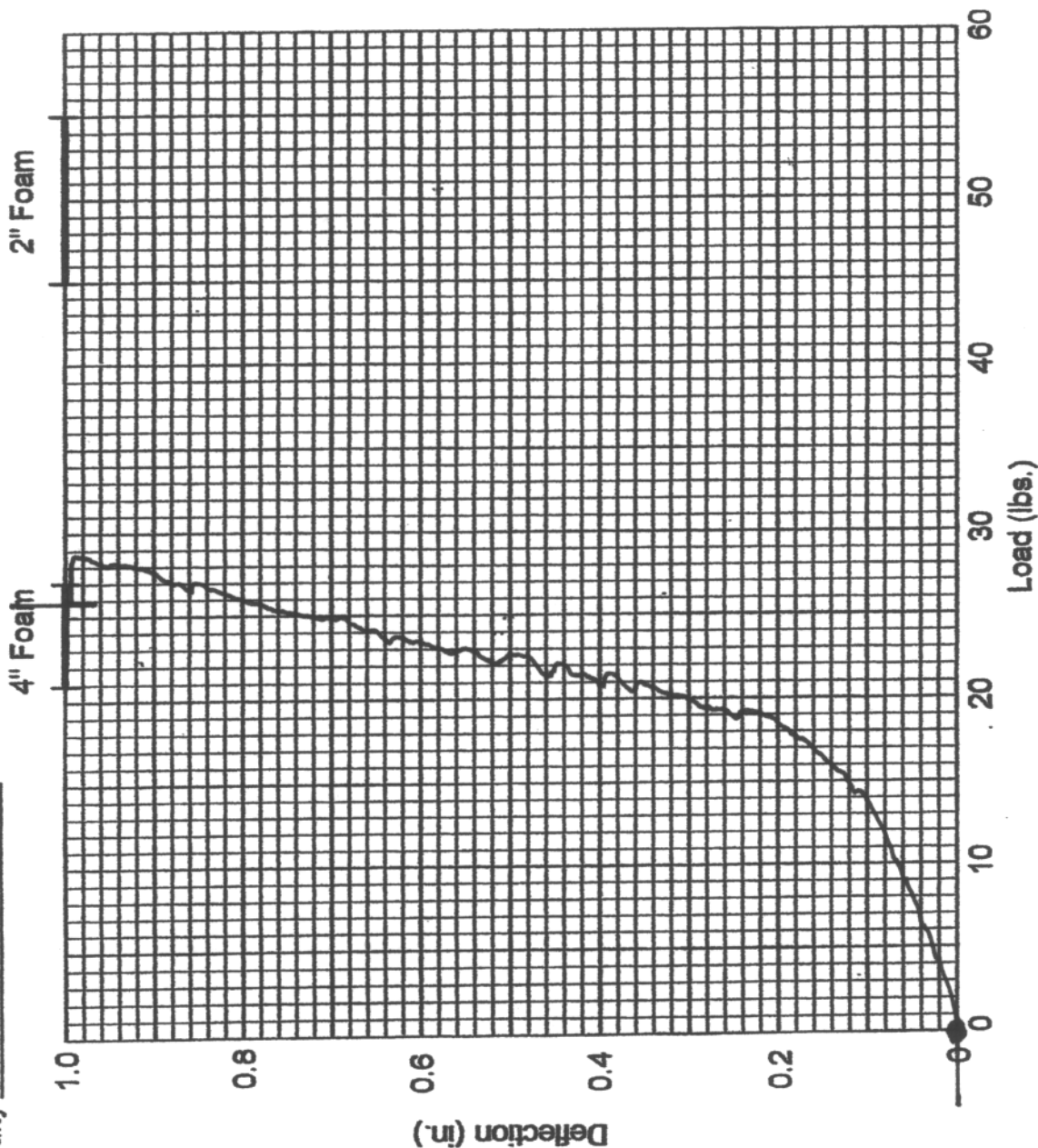
2" x 20" 2" x 24" I 6

Foam I.D. Number

| Date    | Peak Load | Pass/Fail                                                                         |
|---------|-----------|-----------------------------------------------------------------------------------|
| 8/13/03 | 52 LBS    |  |

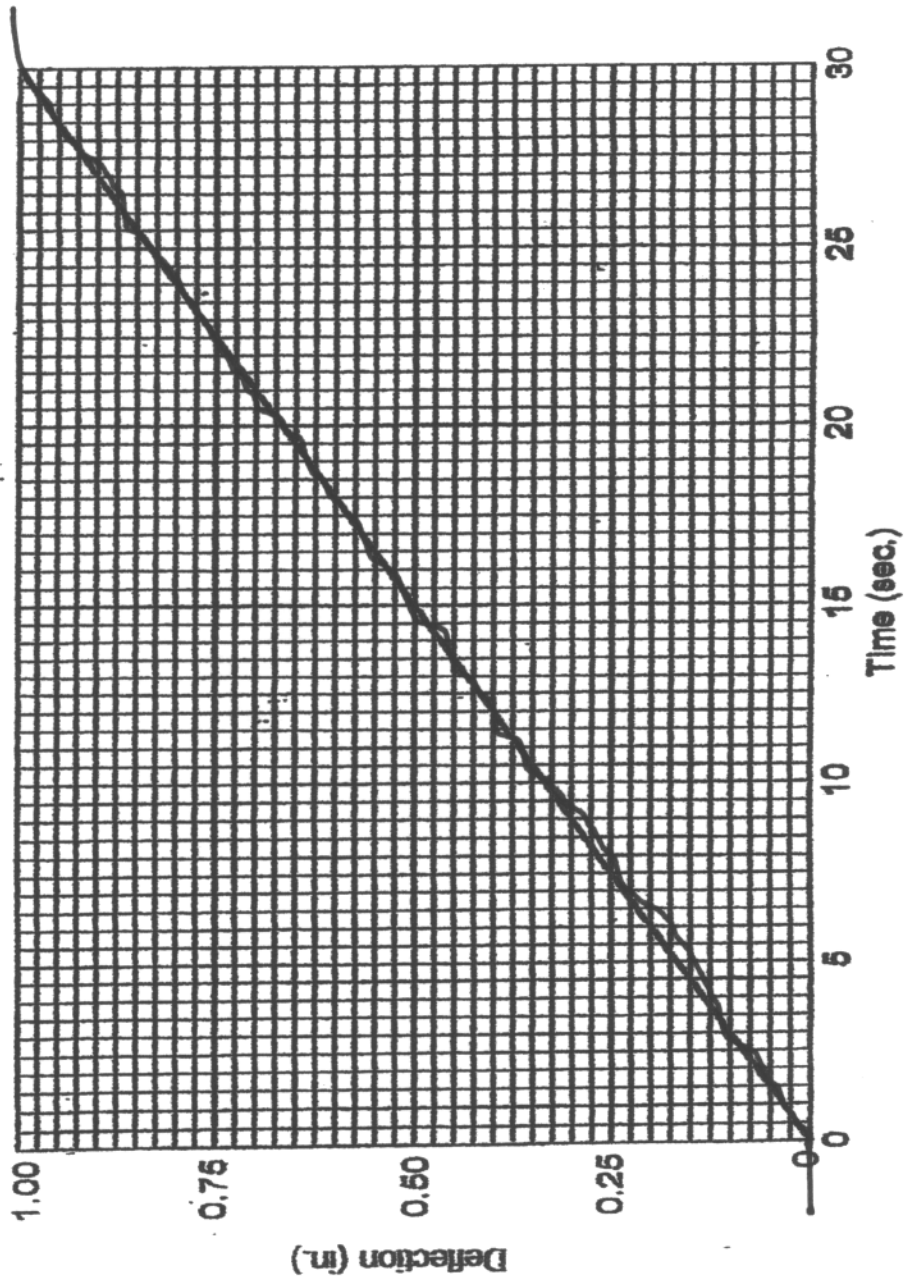
Foam No. 4 x 20" I 6

Date 8/13/03  
 Performed By [Signature]  
 Temp. 70°  
 Humidity 50%



Compression - Deflection Resistance Test  
 Child Seat Foam

Date 8/15/03  
 Temp 70°  
 Humidity 50%  
 Foam No. 4"X20"IG



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

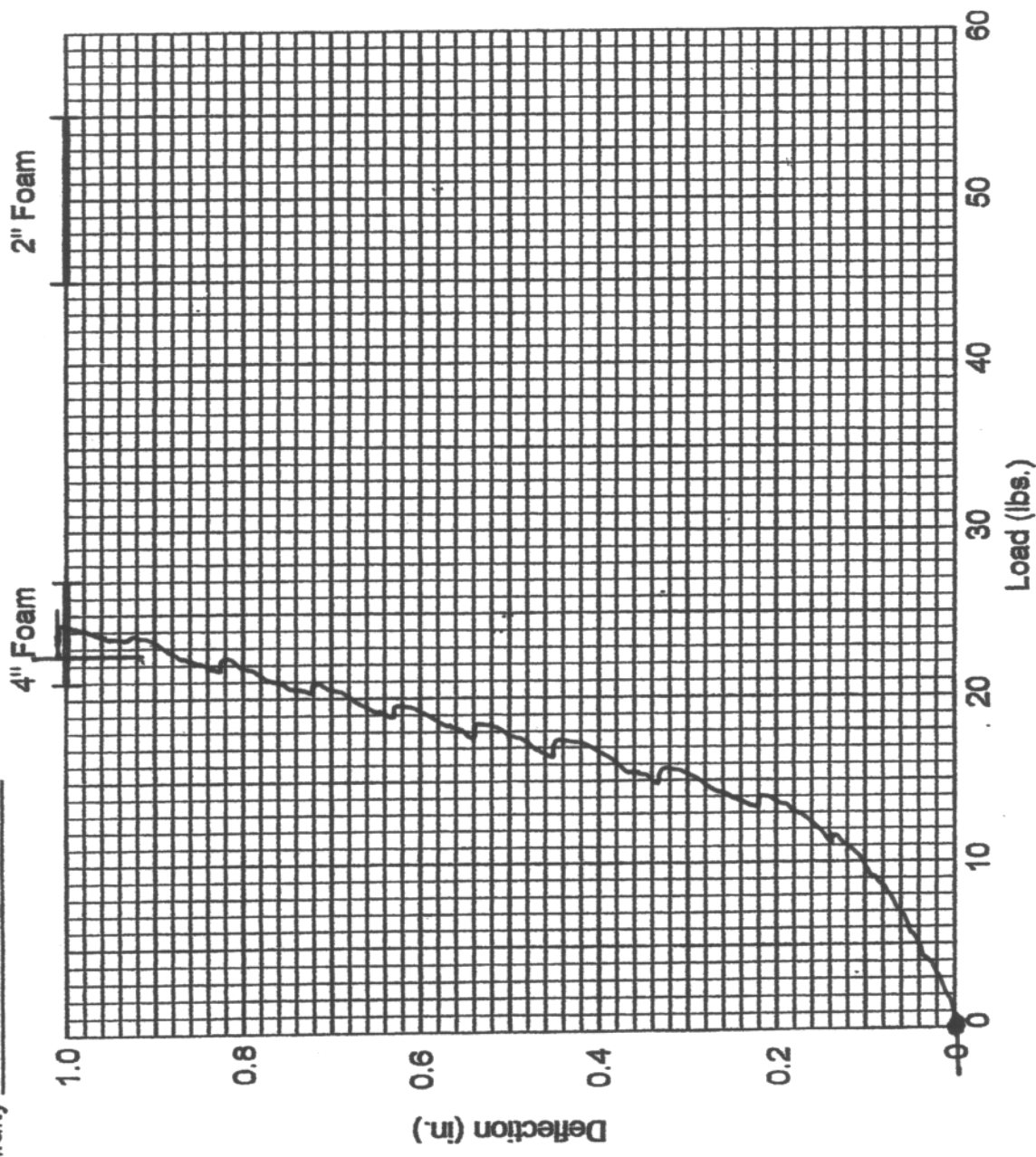
4' x 20" IL

Foam I.D. Number

| Pass/Fail | Peak Load | Date    |
|-----------|-----------|---------|
| Pass      | 25.75 LBS | 8/13/03 |

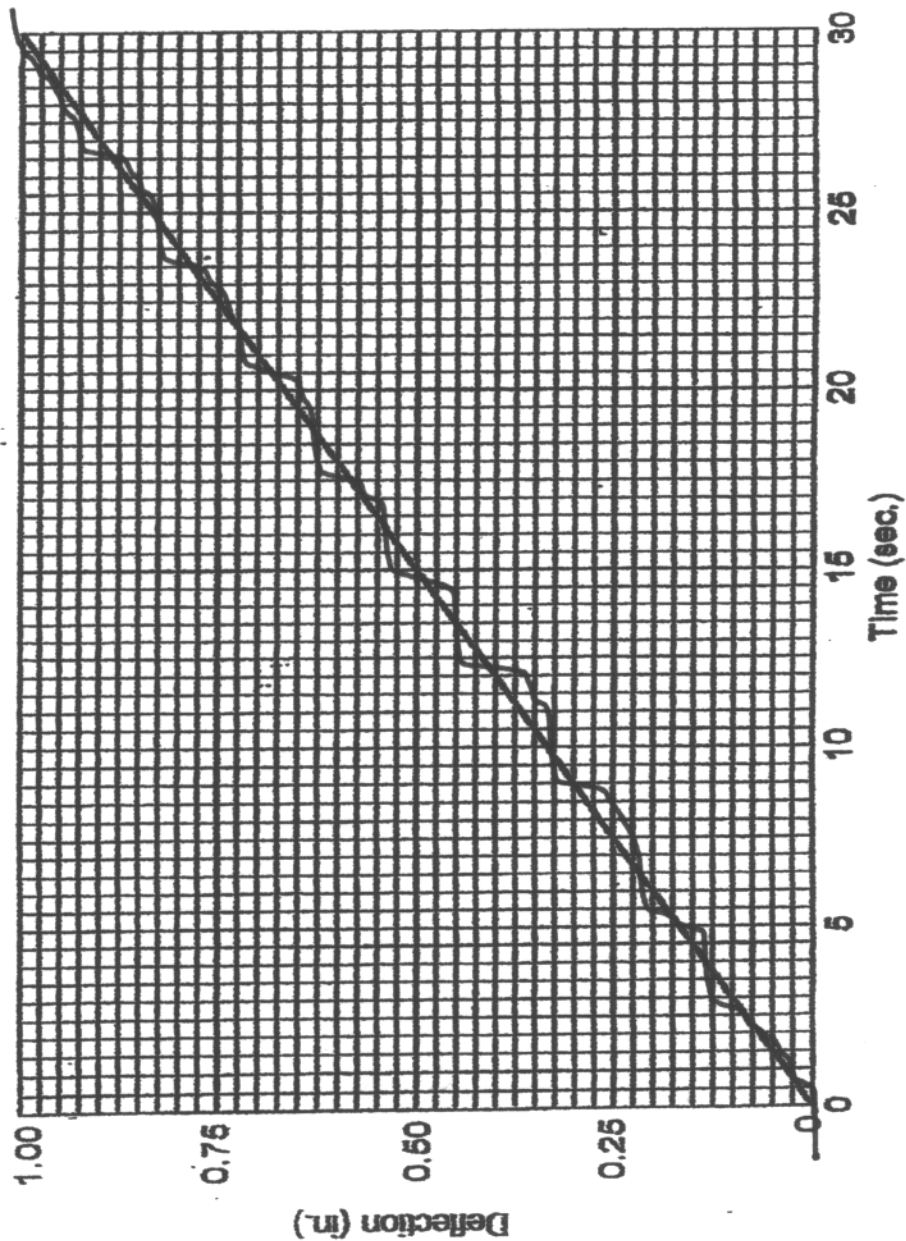
Foam No. 482A'FC

Date 8/13/03  
Performed By [Signature]  
Temp. 70°  
Humidity 50%



Compression - Deflection Resistance Test  
Child Seat Foam

Date 8/13/03  
 Temp 77°  
 Humidity 50%  
 Foam No. 4" X 24" I6



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

4" x 24" x 12"

Foam I.D. Number

| Date    | Peak Load | Pass/Fail |
|---------|-----------|-----------|
| 8/13/03 | 22.5 LBS  | Pass      |

## **SECTION 10**

### **Child Dummy Calibration Data Traces and Tables**

# HYIII 3 Year Old Head Drop Test S/N:142

Part 572P Head Drop

Calibration Date:

July 21, 2003

Serial No: 142

Work File:

4001

## -----TEST RESULTS-----

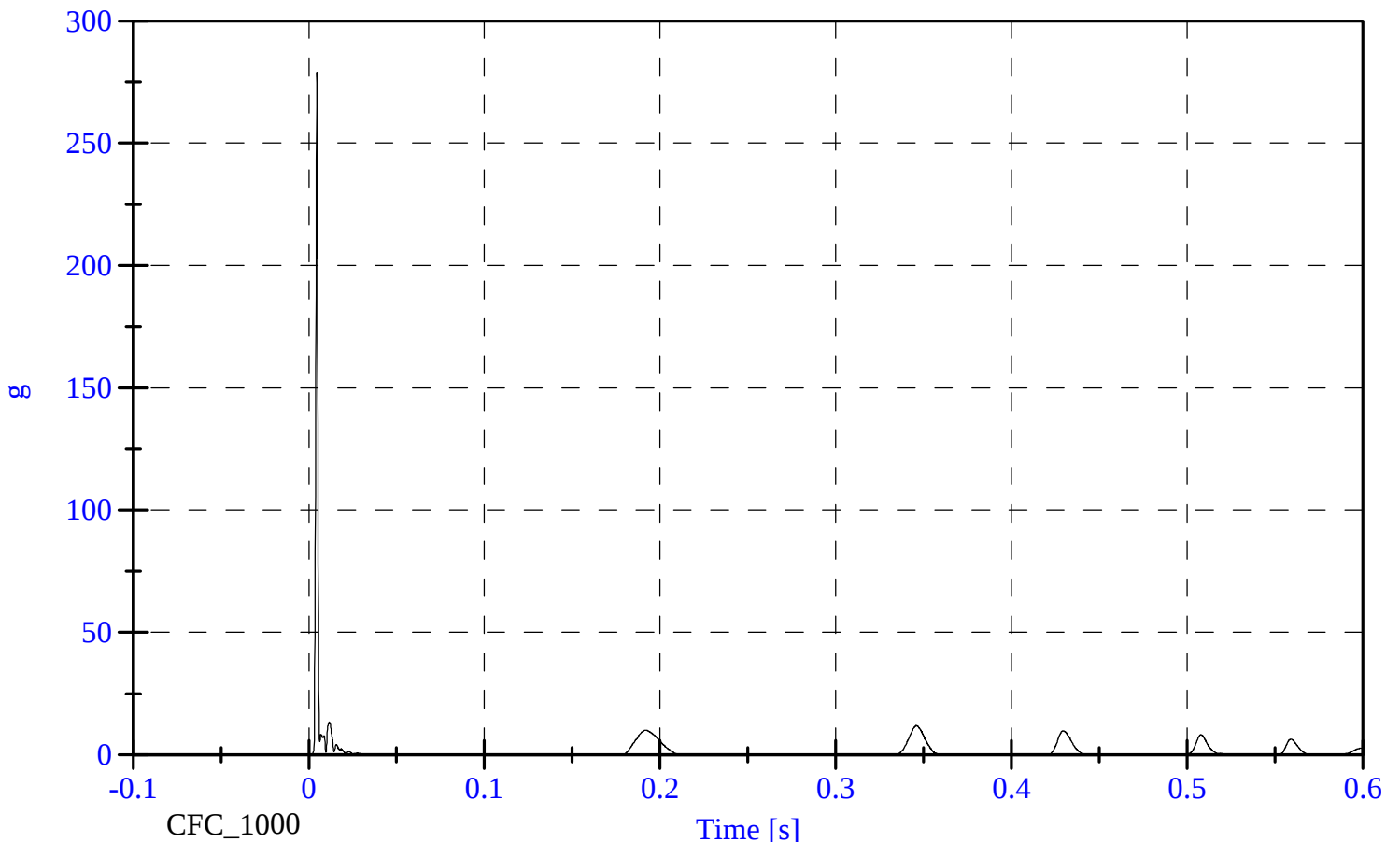
| <u>TEST CONDITION</u>   | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-------------------------|-------------------|----------------|---------------|
| Lab Temperature:        | 66.0-78.0 F       | 70.0 F         | Passed        |
| Lab Humidity:           | 10-70 %           | 35.00 %        | Passed        |
| Peak Resultant Accel.:  | 250-280 Gs        | 279.06 Gs      | Passed        |
| Peak Lateral Accel.:    | 15 Gs Max         | 14.76 Gs       | Passed        |
| Curve PerCent NonModal: | < 10%             | 4.82 %         | Passed        |

HYIII 3 Year Old Head Drop Test S/N:142

Head Resultant

Max: 279.1 [g] at 0.005 [s]

Min: 0.0 [g] at 0.398 [s]



## Hybrid III Head Neck Extention Test S/N:142

|            |                     |                   |               |
|------------|---------------------|-------------------|---------------|
| Part 572P  | Neck Extension Test | Calibration Date: | July 16, 2003 |
| Serial No: | 142                 | Work File:        | 4001          |

### -----TEST RESULTS-----

| <u>TEST CONDITION</u> | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-----------------------|-------------------|----------------|---------------|
| Lab Temperature:      | 69.0-72.0 F       | 70.00 F        | Passed        |
| Lab Humidity:         | 10-70 %           | 35.00 %        | Passed        |
| Test Pendulum Speed:  | 11.58-12.38 ft/s  | 12.30 ft/s     | Passed        |

### -----PENDULUM PULSE-----

|                 |                 |           |        |
|-----------------|-----------------|-----------|--------|
| Pulse at 6 ms:  | 3.30- 4.60 ft/s | 3.88 ft/s | Passed |
| Pulse at 10 ms: | 6.20- 8.20 ft/s | 6.82 ft/s | Passed |
| Pulse at 14 ms: | 9.20-11.50 ft/s | 9.36 ft/s | Passed |

### -----D PLANE ROTATION-----

|                   |               |           |        |
|-------------------|---------------|-----------|--------|
| Maximum Rotation: | 83.0-93.0 Deg | 84.20 Deg | Passed |
|-------------------|---------------|-----------|--------|

### -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

|                         |                   |            |        |
|-------------------------|-------------------|------------|--------|
| Max Occipital Moment:   | -53.30--43.70 N-m | -44.75 N-m | Passed |
| Occipital Moment Decay: | 60.0-80.0 ms      | 65.30 ms   | Passed |

## Hybrid III 3 Year Old Head Neck Flexion Test S/N:142

|            |                   |                   |               |
|------------|-------------------|-------------------|---------------|
| Part 572P  | Neck Flexion Test | Calibration Date: | July 16, 2003 |
| Serial No: | 142               | Work File:        | 4001          |

### -----TEST RESULTS-----

| <u>TEST CONDITION</u> | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-----------------------|-------------------|----------------|---------------|
| Lab Temperature:      | 69.0-72.0 F       | 70.00 F        | Passed        |
| Lab Humidity:         | 10-70 %           | 35.00 %        | Passed        |
| Test Pendulum Speed:  | 17.65-18.45 ft/s  | 18.34 ft/s     | Passed        |

### -----PENDULUM PULSE-----

|                 |                  |            |        |
|-----------------|------------------|------------|--------|
| Pulse at 10 ms: | 6.60- 8.90 ft/s  | 7.19 ft/s  | Passed |
| Pulse at 15 ms: | 9.80-13.10 ft/s  | 10.46 ft/s | Passed |
| Pulse at 20 ms: | 13.10-16.70 ft/s | 14.31 ft/s | Passed |

### -----D PLANE ROTATION-----

|                   |               |           |        |
|-------------------|---------------|-----------|--------|
| Maximum Rotation: | 70.0-82.0 Deg | 77.80 Deg | Passed |
|-------------------|---------------|-----------|--------|

### -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

|                         |                  |           |        |
|-------------------------|------------------|-----------|--------|
| Max Occipital Moment:   | 42.00- 53.00 N-m | 50.03 N-m | Passed |
| Occipital Moment Decay: | 60.0-80.0 ms     | 73.8 ms   | Passed |

# Hybrid III 3 Year Old Thorax Test S/N:142

Part 572P Thorax Impact

Calibration Date:

July 21, 2003

Serial No: 142

Work File:

4001

## -----TEST RESULTS-----

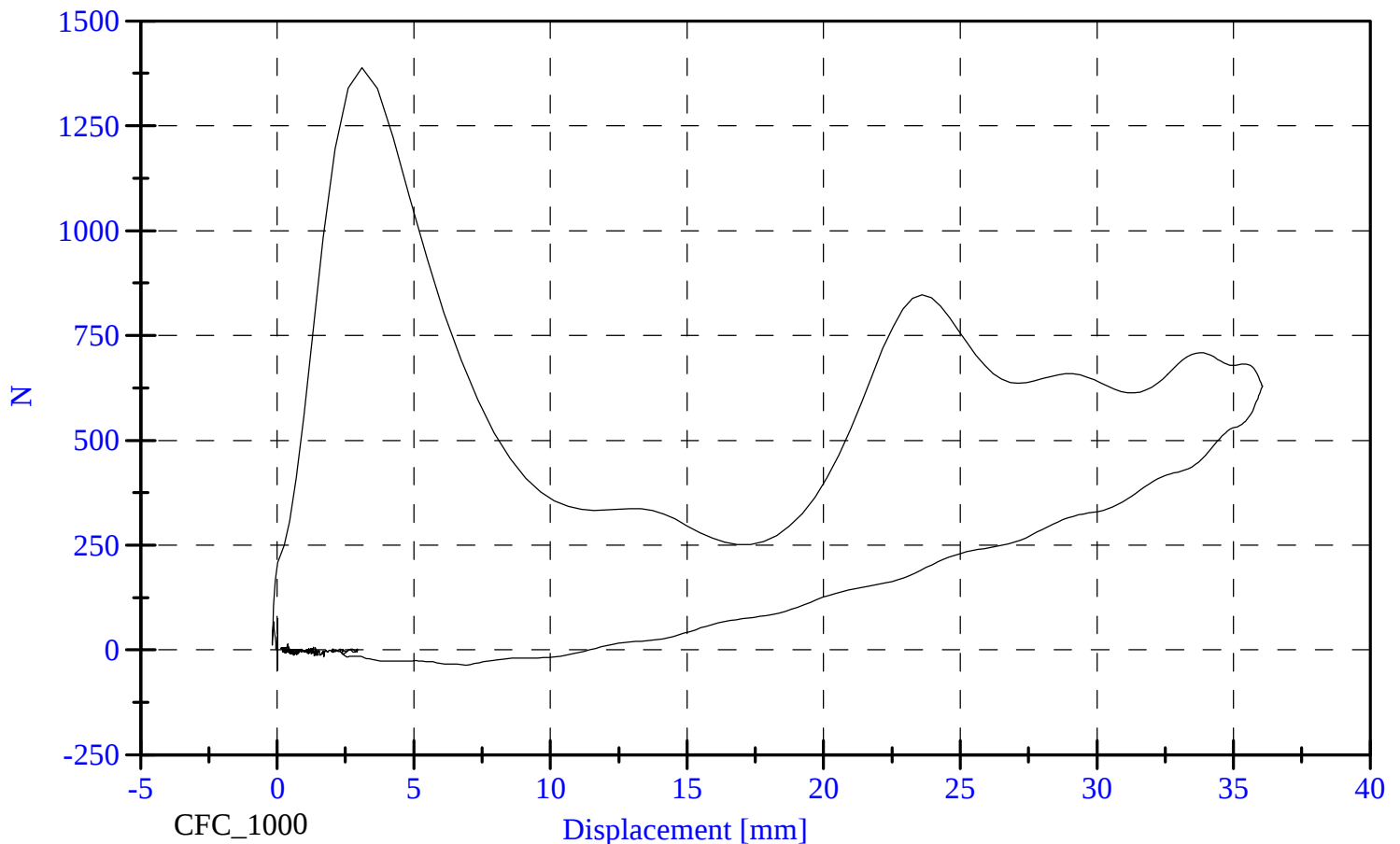
| <u>TEST CONDITION</u>         | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-------------------------------|-------------------|----------------|---------------|
| Lab Temperature:              | 20.6-22.2 C       | 21.1 C         | Passed        |
| Lab Humidity:                 | 10-70 %           | 34.00 %        | Passed        |
| Pendulum Velocity:            | 5.90- 6.10 m/s    | 6.07 m/s       | Passed        |
| Maximum Deflection:           | 32.00-38.00 mm    | 36.06 mm       | Passed        |
| Maximum Res. Force:           | 680.00- 810.00 N  | 709.45 N       | Passed        |
| Internal Hysteresis:          | 65-85 %           | 75.47 %        | Passed        |
| Pass Sternum Force Criteria?: | 860.00 N          | 846.79         | Passed        |

Hybrid III 3 Year Old Thorax Test S/N:142

Probe Force vs. Displacement

Max: 1388.0 [N] at 3.104 [mm]

Min: -48.5 [N] at 0.011 [mm]



# 144 Head Drop

Part 572N HYIII 6 Year Old Head Drop

Calibration Date: 07-28-03

Serial No: 144

Work File: 144H 07-28-03

## -----TEST RESULTS-----

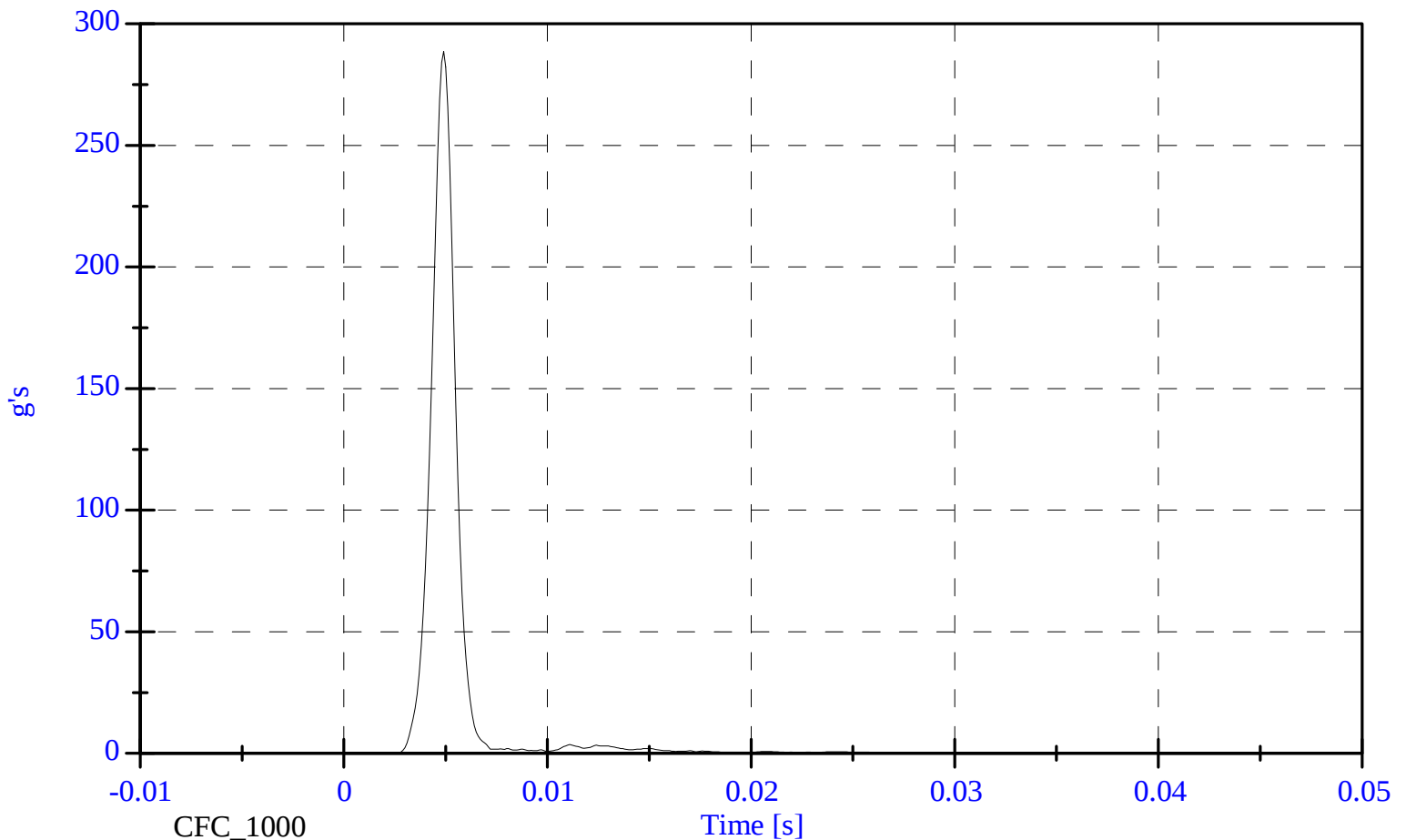
| <u>TEST CONDITION</u>   | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-------------------------|-------------------|----------------|---------------|
| Lab Temperature:        | 66.0-78.0 F       | 70.0 F         | Passed        |
| Lab Humidity:           | 10-70 %           | 36.00 %        | Passed        |
| Peak Resultant Accel.:  | 245-300 Gs        | 288.60 Gs      | Passed        |
| Peak Lateral Accel.:    | 15 Gs Max         | 12.06 Gs       | Passed        |
| Curve PerCent NonModal: | < 10%             | 1.25 %         | Passed        |

144 Head Drop

Head Resultant

Max: 288.6 [g's] at 0.005 [s]

Min: 0.0 [g's] at -0.010 [s]



## S/N 144 Neck Extension

Part 572N HYIII 6 Year Old Neck Extension Test

Calibration Date: 07-29-03

Serial No: 144

Work File: 144NE 07-29-03

### -----TEST RESULTS-----

| <u>TEST CONDITION</u> | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-----------------------|-------------------|----------------|---------------|
| Lab Temperature:      | 69.0-72.0 F       | 70.00 F        | Passed        |
| Lab Humidity:         | 10-70 %           | 28.00 %        | Passed        |
| Test Pendulum Speed:  | 13.70-14.50 ft/s  | 13.80 ft/s     | Passed        |

### -----PENDULUM PULSE-----

|                 |                  |            |        |
|-----------------|------------------|------------|--------|
| Pulse at 10 ms: | 3.30- 4.60 ft/s  | 4.29 ft/s  | Passed |
| Pulse at 20 ms: | 7.20- 9.80 ft/s  | 8.84 ft/s  | Passed |
| Pulse at 30 ms: | 10.50-13.80 ft/s | 12.69 ft/s | Passed |

### -----D PLANE ROTATION-----

|                   |                |           |        |
|-------------------|----------------|-----------|--------|
| Maximum Rotation: | 85.0-103.0 Deg | 86.20 Deg | Passed |
|-------------------|----------------|-----------|--------|

### -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

|                         |                   |            |        |
|-------------------------|-------------------|------------|--------|
| Max Occipital Moment:   | -24.00--19.00 N-m | -22.02 N-m | Passed |
| Occipital Moment Decay: | 123.0-147.0 ms    | 126.80 ms  | Passed |

## S/N 144 Neck Flexion

Part 572N HYIII 6 Year Old Neck Flexion Test

Calibration Date: 07-29-03

Serial No: 144

Work File: 144NF1 07-29-03

### -----TEST RESULTS-----

| <u>TEST CONDITION</u> | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-----------------------|-------------------|----------------|---------------|
| Lab Temperature:      | 20.6-22.2 C       | 21.11 C        | Passed        |
| Lab Humidity:         | 10-70 %           | 28.00 %        | Passed        |
| Test Pendulum Speed:  | 4.83- 5.07 m/s    | 4.88 m/s       | Passed        |

### -----PENDULUM PULSE-----

|                 |                |          |        |
|-----------------|----------------|----------|--------|
| Pulse at 10 ms: | 1.20- 1.60 m/s | 1.54 m/s | Passed |
| Pulse at 20 ms: | 2.40- 3.40 m/s | 2.94 m/s | Passed |
| Pulse at 30 ms: | 3.80- 5.00 m/s | 4.19 m/s | Passed |

### -----D PLANE ROTATION-----

|                   |               |           |        |
|-------------------|---------------|-----------|--------|
| Maximum Rotation: | 74.0-92.0 Deg | 76.04 Deg | Passed |
|-------------------|---------------|-----------|--------|

### -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

|                         |                  |           |        |
|-------------------------|------------------|-----------|--------|
| Max Occipital Moment:   | 27.00- 33.00 N-m | 29.28 N-m | Passed |
| Occipital Moment Decay: | 103.0-123.0 ms   | 110.80 ms | Passed |

## S/N 144 Chest Impact

Part 572N HYIII 6 Year Old Thorax Impact

Calibration Date: 07-29-03

Serial No: 144

Work File: 144T2 07-29-03

### -----TEST RESULTS-----

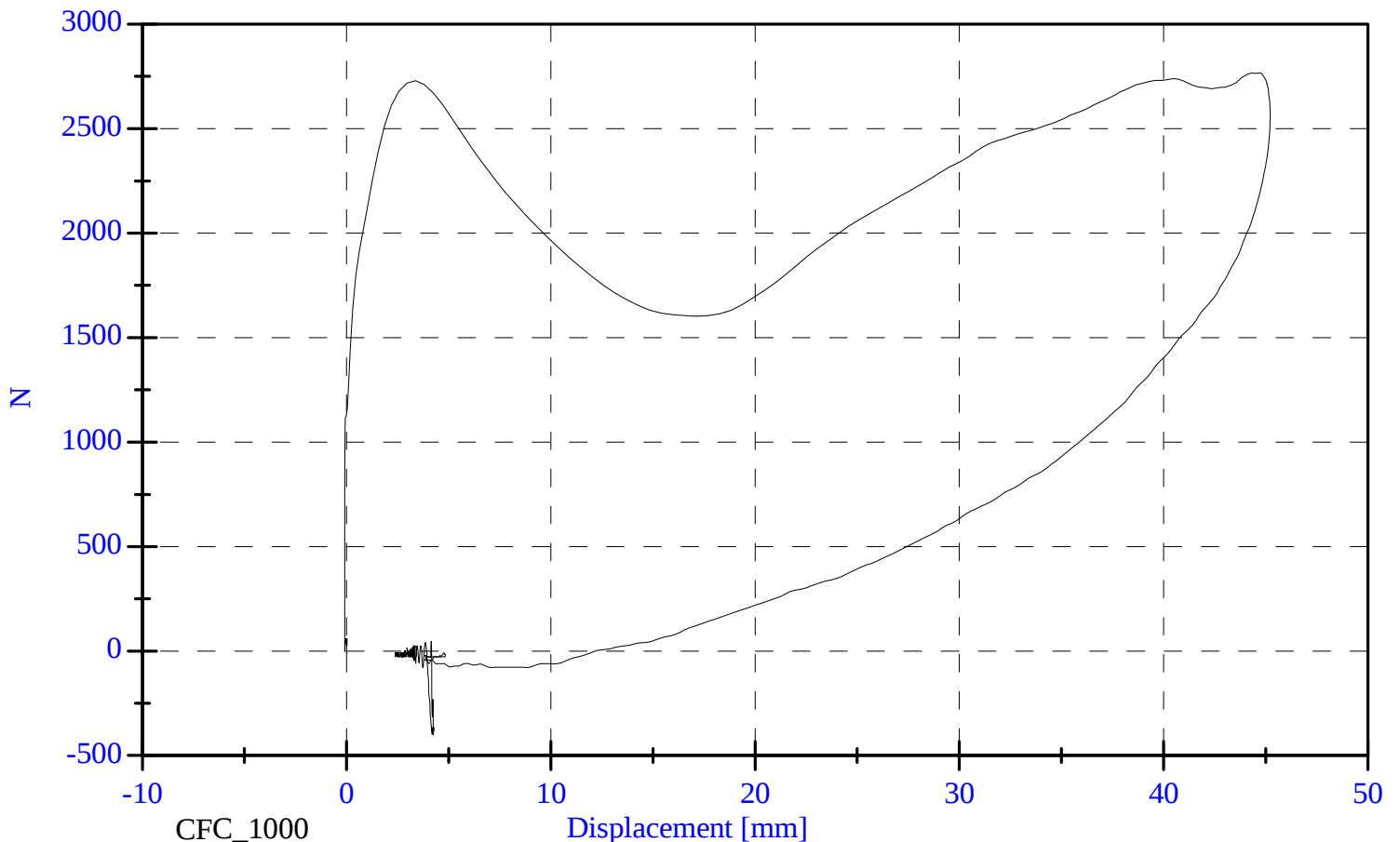
| <u>TEST CONDITION</u> | <u>PARAMETERS</u> | <u>RESULTS</u> | <u>STATUS</u> |
|-----------------------|-------------------|----------------|---------------|
| Lab Temperature:      | 20.6-22.2 C       | 21.1 C         | Passed        |
| Lab Humidity:         | 10-70 %           | 28.00 %        | Passed        |
| Pendulum Velocity:    | 6.59- 6.83 m/s    | 6.64 m/s       | Passed        |
| Maximum Deflection:   | 38.00-46.00 mm    | 45.22 mm       | Passed        |
| Maximum Res. Force:   | 1150.00-1380.00 N | 1176.02 N      | Passed        |
| Internal Hysteresis:  | 65-85 %           | 76.45 %        | Passed        |

Chest Impact

Probe Force vs. Displacement

Max: 2765.9 [N] at 44.693 [mm]

Min: -401.4 [N] at 4.248 [mm]



## **SECTION 11**

### **Test Equipment and Instrumentation Calibration**

# Calibrations for Test 08-3-29

| SHORTNAME   | SENSCOM                       | CALDATE   |
|-------------|-------------------------------|-----------|
| Sled Ax     | MFG: ENDEVCO S/N: 24144       | 7/24/2003 |
| P3 HDCG Ax  | MFG: ENTRAN S/N: 99108-F29    | 7/15/2003 |
| P3 HDCG Ay  | MFG: ENTRAN S/N: 99102-F12    | 7/15/2003 |
| P3 HDCG Az  | MFG: ENTRAN S/N: 00L13-F03    | 7/15/2003 |
| P3 HDCG RAz | MFG: ENTRAN S/N: 98G18-F18    | 7/15/2003 |
| P3 CHST Ax  | MFG: ENTRAN S/N: 99108-F30    | 7/15/2003 |
| P3 CHST Ay  | MFG: ENTRAN S/N: 99108-F28    | 7/15/2003 |
| P3 CHST Az  | MFG: ENTRAN S/N: 99H30-Z04    | 7/15/2003 |
| P3 CHST Dx  | MFG: SERVO S/N: 142           | 7/22/2003 |
| P3 PVCN Ax  | MFG: ENTRAN S/N: 99102-F06    | 7/15/2003 |
| P3 PVCN Ay  | MFG: ENTRAN S/N: 99102-F15    | 7/15/2003 |
| P3 PVCN Az  | MFG: ENTRAN S/N: 99G29-Q13    | 7/15/2003 |
| P3 NEKU Fx  | MFG: Denton S/N: 213-FX       | 7/21/2003 |
| P3 NEKU Fy  | MFG: Denton S/N: 213-Fy       | 7/21/2003 |
| P3 NEKU Fz  | MFG: Denton S/N: 213-Fz       | 7/21/2003 |
| P3 NEKU Mx  | MFG: Denton S/N: 213-Mx       | 7/21/2003 |
| P3 NEKU My  | MFG: Denton S/N: 213-My       | 7/21/2003 |
| P3 NEKU Mz  | MFG: Denton S/N: 213-Mz       | 7/21/2003 |
| P3 NEKL Fx  | MFG: Denton S/N: 214Fx        | 7/21/2003 |
| P3 NEKL Fy  | MFG: Denton S/N: 214-Fy       | 7/21/2003 |
| P3 NEKL Fz  | MFG: Denton S/N: 214-Fz       | 7/21/2003 |
| P3 NEKL Mx  | MFG: Denton S/N: 214-Mx       | 7/21/2003 |
| P3 NEKL My  | MFG: Denton S/N: 214-My       | 7/21/2003 |
| P3 NEKL Mz  | MFG: Denton S/N: 214-Mz       | 7/21/2003 |
| P4 HDCG Ax  | MFG: ENDEVCO S/N: P10099      | 7/30/2003 |
| P4 HDCG Ay  | MFG: ENTRAN S/N: 02I02I10-N09 | 7/10/2003 |
| P4 HDCG Az  | MFG: ENTRAN S/N: 02I02I10-N17 | 7/10/2003 |
| P4 CHST Ax  | MFG: ENTRAN S/N: 02I02I10-N04 | 7/10/2003 |
| P4 CHST Ay  | MFG: ENTRAN S/N: 02I02I10-N15 | 7/10/2003 |
| P4 CHST Az  | MFG: ENTRAN S/N: 02I02I24-N07 | 7/10/2003 |
| P4 PVCN Ax  | MFG: ENTRAN S/N: 02I02I10-N01 | 7/10/2003 |
| P4 PVCN Ay  | MFG: ENTRAN S/N: 02I02I10-N02 | 7/10/2003 |
| P4 PVCN Az  | MFG: ENTRAN S/N: 02A16-A28    | 7/10/2003 |
| P4 CHST Dx  | MFG: SERVO S/N: 144           | 7/22/2003 |
| P4 NEKU Fx  | MFG: DENTON S/N: 1037Fx       | 8/10/2003 |
| P4 NEKU Fy  | MFG: DENTON S/N: 1037Fy       | 8/13/2003 |
| P4 NEKU Fz  | MFG: DENTON S/N: 1037Fz       | 8/13/2003 |
| P4 NEKU Mx  | MFG: DENTON S/N: 1037Mx       | 8/13/2003 |
| P4 NEKU My  | MFG: DENTON S/N: 1037My       | 8/13/2003 |
| P4 NEKU Mz  | MFG: DENTON S/N: 1037Mz       | 8/13/2003 |

## **SECTION 12**

**[Link to High Speed Movies](#)**

Test 08-3-29 North View

Test 08-3-29 South View