

REPORT NUMBER: 8708-SLEDNCAP-40

**CHILD RESTRAINT SYSTEM IN
DYNAMIC SLED TEST
GRACO COMFORT SPORT 2 IN 1 WITH A HYIII 3 YEAR OLD
GRACO COMFORT SPORT 2 IN 1 WITH A CRABI**

TEST NUMBER: 08-3-41

**PREPARED BY:
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AUGUST 29TH, 2003

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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Date of Acceptance

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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 Graco Comfort Sport 2 in 1 Child Restraint System. This seat was tested with a HYIII 3 Year Old ATD. Position 4 was a Graco Comfort Sport 2 in 1 Child Restraint System. This seat was tested with a Crabi ATD.			
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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 24th, 2003. Any reference to FMVSS No. 213 in this document refers to the Final Rule published June 24th, 2003, for FMVSS No. 213 Child Restraint Systems.

The test was conducted at Veridian Engineering on August 29th, 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) Hybrid III 3 Year Old ATD, Serial Number S/N 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 Graco Comfort Sport 2 in 1 child seat and the seat was located in Position 3 – Right Rear Passenger.

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 Graco Comfort Sport 2 in 1 child seat and the seat was located in Position 4 – Left Rear Passenger. 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.: 08-3-41

Test Date: August 29th, 2003

POSITION 3

Child Restraint Type (forward-facing, rearward facing, booster)	FORWARD FACING
LATCH or NON-LATCH	LATCH WITH TETHER
Harness Type	5 POINT
Child Restraint Manufacturer	GRACO
Child Restraint Model	COMFORT SPORT 2 IN 1
Model Number	8437LIB
Date of Manufacture	7/02/2003
Child Restraint Height Limits (mm)	483 - 1016
Child Restraint Weight Limits (kg)	2.3 – 18.1
Weight of Child Restraint (kg)	5.0

POSITION 4

Child Restraint Type (forward-facing, rearward facing, booster)	FORWARD FACING
LATCH or NON-LATCH	LATCH WITH TETHER
Harness Type	5 POINT
Child Restraint Manufacturer	GRACO
Child Restraint Model	COMFORT SPORT 2 IN 1
Model Number	8437PAR
Date of Manufacture	5/16/2003
Child Restraint Height Limits (mm)	483 - 1016
Child Restraint Weight Limits (kg)	2.3 – 18.1
Weight of Child Restraint (kg)	5.1

SECTION 3

POST-TEST OBSERVATIONS

Test No.: 08-3-41

Test Date: August 29th, 2003

POSITION 3

Child Seat	GRACO COMFORT SPORT 2 IN 1
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Head Excursion (mm)	610
Max. Knee Excursion (mm)	770
Velocity (kph)	46.7
Acceleration (G's)	23.3

POSITION 4

Child Seat	GRACO COMFORT SPORT 2 IN 1
Belt Fraying	NONE
Stress Marks	NONE
Cracks	NONE
Buckle Stress	NONE
Latch Hooks	NONE
Max. Head Excursion (mm)	551
Max. Knee Excursion (mm)	559
Velocity (kph)	46.7
Acceleration (G's)	23.3

SECTION 4

ATD INJURY CRITERIA AND SENSOR DATA POSITION 3 – HYIII THREE YEAR OLD

Test No.: 08-3-41

Test Date: August 29th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	23.0	202.1	-36.5	76.5
Head CG	Y	G's	1.7	200.8	-3.6	98.6
Head CG	Z	G's	30.2	68.3	-1.9	41.6
Head CG Resultant	N/A	G's	42.6	76.5		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	10.4	224.7	-26.4	76.1
Chest CG	Y	G's	2.3	65.2	-2.5	92.0
Chest CG	Z	G's	6.9	213.8	-24.1	56.8
Chest CG Resultant	N/A	G's	34.6	75.4		

SEAT BELT SENSOR PEAK VALUES

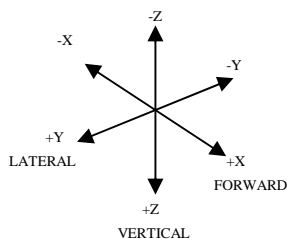
Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P3 (Right) Rear Passenger			
	HIC	Avg. G's	T ¹	T ²
Head CG Primary (36 msec)	268.3	35.4	62.4	98.4
Head CG Primary (15 msec)	152.8	40.1	68.4	83.4

CHEST CLIP (3 MSEC)

Location	P3 (Right) Rear Passenger		
	Clip	T ¹	T ²
Chest CG Primary	34.0	74.1	77.1



**ATD INJURY CRITERIA AND SENSOR DATA...(continued)
POSITION 3 - HYIII THREE YEAR OLD**

Test No.: 08-3-41

Test Date: August 29th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	9.9	91.9	-39.4	68.8
Pelvis	Y	G's	10.3	56.3	-5.3	64.6
Pelvis	Z	G's	8.7	215.5	-35.3	68.1

UPPER NECK PEAK FORCES AND MOMENTS

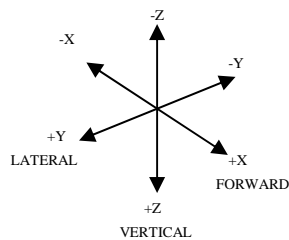
Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	24.3	194.5	-685.0	77.1
Neck Force	Y	Newtons	20.8	44.8	-87.5	104.7
Neck Force	Z	Newtons	1388.3	79.2	-60.2	42.3
Neck Moment	X	Nm	3.9	105.7	-3.1	204.4
Neck Moment	Y	Nm	9.4	221.3	-3.6	154.9
Neck Moment	Z	Nm	2.3	232.0	-2.6	107.4

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	179.6	202.9	-1324.9	79.0
Neck Force	Y	Newtons	17.3	189.5	-145.0	103.5
Neck Force	Z	Newtons	567.7	203.0	-140.6	43.4
Neck Moment	X	Nm	3.5	46.0	-15.5	104.7
Neck Moment	Y	Nm	116.1	77.9	-13.2	202.9
Neck Moment	Z	Nm	2.7	55.7	-5.5	103.8

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	P3 (Right) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	mm	0.1	212.9	-17.8	110.1



SECTION 4

ATD INJURY CRITERIA AND SENSOR DATA POSITION 4 - CRABI

Test No.: 08-3-41

Test Date: August 29th, 2003

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Head CG	X	G's	33.3	212.4	-21.8	110.5
Head CG	Y	G's	3.1	113.0	-3.4	214.2
Head CG	Z	G's	50.8	78.6	-11.4	44.4
Head CG Resultant	N/A	G's	51.3	78.6		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Chest CG	X	G's	8.4	245.7	-31.4	63.0
Chest CG	Y	G's	2.8	56.5	-2.8	80.9
Chest CG	Z	G's	21.7	77.1	-23.1	56.7
Chest CG Resultant	N/A	G's	36.9	44.2		

SEAT BELT SENSOR PEAK VALUES

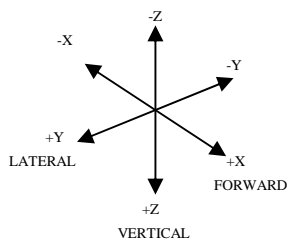
Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Tether Belt	N/A	Newtons	NA	NA		

HEAD INJURY CRITERIA (HIC)

Location	P4 (Left) Rear Passenger			
	HIC	Avg. G's	T ¹	T ²
Head CG Primary (36 msec)	305.0	37.3	60.6	96.6
Head CG Primary (15 msec)	204.1	45.0	69.8	84.8

CHEST CLIP (3 MSEC)

Location	P4 (Left) Rear Passenger		
	Clip	T ¹	T ²
Chest CG Primary	36.3	53.9	56.9



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

Test No.: 08-3-41

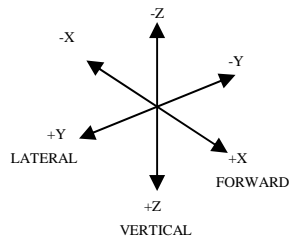
Test Date: August 29th, 2003

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Pelvis	X	G's	45.0	60.1	-7.4	239.0
Pelvis	Y	G's	4.6	48.4	-4.8	38.9
Pelvis	Z	G's	31.6	56.3	-12.4	219.3

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	P4 (Left) Rear Passenger			
			Max	Time	Min	Time
Neck Force	X	Newtons	472.8	113.1	-7.5	187.3
Neck Force	Y	Newtons	19.0	75.3	-27.9	105.8
Neck Force	Z	Newtons	1255.8	78.7	-342.5	43.4
Neck Moment	X	Nm	2.8	110.1	-0.9	94.3
Neck Moment	Y	Nm	3.1	159.8	-7.0	84.4
Neck Moment	Z	Nm	0.5	33.8	-0.6	184.0



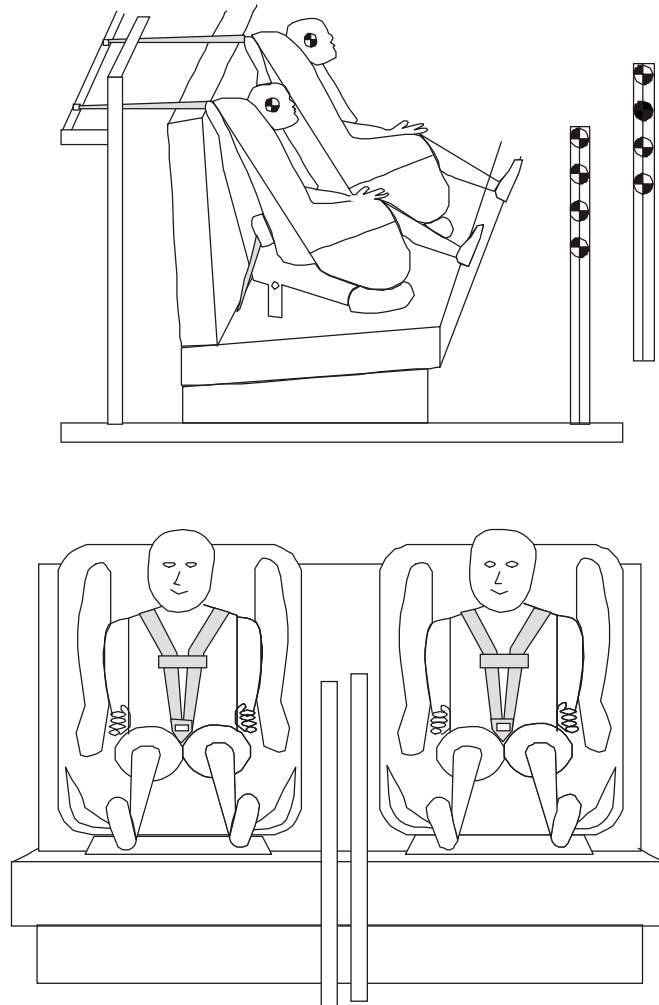
SECTION 5
SLED TEST SET-UP

Test No.: 08-3-41

Test Date: August 29th, 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

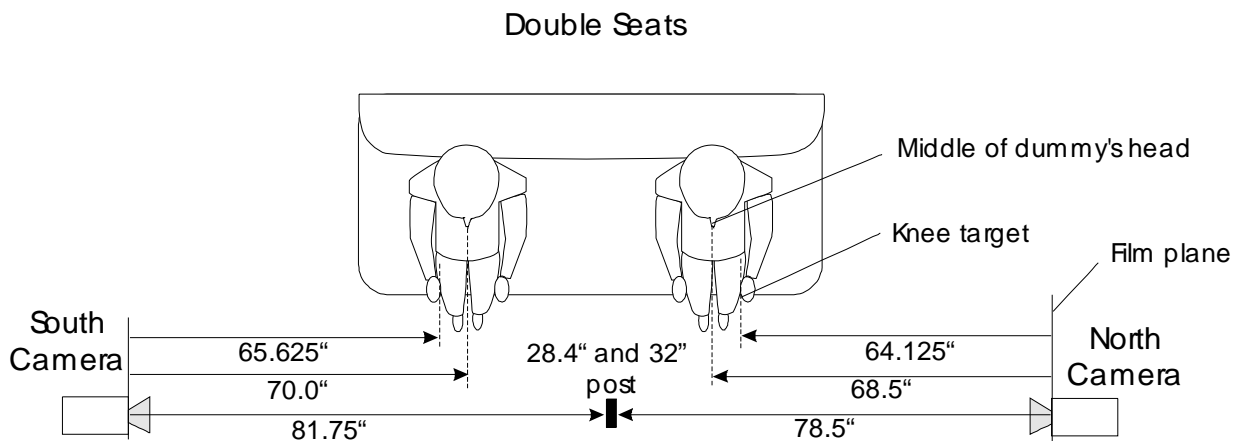


SECTION 6
CAMERA LOCATION

Test No.: 08-3-41

Test Date: August 29th, 2003

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



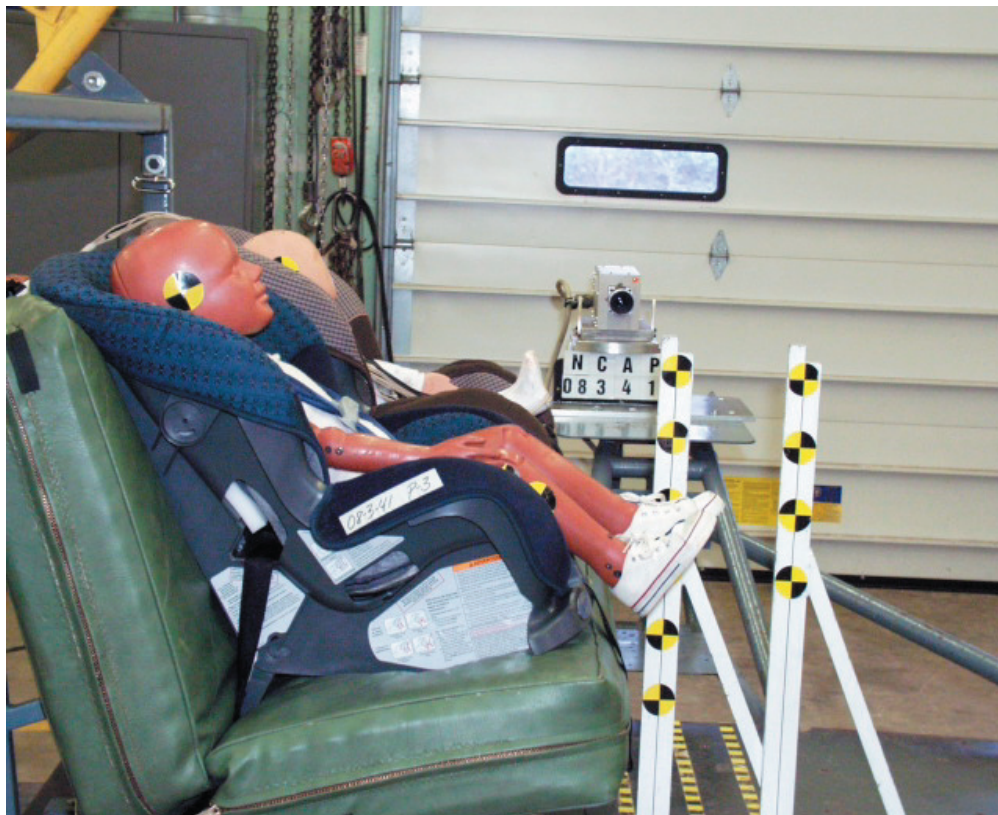
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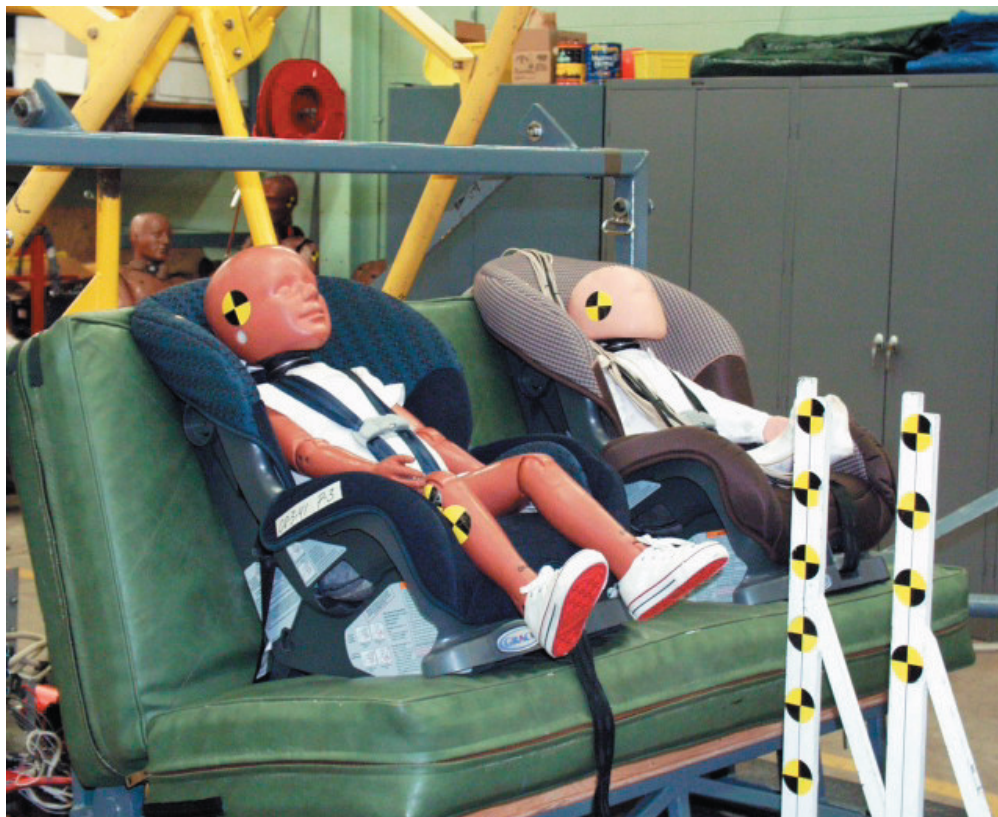
Pre Test Right Side View



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

SECTION 8

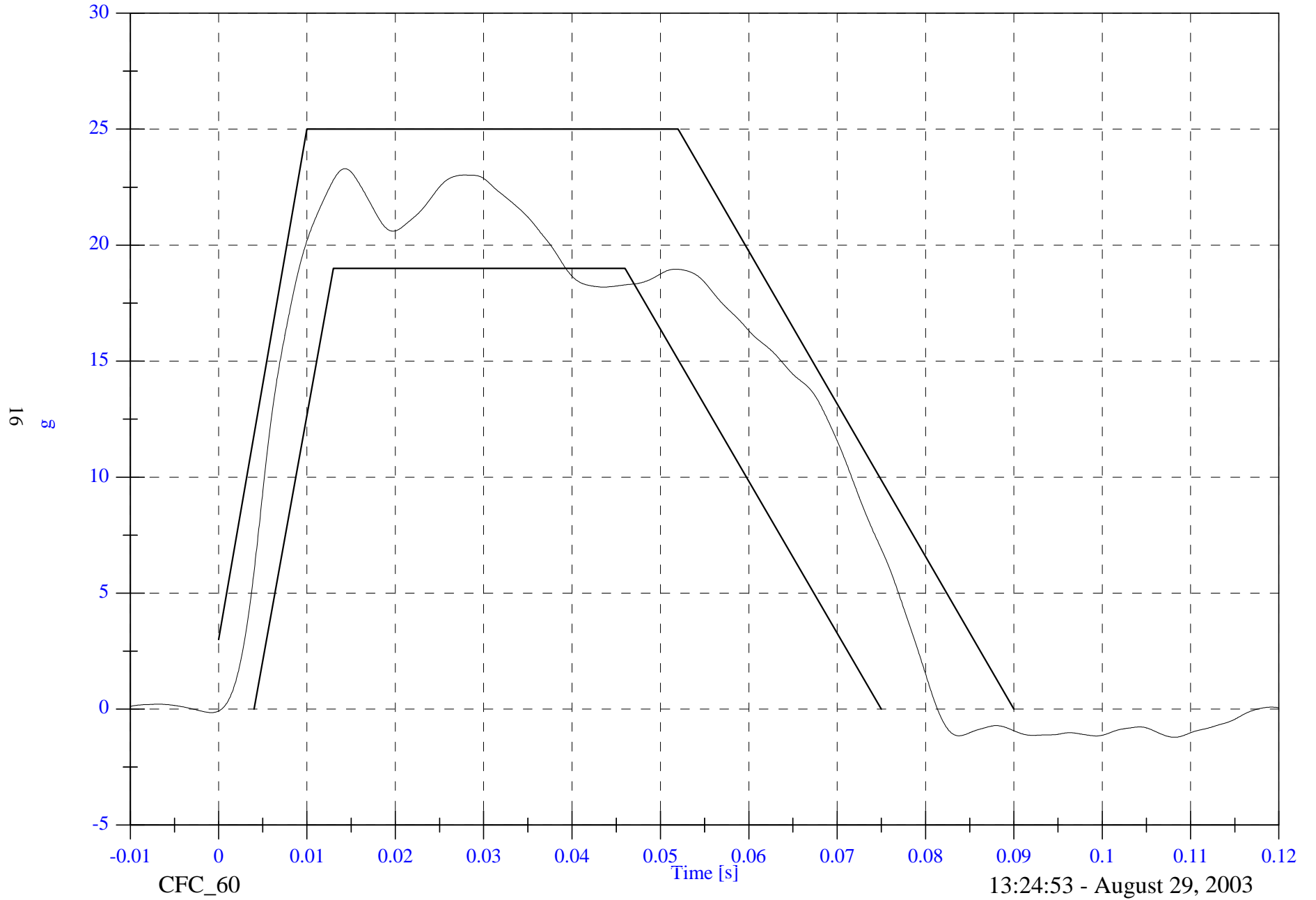
Data Plots

Sled Test NCAP SLED 08-3-41

Sled Pulse Corridor

Max: 23.3 [g] at 0.014 [s]

Min: -1.4 [g] at 0.152 [s]



FACILITY: HYGE SLED

DATE: August 29, 2003

TEST#: 08-3-41

TITLE: Sled Test NCAP SLED 08-3-41

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
41	Sled Acceleration	g	23.3	14.3	-1.4	151.9	CFC_60	
42	Sled Acceleration Velocity	kph	46.7	81.1	-0.0	-11.0	CFC_180	
43	Sled Acceleration Displacement	mm	2654.9	250.0	-0.0	-2.0	CFC_180	
44	P3 Head x	g	23.0	202.1	-36.5	76.5	CFC_1000	
45	P3 Head y	g	1.7	200.8	-3.6	98.9	CFC_1000	
46	P3 Head z	g	30.2	68.3	-1.9	41.6	CFC_1000	
47	P3 Head Resultant	g	42.6	76.5	0.0	-8.7	CFC_1000	
48	P3 Upper Neck Fx	N	24.3	194.5	-685.0	77.1	CFC_1000	
49	P3 Upper Neck Fy	N	20.8	44.8	-87.5	104.7	CFC_1000	
50	P3 Upper Neck Fz	N	1388.3	79.2	-60.2	42.3	CFC_1000	
51	P3 Upper Neck F Resultant	N	1540.5	78.7	0.1	-9.4	CFC_1000	
52	P3 Upper Neck Mx	N-m	3.9	105.7	-3.1	204.4	CFC_600	
53	P3 Upper Neck My	N-m	9.4	221.3	-3.6	154.9	CFC_600	
54	P3 Upper Neck Mz	N-m	2.3	232.0	-2.6	107.4	CFC_600	
55	P3 Upper Neck M Resultant	N-m	9.6	221.3	0.0	-12.2	CFC_600	
56	P3 Lower Neck Fx	N	179.6	202.9	-1324.9	79.0	CFC_1000	
57	P3 Lower Neck Fy	N	17.3	189.5	-145.0	103.5	CFC_1000	
58	P3 Lower Neck Fz	N	567.7	203.0	-140.6	43.4	CFC_1000	
59	P3 Lower Neck F Resultant	N	1333.6	79.5	0.0	-15.7	CFC_1000	
60	P3 Lower Neck Mx	N-m	3.5	46.0	-15.5	104.7	CFC_600	
61	P3 Lower Neck My	N-m	116.1	77.9	-13.2	202.9	CFC_600	
62	P3 Lower Neck Mz	N-m	2.7	55.7	-5.5	103.8	CFC_600	
63	P3 Lower Neck M Resultant	N-m	116.1	77.9	0.0	-8.5	CFC_600	
64	P3 Chest x	g	10.4	224.7	-26.4	76.1	CFC_180	
65	P3 Chest y	g	2.3	65.2	-2.5	92.0	CFC_180	
66	P3 Chest z	g	6.9	213.8	-24.1	56.8	CFC_180	
67	P3 Chest Resultant	g	34.6	75.4	0.0	-9.5	CFC_180	
68	P3 Pelvic x	g	9.9	91.9	-39.4	68.8	CFC_1000	
69	P3 Pelvic y	g	10.3	56.3	-5.3	64.6	CFC_1000	
70	P3 Pelvic z	g	8.7	215.5	-35.3	68.1	CFC_1000	
71	P3 Pelvic Resultant	g	52.8	68.7	0.0	-9.5	CFC_1000	
72	P3 Head Red z	g	37.8	80.0	-13.1	43.4	CFC_1000	
73	P3 Chest Compression	mm	0.1	212.9	-17.8	110.1	CFC_600	
74	P3 Upper Neck Mocy	N-m	9.4	221.3	-3.6	154.9	CFC_600	

FACILITY: HYGE SLED

DATE: August 29, 2003

TEST#: 08-3-41

TITLE: Sled Test NCAP SLED 08-3-41

CHN	NAME	Unit	Max	msec	Min	msec	Filt	Comment
75	P4 Head x	g	33.3	212.4	-21.8	110.5	CFC_1000	
76	P4 Head y	g	3.1	113.0	-3.4	214.2	CFC_1000	
77	P4 Head z	g	50.8	78.6	-11.4	44.4	CFC_1000	
78	P4 Head Resultant	g	51.3	78.6	0.0	-10.4	CFC_1000	
79	P4 Upper Neck Fx	N	472.8	113.1	-7.5	187.3	CFC_1000	
80	P4 Upper Neck Fy	N	19.0	75.3	-27.9	105.8	CFC_1000	
81	P4 Upper Neck Fz	N	1255.8	78.7	-342.5	43.4	CFC_1000	
82	P4 Upper Neck F Resultant	N	1265.6	78.7	0.0	-8.3	CFC_1000	
83	P4 Upper Neck Mx	N-m	2.8	110.1	-0.9	94.3	CFC_600	
84	P4 Upper Neck My	N-m	3.1	159.8	-7.0	84.4	CFC_600	
85	P4 Upper Neck Mz	N-m	0.5	33.8	-0.6	184.0	CFC_600	
86	P4 Upper Neck M Resultant	N-m	7.0	84.4	0.0	-8.7	CFC_600	
87	P4 Chest x	g	8.4	245.7	-31.4	63.0	CFC_180	
88	P4 Chest y	g	2.8	56.5	-2.8	80.9	CFC_180	
89	P4 Chest z	g	21.7	77.1	-23.1	56.7	CFC_180	
90	P4 Chest Resultant	g	36.9	44.2	0.0	-11.8	CFC_180	
91	P4 Pelvic x	g	45.0	60.1	-7.4	239.0	CFC_1000	
92	P4 Pelvic y	g	4.6	48.4	-4.8	38.9	CFC_1000	
93	P4 Pelvic z	g	31.6	56.3	-12.4	219.3	CFC_1000	
94	P4 Pelvic Resultant	g	53.6	60.4	0.0	-11.1	CFC_1000	
95	P4 Upper Neck Mocy	N-m	2.9	159.8	-8.4	84.4	CFC_600	

FACILITY: HYGE SLED

DATE: August 29, 2003

TEST#: 08-3-41

TITLE: Sled Test NCAP SLED 08-3-41

Version 5.00

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P3 HIC(36 ms): 268.3

t1: 62.4 msec

t2: 98.4 msec

Duration: 36.0 msec

Average Acceleration: 35.4 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: 24.3 N 194.5 msec

Min: -685.0 N 77.1 msec

Input channel: P3 Upper Neck Fx (6) CFC_1000

P3 UP NECK Fz: Max: 1388.3 N 79.2 msec

Min: -60.2 N 42.3 msec

Input channel: P3 Upper Neck Fz (8) CFC_1000

P3 UP NECK Mocy (3YO Child OOP)

Max: 9.4 N-m 221.3 msec

Min: -3.6 N-m 154.9 msec

Input channels: P3 Upper Neck Fx (6) CFC_600

P3 Upper Neck My (10) CFC_600

Docy: 0

P3 UP NECK Nij (3YO Child OOP)

Ntf: 0.75 Nij 79.2 msec CVt: 2120 CVf: 68

Nte: 0.43 Nij 68.8 msec CVt: 2120 CVe: 27

Ncf: 0.11 Nij 42.4 msec CVc: 2120 CVf: 68

Nce: 0.00 Nij 2.3 msec CVc: 2120 CVe: 27

Input channels: P3 Upper Neck Fz (8) CFC_600

P3 Upper Neck Mocy [N-m, CFC_600] (85)

FACILITY: HYGE SLED
TEST#: 08-3-41
TITLE: Sled Test NCAP SLED 08-3-41
Version 5.00

DATE: August 29, 2003

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P3 CLIP(3 ms): 34.0 g
t1: 74.1 msec
t2: 77.1 msec
Duration: 3.0 msec

P3 CSI: 225.2
Input channels: P3 Chest x (18) CFC_180
P3 Chest y (19) CFC_180
P3 Chest z (20) CFC_180

P3 CHEST DISP: Max: 0.1 mm 212.9 msec
Min: -17.8 mm 110.1 msec
Input channel: P3 Chest Compression (21) CFC_600

=====

P3 HIC(15 ms): 152.8
t1: 68.4 msec
t2: 83.4 msec
Duration: 15.0 msec
Average Acceleration: 40.1 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 29, 2003

TEST#: 08-3-41

TITLE: Sled Test NCAP SLED 08-3-41

Version 5.00

=====

P4 HIC(36 ms): 305.0

t1: 60.6 msec

t2: 96.6 msec

Duration: 36.0 msec

Average Acceleration: 37.3 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: 472.8 N 113.1 msec

Min: -7.5 N 187.3 msec

Input channel: P4 Upper Neck Fx (28) CFC_1000

P4 UP NECK Fz: Max: 1255.8 N 78.7 msec

Min: -342.5 N 43.4 msec

Input channel: P4 Upper Neck Fz (30) CFC_1000

P4 UP NECK Mocy (1YO Infant OOP)

Max: 2.9 N-m 159.8 msec

Min: -8.4 N-m 84.4 msec

Input channels: P4 Upper Neck Fx (28) CFC_600

P4 Upper Neck My (32) CFC_600

Docy: 0.0058

P4 UP NECK Nij (1YO Infant OOP)

Ntf: 0.85 Nij 73.1 msec CVt: 1460 CVf: 43

Nte: 1.21 Nij 82.5 msec CVt: 1460 CVe: 17

Ncf: 0.00 Nij -7.8 msec CVc: 1460 CVf: 43

Nce: 0.56 Nij 45.2 msec CVc: 1460 CVe: 17

Input channels: P4 Upper Neck Fz (30) CFC_600

P4 Upper Neck Mocy [N-m, CFC_600] (91)

FACILITY: HYGE SLED
TEST#: 08-3-41
TITLE: Sled Test NCAP SLED 08-3-41
Version 5.00

DATE: August 29, 2003

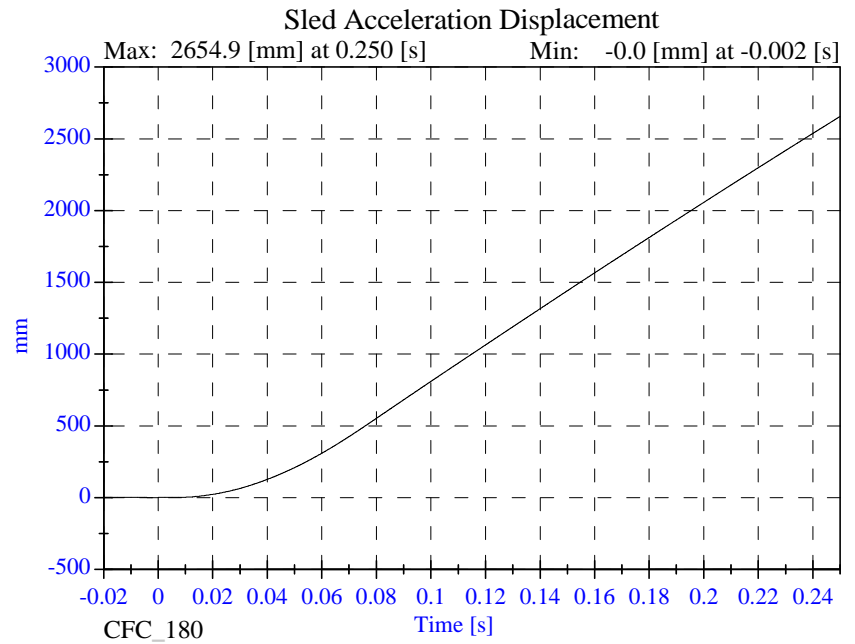
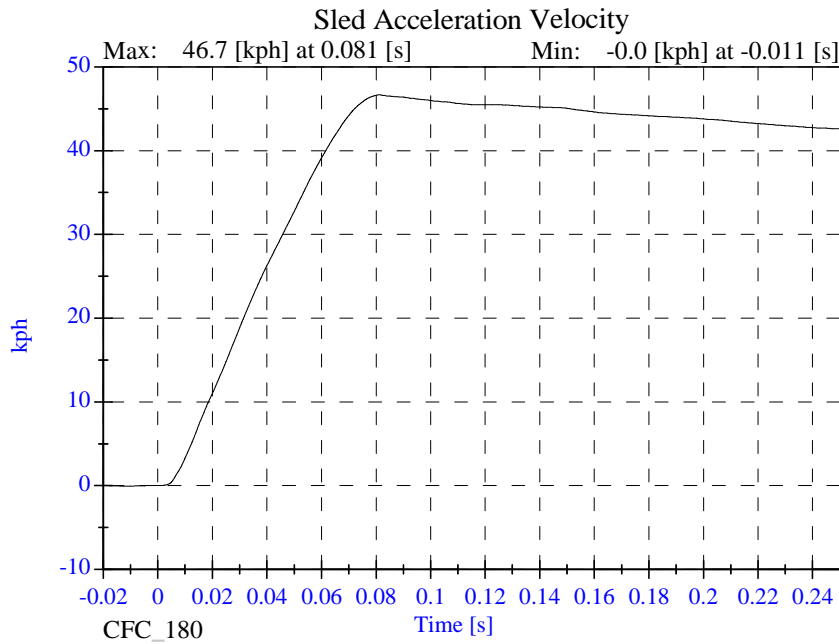
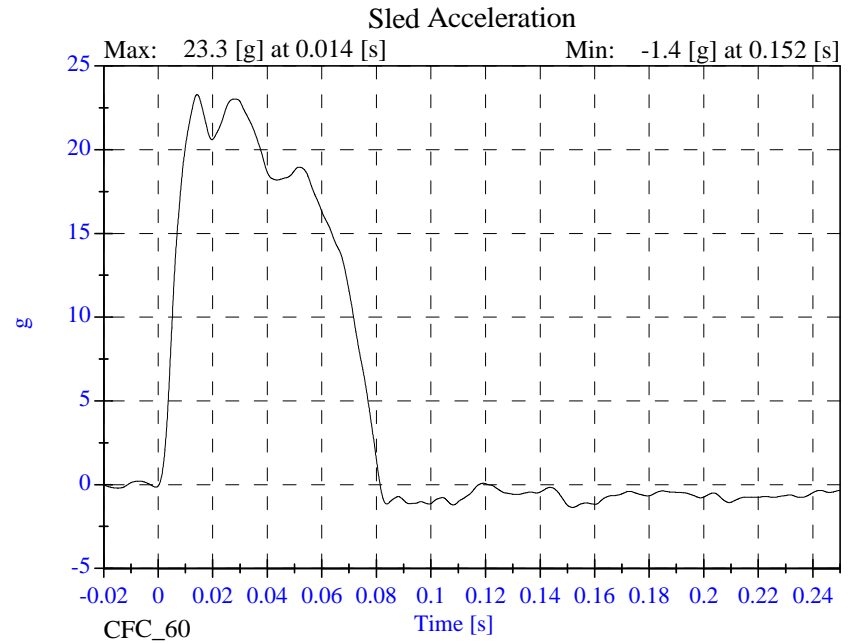
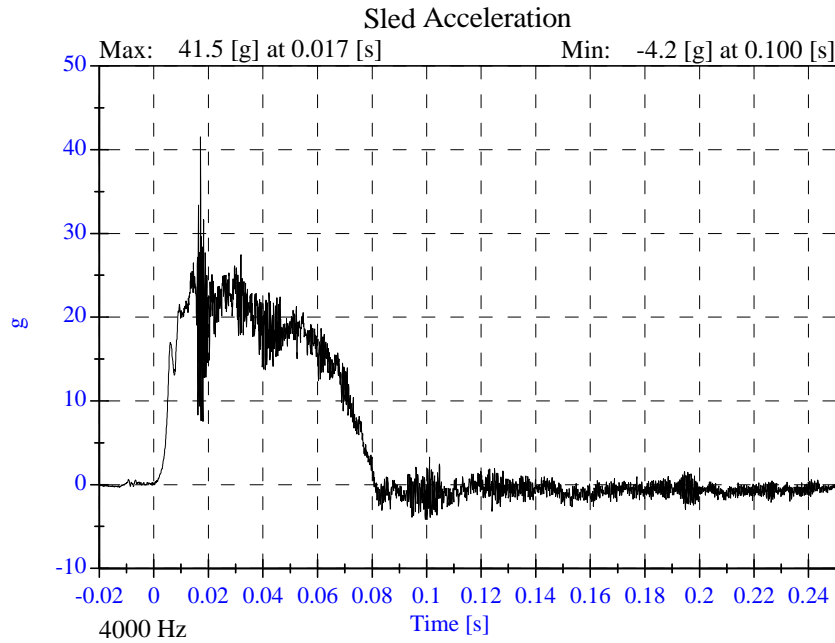
=====
P4 CLIP(3 ms): 36.3 g
 t1: 53.9 msec
 t2: 56.9 msec
 Duration: 3.0 msec
P4 CSI: 266.0
 Input channels: P4 Chest x (34) CFC_180
 P4 Chest y (35) CFC_180
 P4 Chest z (36) CFC_180

=====
P4 HIC(15 ms): 204.1
 t1: 69.8 msec
 t2: 84.8 msec
 Duration: 15.0 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

=====

Sled Test NCAP SLED 08-3-41

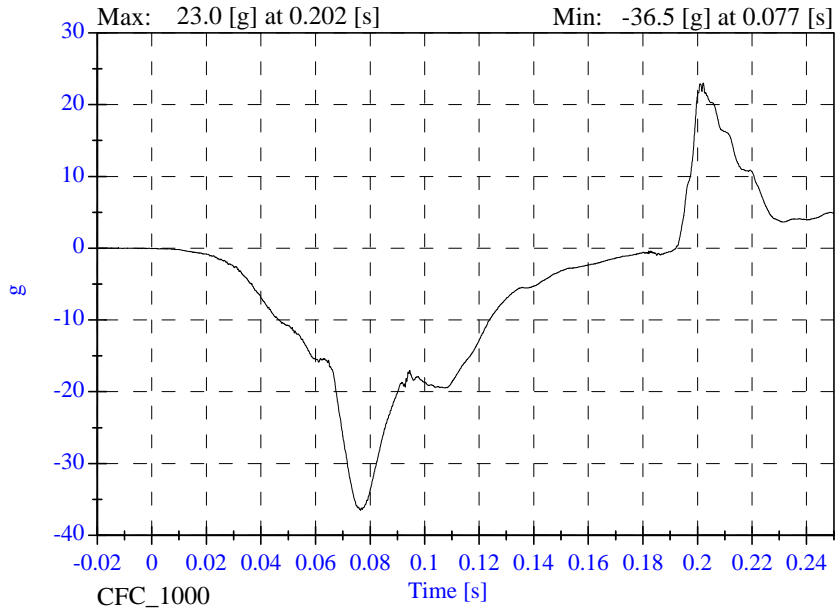
- August 29, 2003



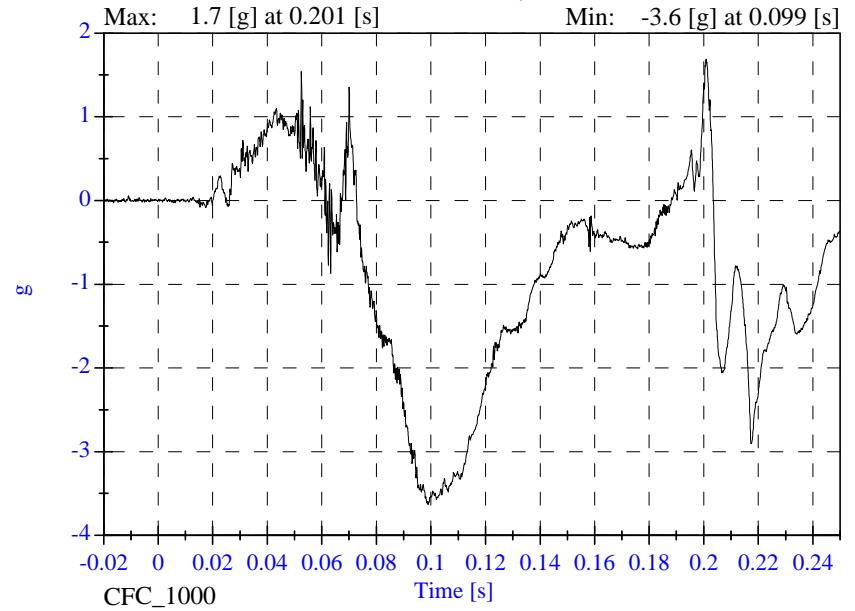
Sled Test NCAP SLED 08-3-41

- August 29, 2003

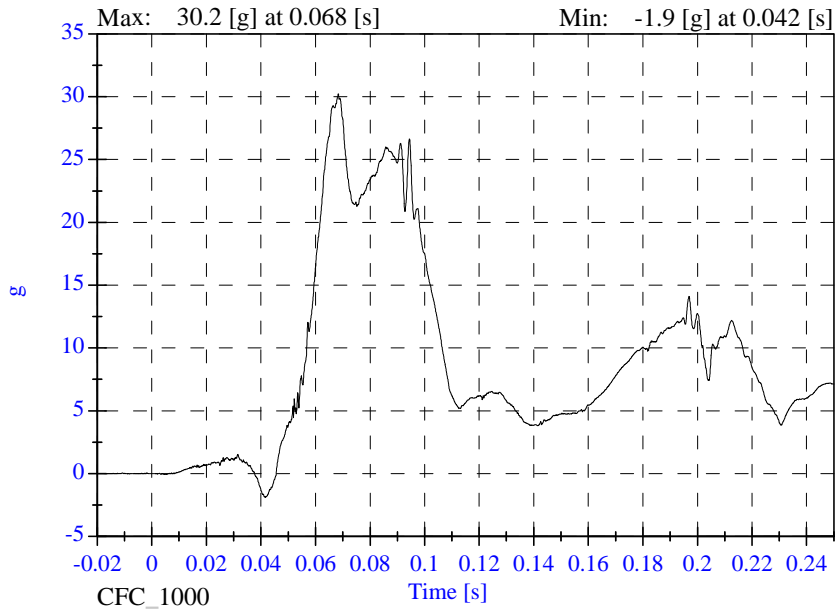
P3 Head x



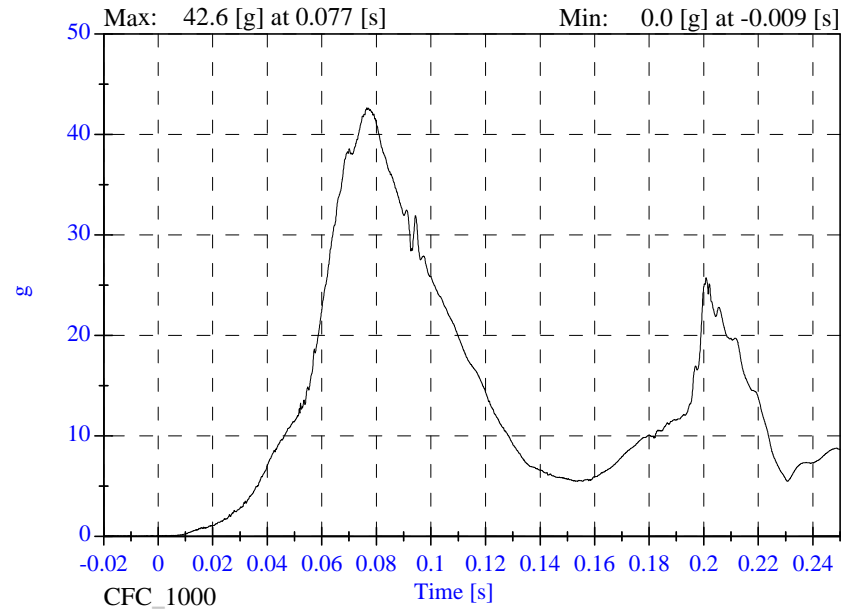
P3 Head y



P3 Head z

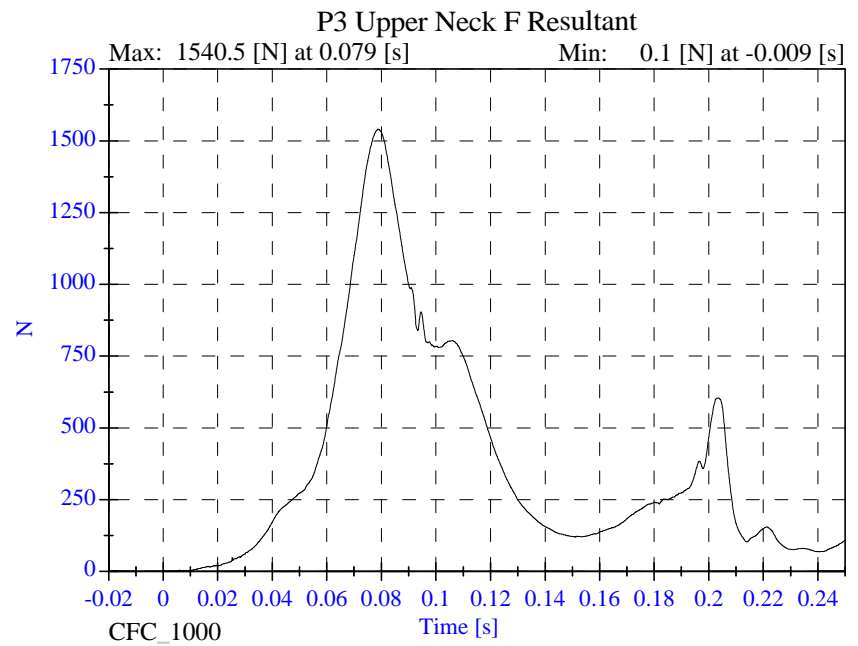
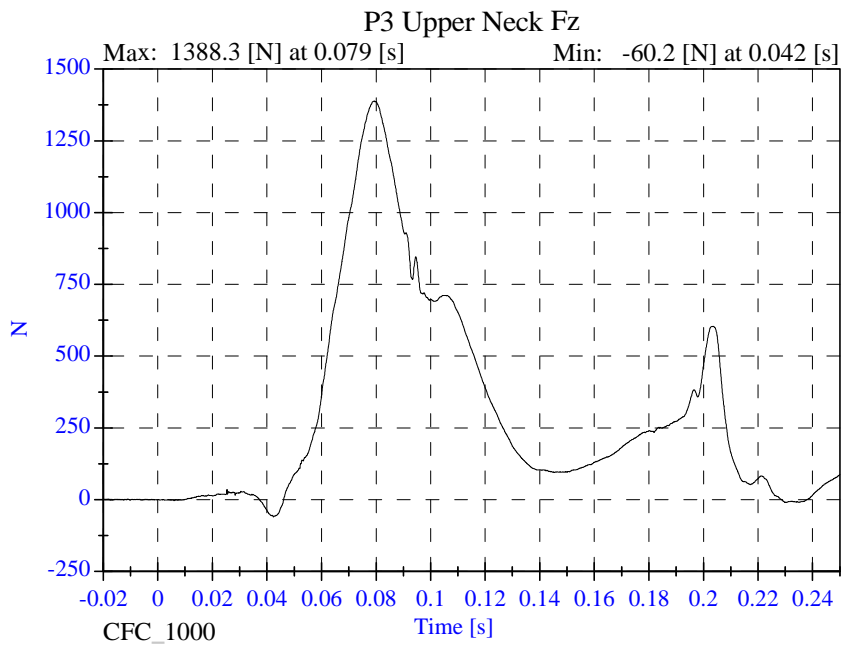
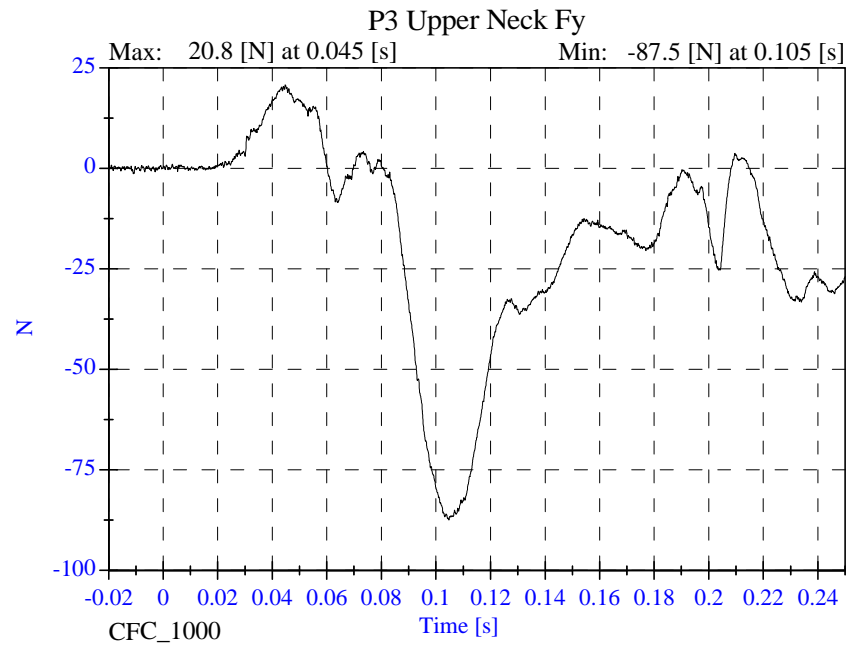
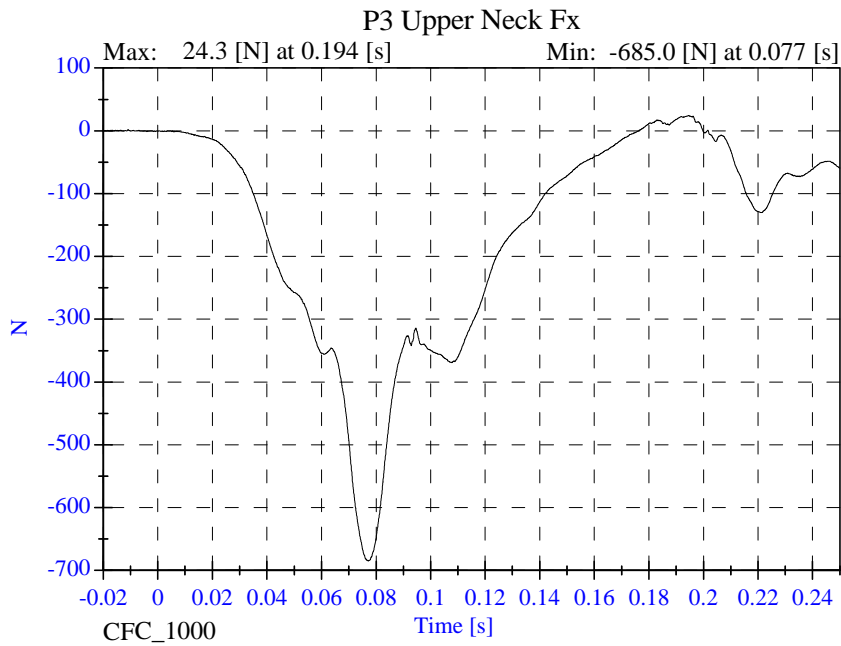


P3 Head Resultant



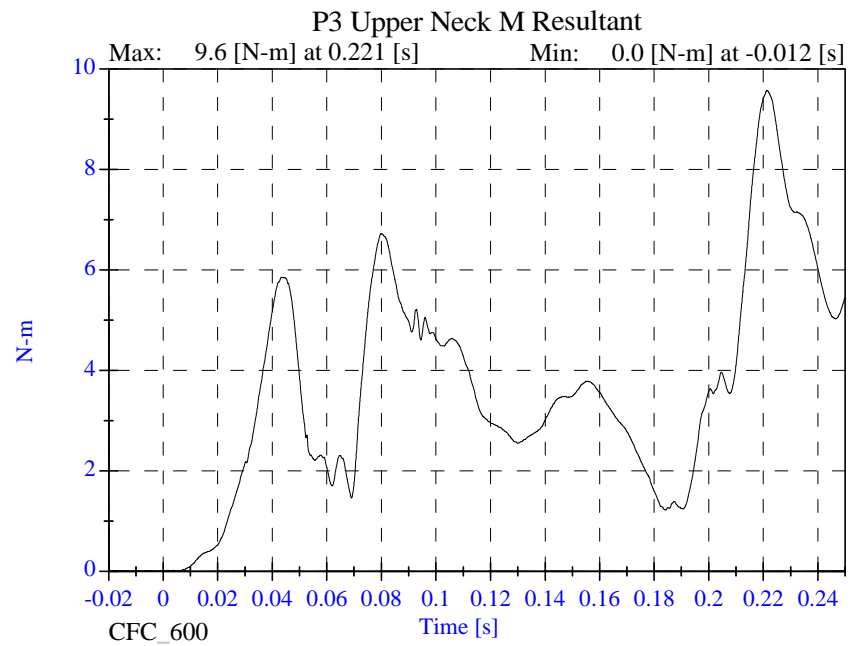
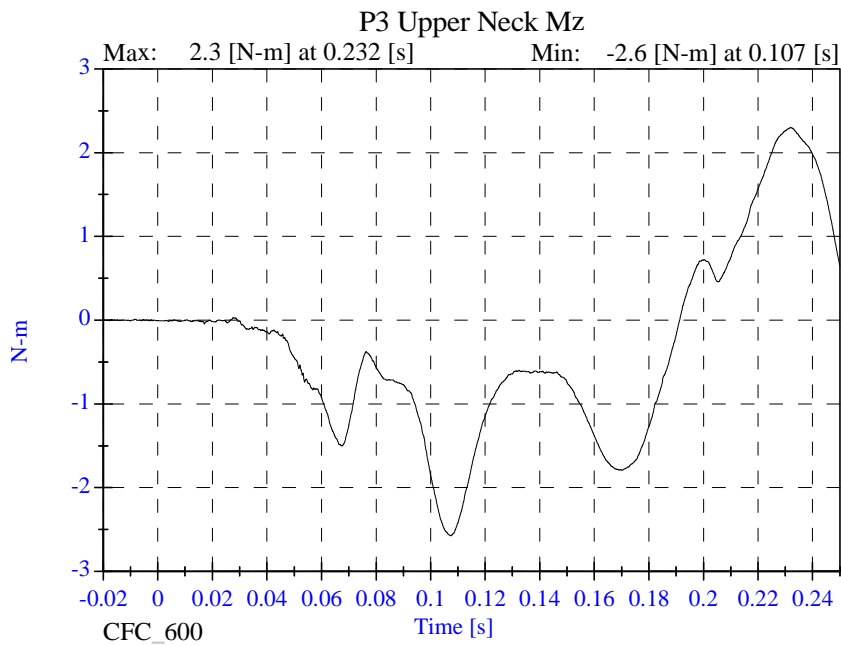
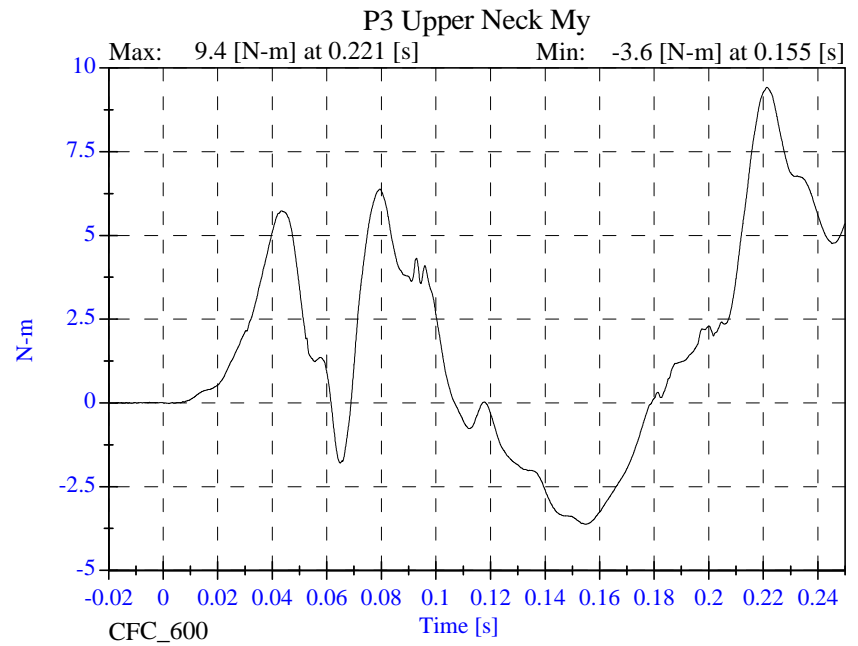
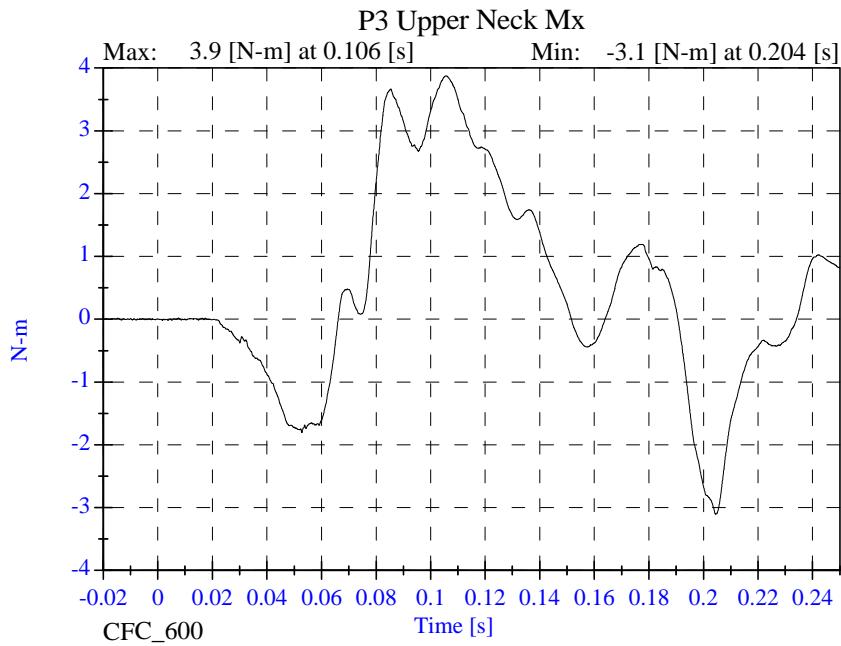
Sled Test NCAP SLED 08-3-41

- August 29, 2003



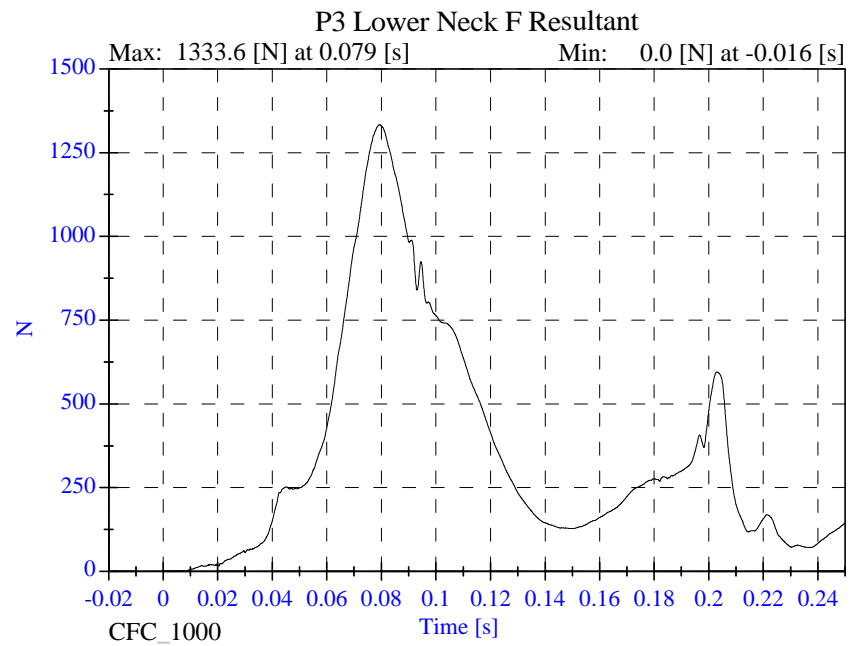
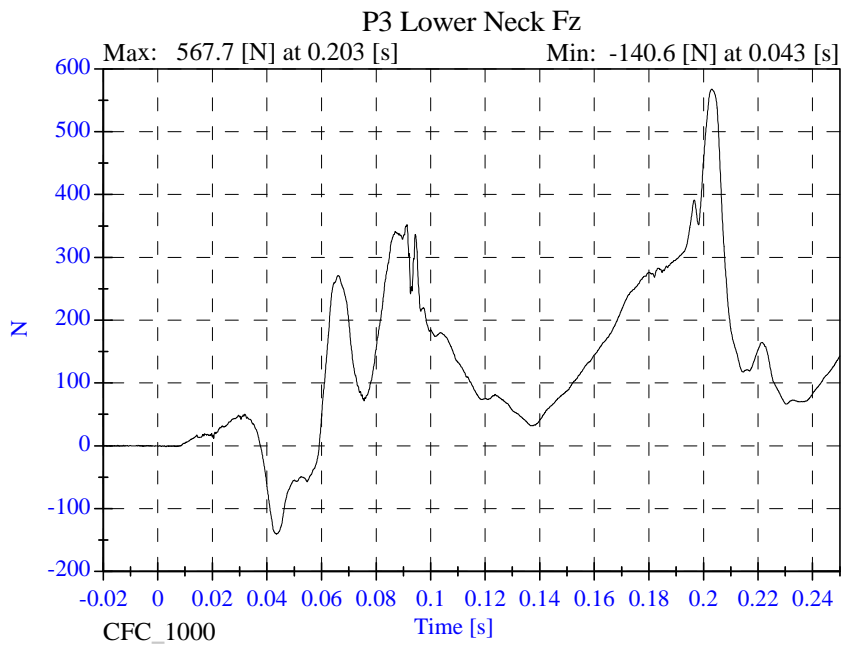
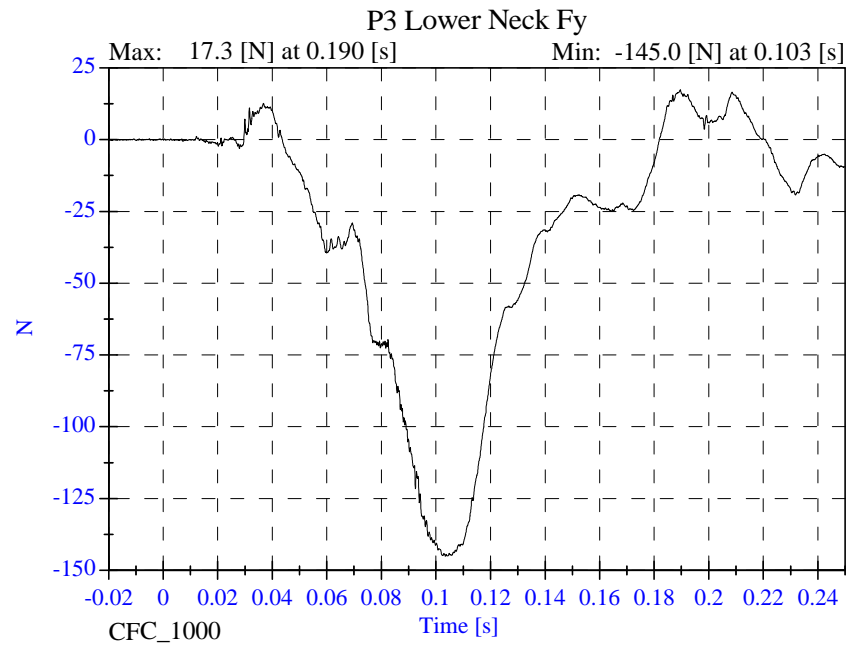
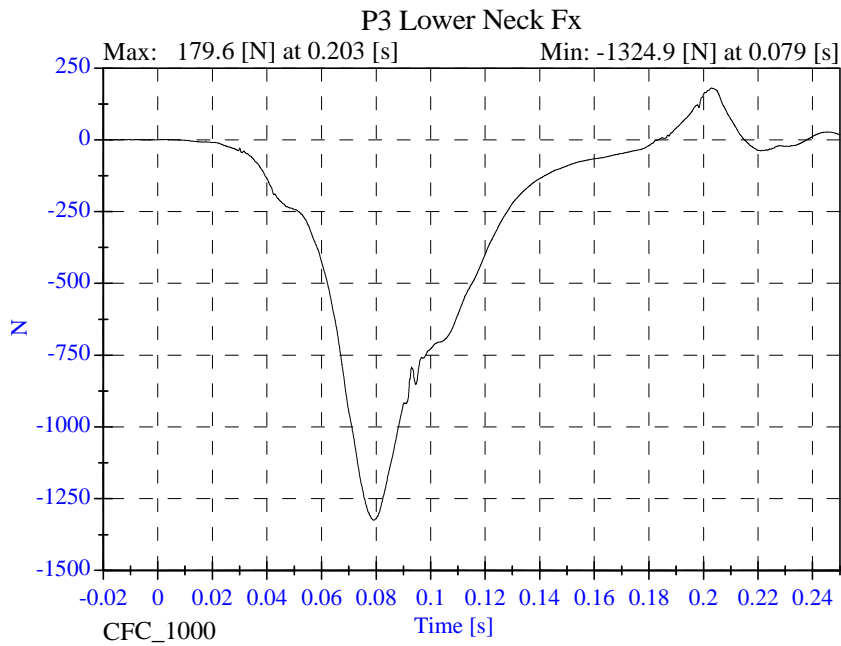
Sled Test NCAP SLED 08-3-41

- August 29, 2003



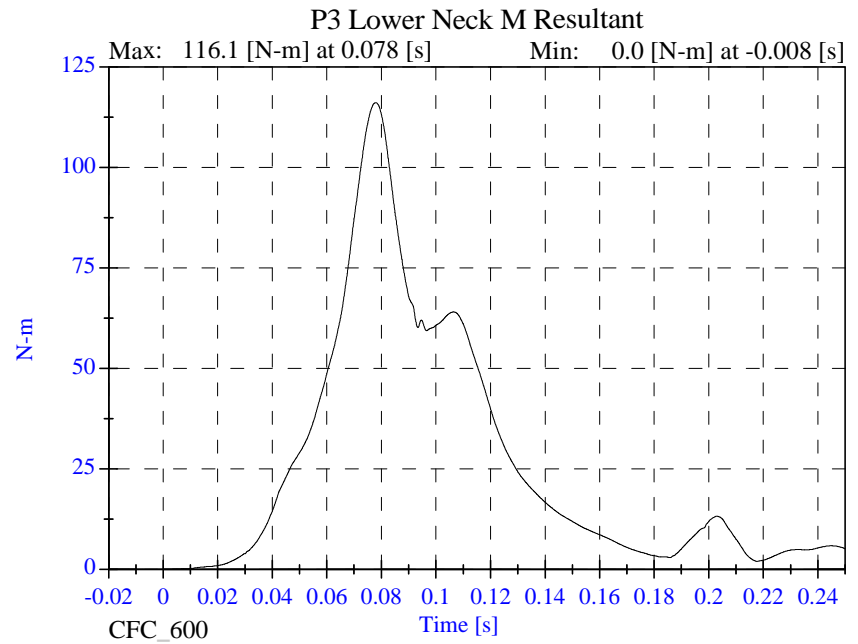
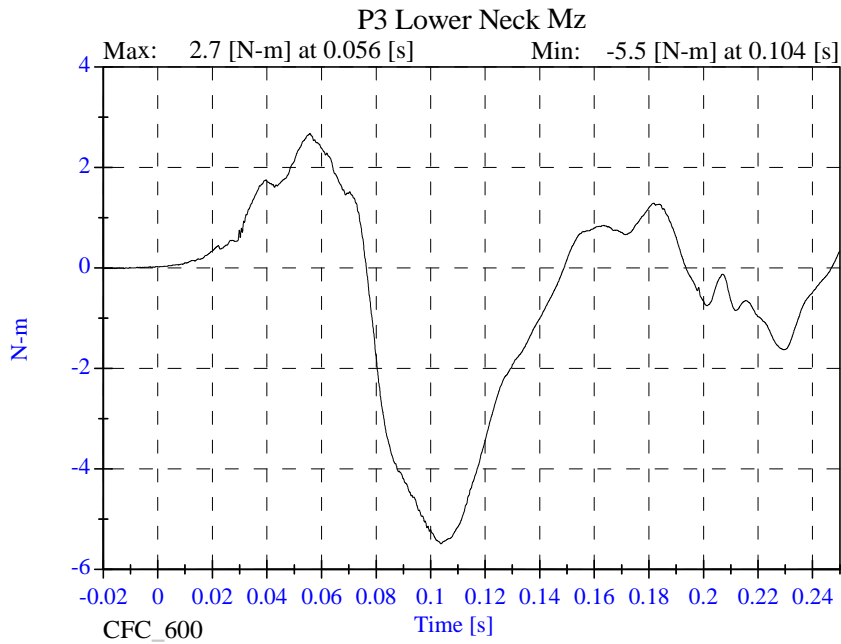
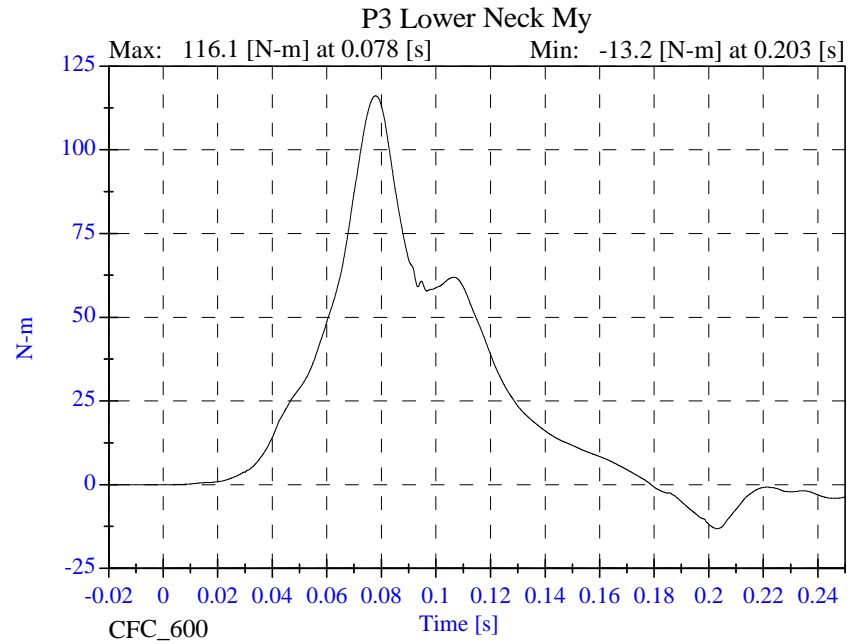
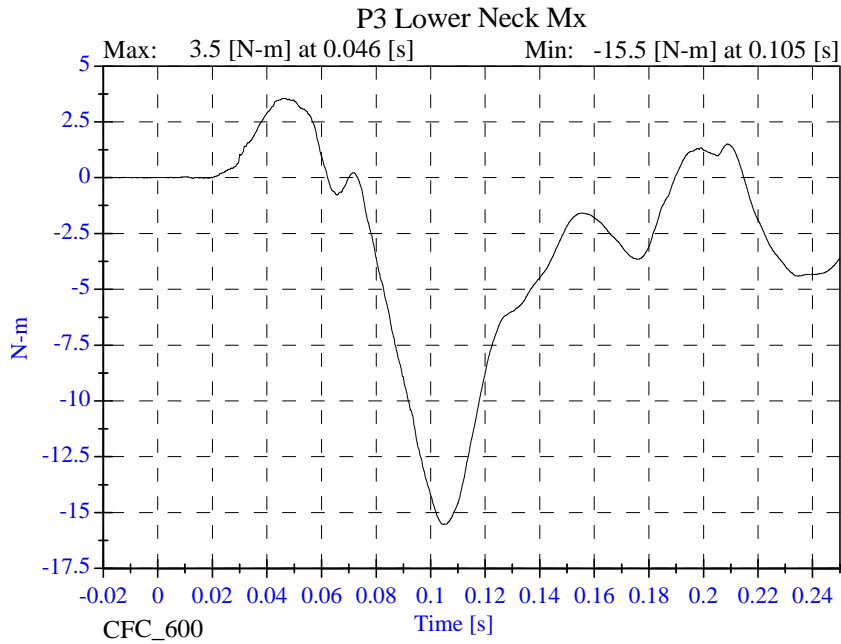
Sled Test NCAP SLED 08-3-41

- August 29, 2003



Sled Test NCAP SLED 08-3-41

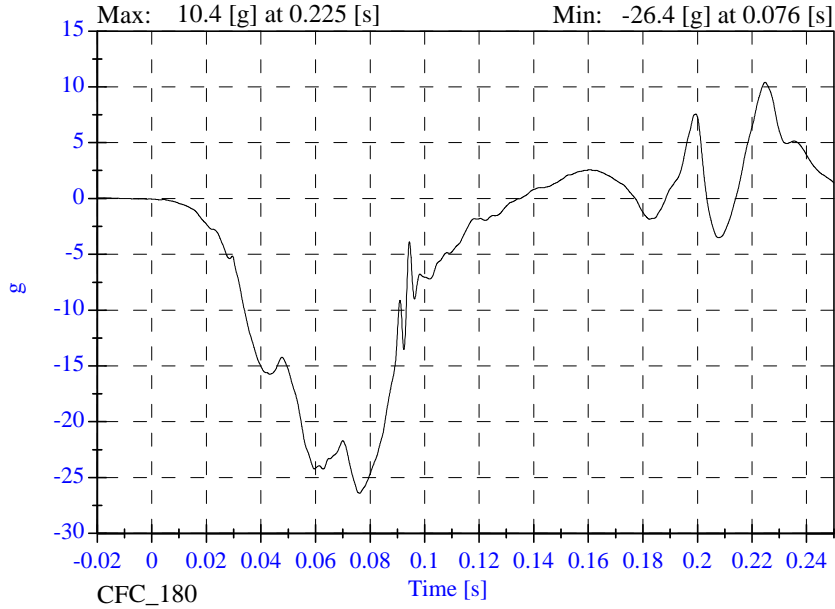
- August 29, 2003



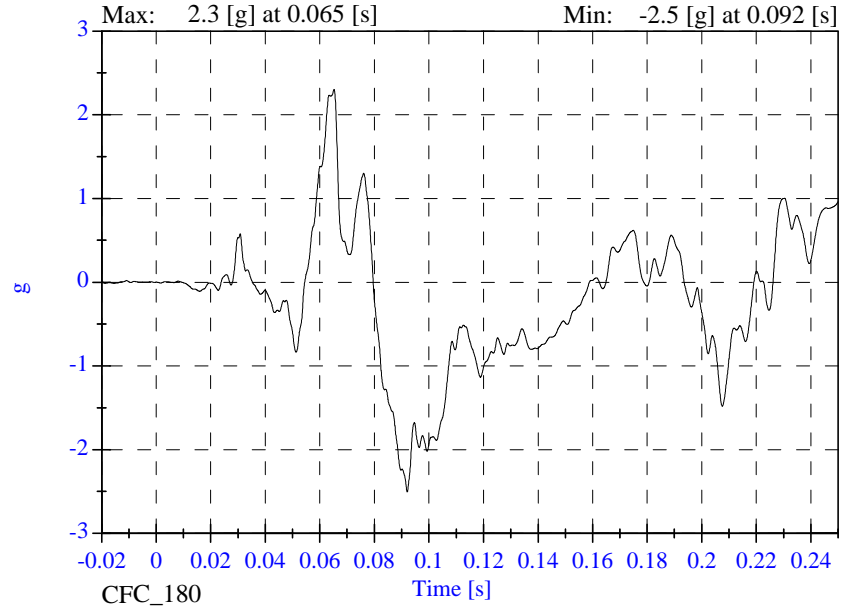
Sled Test NCAP SLED 08-3-41

- August 29, 2003

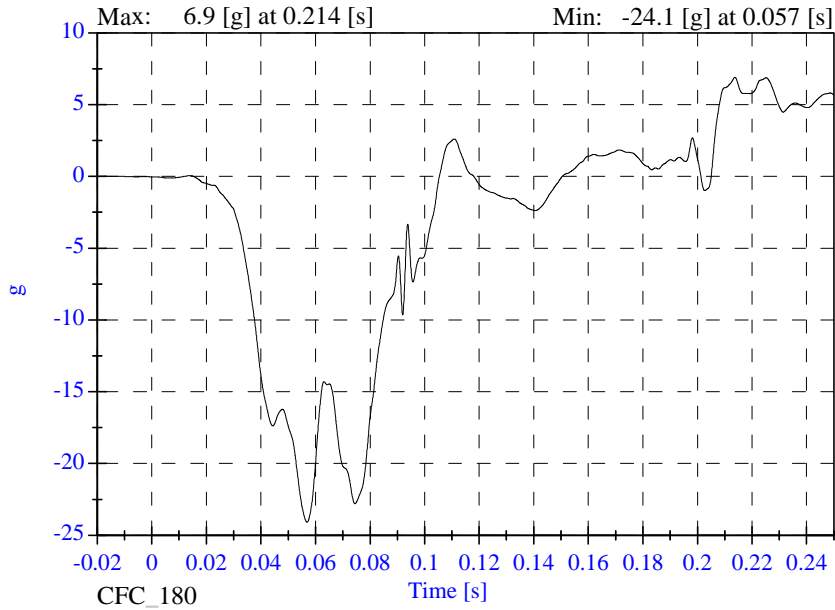
P3 Chest x



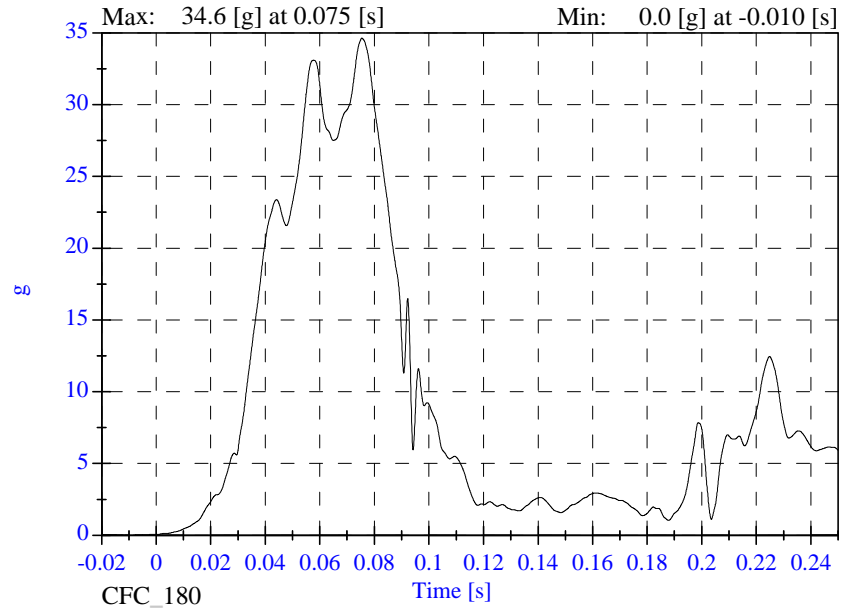
P3 Chest y



P3 Chest z



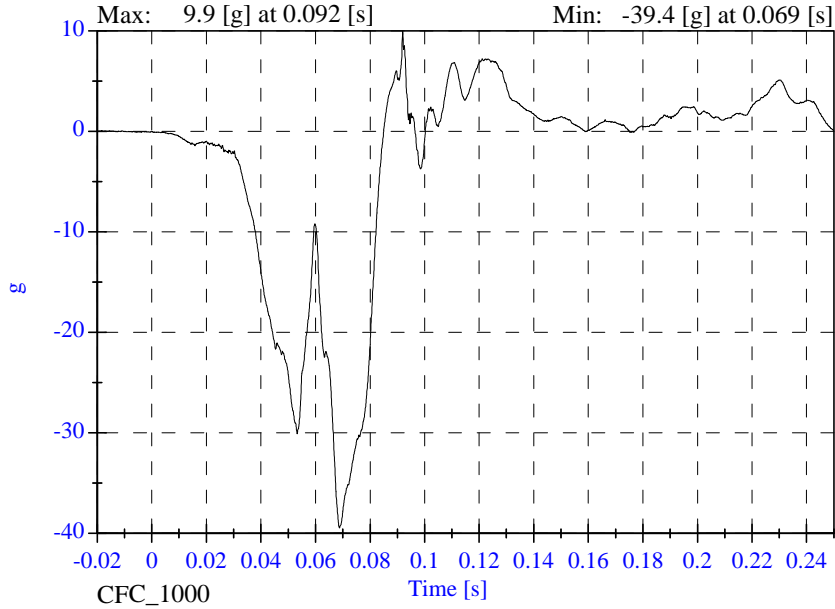
P3 Chest Resultant



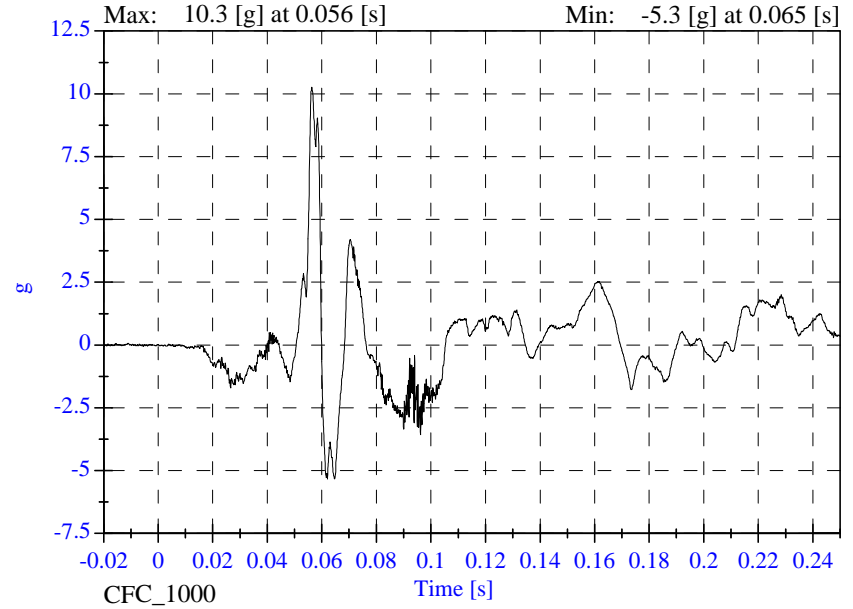
Sled Test NCAP SLED 08-3-41

- August 29, 2003

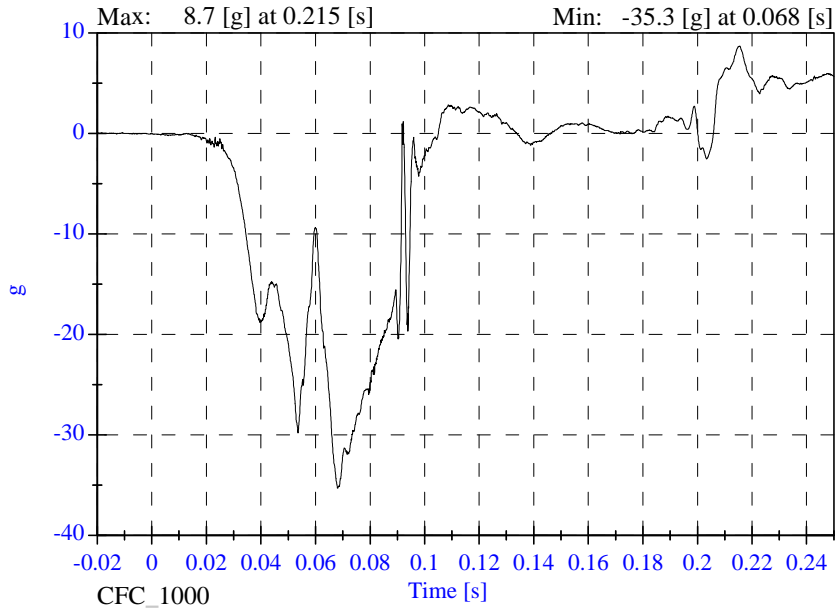
P3 Pelvic x



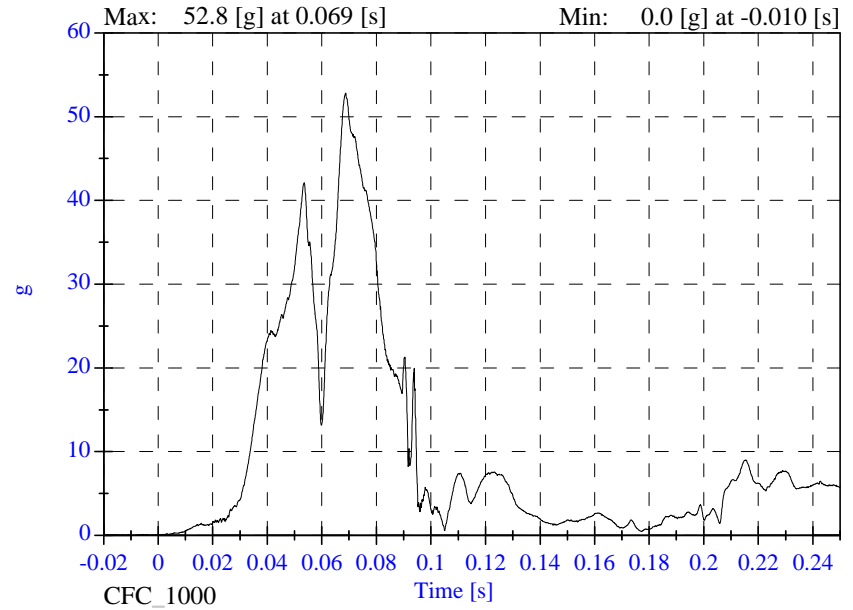
P3 Pelvic y



P3 Pelvic z



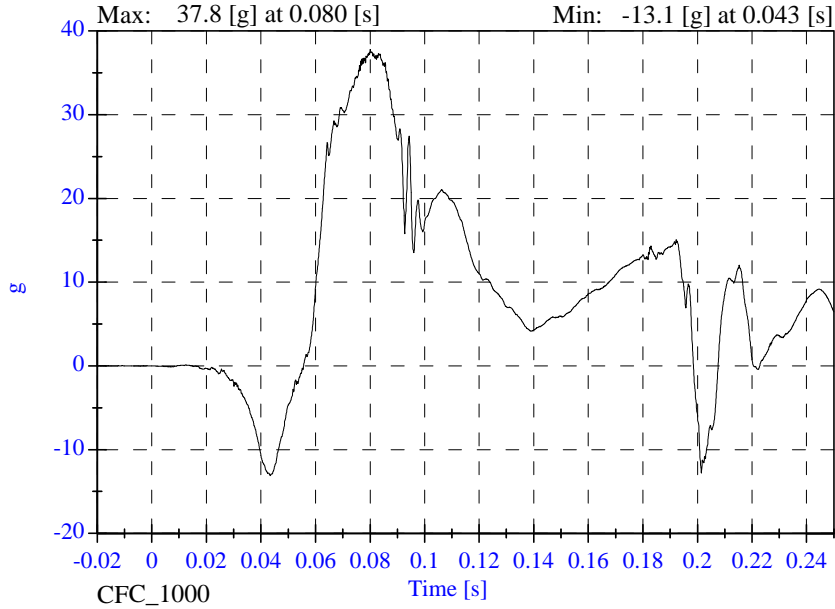
P3 Pelvic Resultant



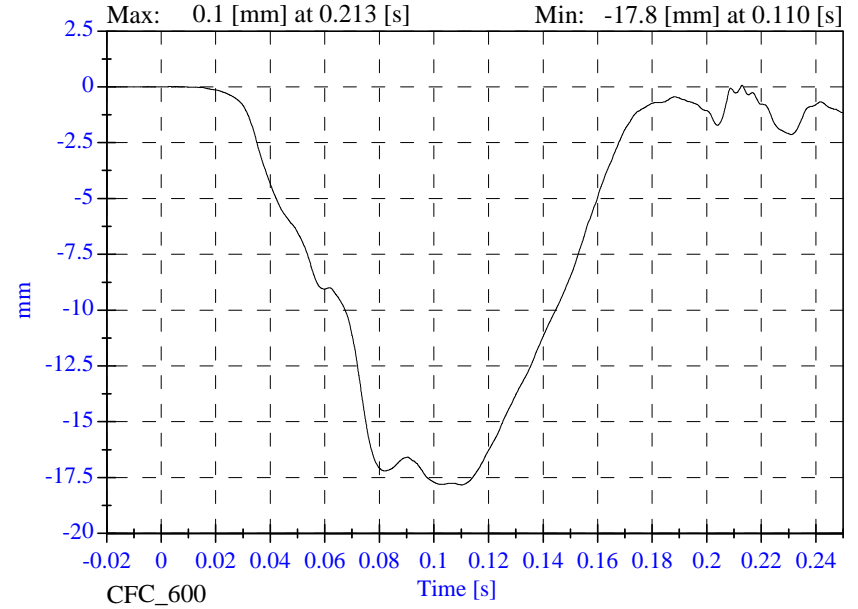
Sled Test NCAP SLED 08-3-41

- August 29, 2003

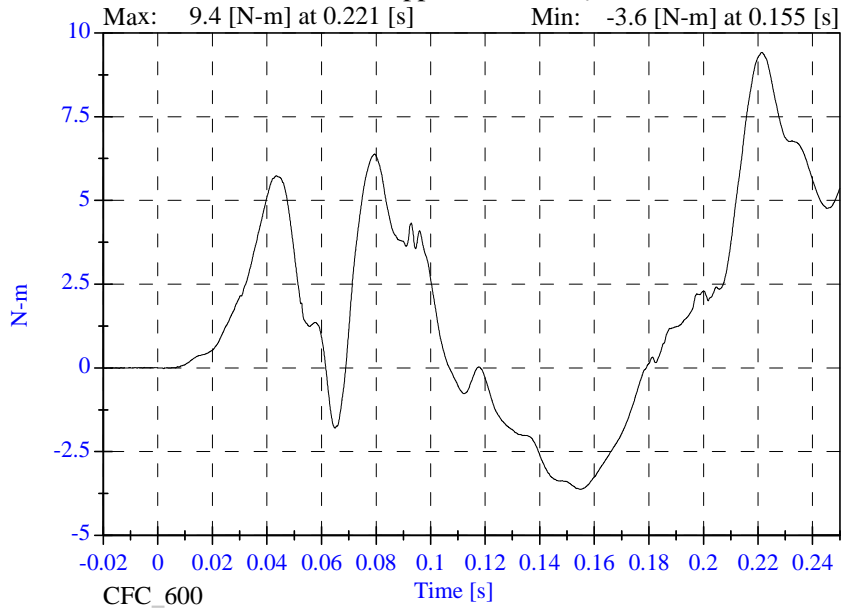
P3 Head Red z



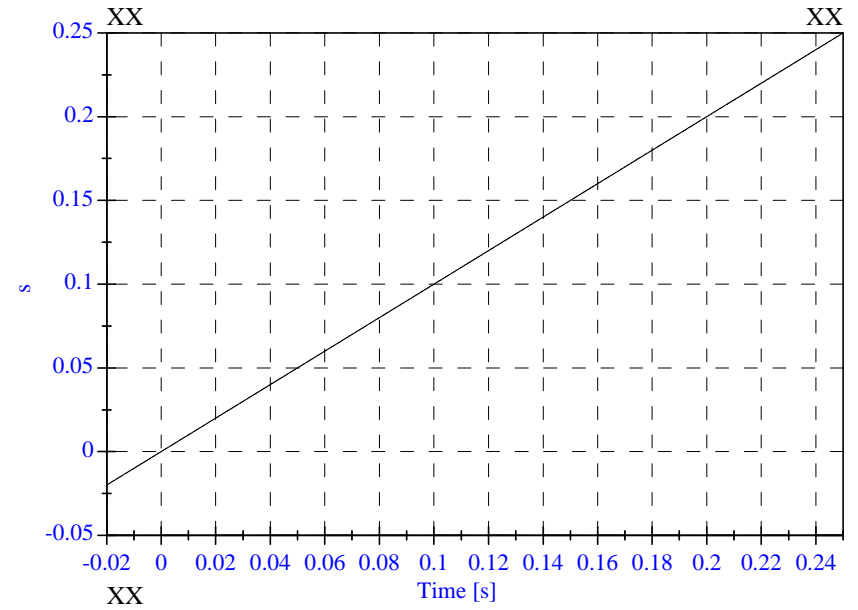
P3 Chest Compression



P3 Upper Neck Mocyc

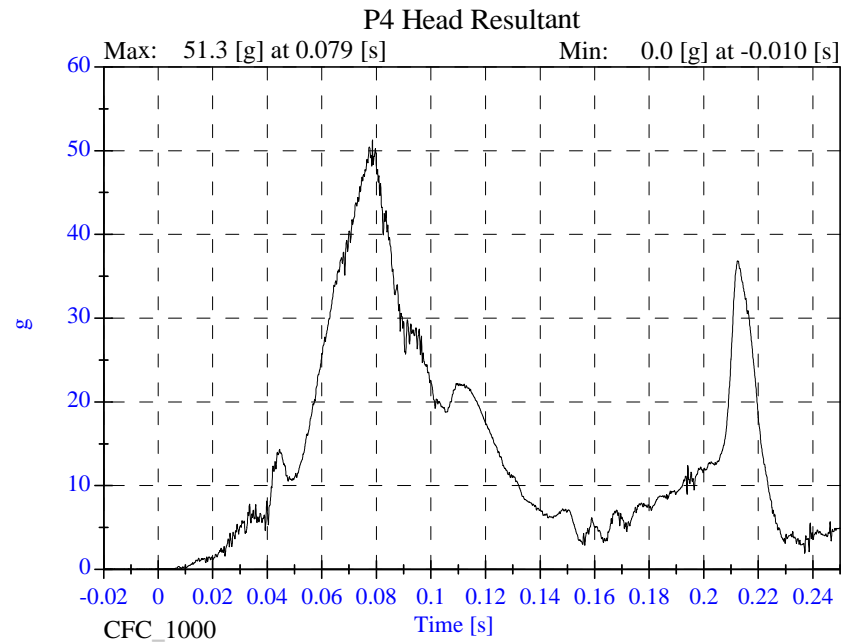
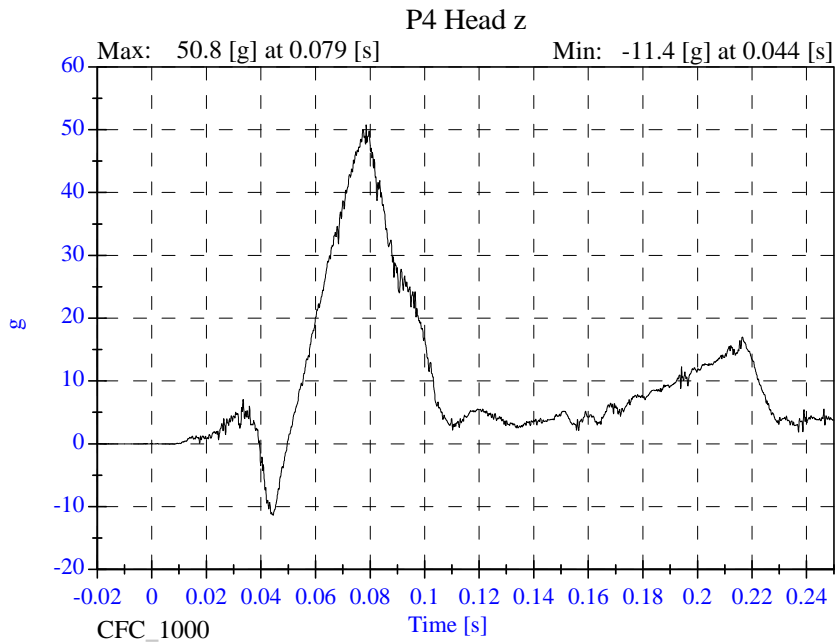
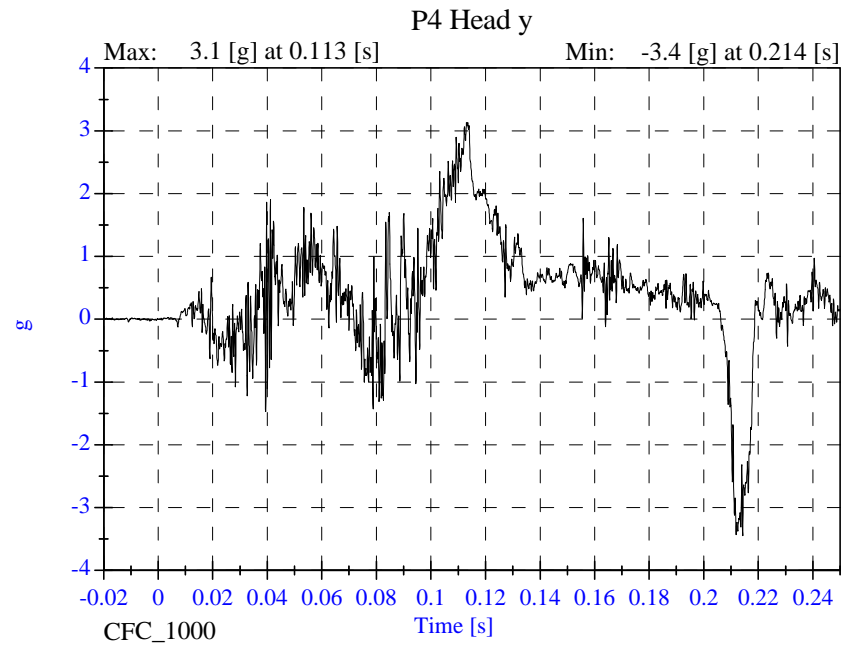
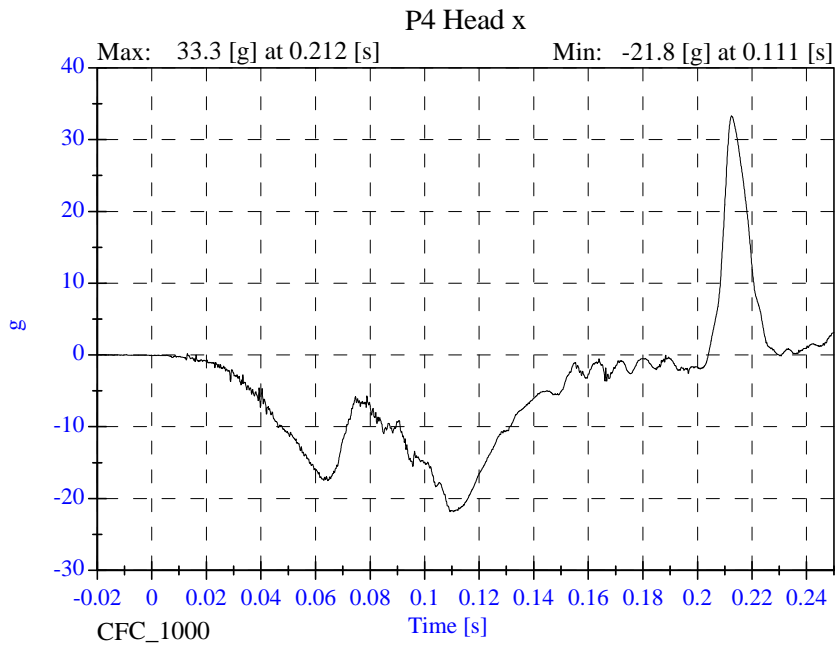


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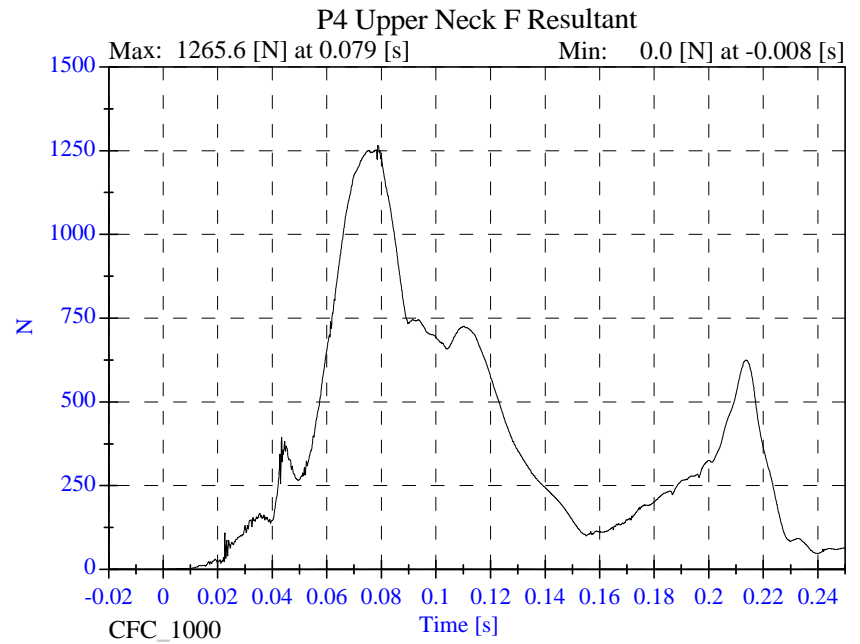
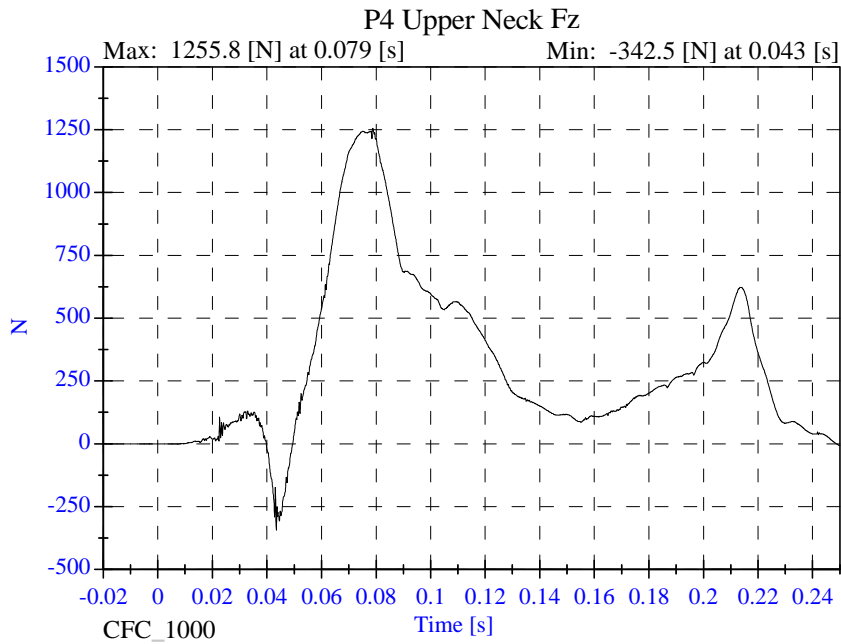
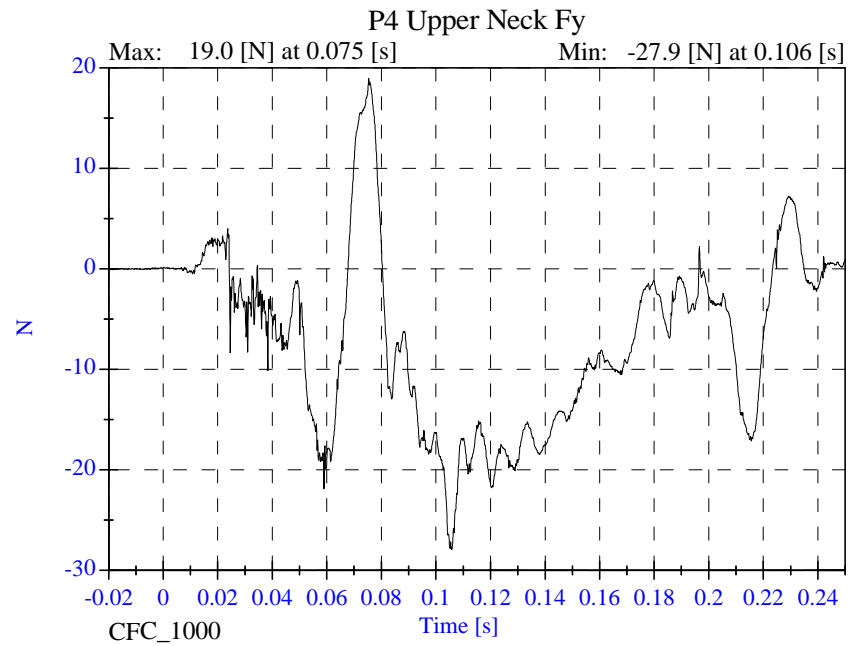
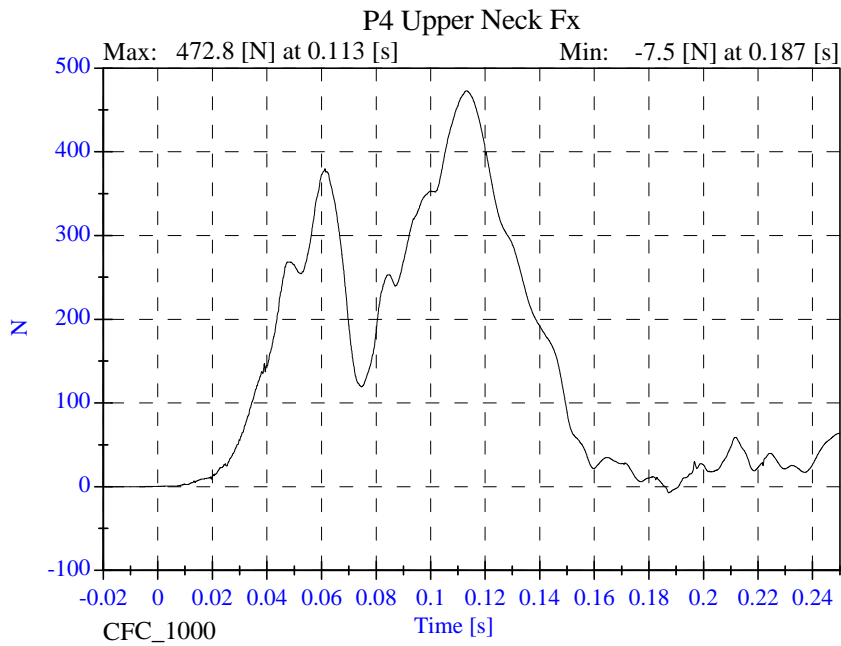
Sled Test NCAP SLED 08-3-41

- August 29, 2003



Sled Test NCAP SLED 08-3-41

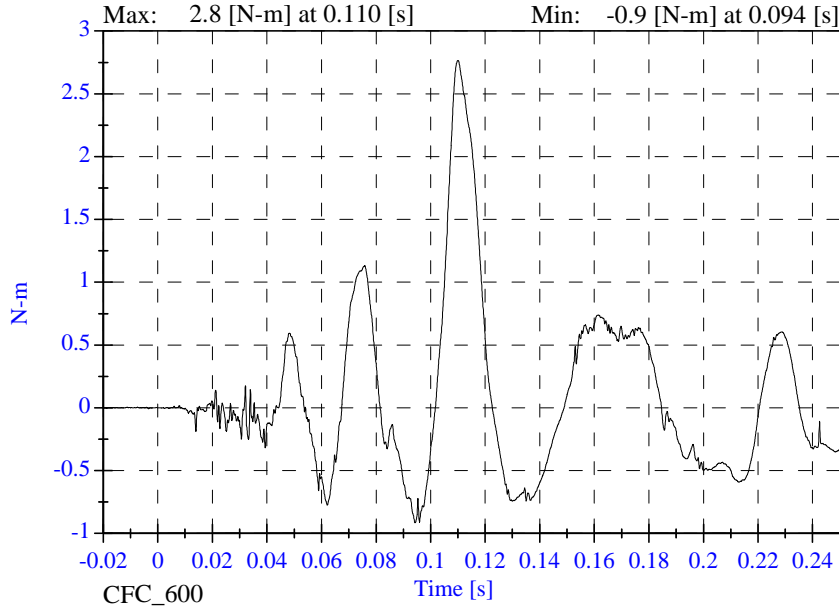
- August 29, 2003



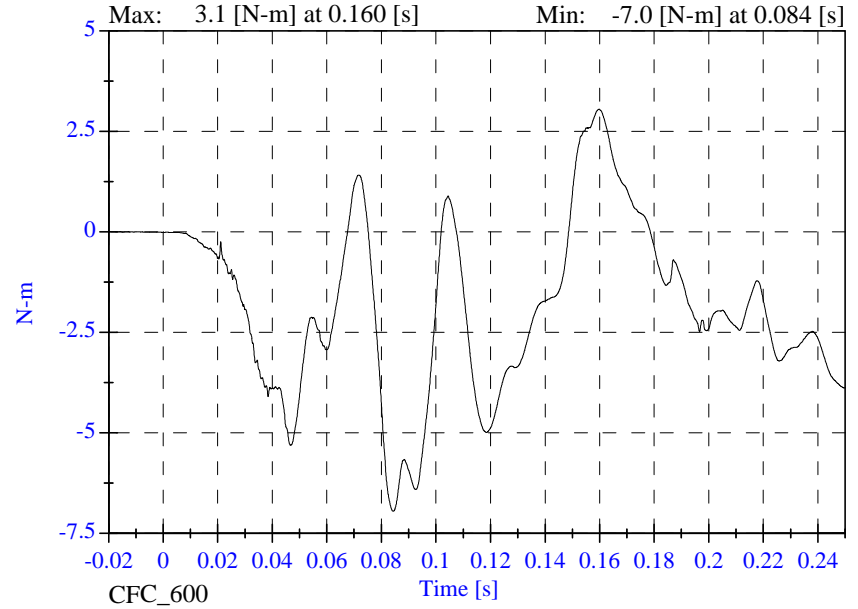
Sled Test NCAP SLED 08-3-41

- August 29, 2003

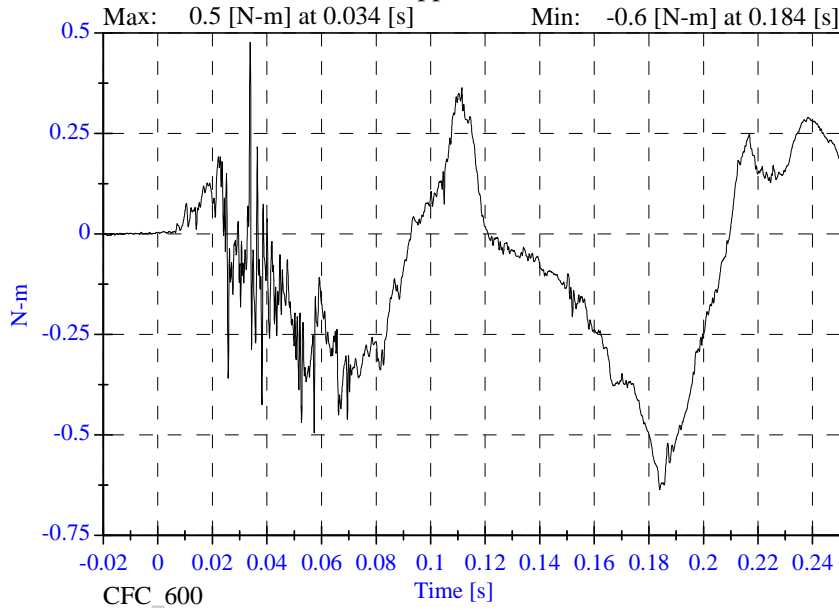
P4 Upper Neck Mx



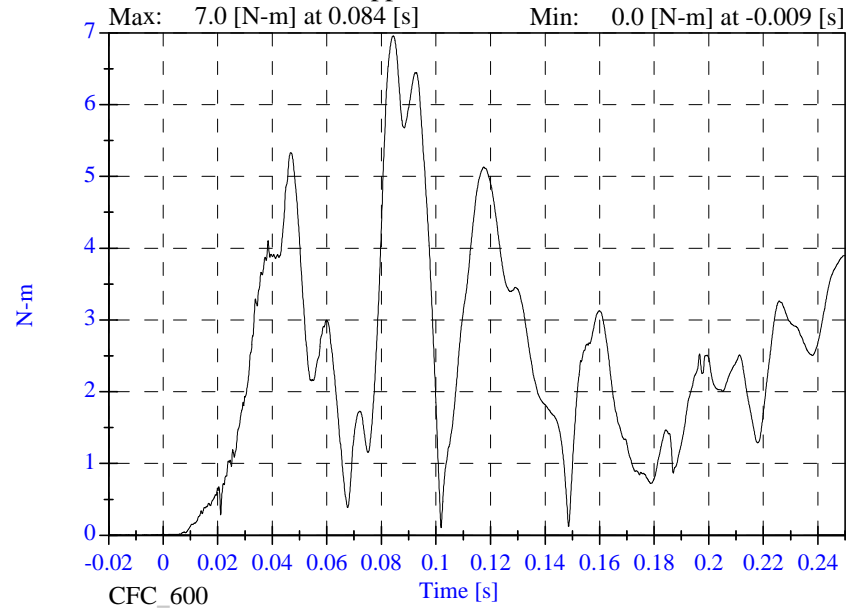
P4 Upper Neck My



P4 Upper Neck Mz



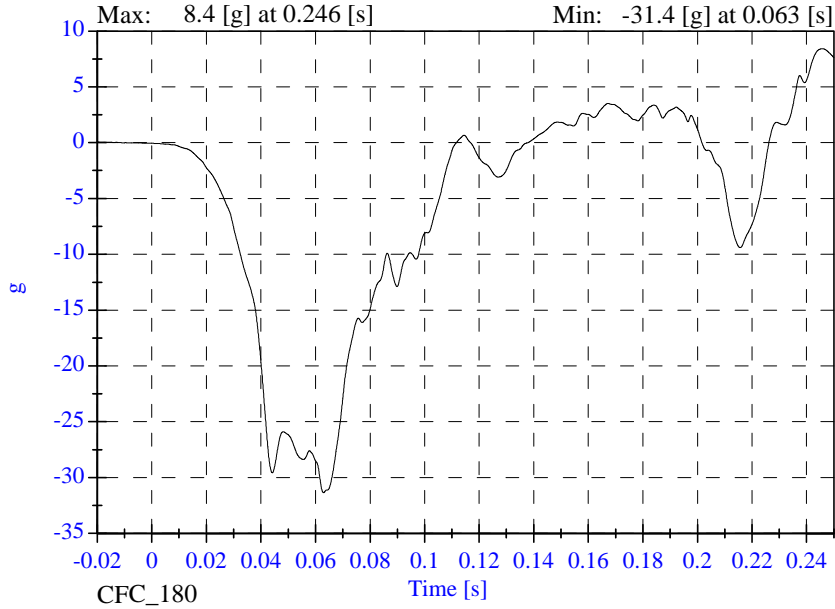
P4 Upper Neck M Resultant



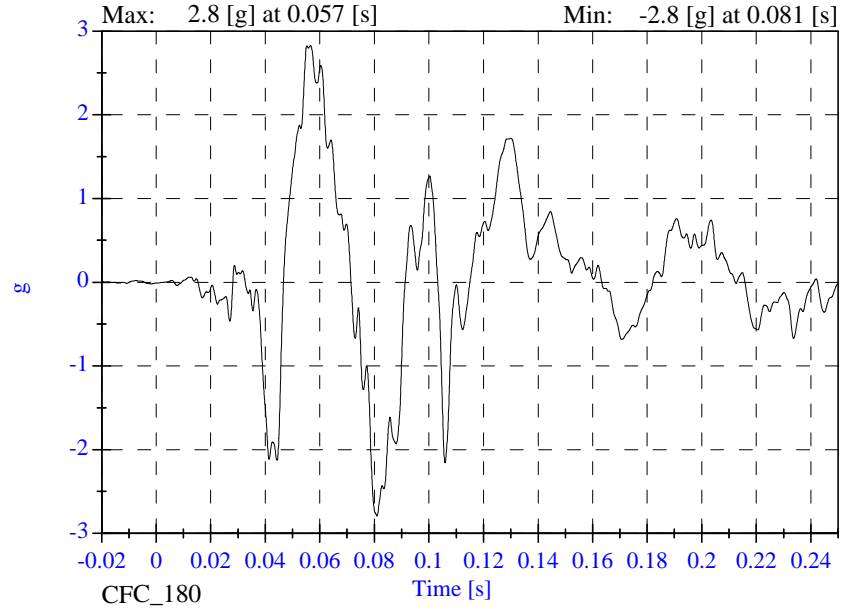
Sled Test NCAP SLED 08-3-41

- August 29, 2003

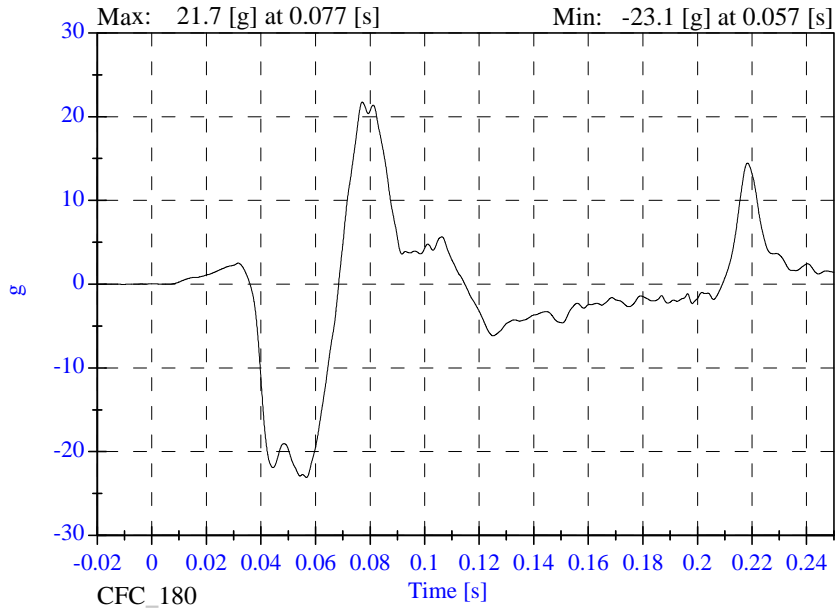
P4 Chest x



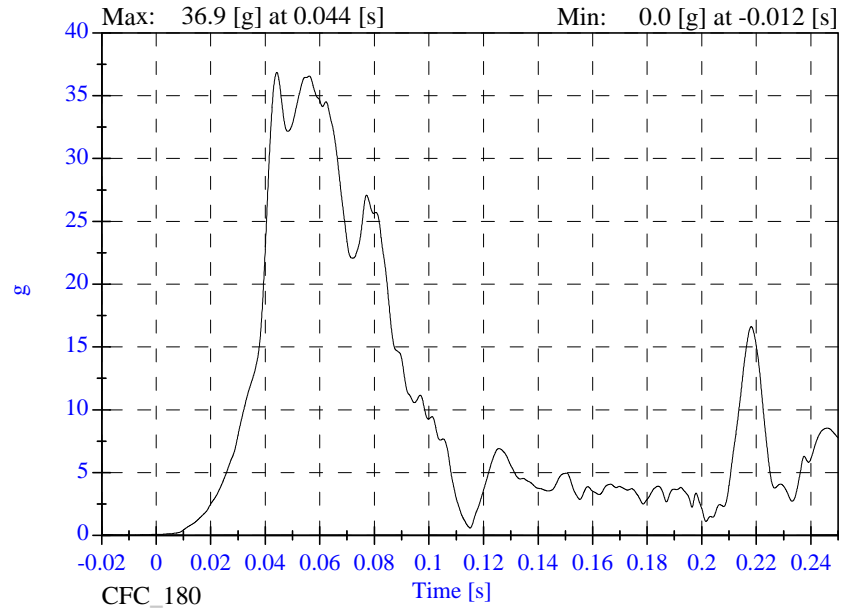
P4 Chest y



P4 Chest z



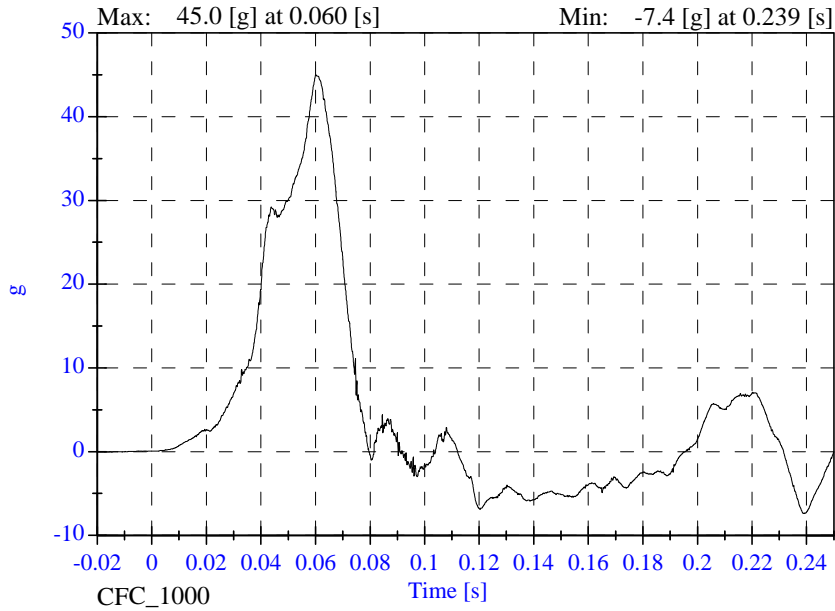
P4 Chest Resultant



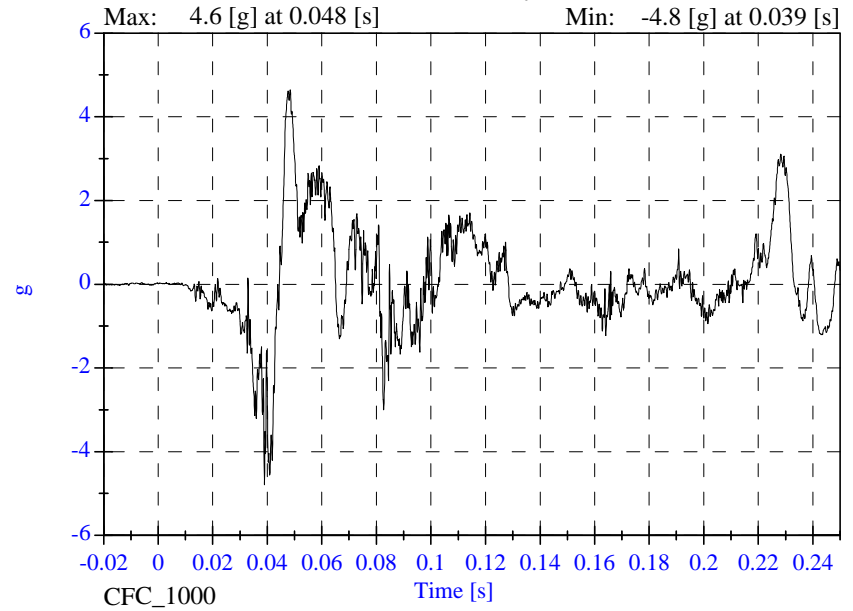
Sled Test NCAP SLED 08-3-41

- August 29, 2003

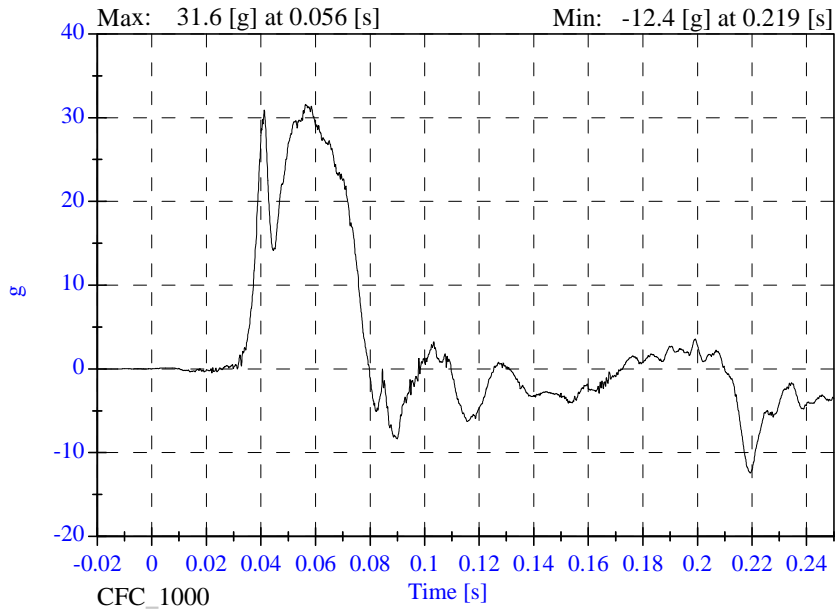
P4 Pelvic x



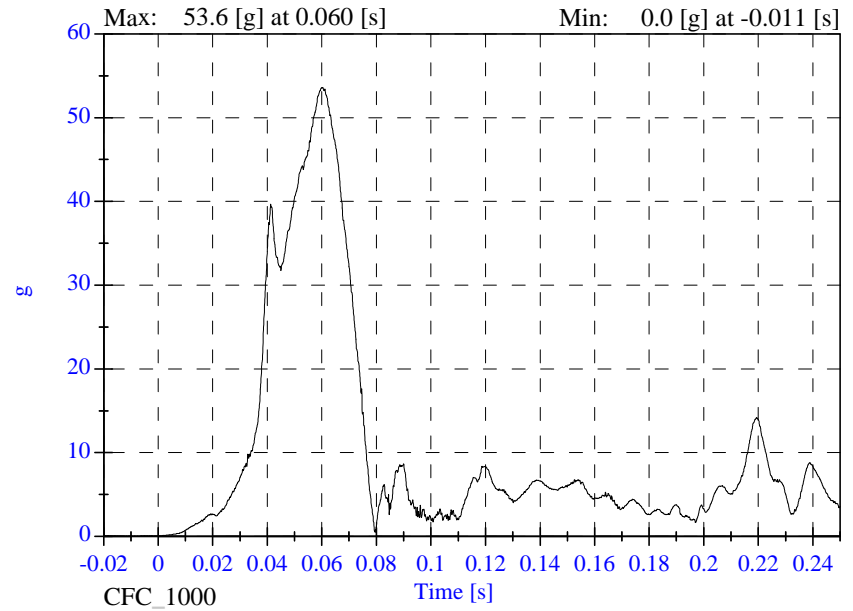
P4 Pelvic y



P4 Pelvic z



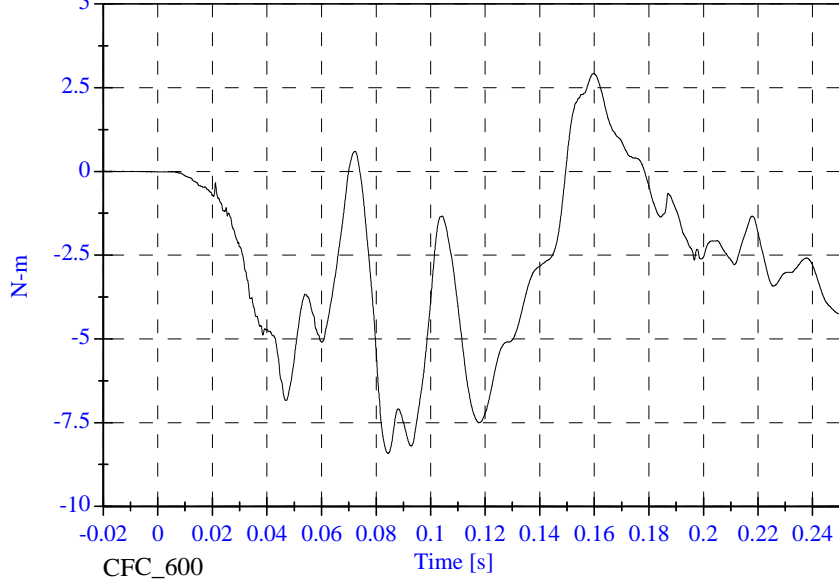
P4 Pelvic Resultant



Sled Test NCAP SLED 08-3-41

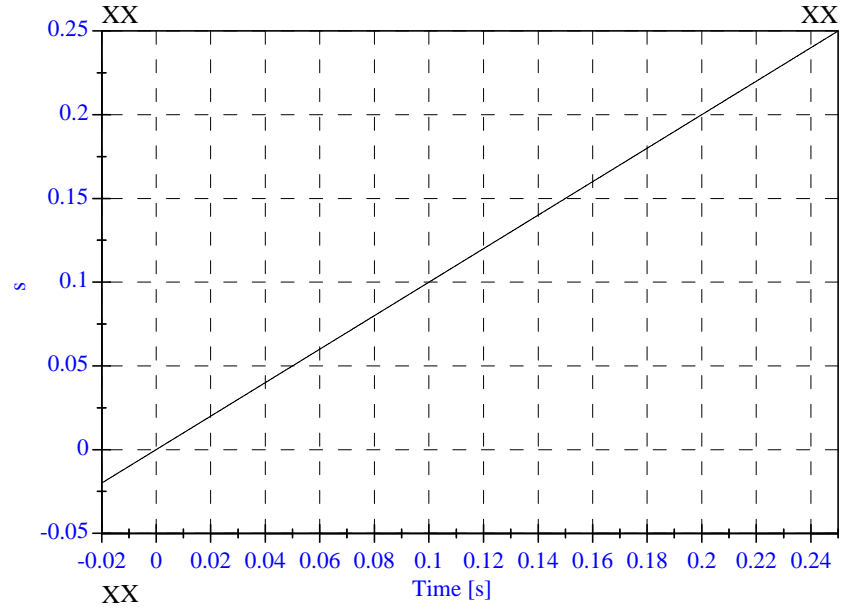
P4 Upper Neck Mocyc

Max: 2.9 [N-m] at 0.160 [s] Min: -8.4 [N-m] at 0.084 [s]

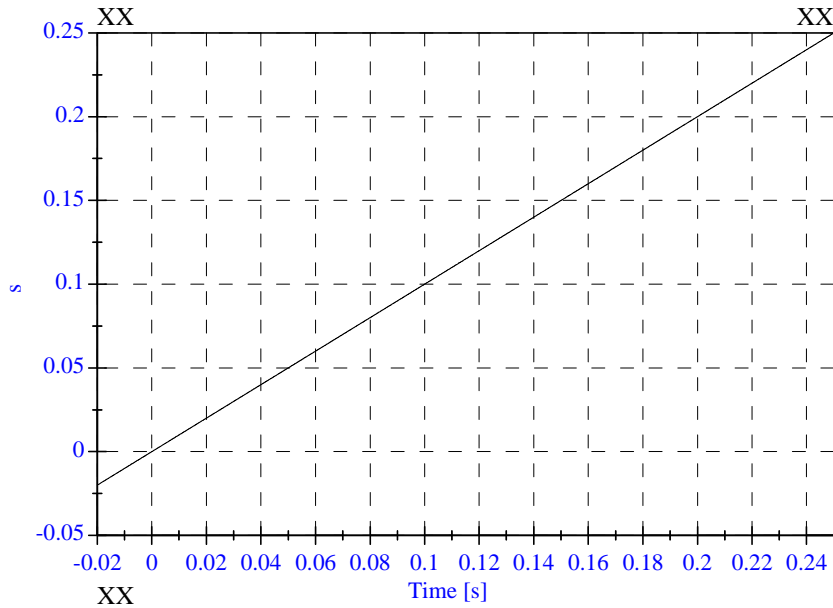


- August 29, 2003

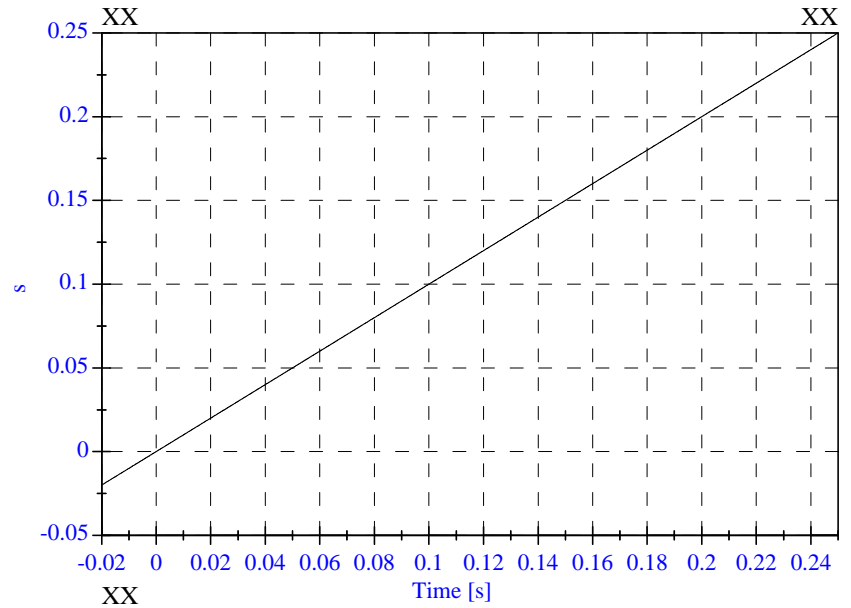
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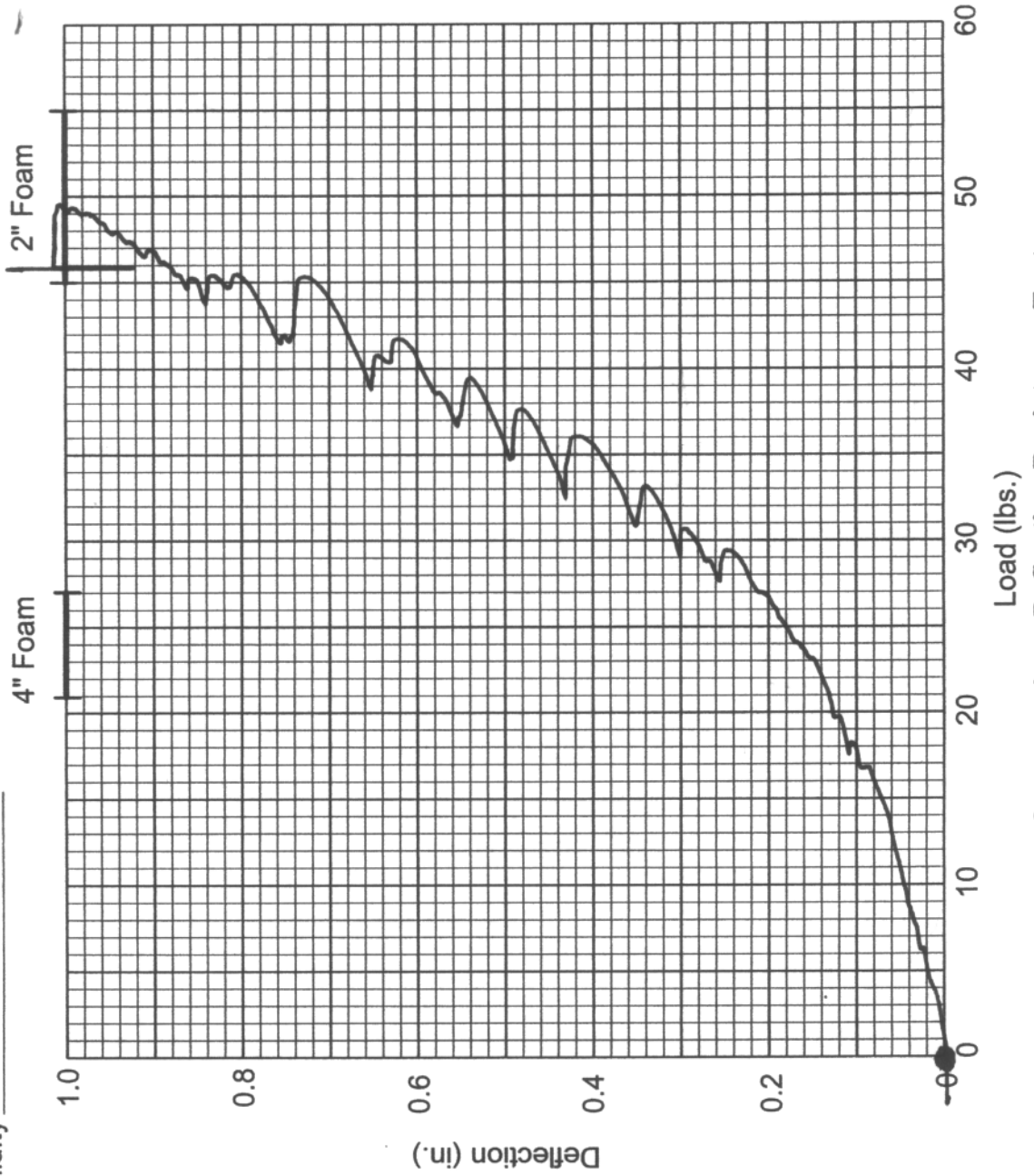


SECTION 9

Compression – Deflection Resistance Test

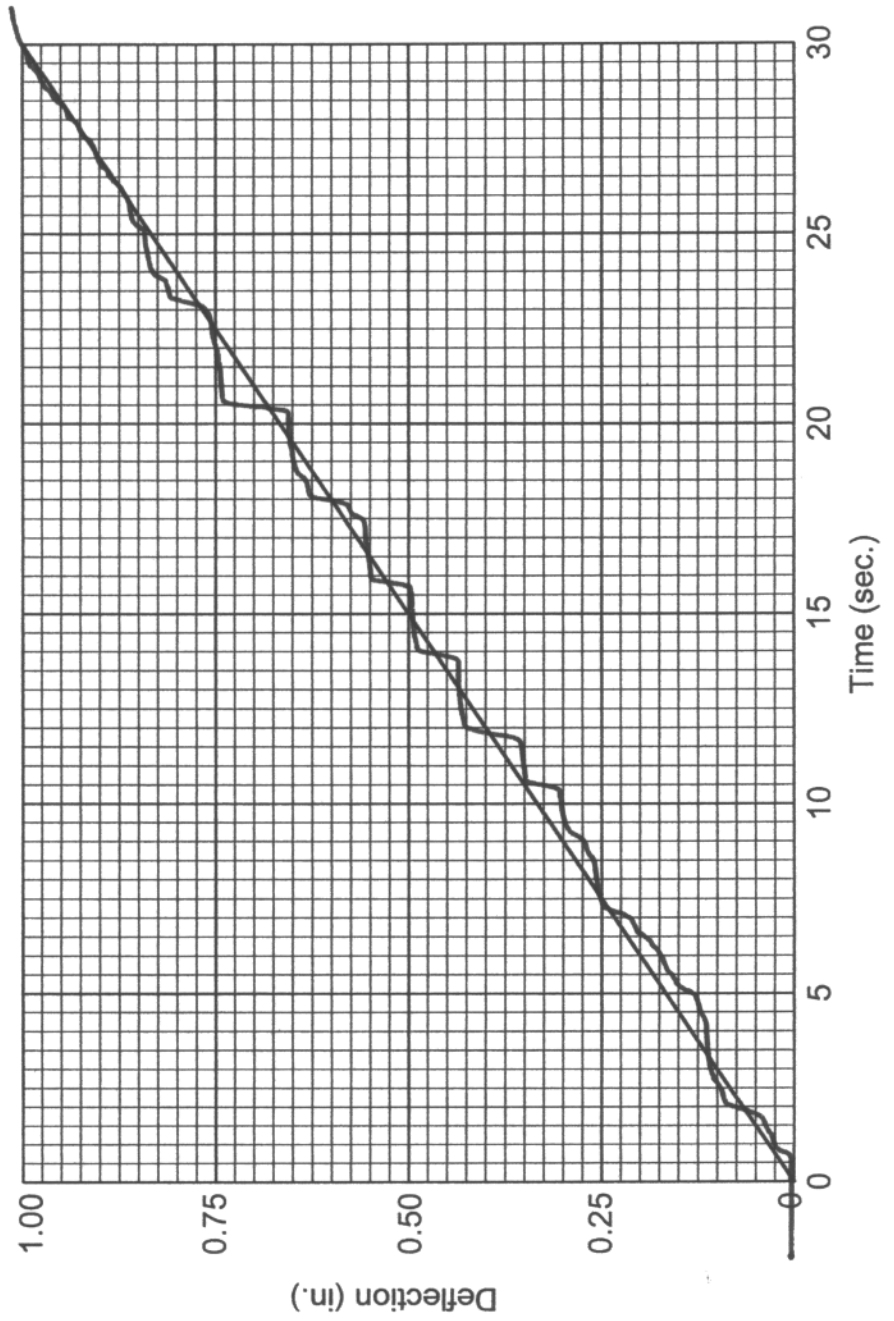
Date 8/29/03
 Performed By SD
 Temp. 70
 Humidity 50%

Foam No. 2" x 20" 2" x 29" I 7



Compression - Deflection Resistance Test
 Child Seat Foam


Date 8/29/05
 Temp 70°
 Humidity 50%
 Foam No. 2" X 20" 2" X 24" 2"



Compression - Deflection Resistance Test Child Seat Foam

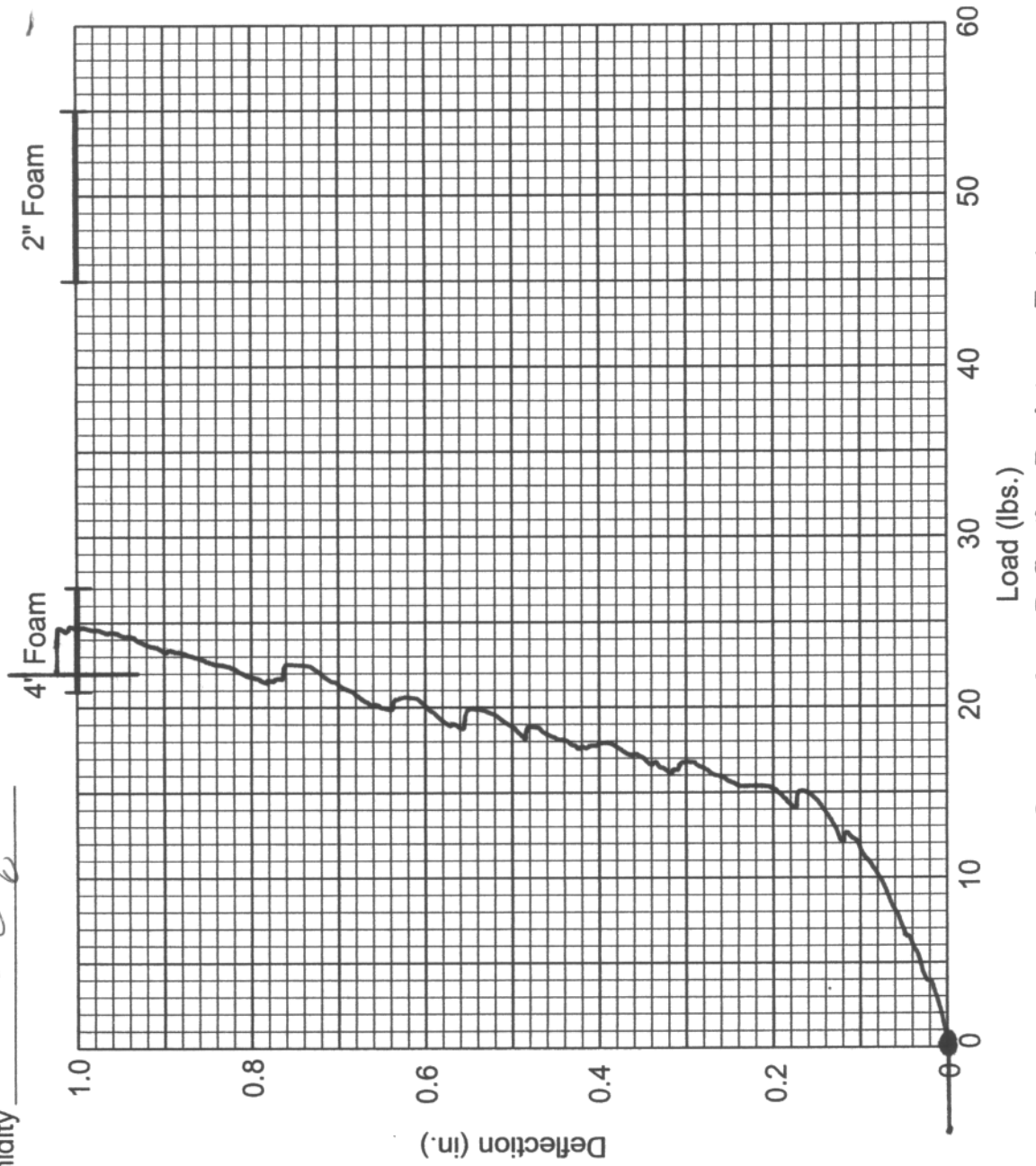
SEAT FOAM USAGE LOG

Foam I.D. Number 2" x 20" 2" x 29" I 1

Date	Peak Load	Pass/Fail
8/29/03	46 LBS	

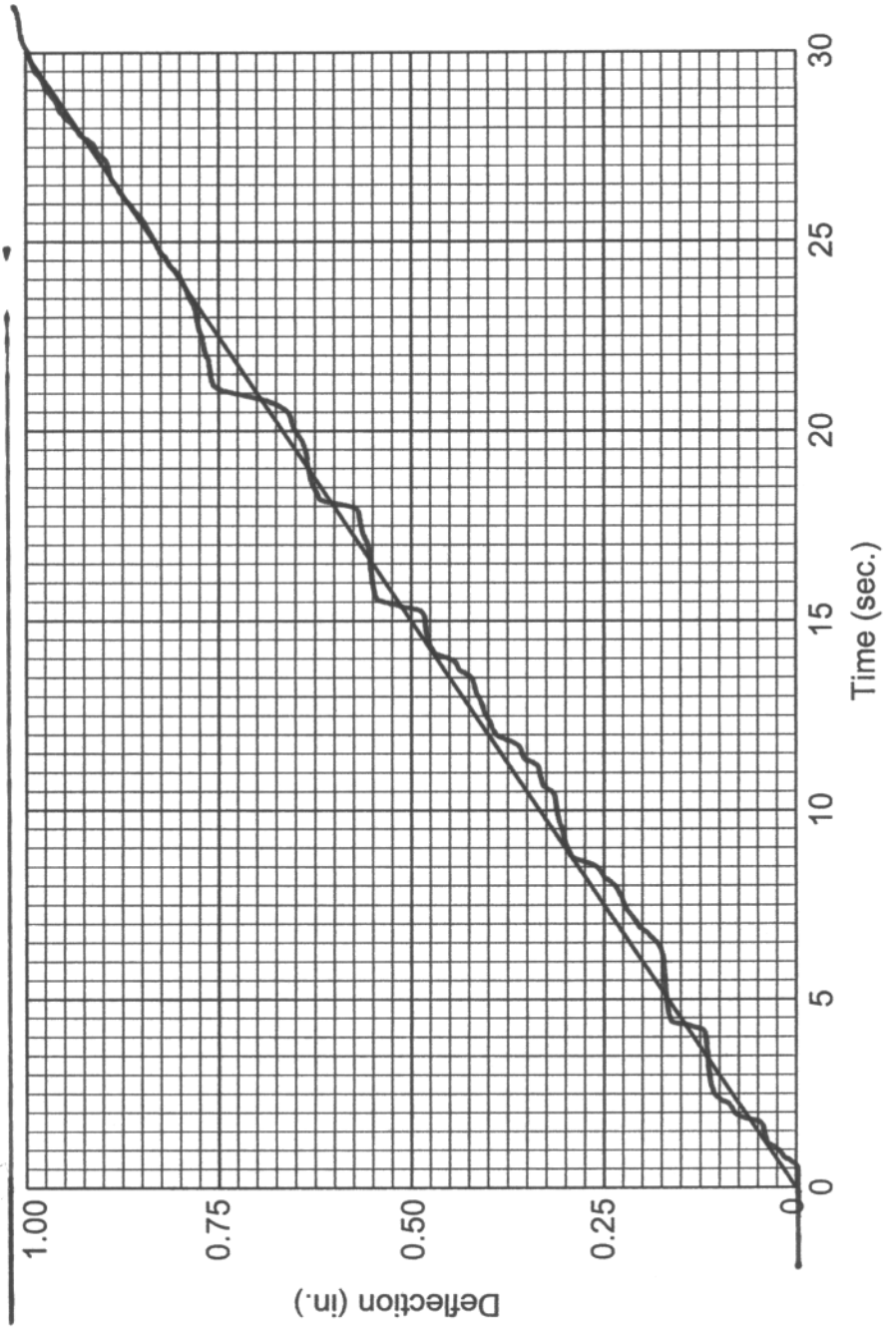
Date 8/29/03
Performed By [Signature]
Temp. 70°
Humidity 30%

Foam No. 5" X 20" I7



Compression - Deflection Resistance Test
Child Seat Foam

Date 8/29/03
 Temp 70
 Humidity 50%
 Foam No. A1X20 177




Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

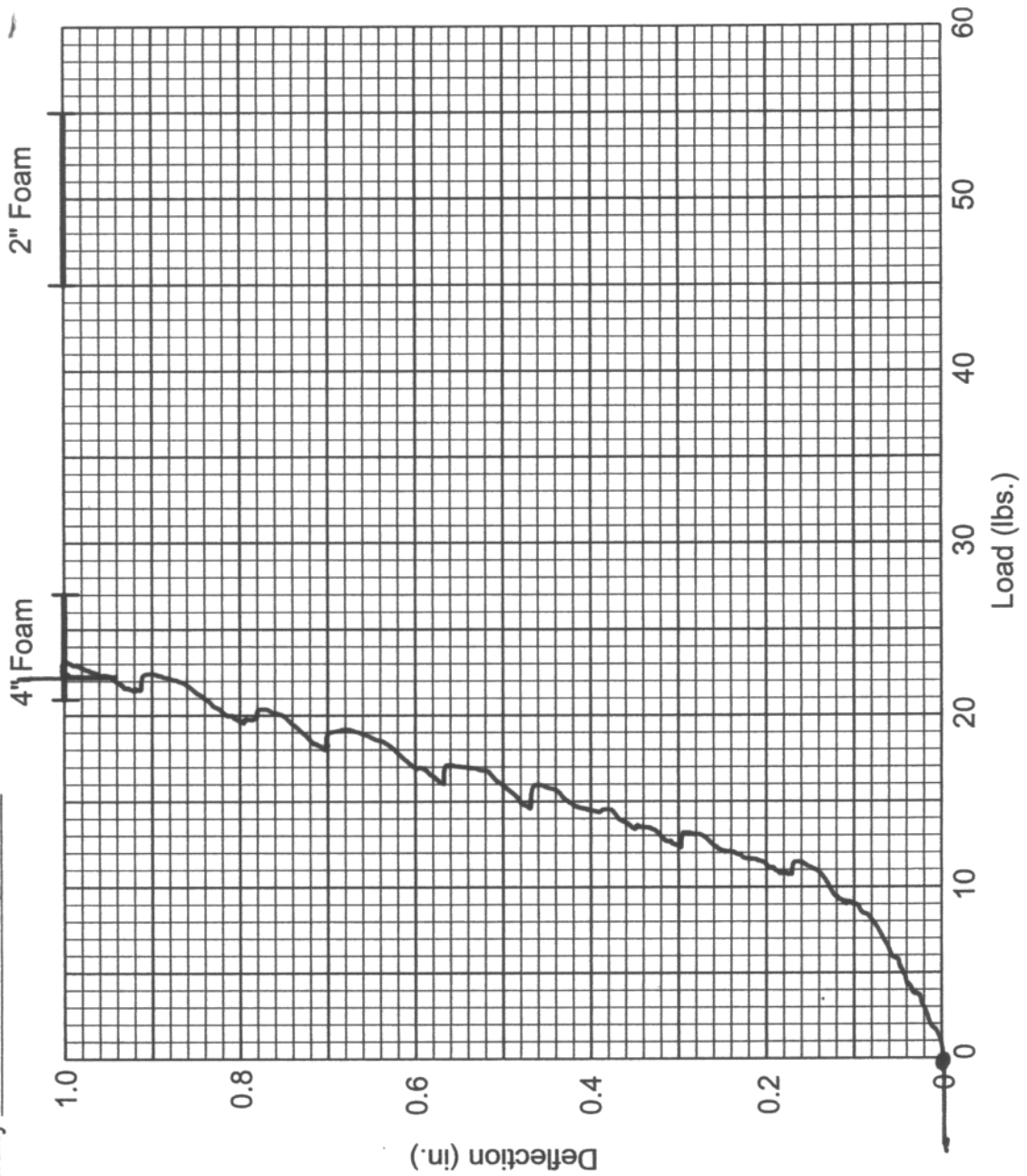
4" x 20" I

Foam I.D. Number

Date	Peak Load	Pass/Fail
8/29/03	22 LBS	

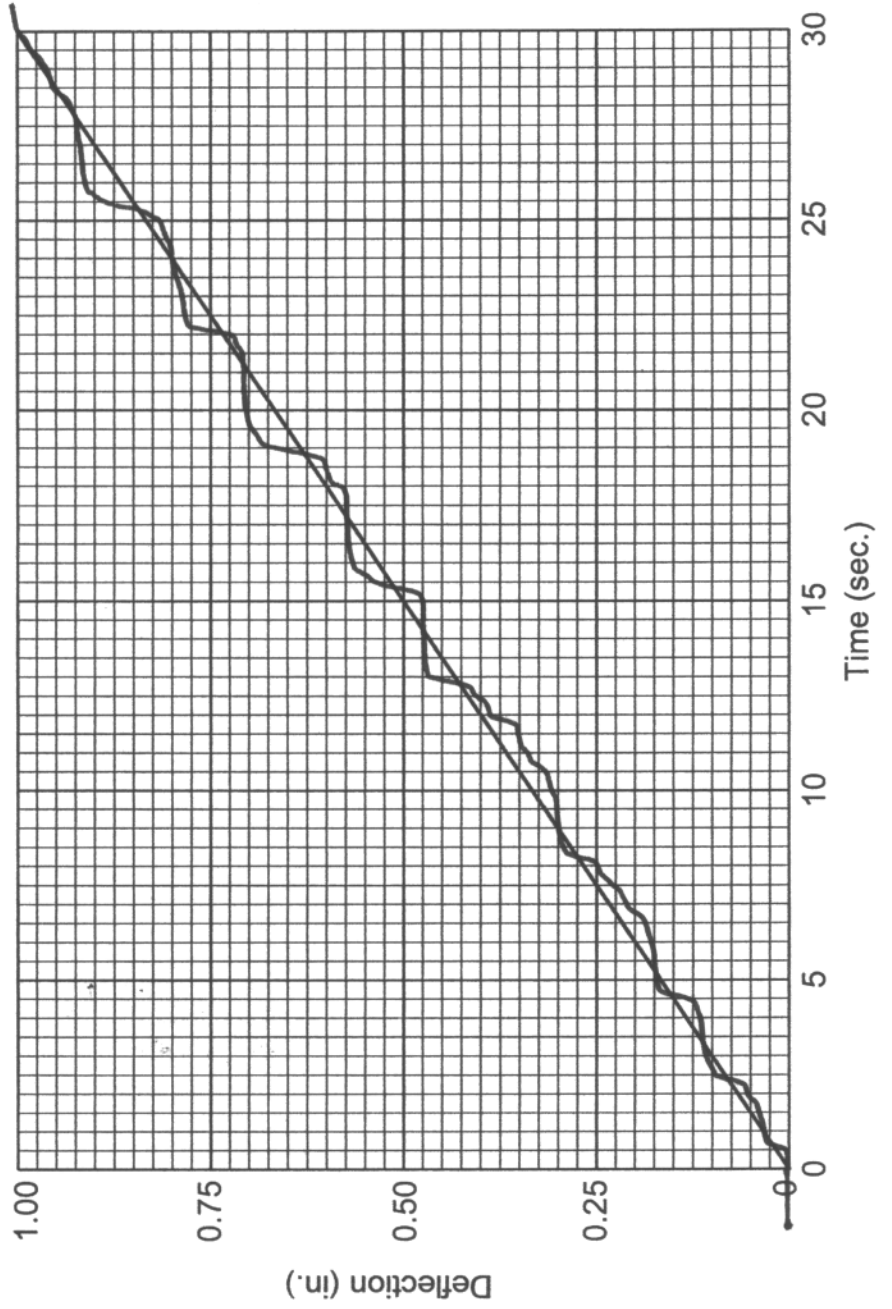
Date 8/29/03
Performed By [Signature]
Temp. 70
Humidity 50%

Foam No. A'x 29" I'



Compression - Deflection Resistance Test
Child Seat Foam

Date 8/29/05
 Temp 70°
 Humidity 50%
 Foam No. A"XZ4 I-3



Compression - Deflection Resistance Test Child Seat Foam

SEAT FOAM USAGE LOG

Foam I.D. Number

4" x 24" Fry

Date	Peak Load	Pass/Fail
8/29/03	22 LBS	Pass

SECTION 10

Child Dummy Calibration Data Traces and Tables

HYIII 3 Year Old Head Drop Test S/N:044

Part 572P Head Drop

Calibration Date: July 22, 2003

Serial No: 044

Work File: 4001

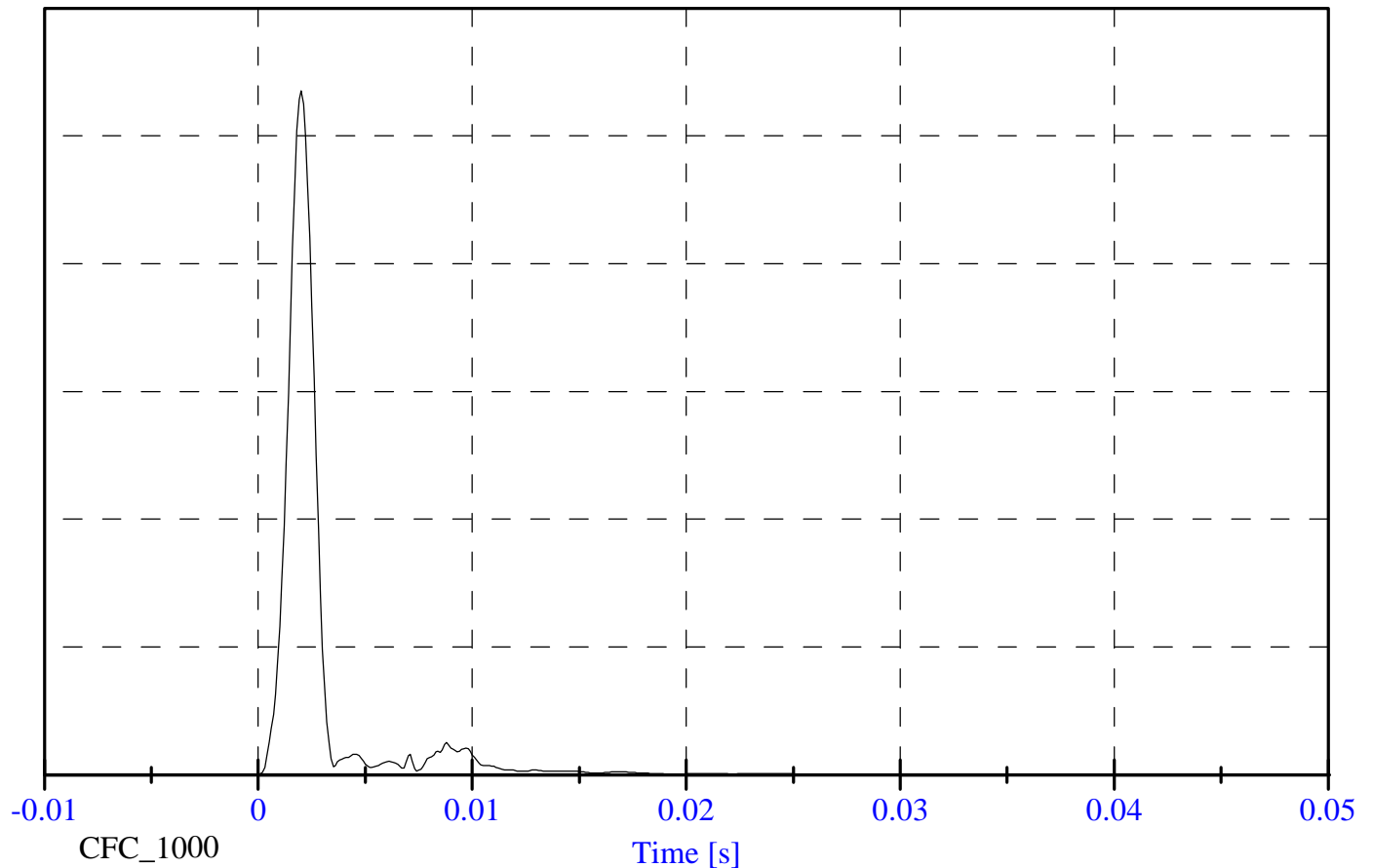
-----TEST RESULTS-----

<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	267.66 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	5.53 Gs	Passed
Curve PerCent NonModal:	< 10%	6.05 %	Passed

HYIII 3 Year Old Head Drop Test S/N:044 Head Resultant

Max: 267.7 [g] at 0.002 [s]

Min: 0.0 [g] at -0.080 [s]



Hybrid III Head Neck Extention Test S/N:044

Part 572P Neck Extension Test Calibration Date: July 22, 2003
Serial No: 144 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	3.89 ft/s	Passed
Pulse at 10 ms:	6.20- 8.20 ft/s	6.94 ft/s	Passed
Pulse at 14 ms:	9.20-11.50 ft/s	9.47 ft/s	Passed

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

Maximum Rotation:	83.0-93.0 Deg	86.18 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	-53.30--43.70 N-m	-45.61 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	71.60 ms	Passed

Hybrid III 3 Year Old Head Neck Flexion Test S/N:044

Part 572P Neck Flexion Test Calibration Date: July 22, 2003
Serial No: 044 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:	5.40- 5.60 m/s	5.60 m/s	Passed

-----PENDULUM PULSE-----

Pulse at 10 ms:	2.00- 2.70 m/s	2.13 m/s	Passed
Pulse at 15 ms:	3.00- 4.00 m/s	3.10 m/s	Passed
Pulse at 20 ms:	4.00- 5.10 m/s	4.20 m/s	Passed

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

Maximum Rotation:	70.0-82.0 Deg	81.53 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	42.00- 53.00 N-m	47.85 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	74.00 ms	Passed

Hybrid III 3 Year Old Thorax Test S/N:044

Part 572P Thorax Impact

Calibration Date:

July 22, 2003

Serial No: 044

Work File:

4001

-----TEST RESULTS-----

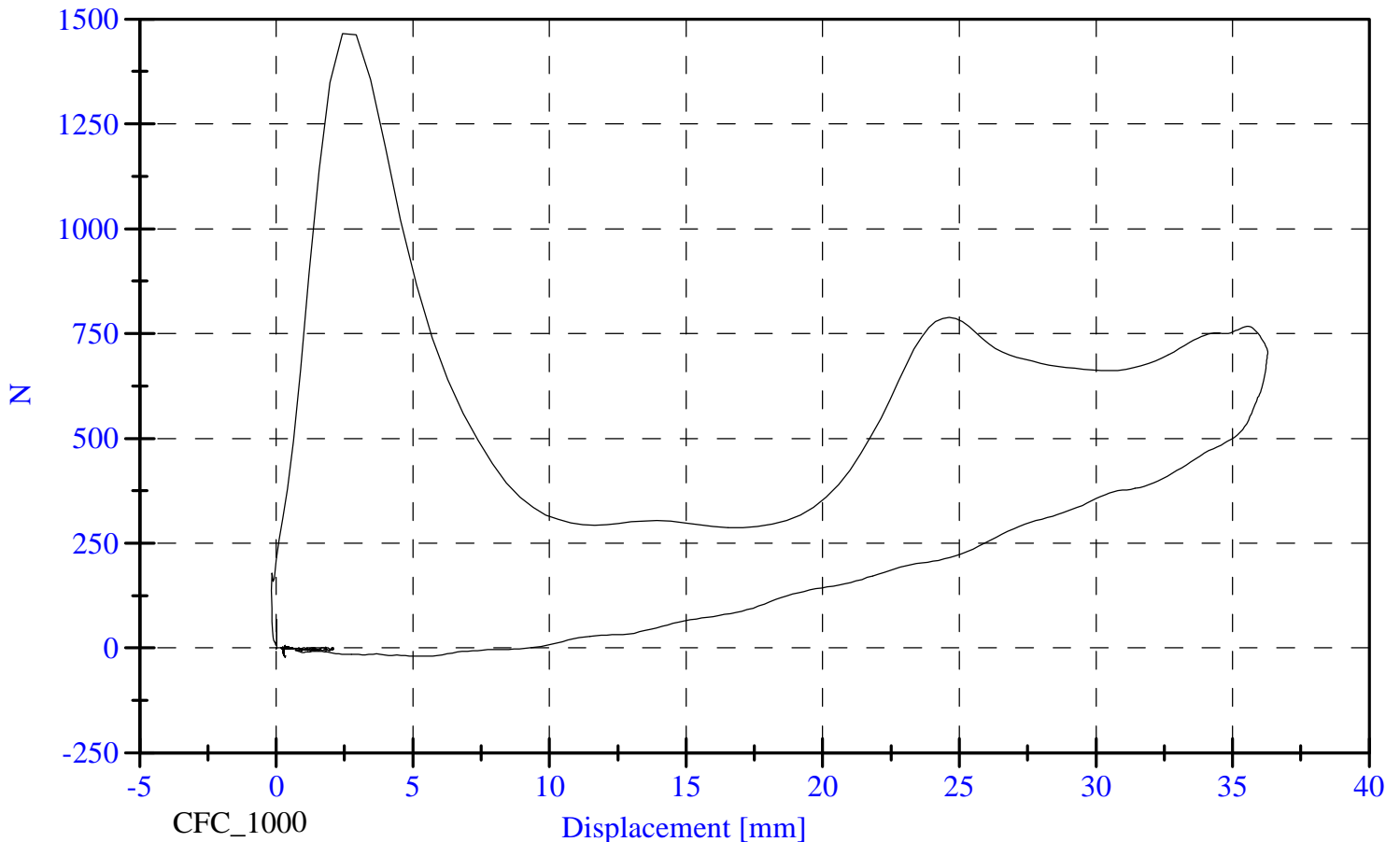
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	20.6-22.2 C	21.1 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Pendulum Velocity:	5.90- 6.10 m/s	6.08 m/s	Passed
Maximum Deflection:	32.00-38.00 mm	36.28 mm	Passed
Maximum Res. Force:	680.00- 810.00 N	767.48 N	Passed
Internal Hysteresis:	65-85 %	73.20 %	Passed
Pass Sternum Force Criteria?:	860.00 N	788.71	Passed

Hybrid III 3 Year Old Thorax Test S/N:044

Probe Force vs. Displacement

Max: 1465.5 [N] at 2.421 [mm]

Min: -21.7 [N] at 0.325 [mm]



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

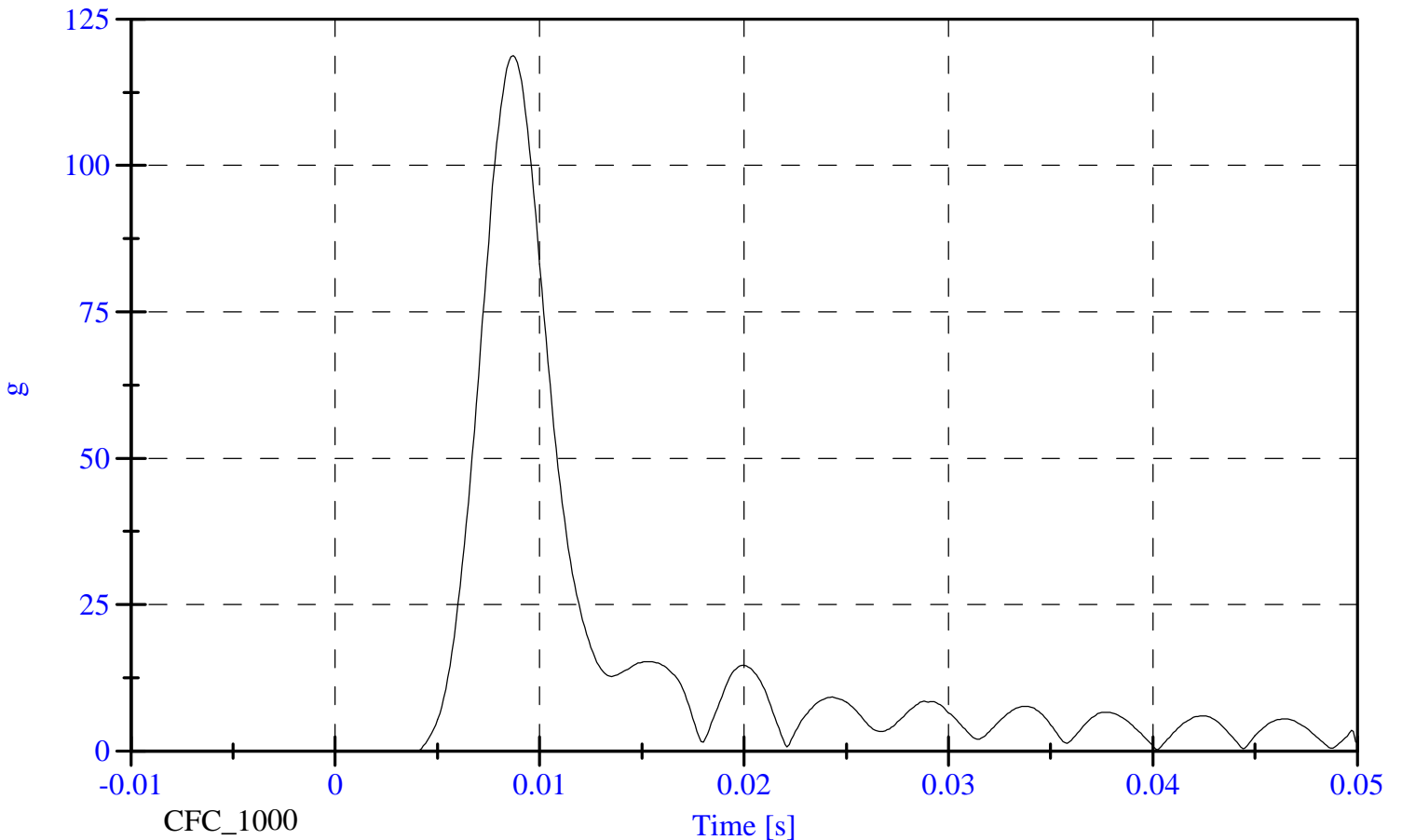
-----TEST RESULTS-----

<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

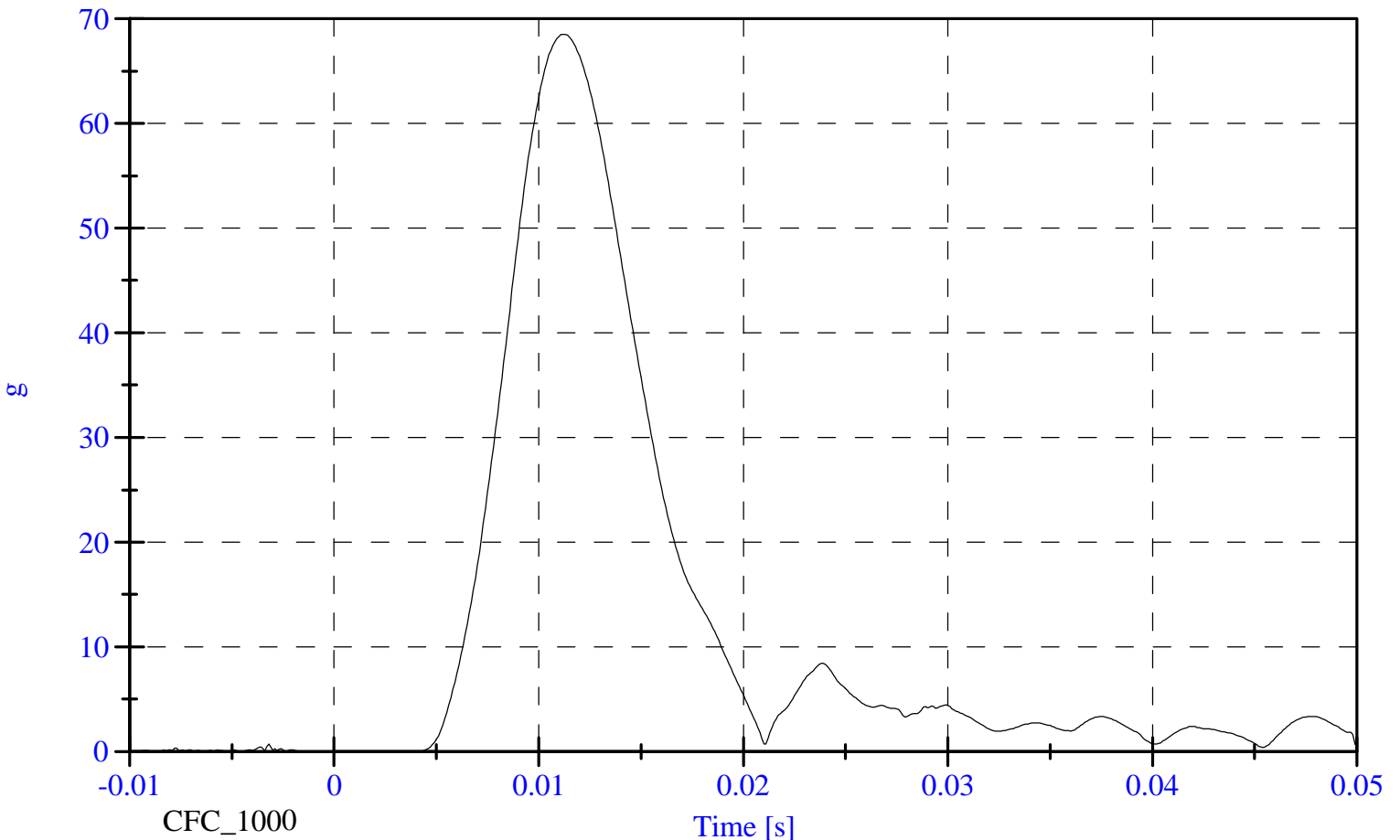
Work File: 4001

-----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 Extention Test S/N:102

Part 572R Neck Extension Test Calibration Date: July 24, 2003
Serial No: 102 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	1.12 m/s	Passed
Pulse at 10 ms:	1.50- 2.10 m/s	1.99 m/s	Passed
Pulse at 14 ms:	2.20- 2.90 m/s	2.56 m/s	Passed

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

Maximum Rotation:	80.0-92.0 Deg	84.72 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	-23.00--12.00 N-m	-17.31 N-m	Passed
Occipital Moment Decay:	76.0-90.0 ms	77.10 ms	Passed

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

Calibrations for Test 08-3-41

SHORTNAME	SENSCOM	CALDATE
Sled Ax	MFG: ENDEVCO S/N: 10301	6/23/2003
P3 HDCG Ax	MFG: ENDEVCO S/N: P17912	7/17/2003
P3 HDCG Ay	MFG: ENDEVCO S/N: P17743	7/17/2003
P3 HDCG Az	MFG: ENDEVCO S/N: P15319	6/26/2003
P3 HDCG RAz	MFG: ENDEVCO S/N: P16279	6/25/2003
P3 CHST Ax	MFG: ENDEVCO S/N: P15334	7/17/2003
P3 CHST Ay	MFG: ENDEVCO S/N: P15321	7/17/2003
P3 CHST Az	MFG: ENDEVCO S/N: P17758	7/17/2003
P3 CHST Dx	MFG: SERVO S/N: 044	7/22/2003
P3 PVCN Ax	MFG: ENDEVCO S/N: P16755	7/17/2003
P3 PVCN Ay	MFG: ENDEVCO S/N: P15591	7/17/2003
P3 PVCN Az	MFG: ENDEVCO S/N: P16155	7/17/2003
P3 NEKU Fx	MFG: Denton S/N: 248-FX	7/18/2003
P3 NEKU Fy	MFG: Denton S/N: 248-FY	7/18/2003
P3 NEKU Fz	MFG: Denton S/N: 248-FZ	7/18/2003
P3 NEKU Mx	MFG: Denton S/N: 248-MX	7/18/2003
P3 NEKU My	MFG: Denton S/N: 248-MY	7/18/2003
P3 NEKU Mz	MFG: Denton S/N: 248-MZ	7/18/2003
P3 NEKL Fx	MFG: Denton S/N: 249Fx	7/18/2003
P3 NEKL Fy	MFG: Denton S/N: 249Fy	7/18/2003
P3 NEKL Fz	MFG: Denton S/N: 249Fz	7/18/2003
P3 NEKL Mx	MFG: Denton S/N: 249Mx	7/18/2003
P3 NEKL My	MFG: Denton S/N: 249My	7/18/2003
P3 NEKL Mz	MFG: Denton S/N: 249Mz	7/18/2003
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: 283-MX	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 08-3-41 North View

Test 08-3-41 South View