

**REPORT NUMBER: 8708-SLEDNCAP-37**

**CHILD RESTRAINT SYSTEM IN  
DYNAMIC SLED TEST  
COSCO DESIGNER 22 WITH BASE  
COSCO DESIGNER 22 WITHOUT BASE**

**TEST NUMBER: 08-3-38**

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



**AUGUST 28<sup>TH</sup>, 2003**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
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COTR, NCAP Dynamic Sled Test Program

\_\_\_\_\_  
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16. Abstract 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.  Two (2) seats were tested during this run. Position 3 was a Cosco Designer 22 Child Restraint System with a seat base. Position 4 was a Cosco Designer 22 Child Restraint System without a seat base.			
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## 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 28<sup>th</sup>, 2003 at a speed of 46.7 kph ( 29.0 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 two (2) anthropomorphic test devices (ATDs). One (1) Crabi ATD, Serial Number S/N 093, was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper neck load cells. This dummy was placed in a Cosco Designer 22 child seat and the seat was located in Position 3 – Right Rear Passenger. This seat was tested with a seat base.

One (1) Crabi ATD, Serial Number S/N 102, was instrumented with head, chest, and pelvic tri-axial accelerometers, and upper neck load cells. This dummy was placed in a Cosco Designer 22 child seat and the seat was located in Position 4 – Left Rear Passenger. This seat was tested without a seat base.

The Crabi ATDs were 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.: 08-3-38

Test Date: August 28<sup>th</sup>, 2003

#### **POSITION 3**

Child Restraint Type (forward-facing, rearward facing, booster)	REARWARD FACING WITH BASE
LATCH or NON-LATCH	NON-LATCH – BELT ONLY
Harness Type	5 - POINT
Child Restraint Manufacturer	COSCO
Child Restraint Model	DESIGNER 22
Model Number	22-300-AZY
Date of Manufacture	1/29/2003
Child Restraint Height Limits (mm)	480 – 740
Child Restraint Weight Limits (kg)	2.3 – 10.0
Weight of Child Restraint (kg)	5.5

#### **POSITION 4**

Child Restraint Type (forward-facing, rearward facing, booster)	REARWARD FACING WITHOUT BASE
LATCH or NON-LATCH	NON-LATCH – BELT ONLY
Harness Type	5 - POINT
Child Restraint Manufacturer	COSCO
Child Restraint Model	DESIGNER 22
Model Number	22-300-AZY
Date of Manufacture	1/29/2003
Child Restraint Height Limits (mm)	480 – 740
Child Restraint Weight Limits (kg)	2.3 – 10.0
Weight of Child Restraint (kg)	3.7

**SECTION 3**  
**POST-TEST OBSERVATIONS**

Test No.: 08-3-38

Test Date: August 28<sup>th</sup>, 2003

**POSITION 3**

Child Seat	COSCO DESIGNER 22
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Seat Rotation (deg.)	54
Velocity (kph)	46.7
Acceleration (G's)	23.2

**POSITION 4**

Child Seat	COSCO DESIGNER 22
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Seat Rotation (deg.)	53
Velocity (kph)	46.7
Acceleration (G's)	23.2

**SECTION 4**

**POSITION 3 - CRABI ATD INJURY CRITERIA AND SENSOR DATA**

Test No.: 08-3-38

Test Date: August 28<sup>th</sup>, 2003

**HEAD PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	47.9	79.5	-3.8	122.7
Head CG	Y	G's	0.2	17.3	-8.1	82.3
Head CG	Z	G's	39.3	45.5	-22.1	91.8
Head CG Resultant	N/A	G's	48.5	79.5		

**CHEST PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	29.9	68.7	-3.9	187.0
Chest CG	Y	G's	1.7	105.8	-3.2	62.9
Chest CG	Z	G's	33.1	44.3	-14.2	85.8
Chest CG Resultant	N/A	G's	41.3	44.6		

**SEAT BELT SENSOR PEAK VALUES**

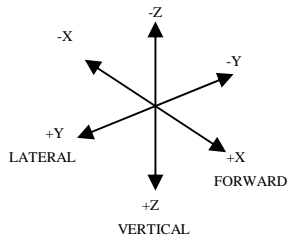
Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

**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)	424.6	42.5	55.9	91.9
Head CG Primary (15 msec)	218.3	46.3	75.1	90.1

**CHEST CLIP (3 MSEC)**

Location	P3 (Right) Rear Passenger		
	Clip	T <sup>1</sup>	T <sup>2</sup>
Chest CG Primary	40.1	43.2	46.2



**POSITION 3 - CRABI ATD INJURY CRITERIA AND SENSOR DATA...(continued)**

Test No.: 08-3-38

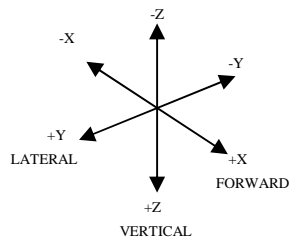
Test Date: August 28<sup>th</sup>, 2003

**PELVIC PEAK ACCELERATIONS**

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	37.8	45.1	-4.9	235.3
Pelvis	Y	G's	3.8	52.5	-2.9	161.6
Pelvis	Z	G's	49.0	44.5	-3.3	165.9

**UPPER NECK PEAK FORCES AND MOMENTS**

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	189.4	88.8	-383.6	47.8
Neck Force	Y	Newtons	19.5	47.8	-59.1	88.4
Neck Force	Z	Newtons	844.0	47.8	-284.2	92.7
Neck Moment	X	Nm	3.5	89.7	-0.5	117.5
Neck Moment	Y	Nm	13.2	90.4	-13.7	48.0
Neck Moment	Z	Nm	0.5	38.4	-0.5	104.5



**SECTION 4**

**POSITION 4 - CRABI ATD INJURY CRITERIA AND SENSOR DATA**

Test No.: 08-3-38

Test Date: August 28<sup>th</sup>, 2003

**HEAD PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	36.5	77.7	-2.9	240.8
Head CG	Y	G's	3.4	38.2	-9.2	83.3
Head CG	Z	G's	28.9	54.7	-9.4	95.5
Head CG Resultant	N/A	G's	41.2	77.8		

**CHEST PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	34.6	67.2	-4.2	198.7
Chest CG	Y	G's	1.5	121.3	-4.4	53.7
Chest CG	Z	G's	24.2	61.0	-7.9	92.9
Chest CG Resultant	N/A	G's	41.5	66.8		

**SEAT BELT SENSOR PEAK VALUES**

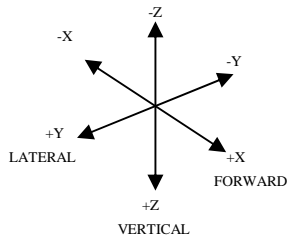
Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

**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)	257.9	34.8	51.1	87.1
Head CG Primary (15 msec)	132.9	37.9	69.7	84.7

**CHEST CLIP (3 MSEC)**

Location	P4 (Left) Rear Passenger		
	Clip	T <sup>1</sup>	T <sup>2</sup>
Chest CG Primary	40.8	65.2	68.2



**POSITION 4 - CRABI ATD INJURY CRITERIA AND SENSOR DATA...(continued)**

Test No.: 08-3-38

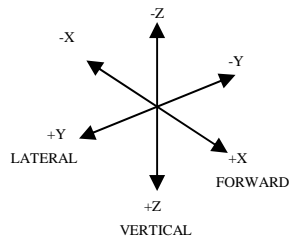
Test Date: August 28<sup>th</sup>, 2003

**PELVIC PEAK ACCELERATIONS**

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	21.9	54.5	-4.6	185.9
Pelvis	Y	G's	1.9	69.9	-2.8	181.8
Pelvis	Z	G's	38.3	65.7	-5.3	98.8

**UPPER NECK PEAK FORCES AND MOMENTS**

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	80.6	96.2	-365.6	49.1
Neck Force	Y	Newtons	16.4	162.0	-107.2	79.7
Neck Force	Z	Newtons	633.3	51.0	-123.8	99.1
Neck Moment	X	Nm	4.0	85.1	-0.9	239.4
Neck Moment	Y	Nm	5.2	99.7	-13.6	48.0
Neck Moment	Z	Nm	0.9	157.2	-1.0	74.8



**SECTION 5**  
**SLED TEST SET-UP**

Test No.: 08-3-38

Test Date: August 28<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 the seat back rotation.

Pre-test Infant and Car Seat Positions

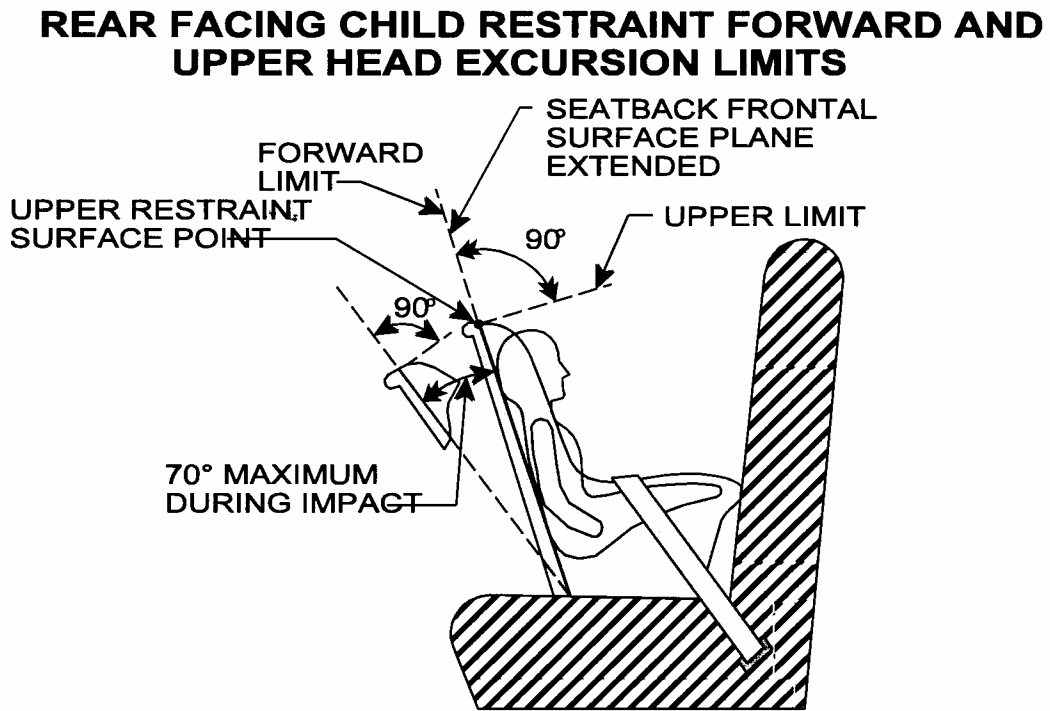


**SECTION 6**  
**CAMERA LOCATION**

Test No.: 08-3-38

Test Date: August 28<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.



**NOTE:** Limits illustrated move during dynamic testing

**SECTION 7**  
**PHOTOGRAPHS**

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Pre Test Right Rear Side View



Post Test Right Rear Side View



Pre Test Right Side View



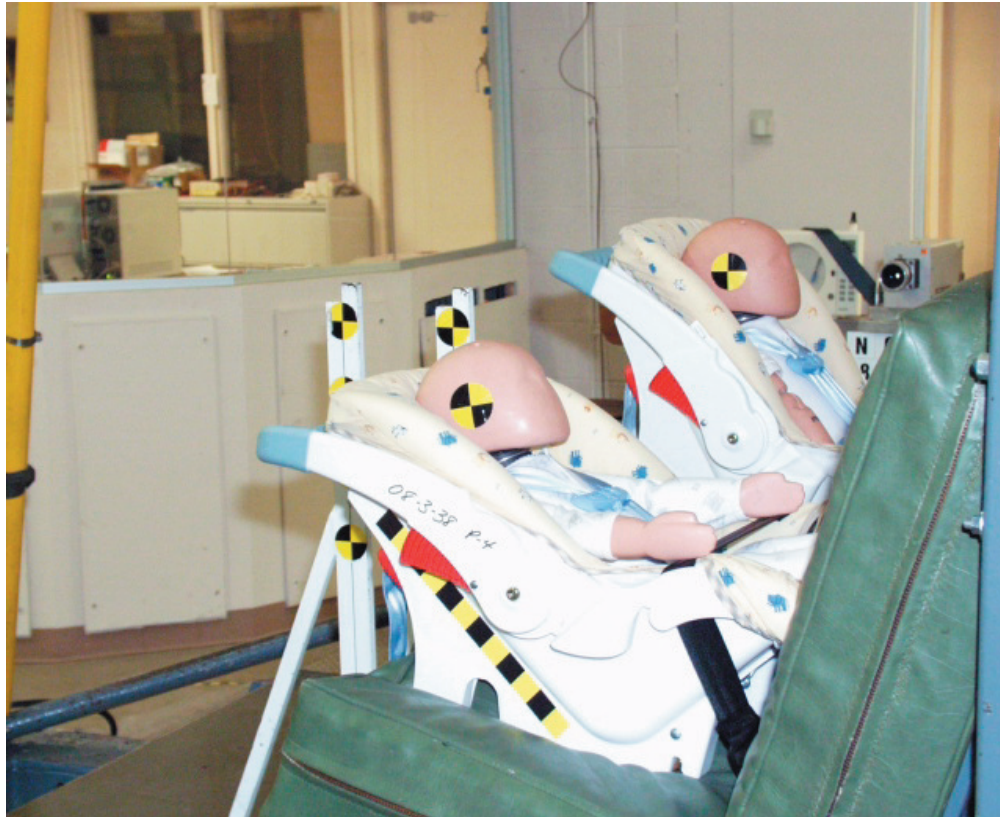
Post Test Right Side View



Pre Test Left Side View



Post Test Left Side View



Pre Test Left Rear Side View



Post Test Left Rear Side View

## **SECTION 8**

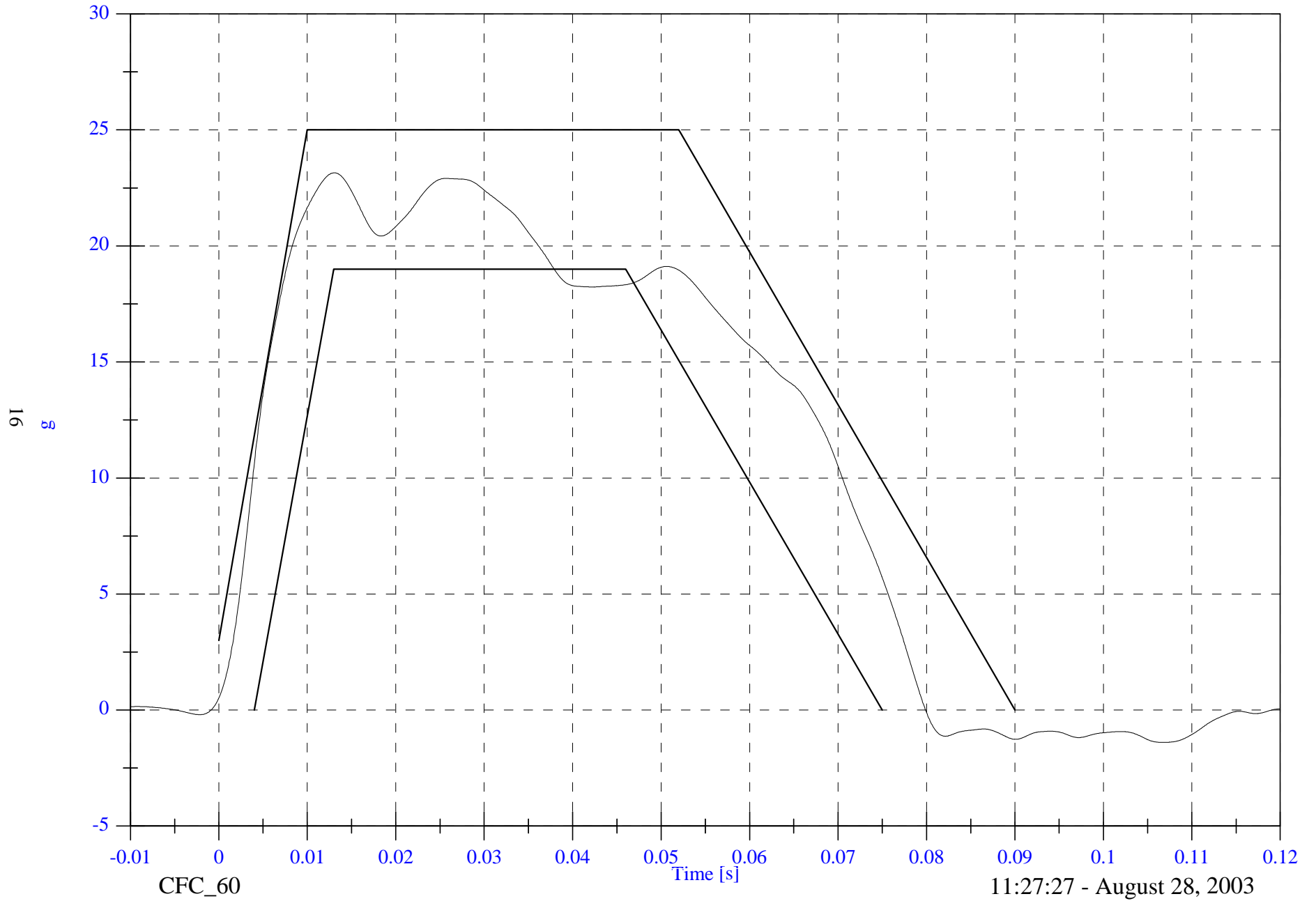
### **Data Plots**

Sled Test NCAP SLED 08-3-38

Sled Pulse Corridor

Max: 23.2 [g] at 0.013 [s]

Min: -1.4 [g] at 0.107 [s]



FACILITY: HYGE SLED

DATE: August 28, 2003

TEST#: 08-3-38

TITLE: Sled Test NCAP SLED 08-3-38

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
33	Sled Acceleration	g	23.2	13.1	-1.4	106.7	CFC_60	
34	Sled Acceleration Velocity	kph	46.7	79.8	-0.0	-13.7	CFC_180	
35	Sled Acceleration Displacement	mm	2671.0	250.7	-0.0	-2.1	CFC_180	
36	P3 Head x	g	47.9	79.5	-3.8	122.7	CFC_1000	
37	P3 Head y	g	0.2	17.3	-8.1	82.3	CFC_1000	
38	P3 Head z	g	39.3	45.5	-22.1	91.8	CFC_1000	
39	P3 Head Resultant	g	48.5	79.5	0.0	-4.9	CFC_1000	
40	P3 Upper Neck Fx	N	189.4	88.8	-383.6	47.8	CFC_1000	
41	P3 Upper Neck Fy	N	19.5	47.8	-59.1	88.4	CFC_1000	
42	P3 Upper Neck Fz	N	844.0	47.8	-284.2	92.7	CFC_1000	
43	P3 Upper Neck F Resultant	N	927.3	47.8	0.0	-12.1	CFC_1000	
44	P3 Upper Neck Mx	N-m	3.5	89.7	-0.5	117.5	CFC_600	
45	P3 Upper Neck My	N-m	13.2	90.4	-13.7	48.0	CFC_600	
46	P3 Upper Neck Mz	N-m	0.5	38.4	-0.5	104.5	CFC_600	
47	P3 Upper Neck M Resultant	N-m	13.7	48.0	0.0	-11.8	CFC_600	
48	P3 Chest x	g	29.9	68.7	-3.9	187.0	CFC_180	
49	P3 Chest y	g	1.7	105.8	-3.2	62.9	CFC_180	
50	P3 Chest z	g	33.1	44.3	-14.2	85.8	CFC_180	
51	P3 Chest Resultant	g	41.3	44.6	0.0	-15.0	CFC_180	
52	P3 Pelvic x	g	37.8	45.1	-4.9	235.3	CFC_1000	
53	P3 Pelvic y	g	3.8	52.5	-2.9	161.6	CFC_1000	
54	P3 Pelvic z	g	49.0	44.5	-3.3	165.9	CFC_1000	
55	P3 Pelvic Resultant	g	61.8	44.6	0.0	-2.3	CFC_1000	
56	P3 Upper Neck Mocy	N-m	12.1	90.5	-11.5	48.0	CFC_600	

FACILITY: HYGE SLED

DATE: August 28, 2003

TEST#: 08-3-38

TITLE: Sled Test NCAP SLED 08-3-38

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
57	P4 Head x	g	36.5	77.7	-2.9	240.8	CFC_1000	
58	P4 Head y	g	3.4	38.2	-9.2	83.3	CFC_1000	
59	P4 Head z	g	28.9	54.7	-9.4	95.5	CFC_1000	
60	P4 Head Resultant	g	41.2	77.8	0.0	-7.3	CFC_1000	
61	P4 Upper Neck Fx	N	80.6	96.2	-365.6	49.1	CFC_1000	
62	P4 Upper Neck Fy	N	16.4	162.0	-107.2	79.7	CFC_1000	
63	P4 Upper Neck Fz	N	633.3	51.0	-123.8	99.1	CFC_1000	
64	P4 Upper Neck F Resultant	N	725.8	50.9	0.0	-6.3	CFC_1000	
65	P4 Upper Neck Mx	N-m	4.0	85.1	-0.9	239.4	CFC_600	
66	P4 Upper Neck My	N-m	5.2	99.7	-13.6	48.0	CFC_600	
67	P4 Upper Neck Mz	N-m	0.9	157.2	-1.0	74.8	CFC_600	
68	P4 Upper Neck M Resultant	N-m	13.6	48.1	0.0	-13.1	CFC_600	
69	P4 Chest x	g	34.6	67.2	-4.2	198.7	CFC_180	
70	P4 Chest y	g	1.5	121.3	-4.4	53.7	CFC_180	
71	P4 Chest z	g	24.2	61.0	-7.9	92.9	CFC_180	
72	P4 Chest Resultant	g	41.5	66.8	0.0	-9.4	CFC_180	
73	P4 Pelvic x	g	21.9	54.5	-4.6	185.9	CFC_1000	
74	P4 Pelvic y	g	1.9	69.9	-2.8	181.8	CFC_1000	
75	P4 Pelvic z	g	38.3	65.7	-5.3	98.8	CFC_1000	
76	P4 Pelvic Resultant	g	43.9	65.7	0.0	-7.3	CFC_1000	
77	P4 Upper Neck Mocy	N-m	4.8	99.8	-11.5	48.0	CFC_600	

FACILITY: HYGE SLED

DATE: August 28, 2003

TEST#: 08-3-38

TITLE: Sled Test NCAP SLED 08-3-38

Version 5.00

=====

P3 HIC(36 ms): 424.6

t1: 55.9 msec

t2: 91.9 msec

Duration: 36.0 msec

Average Acceleration: 42.5 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: 189.4 N 88.8 msec

Min: -383.6 N 47.8 msec

Input channel: P3 Upper Neck Fx (5) CFC\_1000

P3 UP NECK Fz: Max: 844.0 N 47.8 msec

Min: -284.2 N 92.7 msec

Input channel: P3 Upper Neck Fz (7) CFC\_1000

P3 UP NECK Mocy (1YO Infant OOP)

Max: 12.1 N-m 90.5 msec

Min: -11.5 N-m 48.0 msec

Input channels: P3 Upper Neck Fx (5) CFC\_600

P3 Upper Neck My (9) CFC\_600

Docy: 0.0058

P3 UP NECK Nij (1YO Infant OOP)

Ntf: 0.26 Nij 77.5 msec CVt: 1460 CVf: 43

Nte: 1.25 Nij 48.0 msec CVt: 1460 CVe: 17

Ncf: 0.47 Nij 91.8 msec CVc: 1460 CVf: 43

Nce: 0.00 Nij -4.5 msec CVc: 1460 CVe: 17

Input channels: P3 Upper Neck Fz (7) CFC\_600

P3 Upper Neck Mocy [N-m, CFC\_600] (69)

FACILITY: HYGE SLED  
TEST#: 08-3-38  
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DATE: August 28, 2003

=====  
P3 CLIP(3 ms): 40.1 g  
    t1: 43.2 msec  
    t2: 46.2 msec  
    Duration: 3.0 msec  
P3 CSI: 365.6  
    Input channels: P3 Chest x (11) CFC\_180  
                  P3 Chest y (12) CFC\_180  
                  P3 Chest z (13) CFC\_180

=====  
P3 HIC(15 ms): 218.3  
    t1: 75.1 msec  
    t2: 90.1 msec  
    Duration: 15.0 msec  
    Average Acceleration: 46.3 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 28, 2003

TEST#: 08-3-38

TITLE: Sled Test NCAP SLED 08-3-38

Version 5.00

=====

P4 HIC(36 ms): 257.9

t1: 51.1 msec

t2: 87.1 msec

Duration: 36.0 msec

Average Acceleration: 34.8 g

Input channels: P4 Head x (17) CFC\_1000

P4 Head y (18) CFC\_1000

P4 Head z (19) CFC\_1000

P4 UP NECK Fx: Max: 80.6 N 96.2 msec

Min: -365.6 N 49.1 msec

Input channel: P4 Upper Neck Fx (20) CFC\_1000

P4 UP NECK Fz: Max: 633.3 N 51.0 msec

Min: -123.8 N 99.1 msec

Input channel: P4 Upper Neck Fz (22) CFC\_1000

2

P4 UP NECK Mocy (1YO Infant OOP)

Max: 4.8 N-m 99.8 msec

Min: -11.5 N-m 48.0 msec

Input channels: P4 Upper Neck Fx (20) CFC\_600

P4 Upper Neck My (24) CFC\_600

Docy: 0.0058

P4 UP NECK Nij (1YO Infant OOP)

Ntf: 0.09 Nij 87.5 msec CVt: 1460 CVf: 43

Nte: 1.07 Nij 49.3 msec CVt: 1460 CVe: 17

Ncf: 0.20 Nij 99.7 msec CVc: 1460 CVf: 43

Nce: 0.00 Nij -8.3 msec CVc: 1460 CVe: 17

Input channels: P4 Upper Neck Fz (22) CFC\_600

P4 Upper Neck Mocy [N-m, CFC\_600] (75)

FACILITY: HYGE SLED

DATE: August 28, 2003

TEST#: 08-3-38

TITLE: Sled Test NCAP SLED 08-3-38

Version 5.00

=====

P4 CLIP(3 ms): 40.8 g

t1: 65.2 msec

t2: 68.2 msec

Duration: 3.0 msec

P4 CSI: 283.4

Input channels: P4 Chest x (26) CFC\_180

P4 Chest y (27) CFC\_180

P4 Chest z (28) CFC\_180

=====

P4 HIC(15 ms): 132.9

t1: 69.7 msec

t2: 84.7 msec

Duration: 15.0 msec

Average Acceleration: 37.9 g

Input channels: P4 Head x (17) CFC\_1000

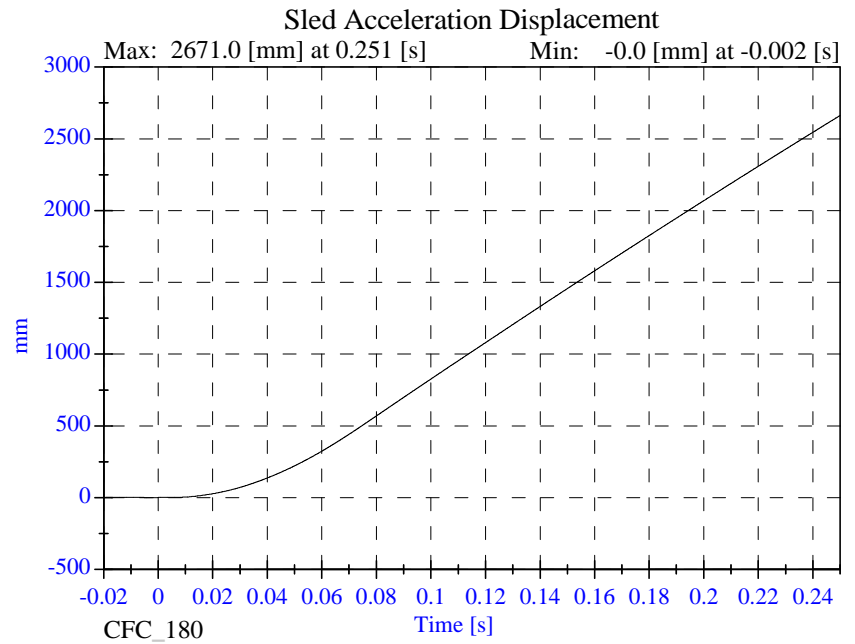
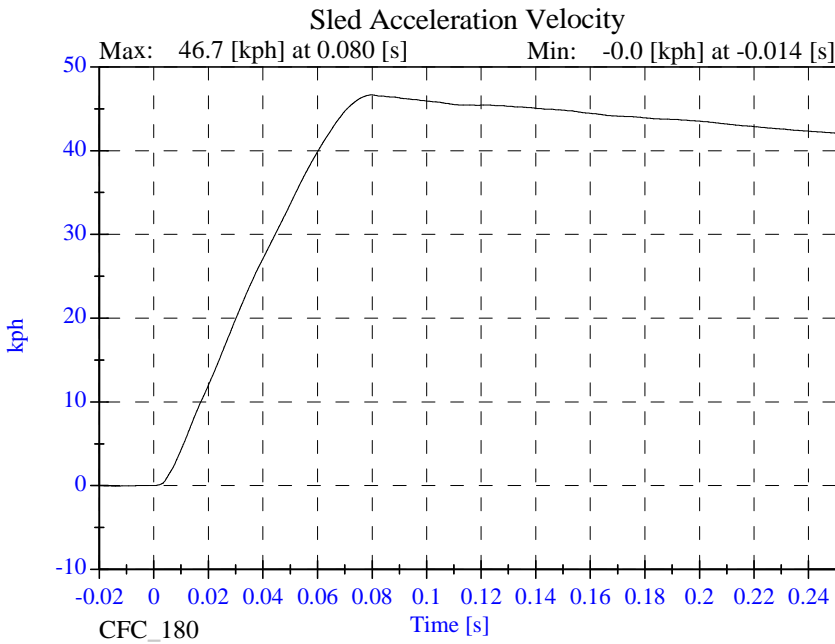
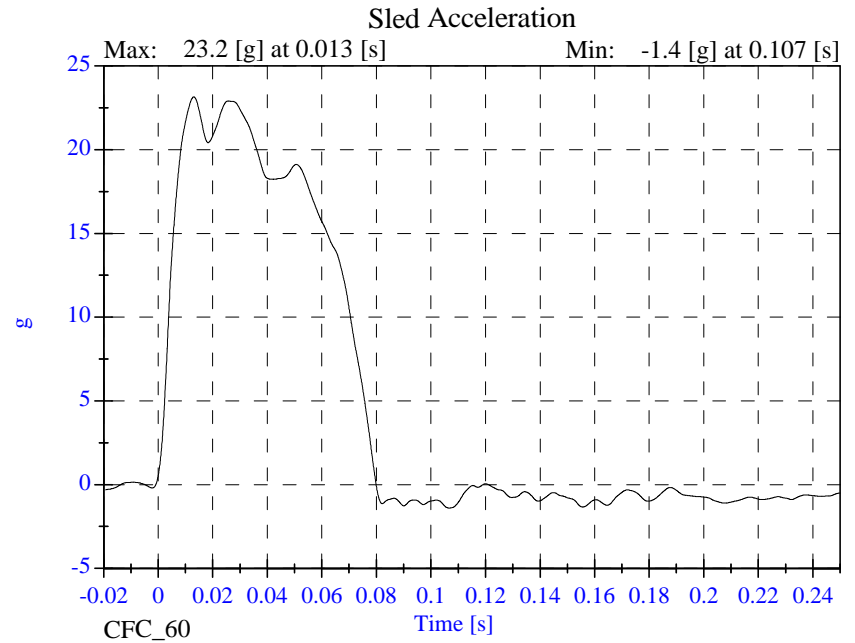
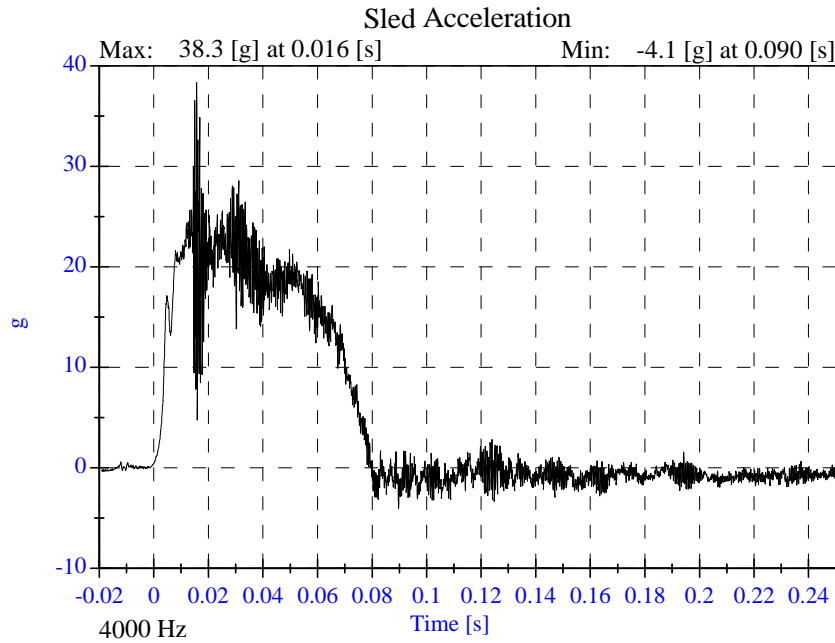
P4 Head y (18) CFC\_1000

P4 Head z (19) CFC\_1000

=====

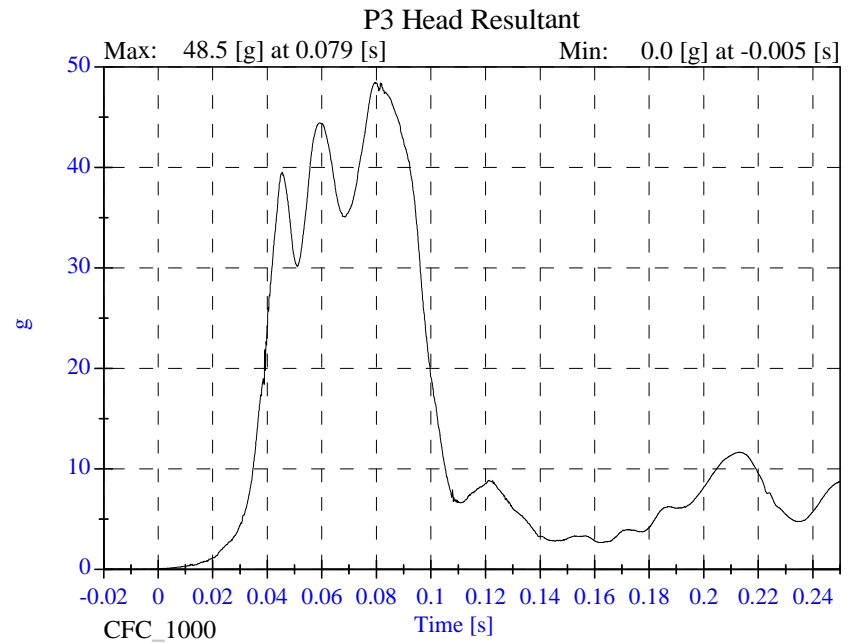
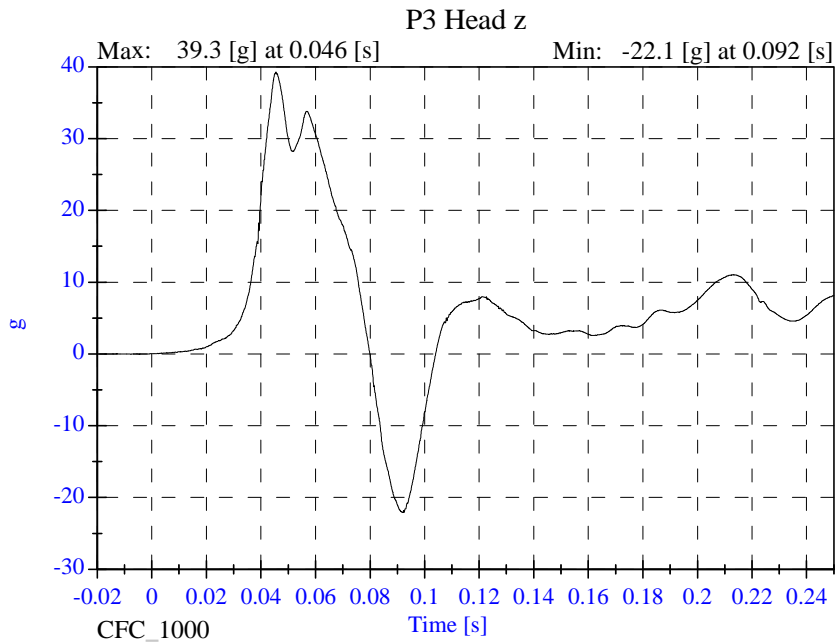
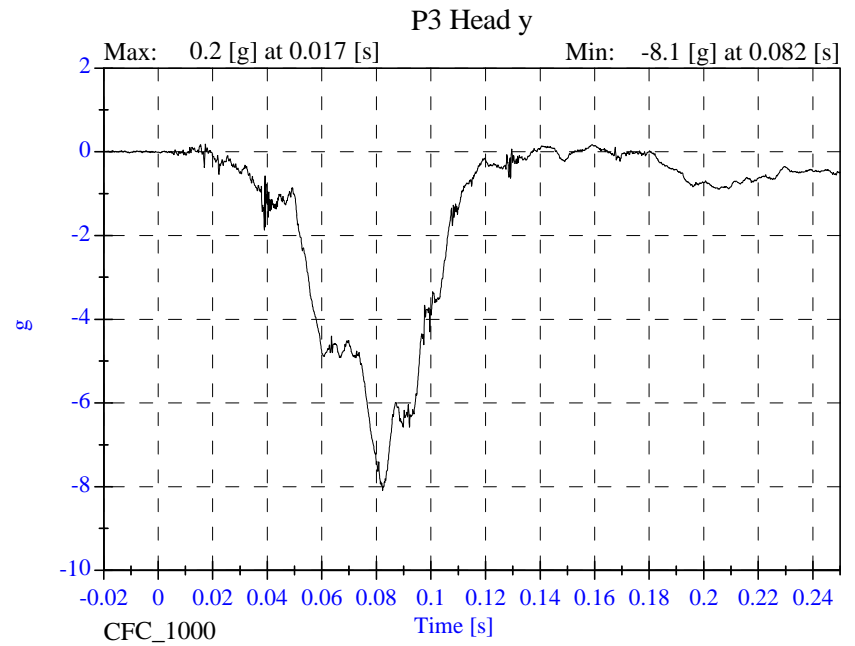
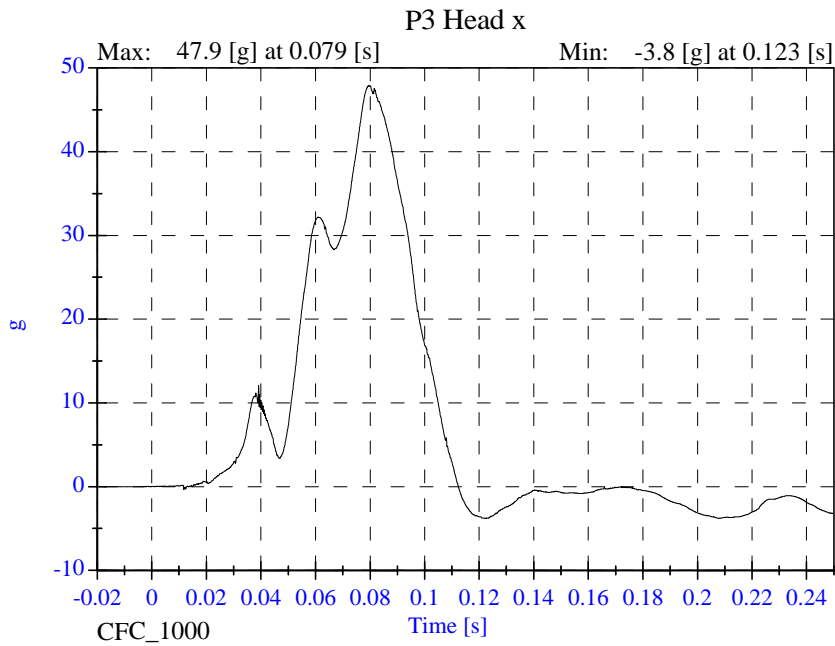
# Sled Test NCAP SLED 08-3-38

- August 28, 2003



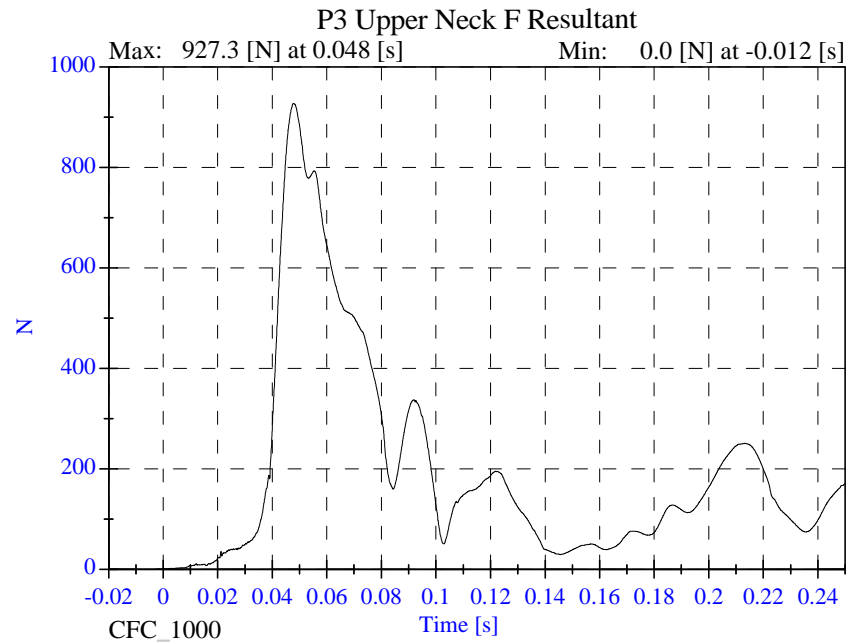
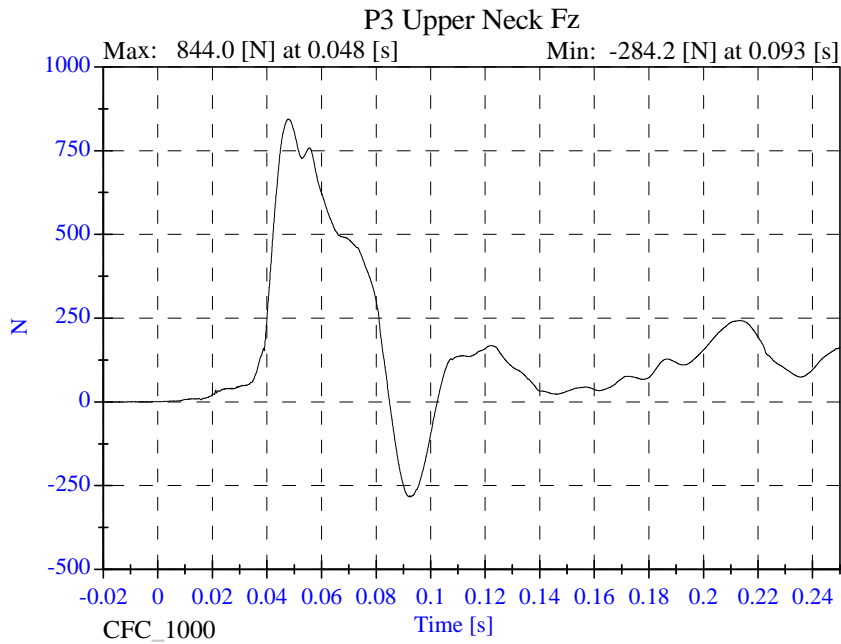
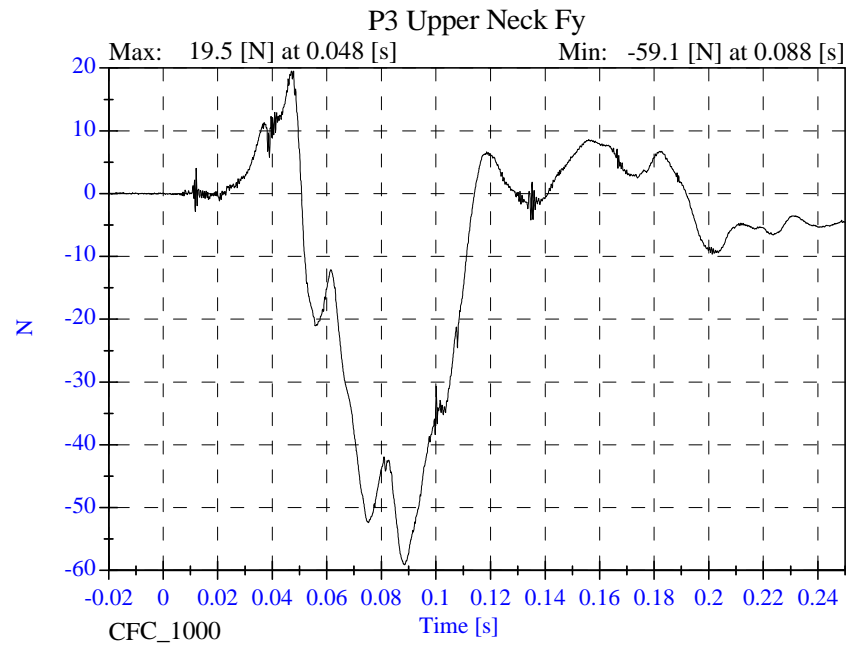
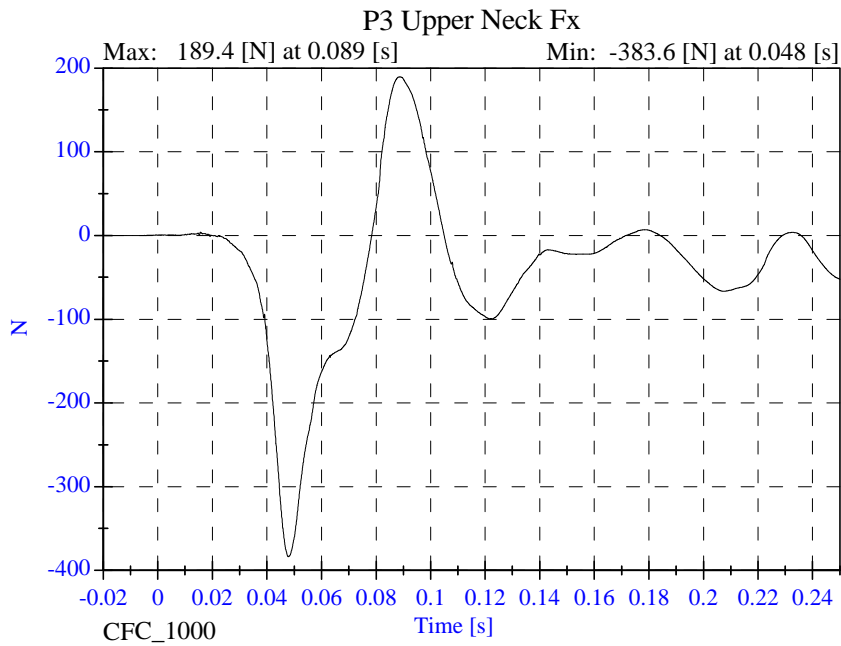
# Sled Test NCAP SLED 08-3-38

- August 28, 2003



# Sled Test NCAP SLED 08-3-38

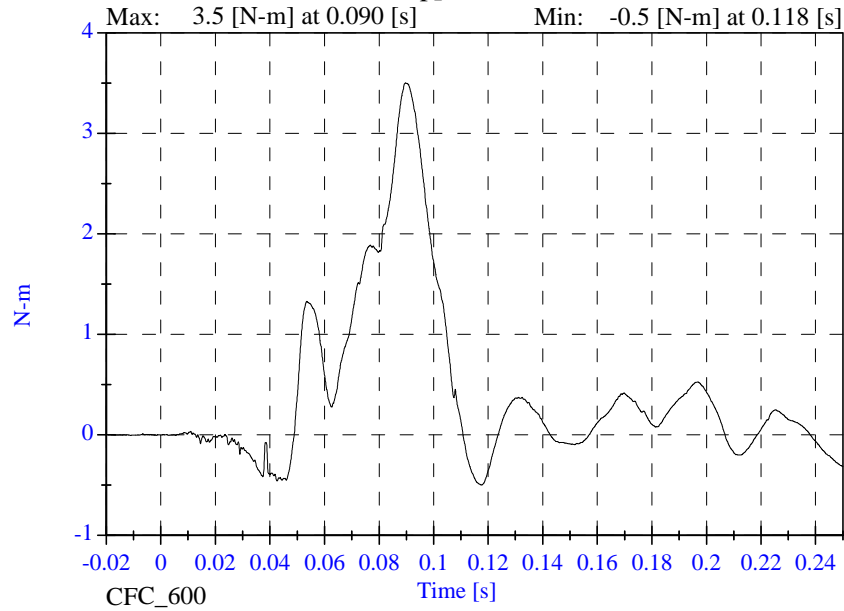
- August 28, 2003



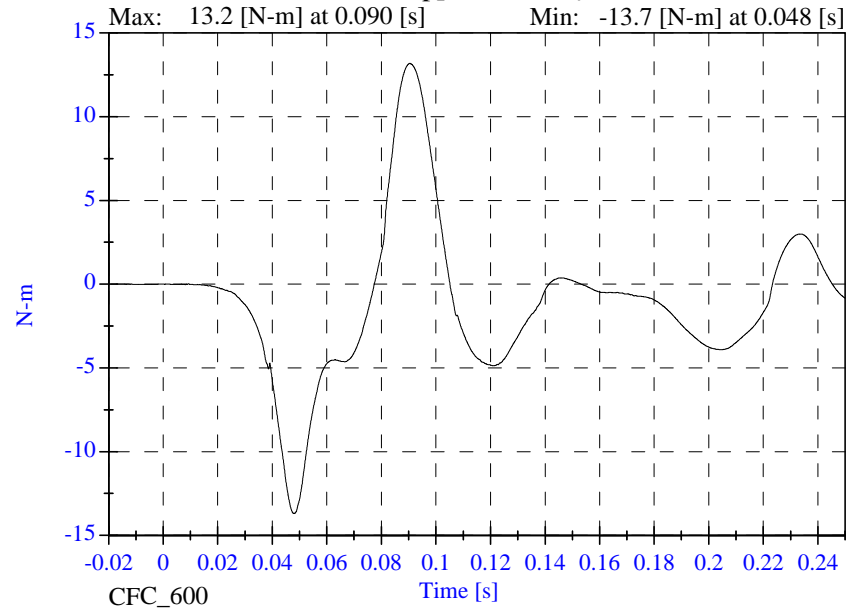
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

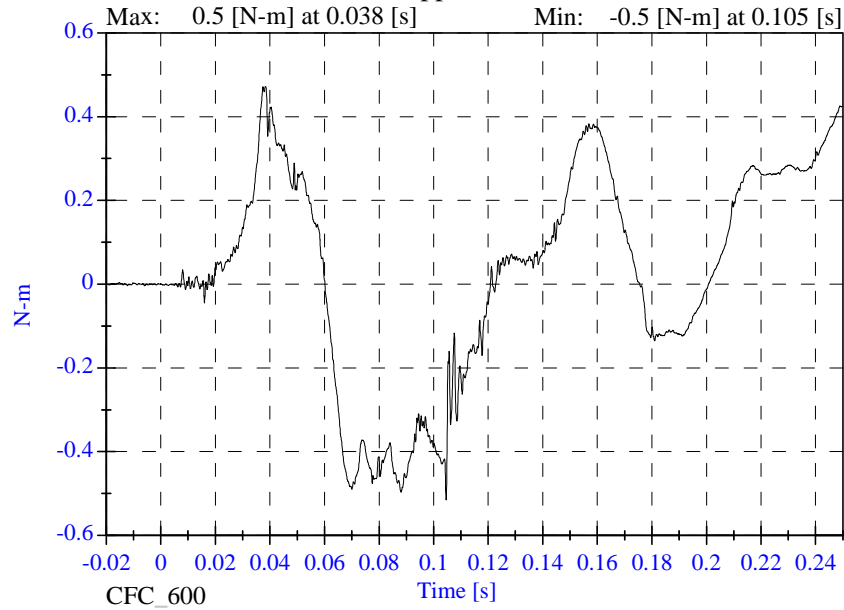
### P3 Upper Neck Mx



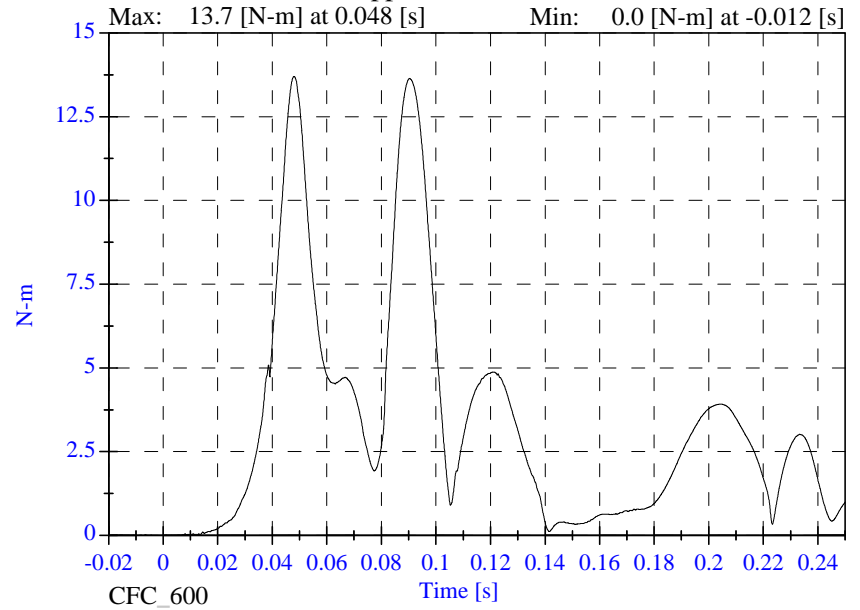
### P3 Upper Neck My



### P3 Upper Neck Mz



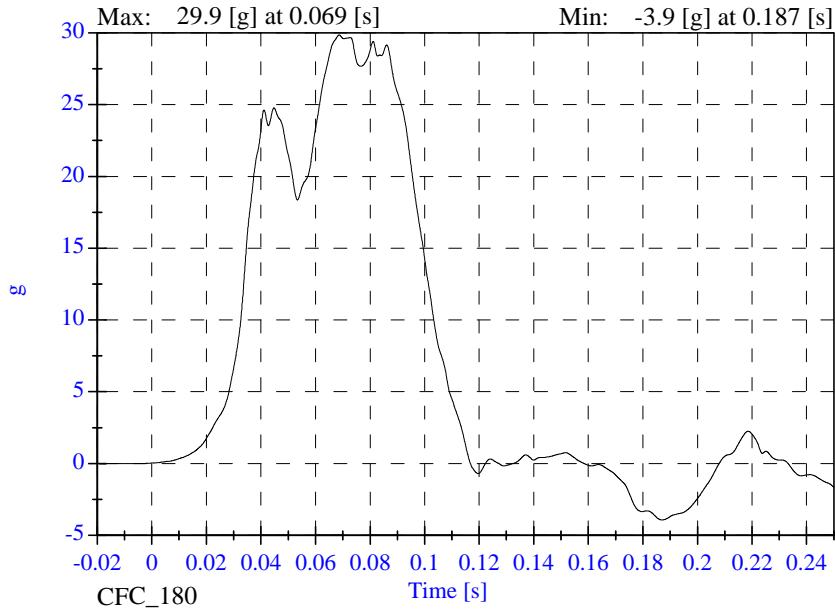
### P3 Upper Neck M Resultant



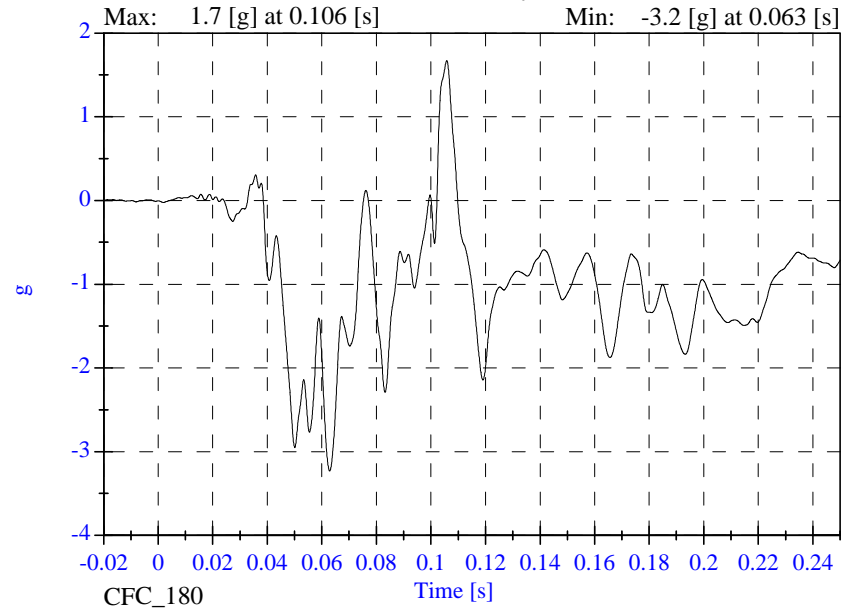
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

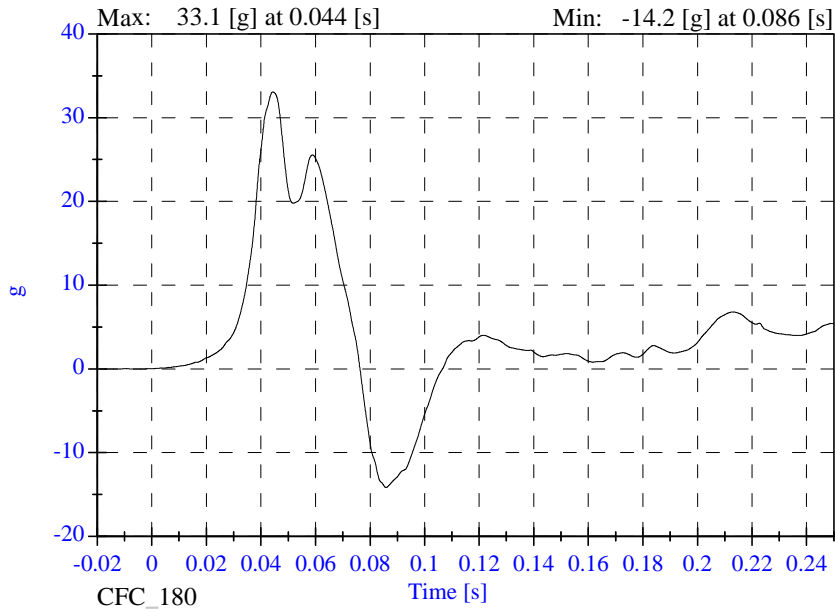
### P3 Chest x



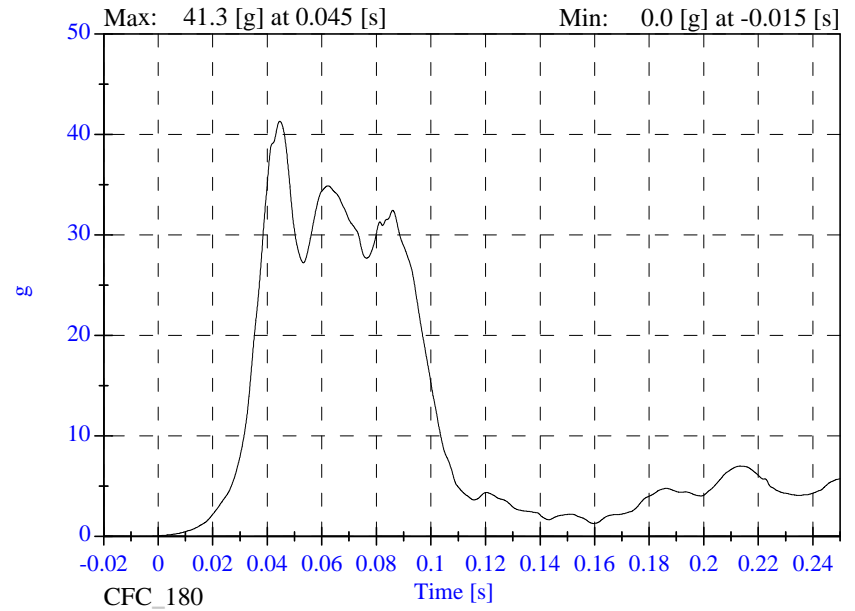
### P3 Chest y



### P3 Chest z



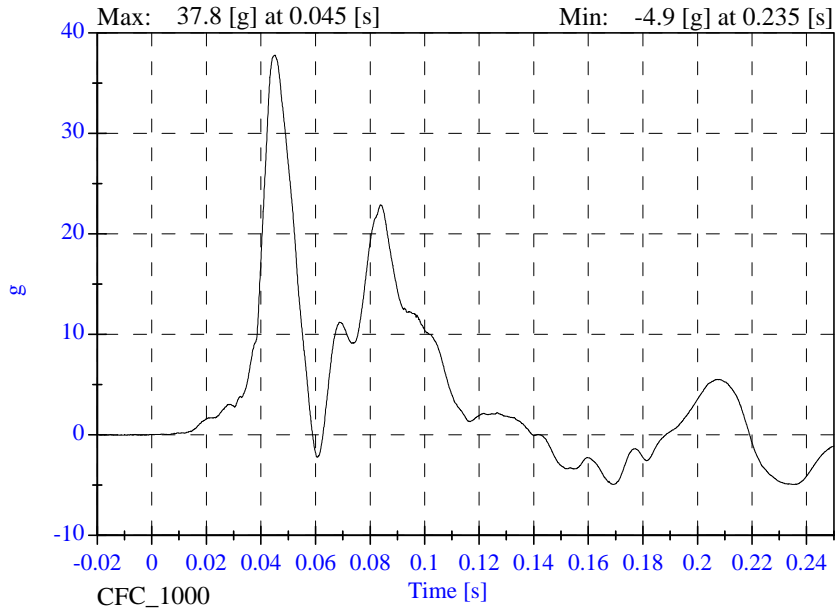
### P3 Chest Resultant



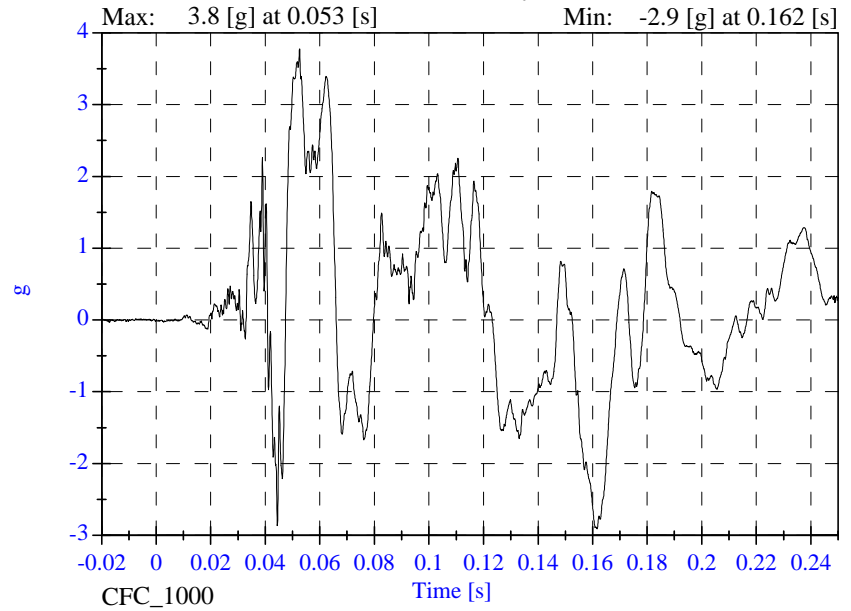
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

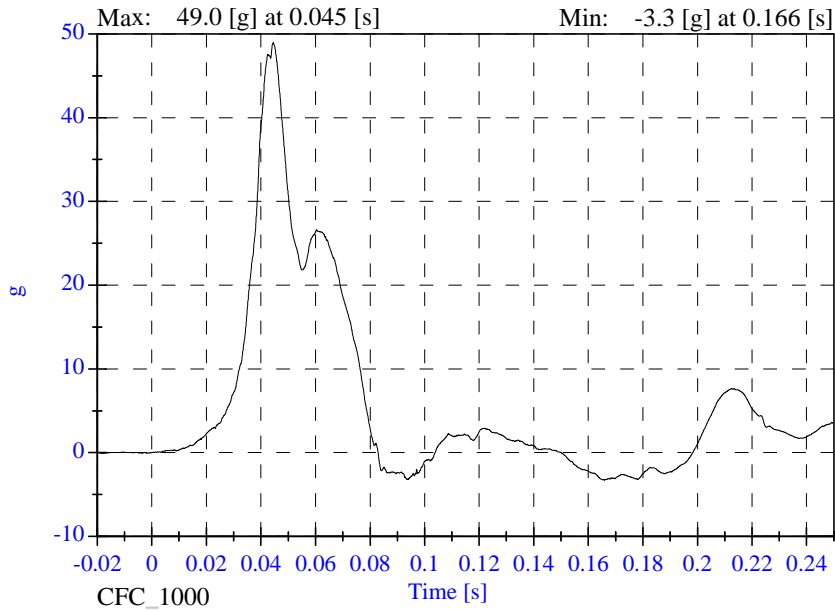
### P3 Pelvic x



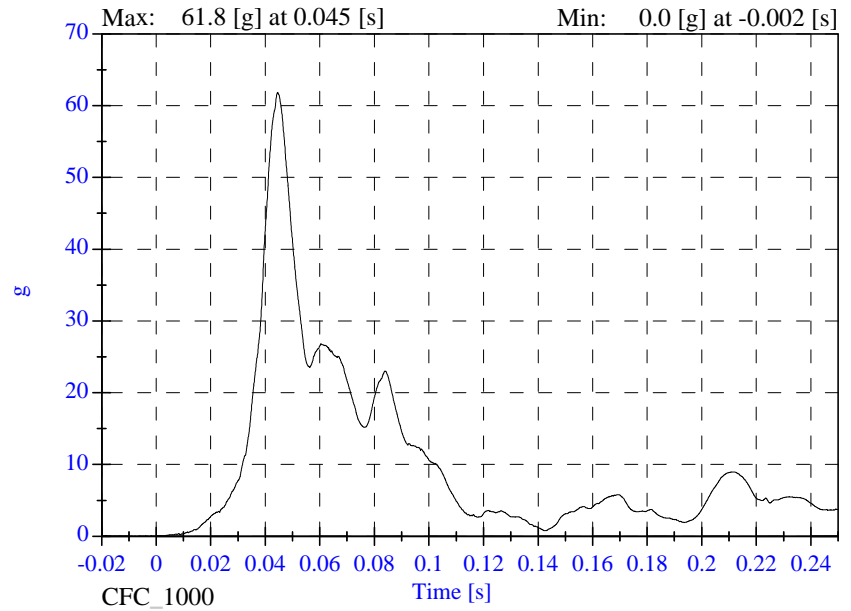
### P3 Pelvic y



### P3 Pelvic z



### P3 Pelvic Resultant

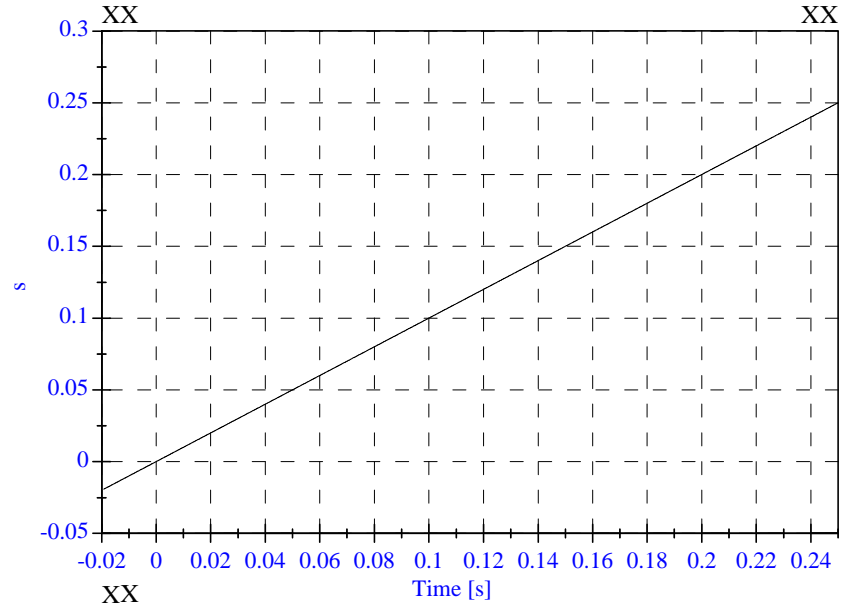
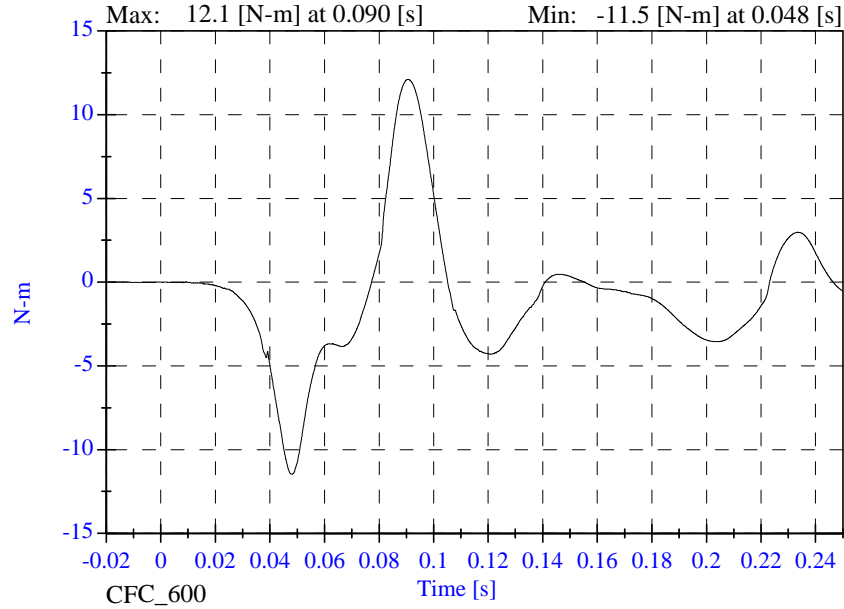


# Sled Test NCAP SLED 08-3-38

P3 Upper Neck Mocyc

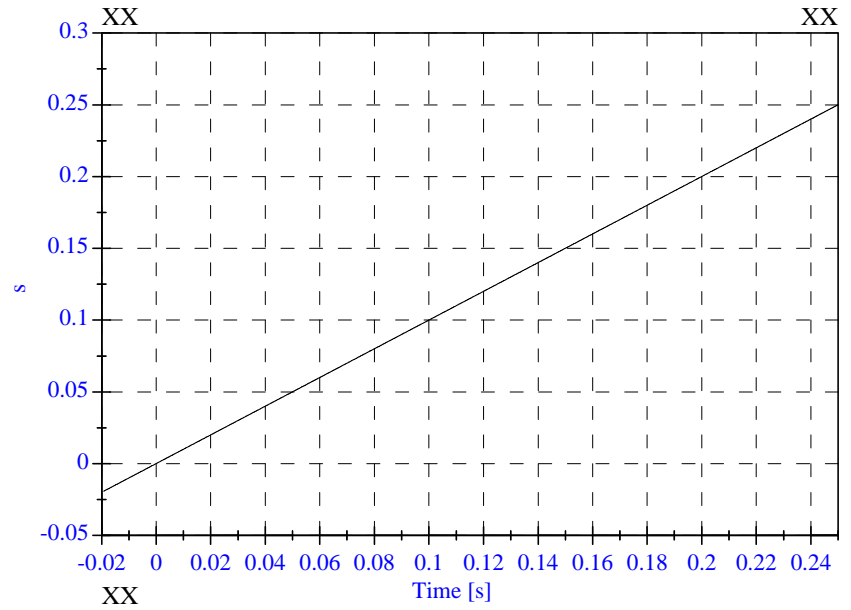
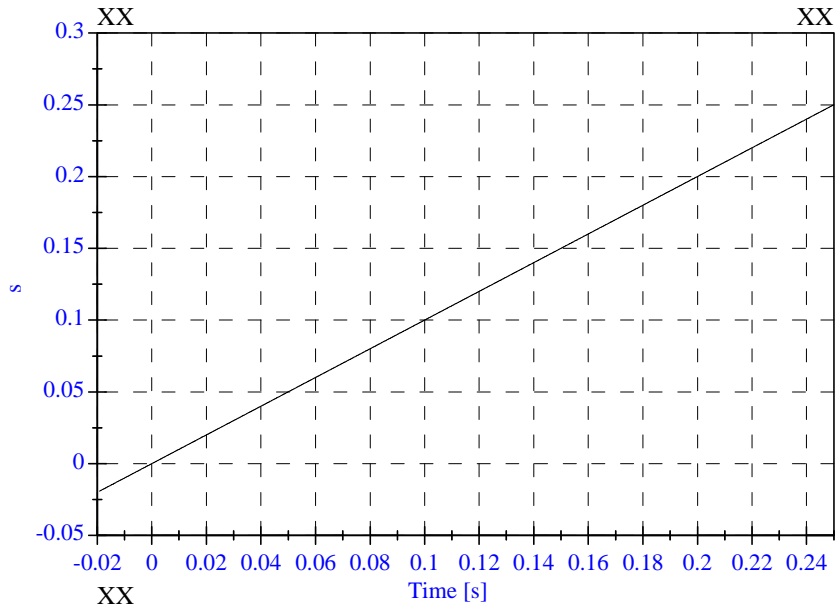
- August 28, 2003

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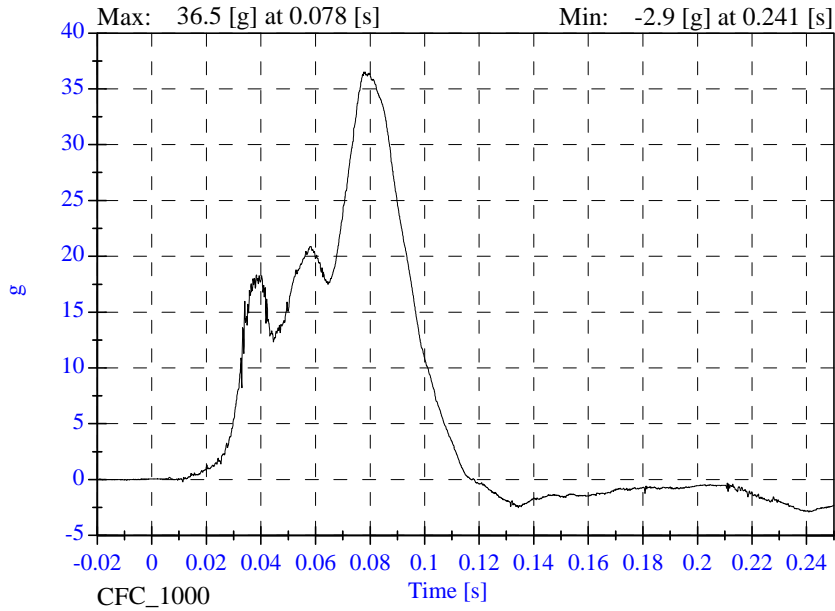
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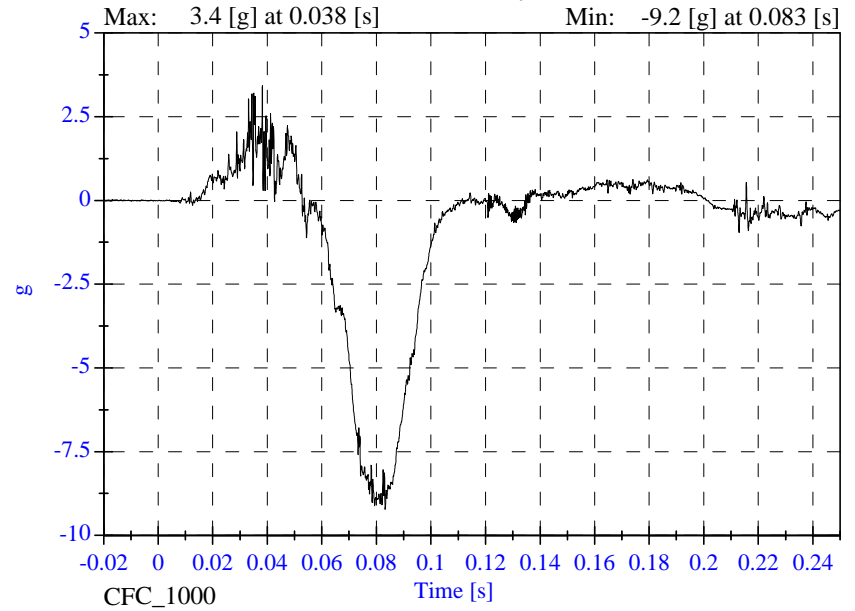
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

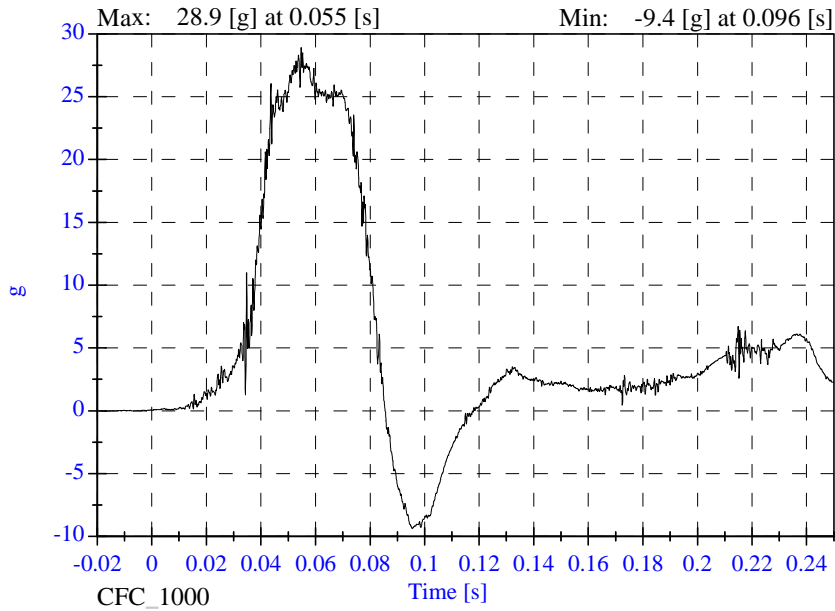
### P4 Head x



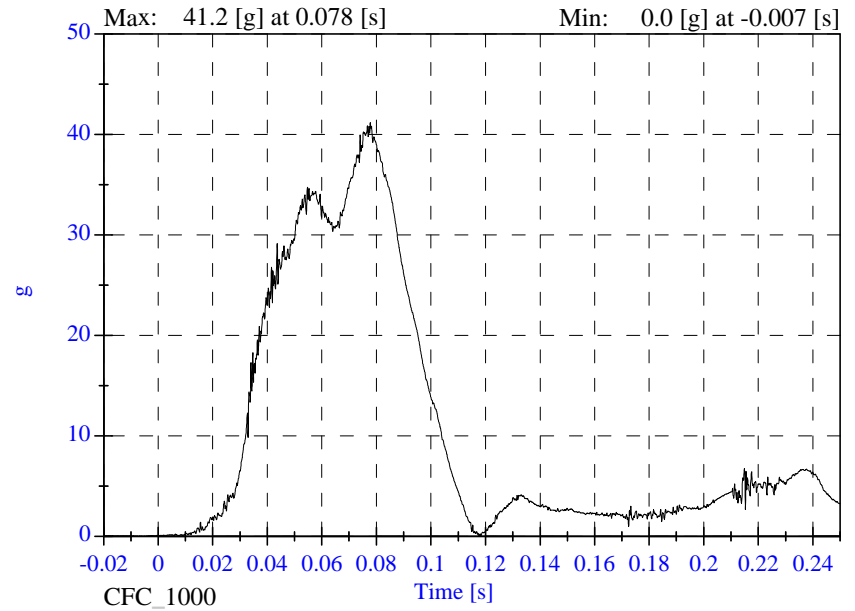
### P4 Head y



### P4 Head z

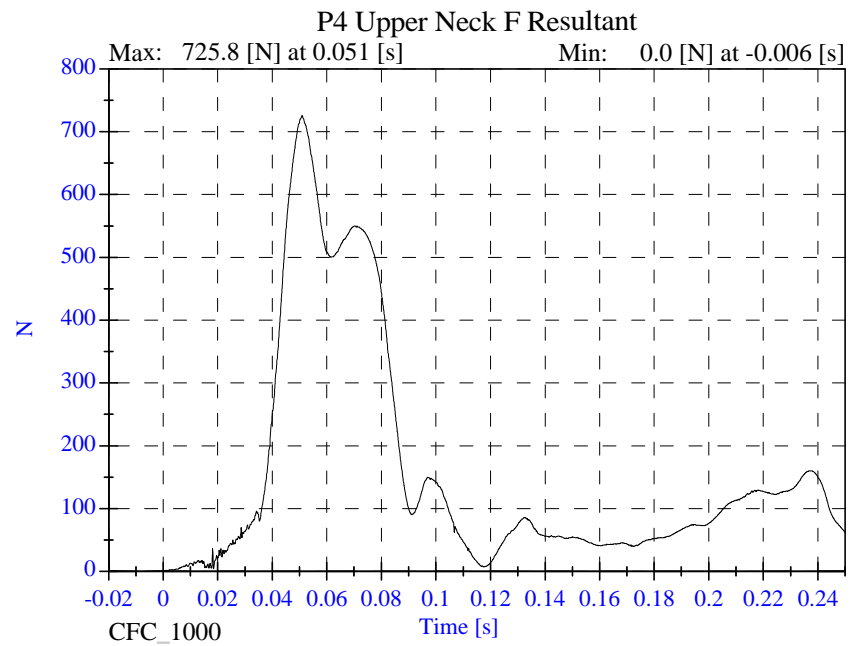
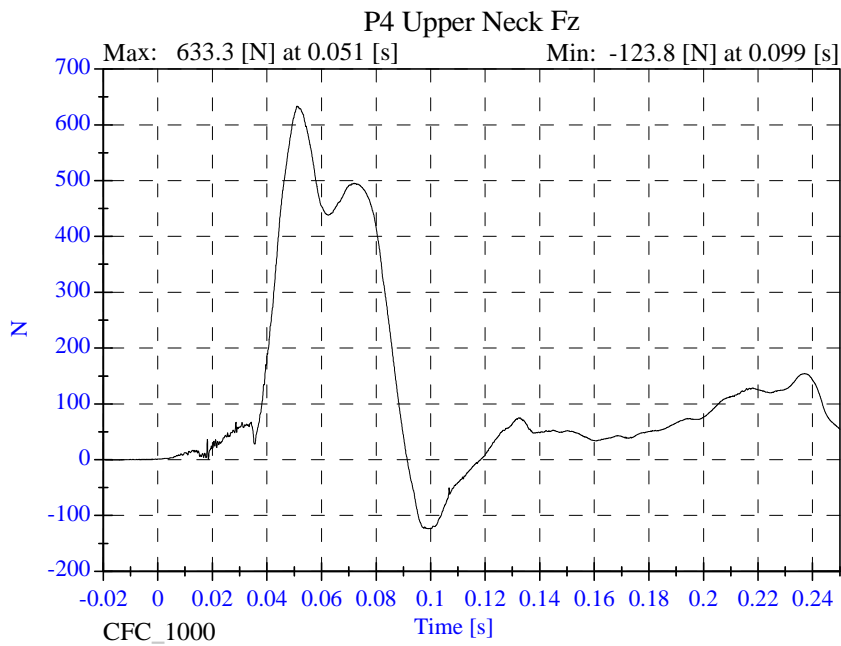
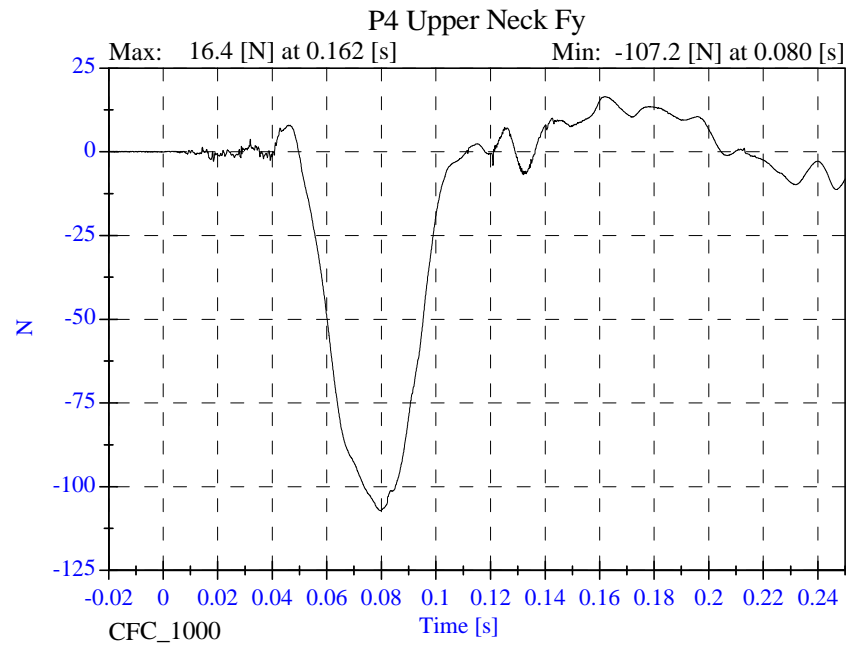
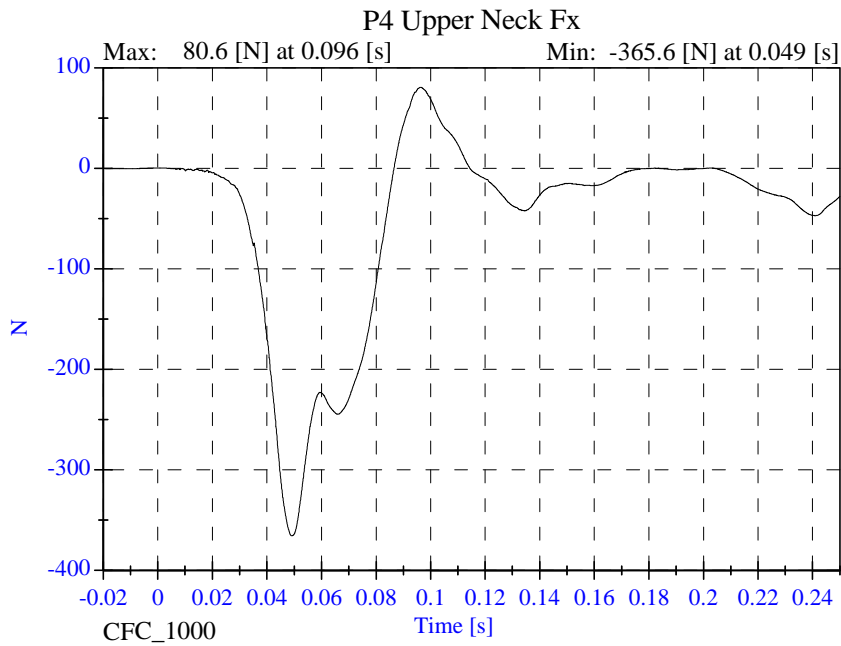


### P4 Head Resultant



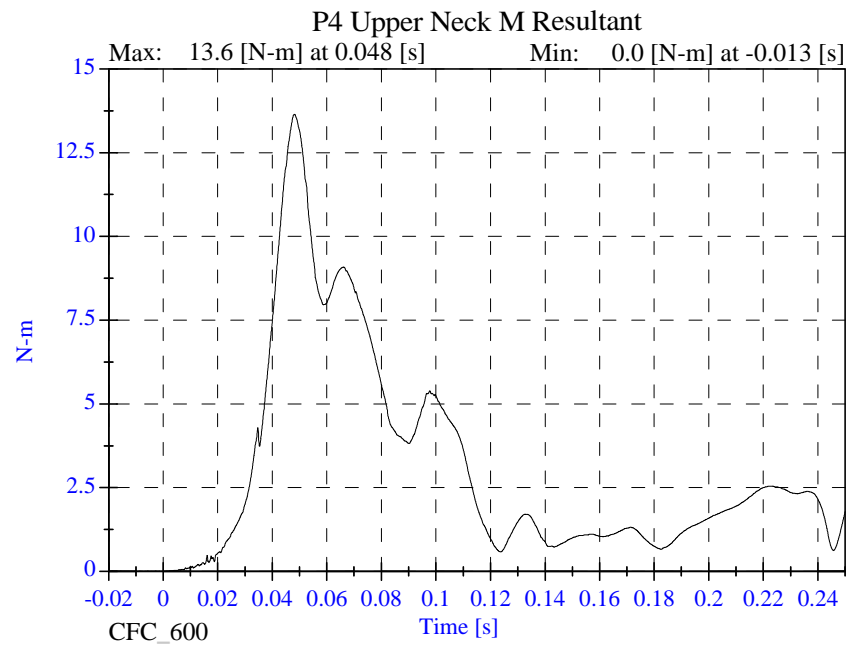
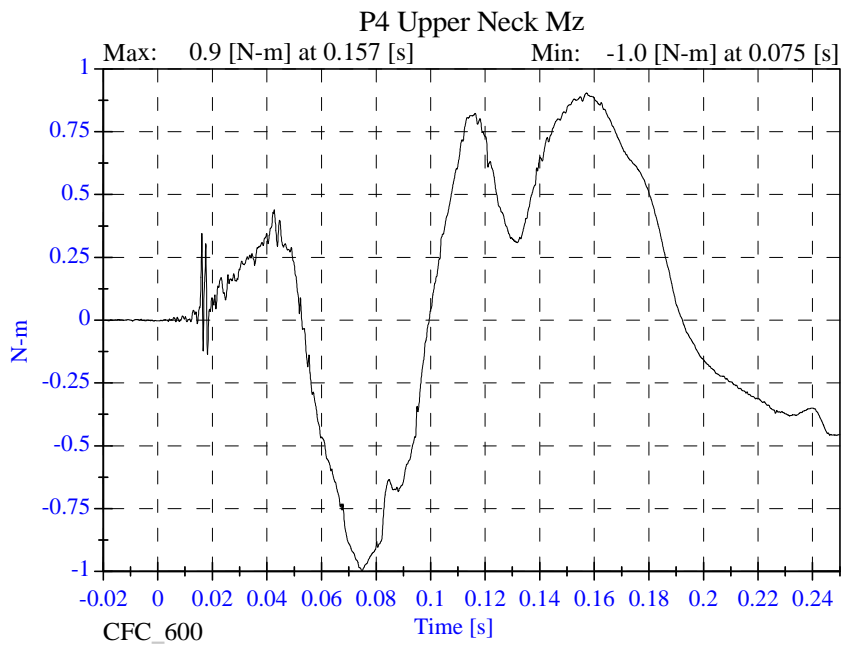
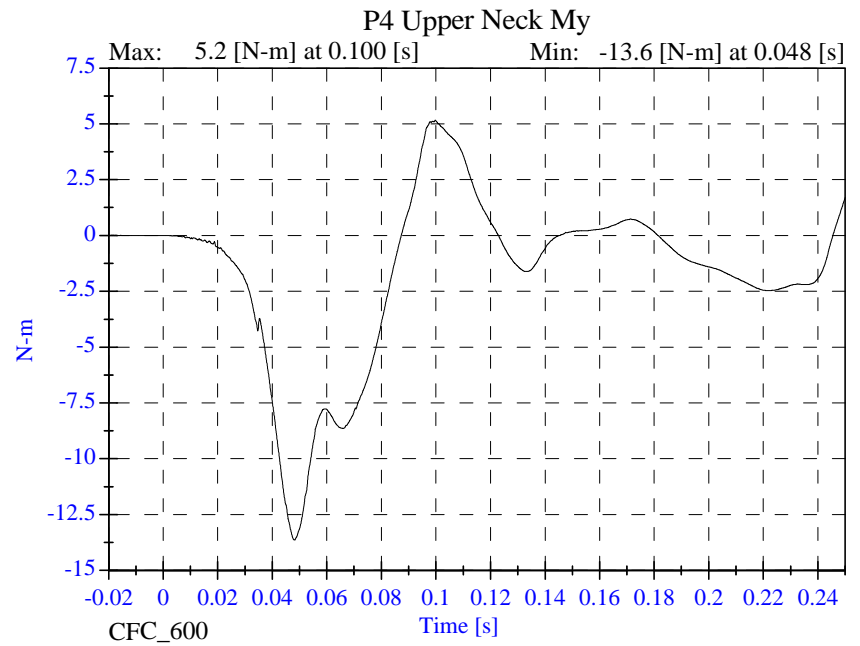
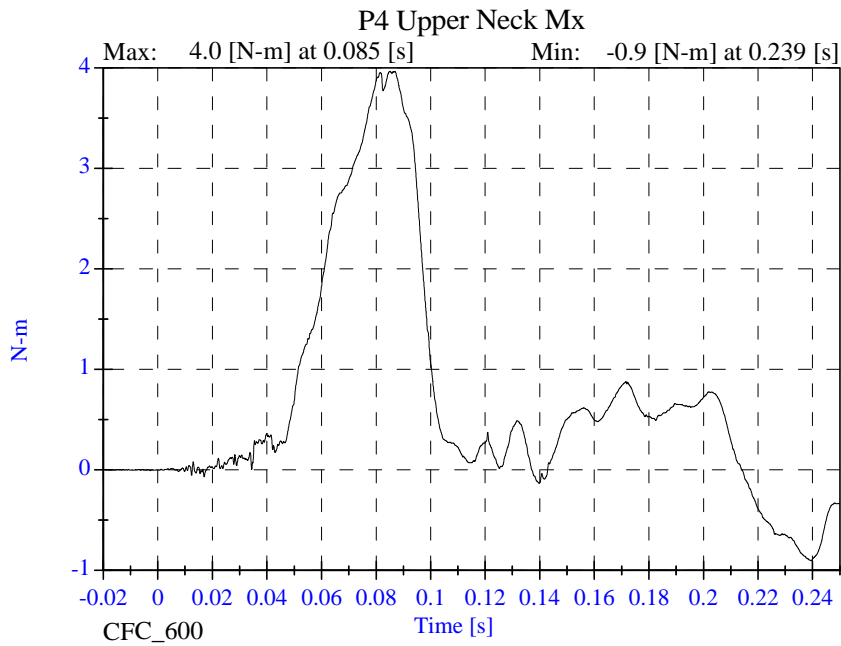
# Sled Test NCAP SLED 08-3-38

- August 28, 2003



# Sled Test NCAP SLED 08-3-38

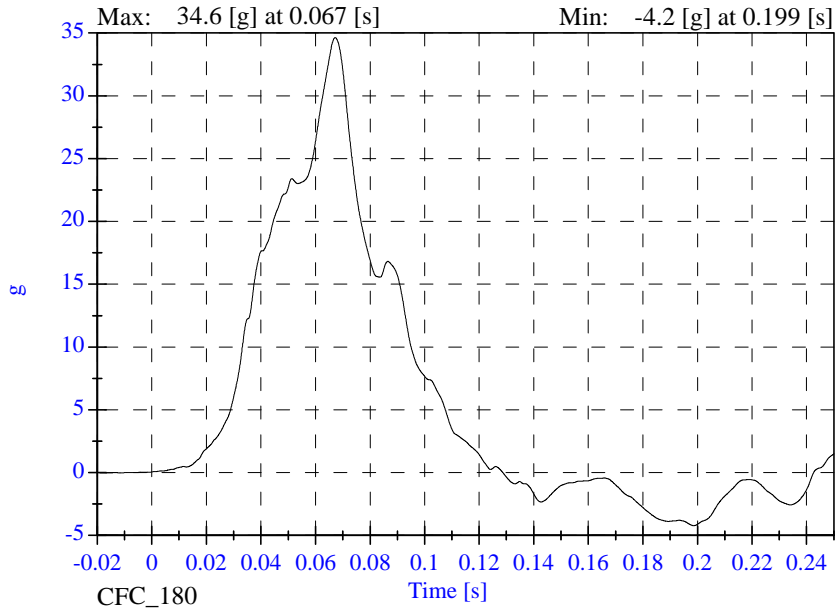
- August 28, 2003



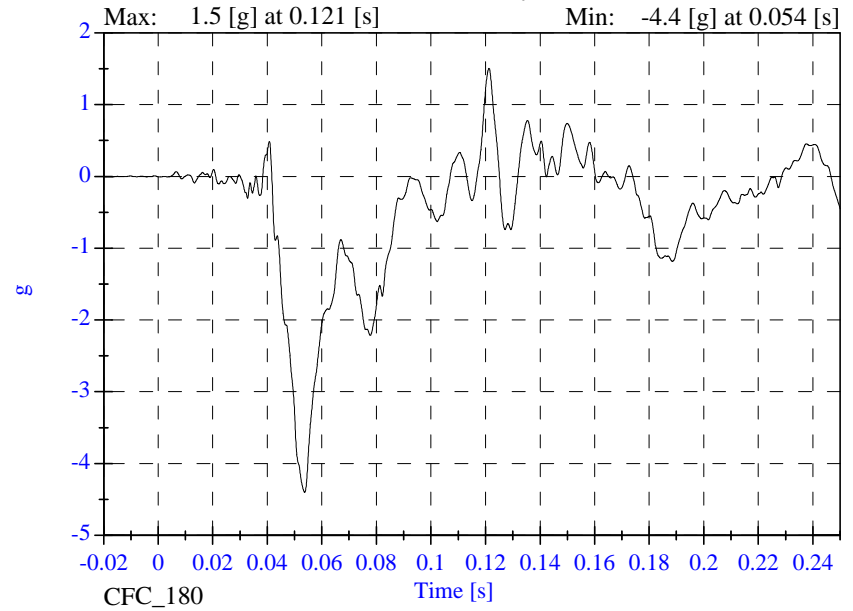
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

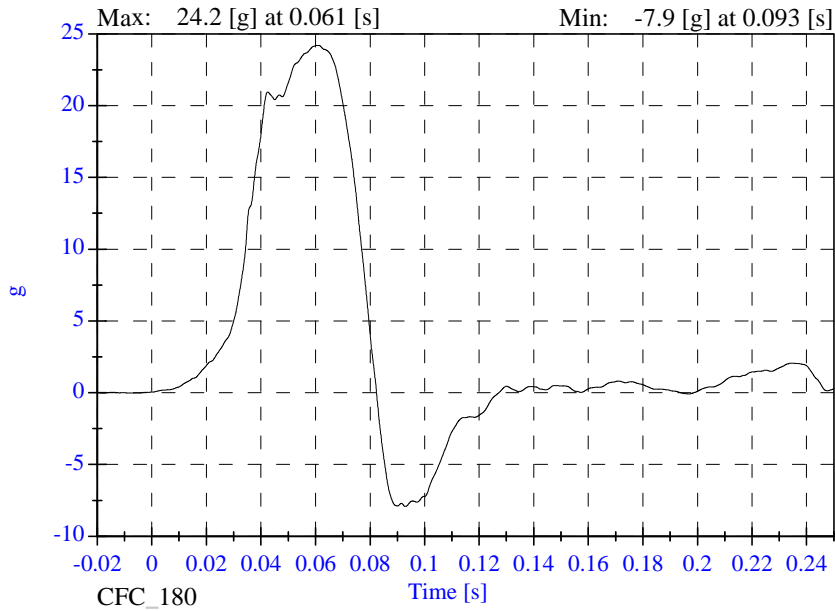
### P4 Chest x



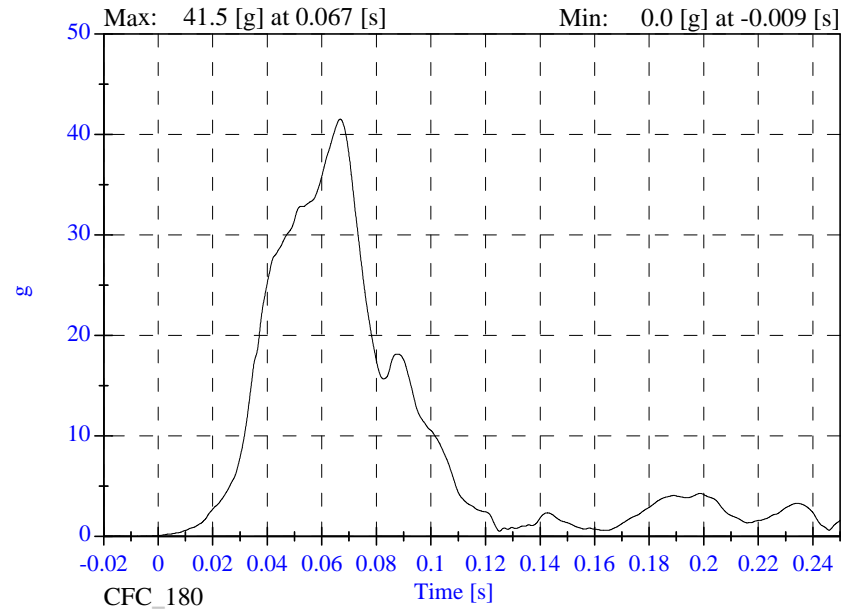
### P4 Chest y



### P4 Chest z



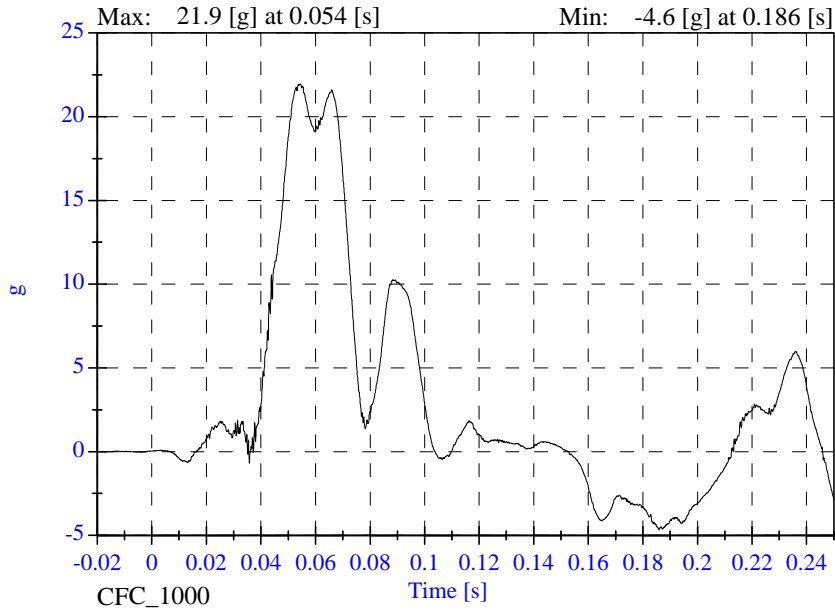
### P4 Chest Resultant



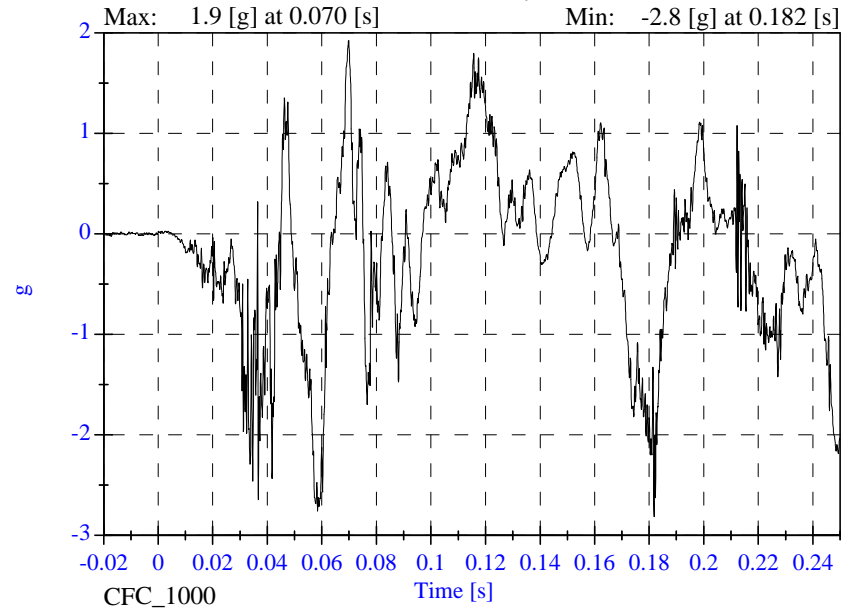
# Sled Test NCAP SLED 08-3-38

- August 28, 2003

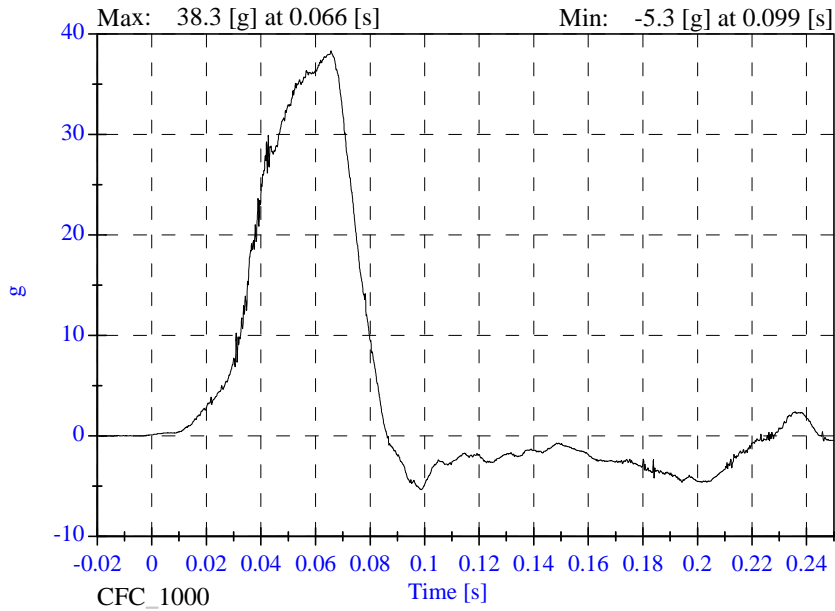
### P4 Pelvic x



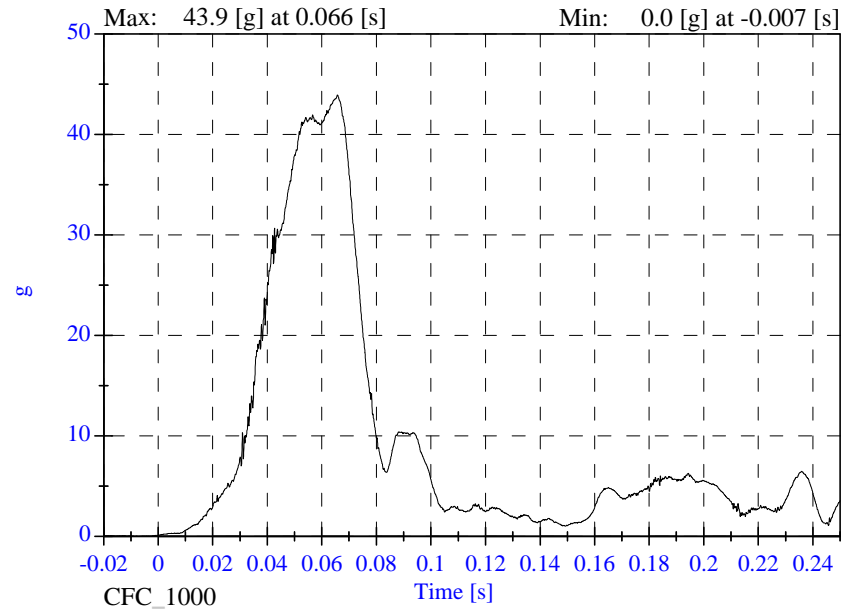
### P4 Pelvic y



### P4 Pelvic z



### P4 Pelvic Resultant

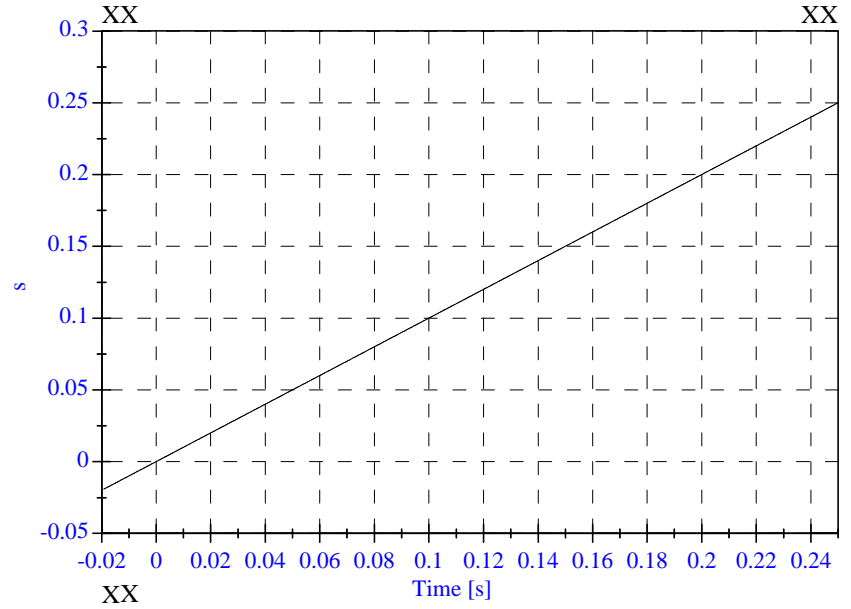
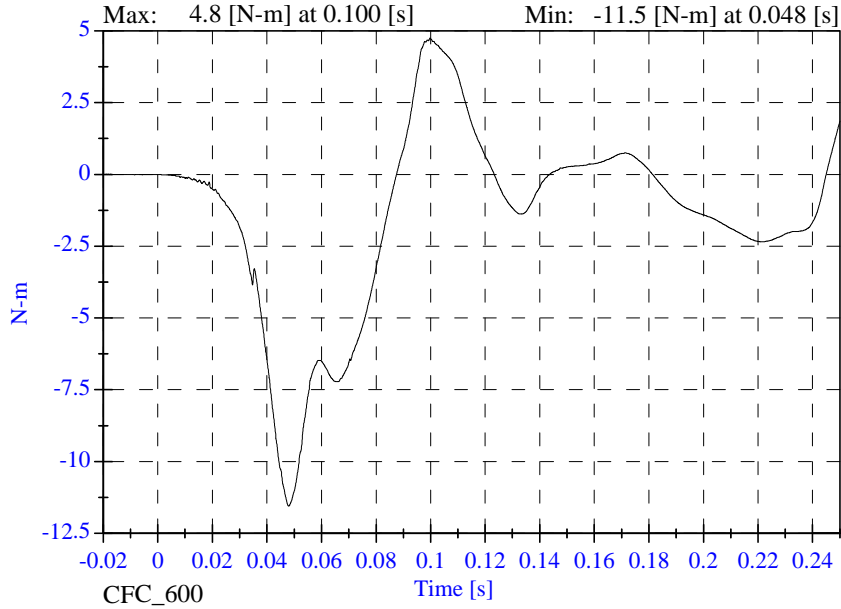


# Sled Test NCAP SLED 08-3-38

P4 Upper Neck Mocyc

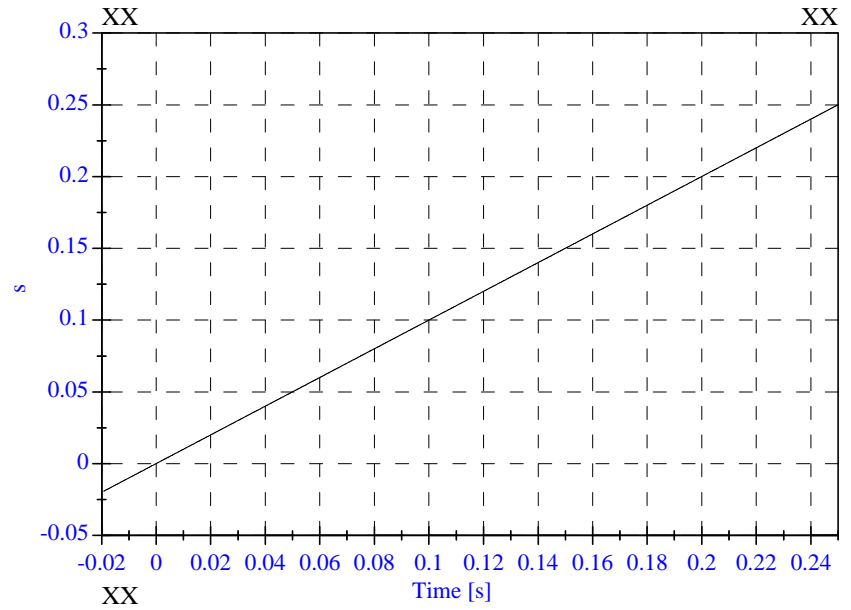
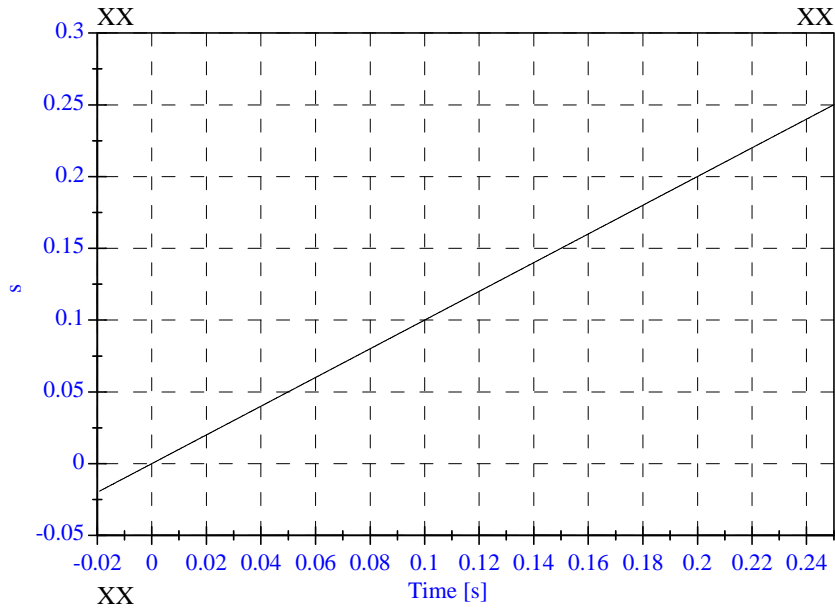
- August 28, 2003

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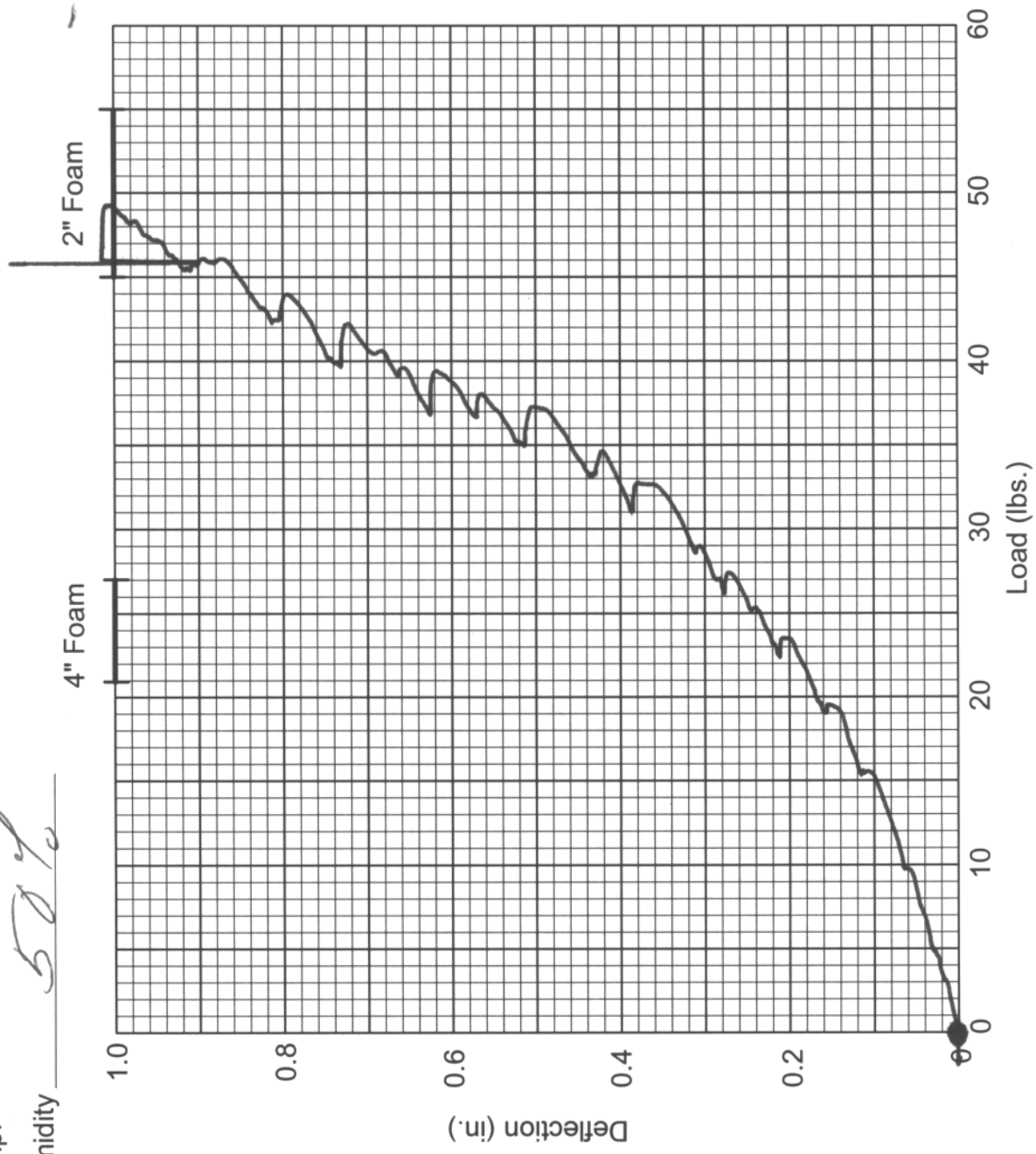


**SECTION 9**

**Compression – Deflection Resistance Test**

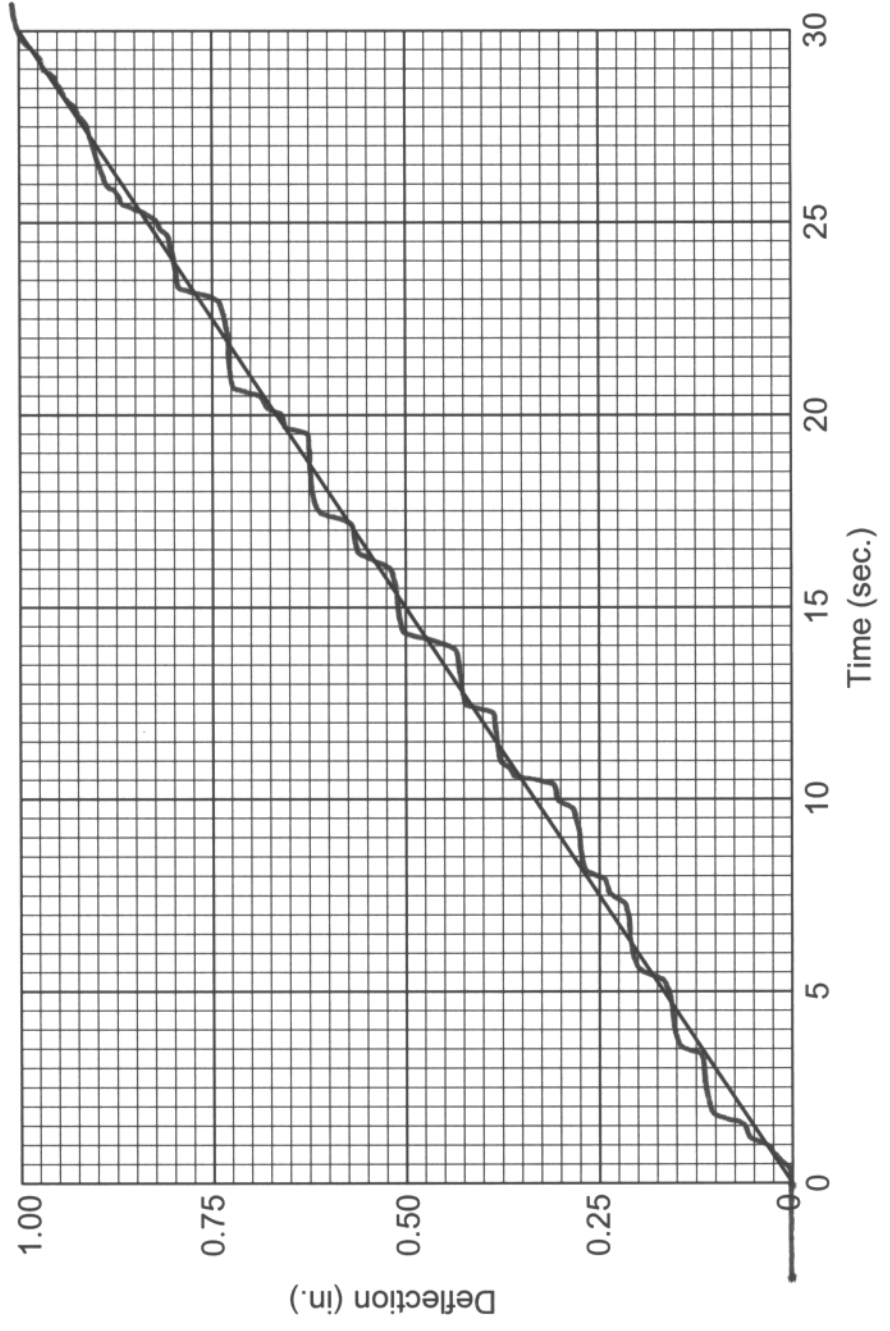
Date 8/28/03  
 Performed By [Signature]  
 Temp. 70°  
 Humidity 50%

Foam No. 2" X 20" 2 X 29 1/2



Compression - Deflection Resistance Test  
 Child Seat Foam

Date 8/28/03  
 Temp 70°  
 Humidity 50%  
 Foam No. 2" X 20" 2' X 24" IR



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

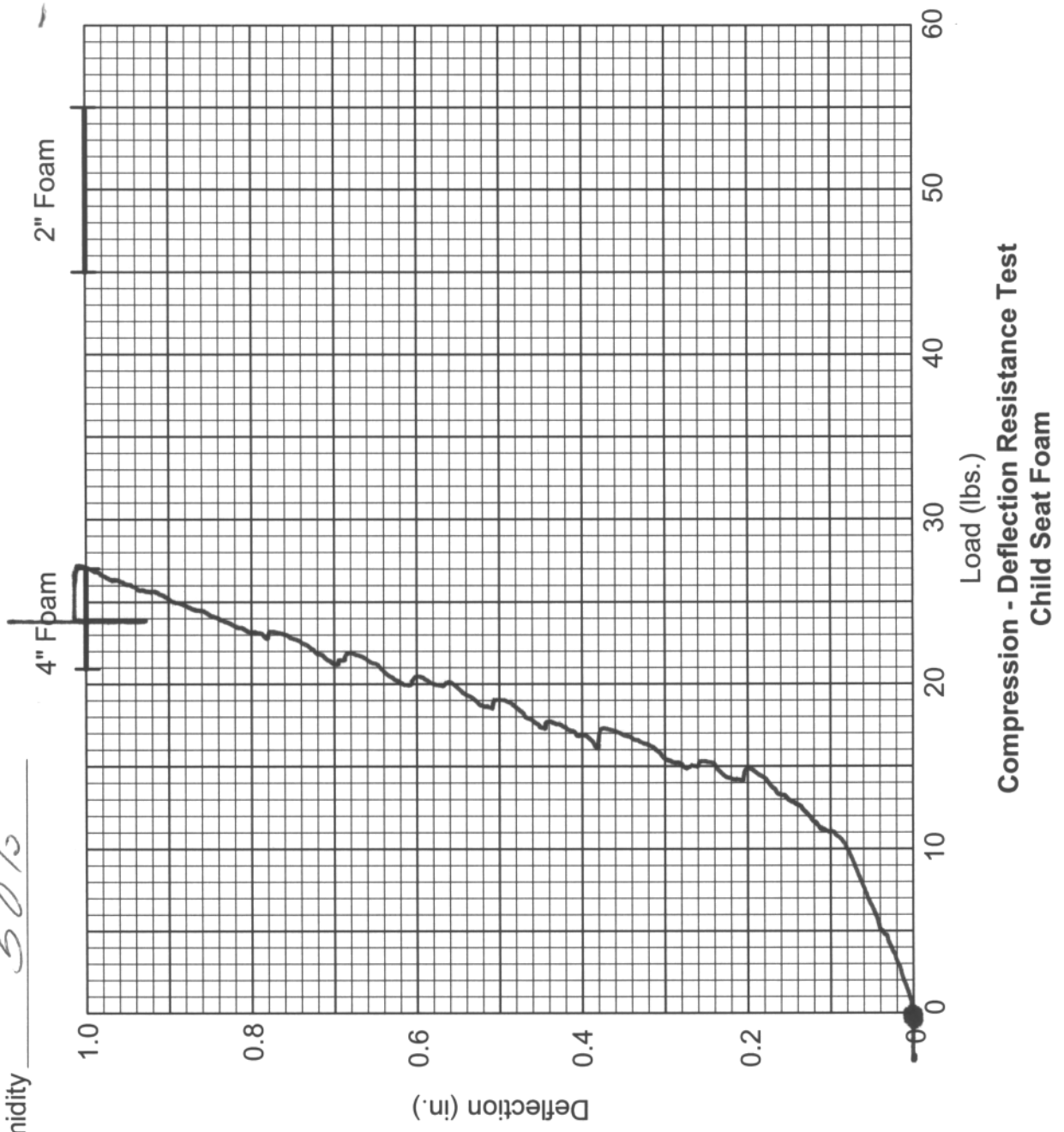
2" X 20" X 24" IZ

Foam I.D. Number

Date	Peak Load	Pass/Fail
8/28/02	ACCESS	PASS

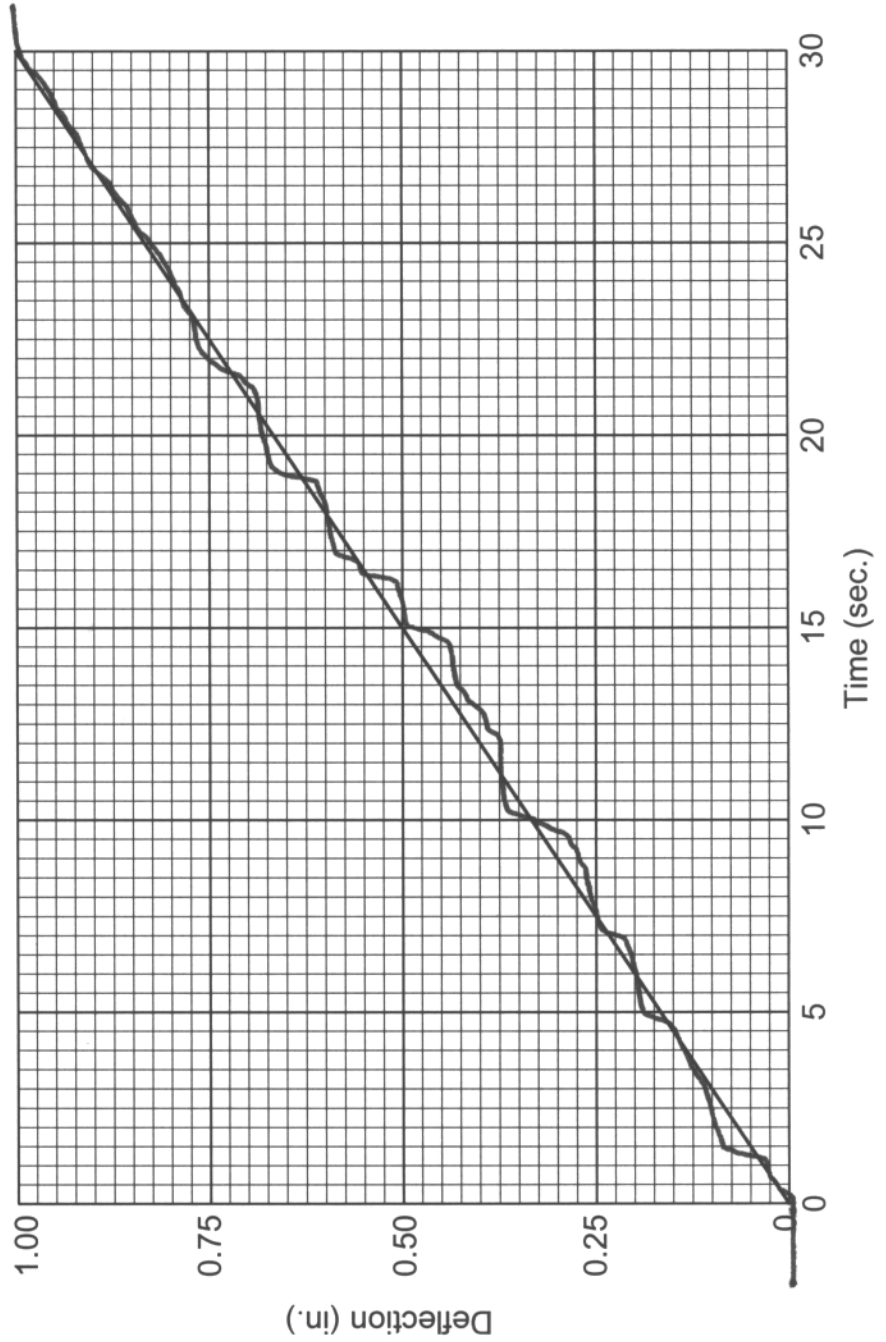
Date 8/28/03  
 Performed By [Signature]  
 Temp. 70°  
 Humidity 50%

Foam No. 4' x 20" I-2



Compression - Deflection Resistance Test  
 Child Seat Foam

Date 8/20/03  
Temp 70°  
Humidity 50%  
Foam No. 4" X 20" I2



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

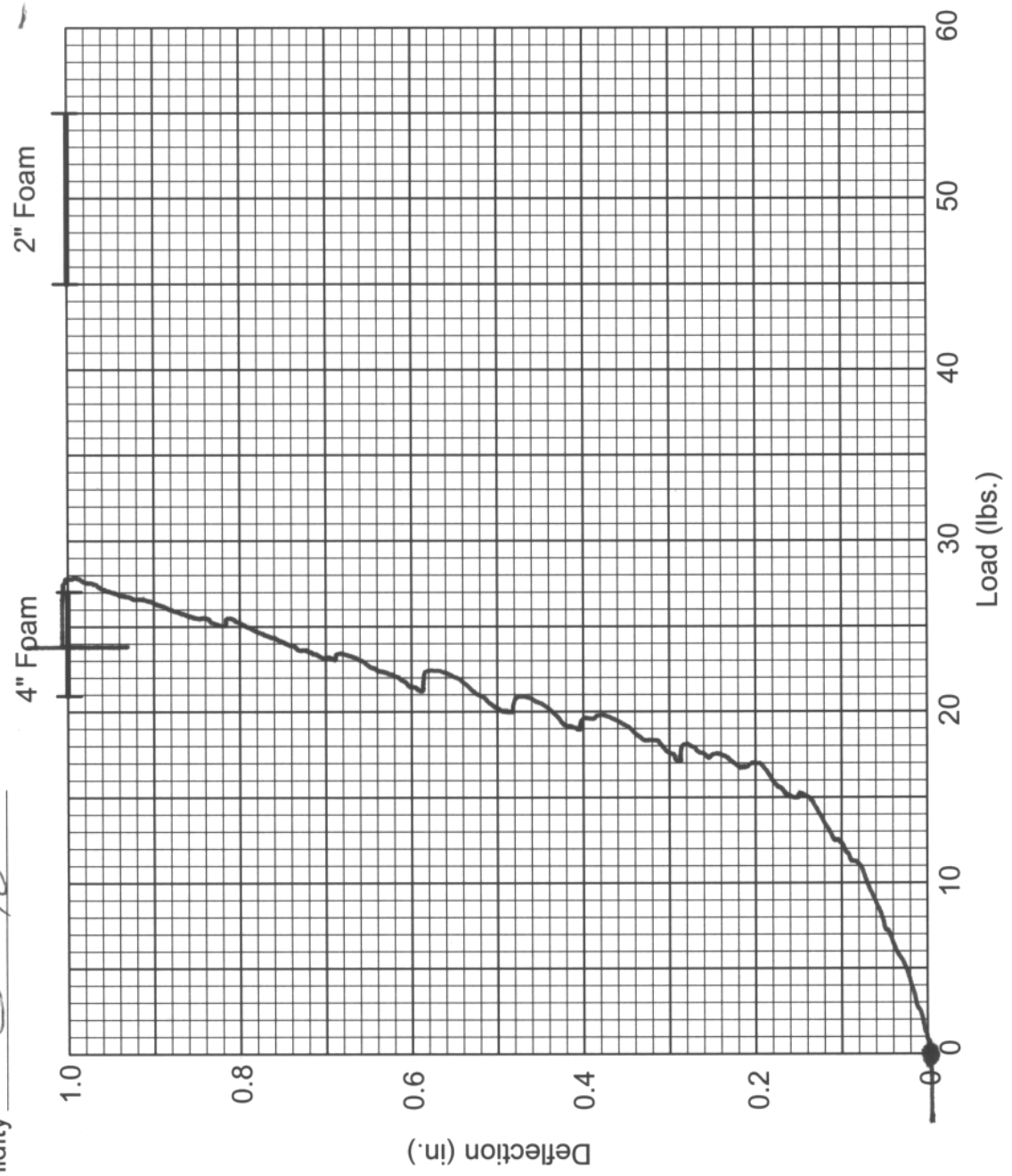
4" X 20" IZ

Foam I.D. Number \_\_\_\_\_

Date	Peak Load	Pass/Fail
8/28/03	24 LBS	Pass

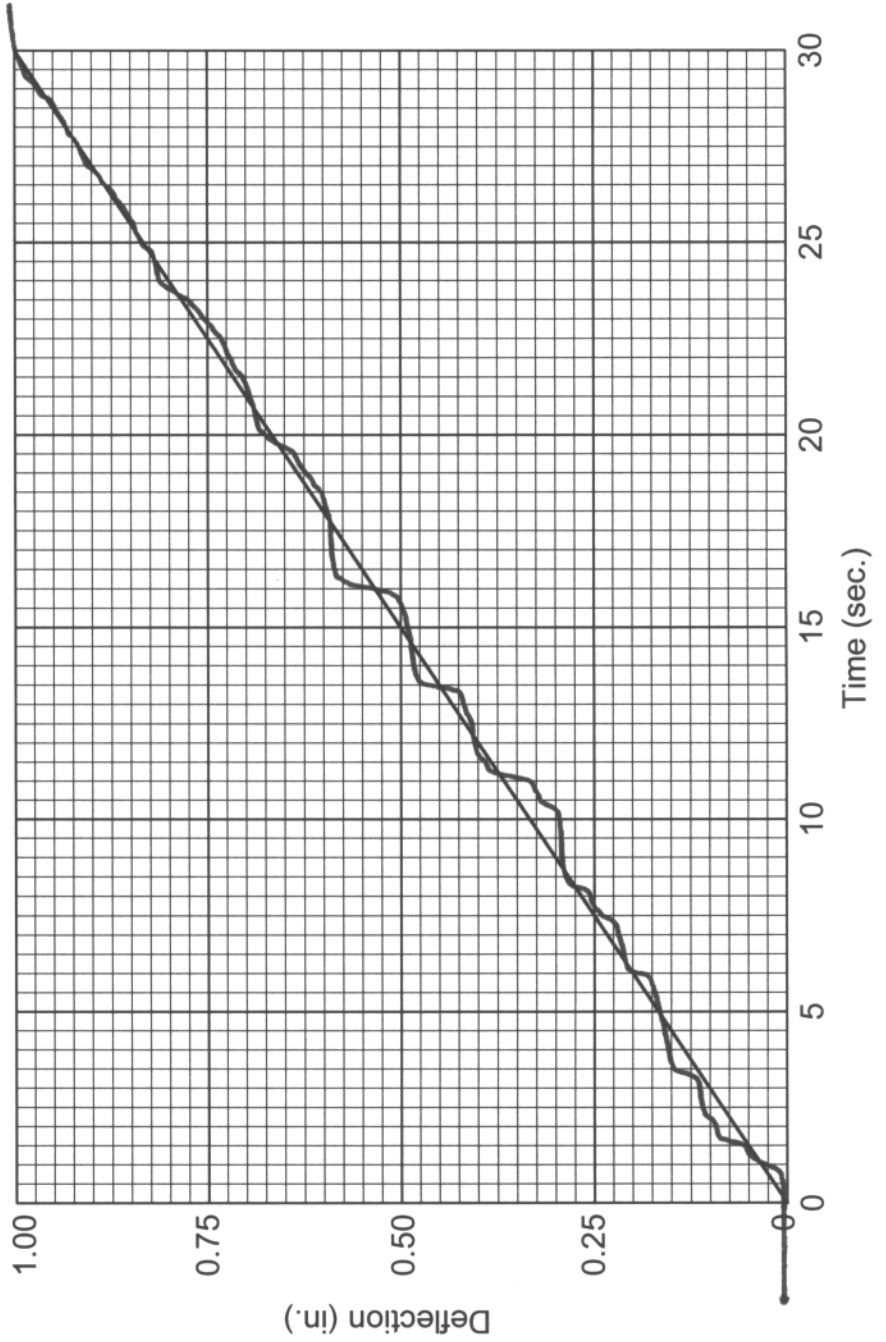
Date 9/28/03  
 Performed By [Signature]  
 Temp. 70°  
 Humidity 50%

Foam No. 4" x 24" IR



Compression - Deflection Resistance Test  
 Child Seat Foam

Date 8/28/03  
 Temp 70°  
 Humidity 50%  
 Foam No. 4" X 24" IR



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

4 X 24" IZ

Foam I.D. Number

Date	Peak Load	Pass/Fail
8/28/03	24 LBS	Pass

**SECTION 10**

**Child Dummy Calibration Data Traces and Tables**

# CRABI 1 Year Old Frontal Head Drop Test S/N:093

Part 572R Frontal Head Drop

Calibration Date: July 22, 2003

Serial No: 093

Work File: 4001

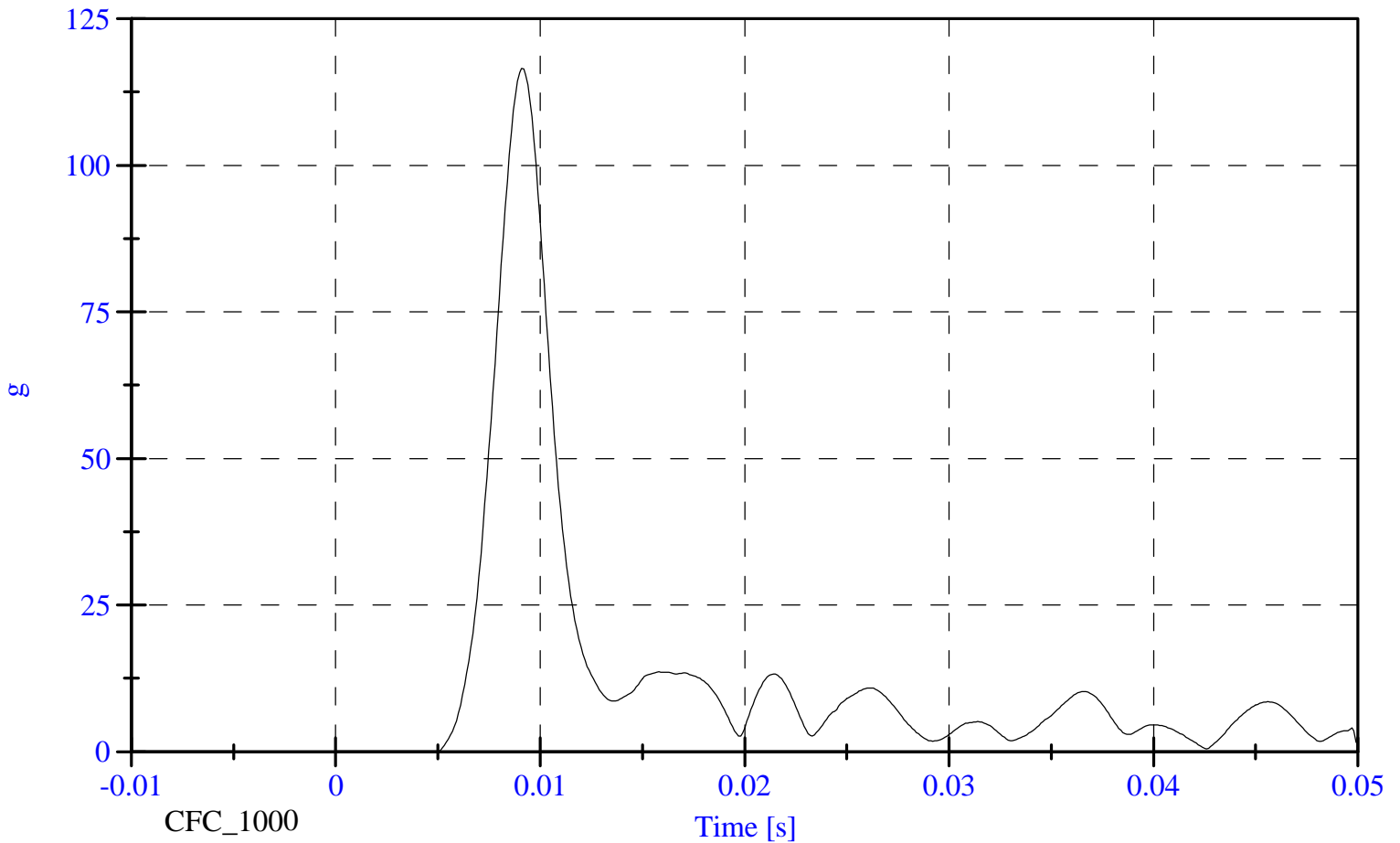
## -----TEST RESULTS-----

<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.:	100-120 Gs	116.59 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	14.34 Gs	Passed
Curve PerCent NonModal:	< 17%	11.67 %	Passed

CRABI 1 Year Old Frontal Head Drop Test S/N:093  
Head Resultant

Max: 116.6 [g] at 0.009 [s]

Min: 0.0 [g] at -0.008 [s]



# CRABI 1 Year Old Rear Head Drop Test S/N:093

Part 572R Rear Head Drop

Calibration Date: July 23, 2003

Serial No: 093

Work File: 4001

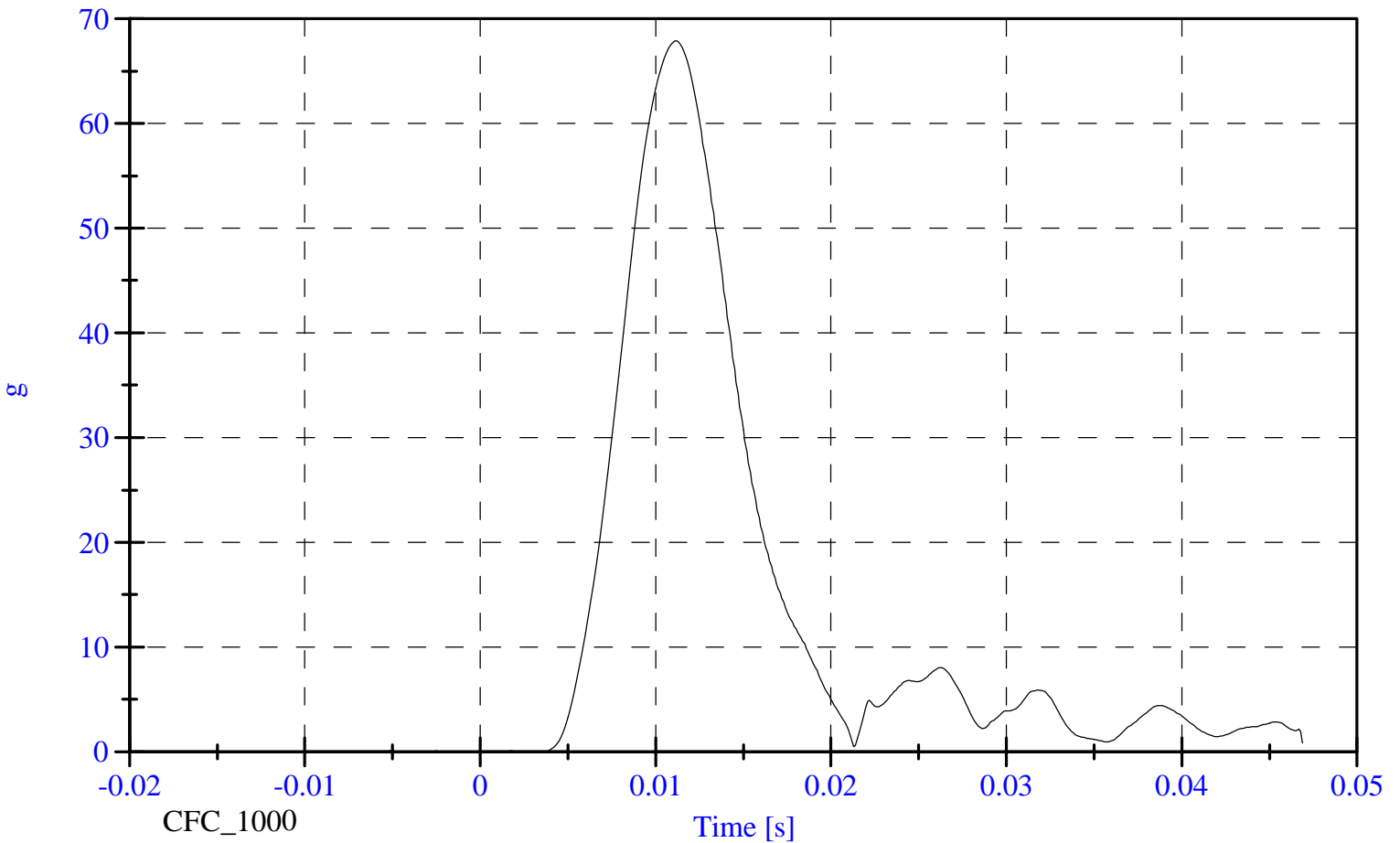
## -----TEST RESULTS-----

<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.:	55-71 Gs	67.89 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	1.82 Gs	Passed
Curve PerCent NonModal:	< 17%	11.85 %	Passed

CRABI 1 Year Old Rear Head Drop Test S/N:093  
Head Resultant

Max: 67.9 [g] at 0.011 [s]

Min: 0.0 [g] at -0.007 [s]



# Crabi 1 Year Old Head Neck Extention Test S/N:093

Part 572R                      Neck Extension Test                      Calibration Date:                      July 24, 2003  
Serial No:                      093                      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	21.11 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Test Pendulum Speed:	2.40- 2.60 m/s	2.47 m/s	Passed

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

Pulse at 6 ms:	0.80- 1.20 m/s	1.08 m/s	Passed
Pulse at 10 ms:	1.50- 2.10 m/s	1.92 m/s	Passed
Pulse at 14 ms:	2.20- 2.90 m/s	2.65 m/s	Passed

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

Maximum Rotation:	80.0-92.0 Deg	87.68 Deg	Passed
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## -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	-23.00--12.00 N-m	-21.92 N-m	Passed
Occipital Moment Decay:	76.0-90.0 ms	81.60 ms	Passed

# Crabi 1 Year Old Head Neck Flexion Test S/N:093

Part 572R

Neck Flexion Test

Calibration Date:

July 24, 2003

Serial No:

093

Work File:

4093

## -----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 %	35.00 %	Passed
Test Pendulum Speed:	5.10- 5.30 m/s	5.30 m/s	Passed

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

Pulse at 10 ms:	1.60- 2.30 m/s	2.12 m/s	Passed
Pulse at 20 ms:	3.40- 4.20 m/s	4.16 m/s	Passed
Pulse at 25 ms:	4.30- 5.20 m/s	5.07 m/s	Passed

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

Maximum Rotation:	75.0-86.0 Deg	80.58 Deg	Passed
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## -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	36.00- 45.00 N-m	41.66 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	65.50 ms	Passed

# CRABI 1 Year Old Front Head Drop Test S/N:102

Part 572R Frontal Head Drop

Calibration Date: July 22, 2003

Serial No: 102

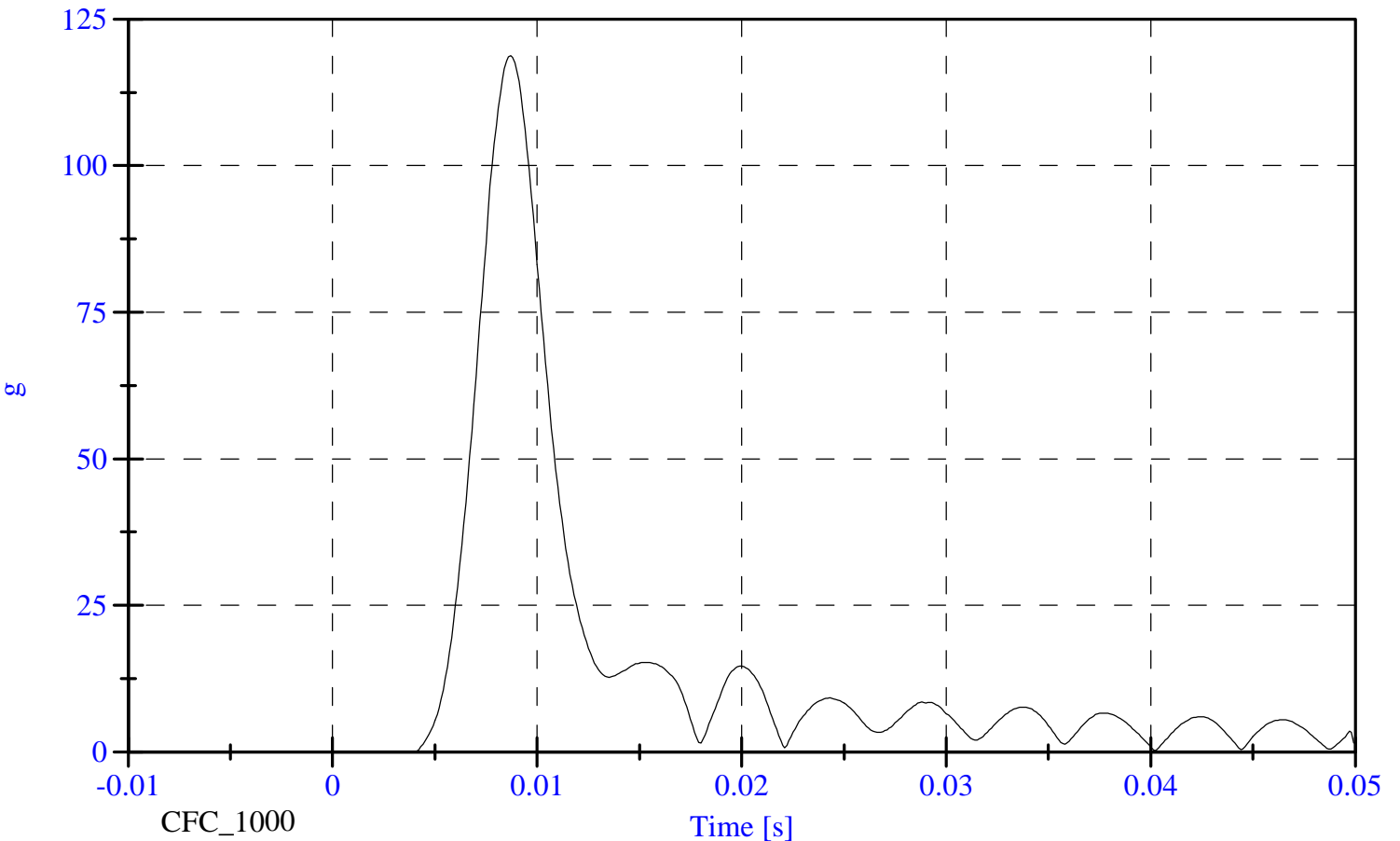
Work File: 4001

## -----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.:	100-120 Gs	118.77 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	1.38 Gs	Passed
Curve PerCent NonModal:	< 17%	12.87 %	Passed

CRABI 1 Year Old Head Drop Test S/N:102 Head Resultant

Max: 118.8 [g] at 0.009 [s]  
 Min: 0.0 [g] at -0.004 [s]



# CRABI 1 Year Old Rear Head Drop Test S/N:102

Part 572R Rear Head Drop

Calibration Date: July 22, 2003

Serial No: 102

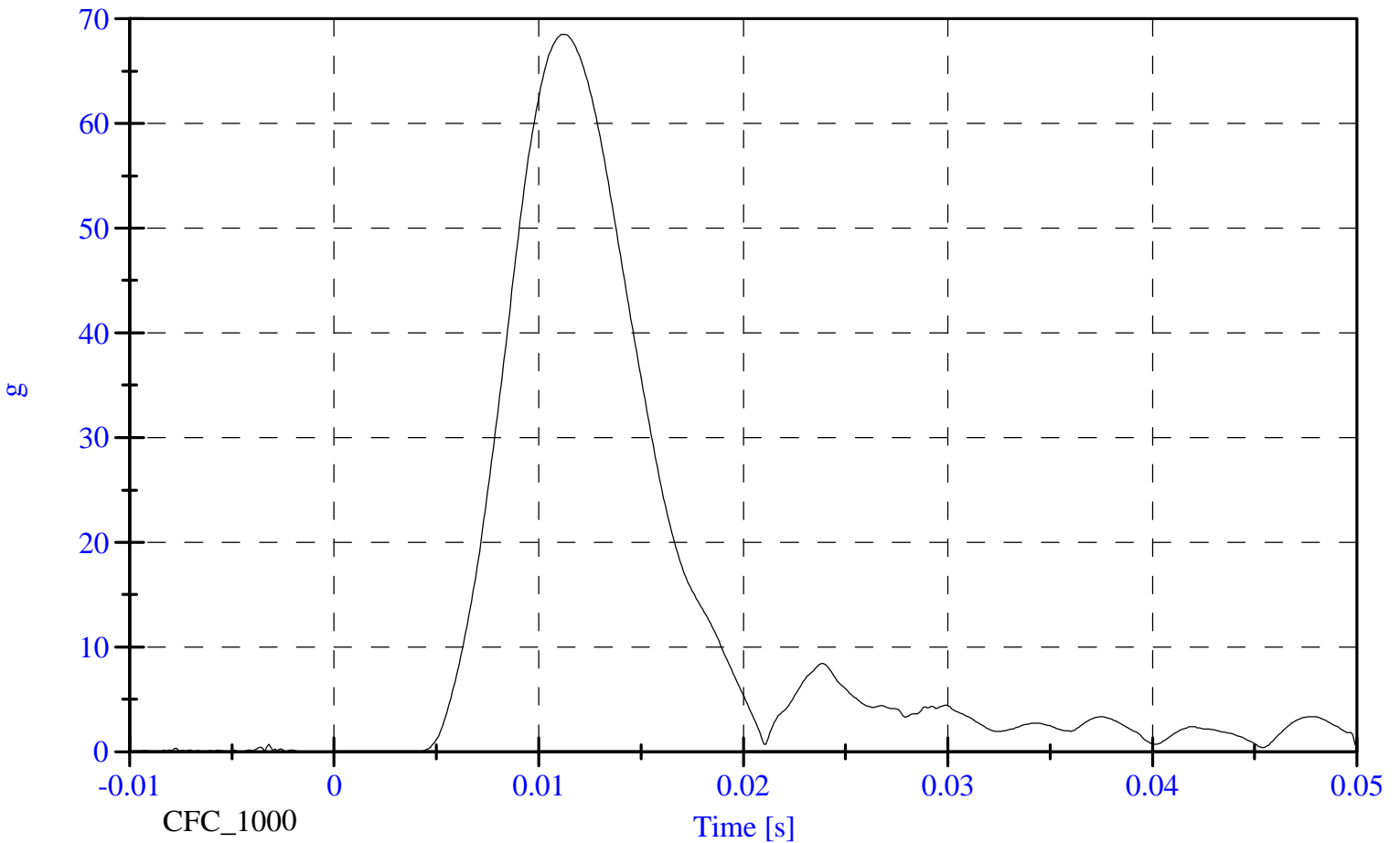
Work File: 4001

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

<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.1 C	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Peak Resultant Accel.:	55-71 Gs	68.52 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	2.06 Gs	Passed
Curve PerCent NonModal:	< 17%	12.32 %	Passed

CRABI 1 Year Old Rear Head Drop Test S/N:102  
Head Resultant

Max: 68.5 [g] at 0.011 [s]  
Min: 0.0 [g] at -0.006 [s]





# Crabi 1 Year Old Head Neck Flexion Test S/N:102

Part 572R                      Neck Flexion Test                      Calibration Date:                      July 24, 2003  
Serial No:                      102                      Work File:                      4093

## -----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 %	36.00 %	Passed
Test Pendulum Speed:	5.10- 5.30 m/s	5.20 m/s	Passed

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

Pulse at 10 ms:	1.60- 2.30 m/s	2.13 m/s	Passed
Pulse at 20 ms:	3.40- 4.20 m/s	4.18 m/s	Passed
Pulse at 25 ms:	4.30- 5.20 m/s	5.02 m/s	Passed

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

Maximum Rotation:	75.0-86.0 Deg	84.26 Deg	Passed
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## -----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	36.00- 45.00 N-m	38.52 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	69.10 ms	Passed

**SECTION 11**

**Test Equipment and Instrumentation Calibration**

Calibration for Test 08-3-38

SHORTNAME	SENSCOM	CALDATE
Sled Ax	MFG: ENDEVCO S/N: 10301	6/23/2003
P3 HDCG Ax	MFG: ENTRAN S/N: 02I02I05-F20	7/14/2003
P3 HDCG Ay	MFG: ENTRAN S/N: 02I02I10-N19	7/14/2003
P3 HDCG Az	MFG: ENTRAN S/N: 02I02I05-F03	7/14/2003
P3 CHST Ax	MFG: ENTRAN S/N: 02I02I05-F16	7/14/2003
P3 CHST Ay	MFG: ENTRAN S/N: 02I02I05-F06	7/14/2003
P3 CHST Az	MFG: ENTRAN S/N: 02I02I05-F07	7/14/2003
P3 PVCN Ax	MFG: ENTRAN S/N: 02I02I05-F11	7/14/2003
P3 PVCN Ay	MFG: ENDEVCO S/N: P10092	7/30/2003
P3 PVCN Az	MFG: ENTRAN S/N: 02I02I16-A05	7/14/2003
P3 NEKU Fx	MFG: DENTON S/N: 280-FX	7/16/2003
P3 NEKU Fy	MFG: DENTON S/N: 280-FY	7/16/2003
P3 NEKU Fz	MFG: DENTON S/N: 280-FZ	7/16/2003
P3 NEKU Mx	MFG: DENTON S/N: 280-MX	7/16/2003
P3 NEKU My	MFG: DENTON S/N: 280-MY	7/16/2003
P3 NEKU Mz	MFG: DENTON S/N: 280-MZ	7/16/2003
P4 HDCG Ax	MFG: ENDEVCO S/N: J27496	7/15/2003
P4 HDCG Ay	MFG: ENDEVCO S/N: J27366	7/15/2003
P4 HDCG Az	MFG: ENDEVCO S/N: AJ7G1	7/15/2003
P4 CHST Ax	MFG: ENDEVCO S/N: J19625	7/14/2003
P4 CHST Ay	MFG: ENDEVCO S/N: J14381	7/14/2003
P4 CHST Az	MFG: ENDEVCO S/N: J20054	7/14/2003
P4 PVCN Ax	MFG: ENDEVCO S/N: ACC14	7/15/2003
P4 PVCN Ay	MFG: ENDEVCO S/N: ALA71	7/15/2003
P4 PVCN Az	MFG: ENDEVCO S/N: J14687	7/15/2003
P4 NEKU Fx	MFG: DENTON S/N: 283-FX	7/16/2003
P4 NEKU Fy	MFG: DENTON S/N: 283-FY	7/16/2003
P4 NEKU Fz	MFG: DENTON S/N: 283-FZ	7/16/2003
P4 NEKU Mx	MFG: DENTON S/N:	7/16/2003
P4 NEKU My	MFG: DENTON S/N: 283-MY	7/16/2003
P4 NEKU Mz	MFG: DENTON S/N: 283-MZ	7/16/2003

**SECTION 12**

**Link to High Speed Movies**

Test 08-3-38 North View

Test 08-3-38 South View