

REPORT NUMBER: SNCAP-CAL-07-09

**NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT TEST**

Graco Snugride Rear Facing

NHTSA NUMBER: M85501

CALSPAN TEST NUMBER: 8765-SNCAP/CRS-26

CALSPAN
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
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September 13, 2007

FINAL REPORT

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U.S. DEPARTMENT OF TRANSPORTATION
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Approval Date: _____

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16. Abstract This CRS test was performed in conjunction with a New Car Assessment Program (NCAP) 55/28 kph 90 ⁰ Impact Moving Deformable Barrier NCAP Side Impact Test. A Graco Snugride rearward facing infant restraint was secured in Position 3 (P3) with the LATCH system. This test was conducted at the Calspan Corporation Crash Test Facility in Buffalo, New York, on September 13, 2007.			
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SECTION 1

PURPOSE AND SUMMARY OF TEST M85501

The purpose of this test was to obtain CRS performance data in a side impact NCAP condition. These data constitute part of the general consumer information collected by the New Car Assessment Program (NCAP).

The 62.6 kph NCAP frontal impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) Side Impact NCAP Laboratory Test Procedure.

SUMMARY

The child dummy was instrumented with head and chest triaxial accelerometers. In addition, redundant head z acceleration, upper six axial neck force and moment transducers were utilized.

The right rear (Position 3) child dummy (serial no. 102) was calibrated previous to this test. Child dummy certification information is found in section 5.

The right rear child dummy's HIC (15 ms) was 88.7, maximum chest deceleration over 3 ms was 22.2 g's.

SECTION 2
DATA SHEET NO. 1
CRASH TEST SUMMARY

TEST DUMMY INFORMATION:

DESCRIPTION	Position #3 CRS
ATD Type/Serial No.	CRABI/102
Restraint System:	Graco Snugride Rear Facing

Number of Data Channels _____ 17 _____
Number of Cameras: _____ 1 _____ Real Time
_____ 1 _____ High Speed

POST TEST DOOR OPENING

DESCRIPTION	FRONT	REAR
Left Side Doors	Doors remained closed and latched	Doors remained closed and latched
Right Side Doors	Doors remained closed and latched Doors opened without tools	Doors remained closed and latched Doors opened without tools
Hatch/Other Door	N/A	Closed, latched, operable without tools

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
P1 (Left Front)	0	None
P2 (Right Front)	0	None
P3 (Right Rear)	N/A	N/A
P4 (Left Rear)	N/A	N/A

VISIBLE DUMMY CONTACT POINTS

	Position #3 CRS
Head Contact:	Right side of head/face with CRS
Upper Torso Contact:	None
Lower Torso Contact:	None
Left Knee Contact:	None
Right Knee Contact:	Right Side of CRS

DATA SHEET NO. 2

CRS PARAMETER DATA

CRS: _Graco Snugride Rear Facing

NHTSA No. M85501

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Delivered Weight of Vehicle with Maximum Fluids = 1394.0 kg (A)

AS TESTED WEIGHT OF VEHICLE (2 ATDs + 2 CRABI w/ CRS +CARGO + EQUIPMENT & INSTRUMENTATION):

Left Front	=	<u>436.0</u>	kg	Left Rear	=	<u>393.5</u>	kg
Right Front	=	<u>404.0</u>	kg	Right Rear	=	<u>362.5</u>	kg
TOTAL FRONT	=	<u>840.0</u>	kg	TOTAL REAR	=	<u>756.0</u>	kg
TOTAL TEST WEIGHT	=	<u>1596.0</u>	kg				

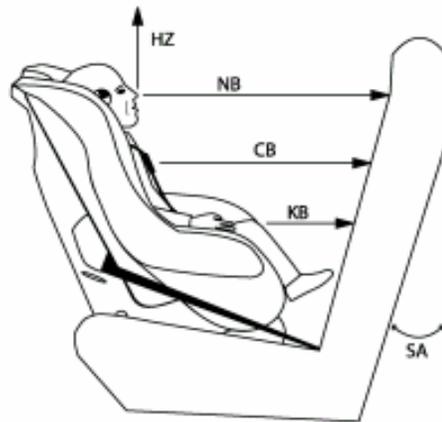
DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

CRS: Graco Snugride Rear Facing

NHTSA No. M85501

Dummy Measurements for Rear-facing CRS Passengers



X—Z View

HZ	-	Head to Roof
NB	-	Nose to Front of Back Seat
CB	-	Chest to Front of Back Seat
KB	-	Knee to Front of Back Seat
SA	-	Seat Back Angle

Measurement	Millimeters unless noted
	P3 CRS (102)
SA	44 °
HZ	429
NB	596
CB	482
KB – LEFT	237
KB – RIGHT	237

All dimensions in mm (unless noted)
 P3 – Right Rear Passenger (CRS #1)

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

CRS: Graco Snugride Rear Facing

NHTSA No. M85501

HEAD INJURY CRITERIA (HIC)

	HIC15				HIC36			
	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #3 - Right	88.7	99.8	114.8	32.3	145.6	92.2	128.2	27.7

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #3 - Right	22.2	99.9	102.9	112.0

* The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

DATA SHEET NO. 5

CRS PERFORMANCE DATA

CRS: Graco Snugride Rear Facing

NHTSA No. M85501

		MAXIMUM VALUE			
DESCRIPTION	Unit	Positive	Time (ms)	Negative	Time (ms)
P3 CRS X	g	11.9	384.2	-33.6	358.8
P3 CRS Y	g	31.7	43.2	-54.4	358.9
P3 CRS Z	g	16.5	109.6	-32.1	358.6
P3 CRS Resultant	g	71.3	358.8	0	-45.8

DATA SHEET NO. 5

CRS PERFORMANCE DATA (CONTINUED)

CRS: Graco Snugride Rear Facing

NHTSA No. M85501

POSITION #3 CRS POST-TEST INSPECTION (Model No. 8465DEN3)

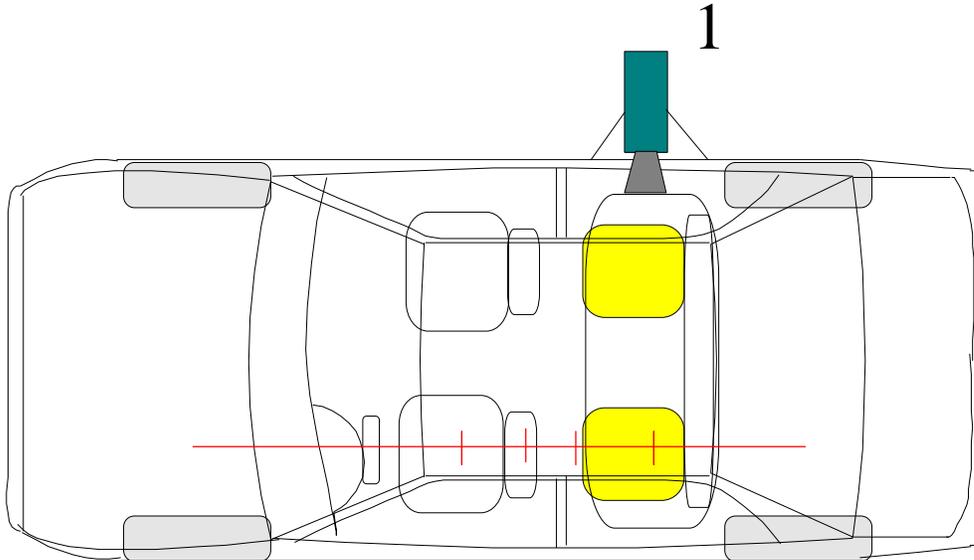
LOCATION	DAMAGE	REMARKS
Upper Tether Strap	N/A	N/A
Upper Tether Buckle	N/A	N/A
Upper Tether Hook	N/A	N/A
Vehicle Upper Tether Anchor	N/A	N/A
Lower Anchor Strap	No	None
Lower Anchor Buckle	No	None
Lower Anchor Hooks	No	None
Vehicle Lower CRS Anchors	No	None
Five Point Harness Connections	No	None
Cracks on CRS	No	None
Fabric Tears on CRS	No	None
Vehicle Seat Structure	No	None
Vehicle Seat Fabric Tears	No	None
Child Dummy	No	None

DATA SHEET NO. 6

CRS CAMERA DATA

CRS: Graco Snugride Rear Facing

NHTSA No. M85501



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Right side CRS lateral view	1530	1710	1156	-5	12.5	1000

* Reference (from point of impact); all measurements accurate to within ± 6 mm.

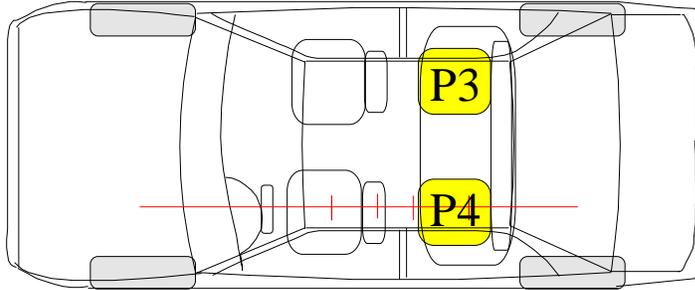
Reference Points X - Impact Line (Positive – Impact Point Forward)
 Y - MDB Left Edge Impact Point (Positive – To Right)
 Z - Ground Plane (Positive – Down)

DATA SHEET NO. 7

CRS ANCHIOR DATA

CRS: Graco Snugride Rear Facing

NHTSA No. M85501



Description	P3		
	X*	Y*	Z*
Outboard Seatbelt floor anchor	1323	-568	-125
Inboard Seatbelt buckle anchor	1300	-195	-154
D-Ring Anchor	1050	-664	467
Inboard LATCH anchor	1273	-250	-94
Outboard LATCH anchor	1276	-526	-95
Top Tether anchor	732	-344	490

* Reference (from rear bumper centerline); all measurements accurate to within ± 6 mm.

- X = + Forward
- Y = + To Right
- Z = + Up

SECTION 3

PHOTOGRAPHS

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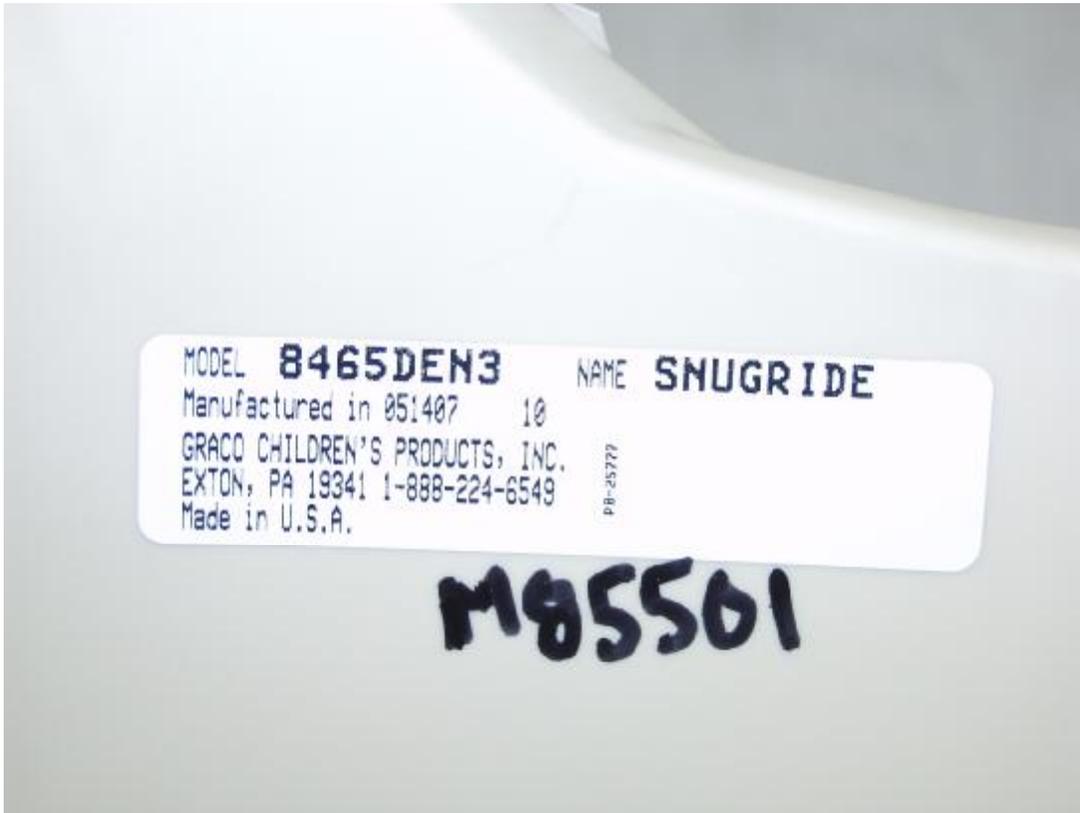


Figure 3-1: CLOSE-UP VIEW OF POSITION 3CRS BASE LABEL

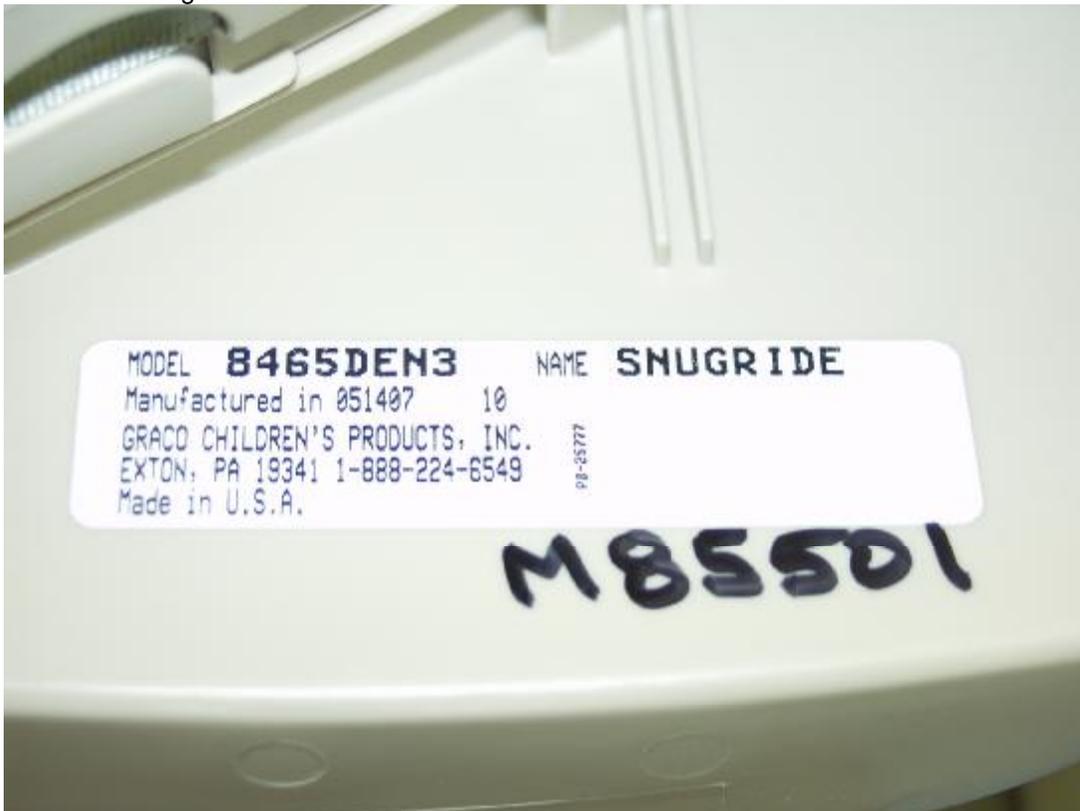


Figure 3-2: CLOSE-UP VIEW OF POSITION 3CRS CARRIER LABEL



Figure 3-3: PRE-TEST FRONTAL VIEW OF POSITION 3CRS



Figure 3-4: POST-TEST FRONTAL VIEW OF POSITION 3CRS



Figure 3-5: PRE-TEST REAR VIEW OF POSITION 3CRS



Figure 3-6: POST-TEST REAR VIEW OF POSITION 3CRS



Figure 3-7: PRE-TEST LEFT SIDE VIEW OF POSITION 3CRS



Figure 3-8: PRE-TEST LEFT SIDE VIEW OF POSITION 3CRS



Figure 3-9: PRE-TEST RIGHT SIDE VIEW OF POSITION 3 CRS



Figure 3-10: POST-TEST RIGHT SIDE VIEW OF POSITION 3 CRS



Figure 3-11: PRE-TEST POSITION 3 LEFT SIDE VIEW



Figure 3-12: POST-TEST POSITION 3 LEFT SIDE VIEW



Figure 3-13: PRE-TEST POSITION 3 RIGHT SIDE VIEW



Figure 3-14: POST-TEST POSITION 3 RIGHT SIDE VIEW



Figure 3-15: PRE-TEST POSITION 3 REAR VIEW



Figure 3-16: POST-TEST POSITION 3 REAR VIEW

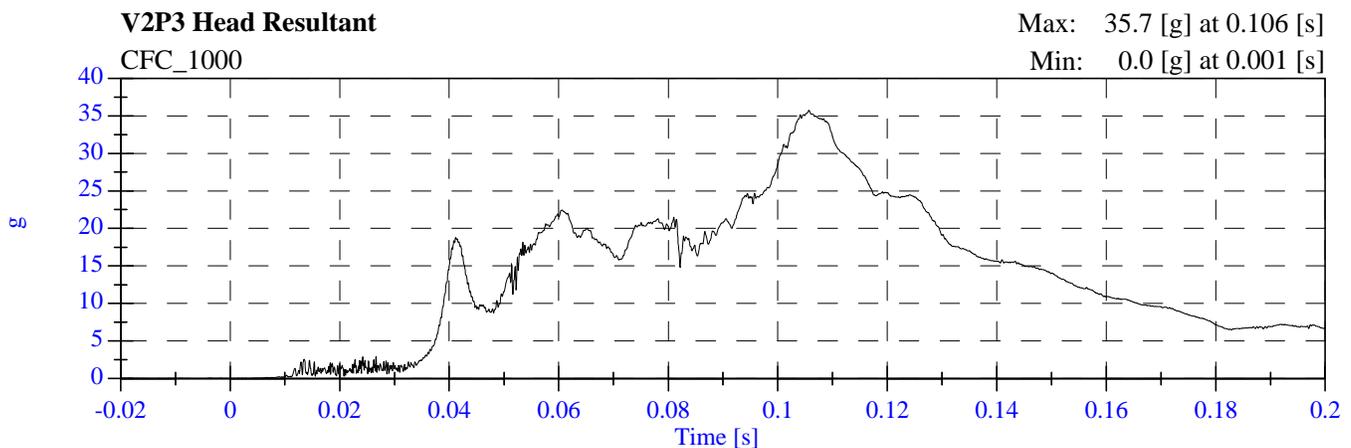
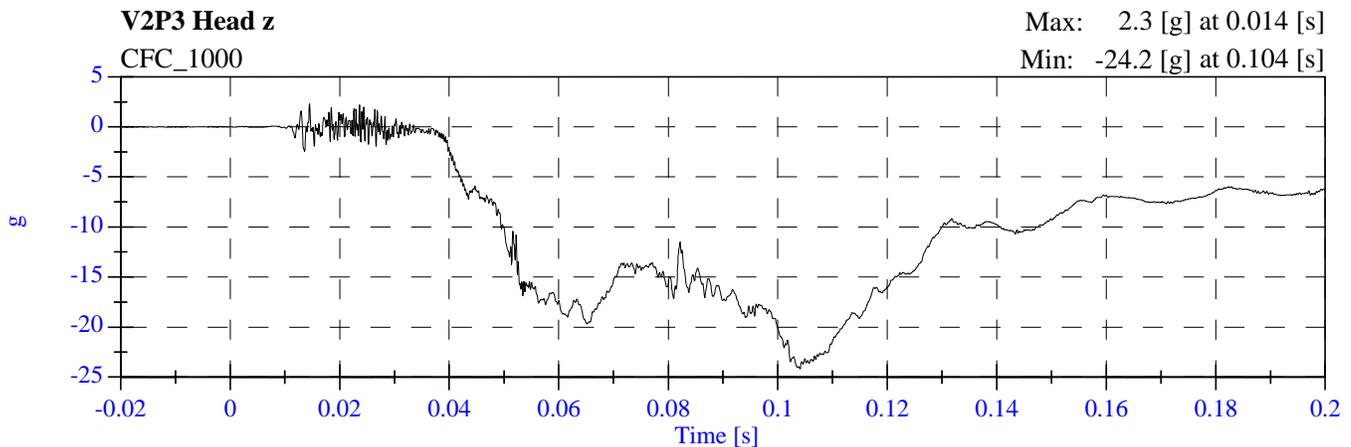
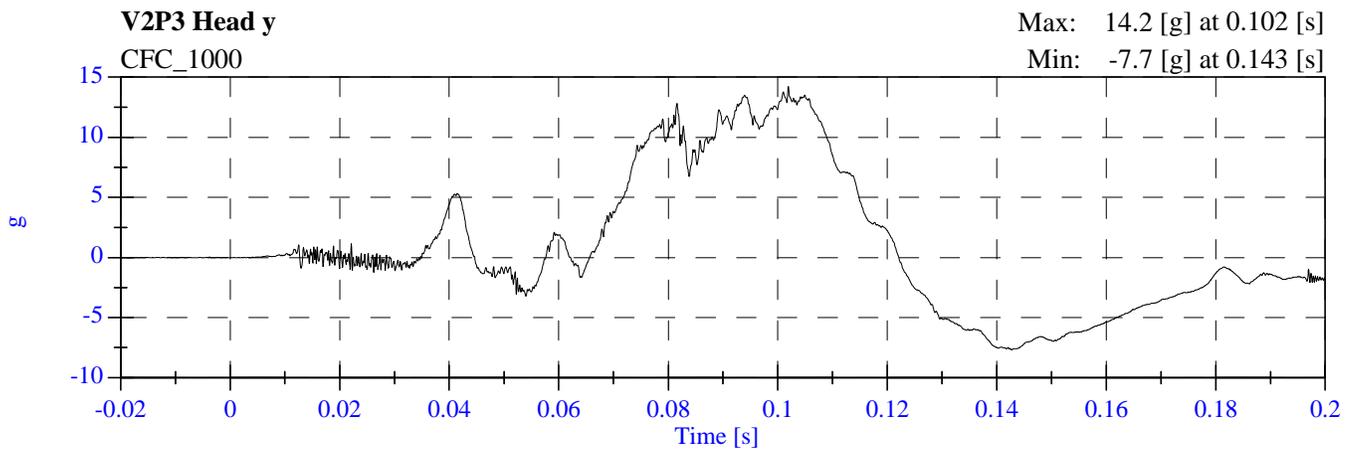
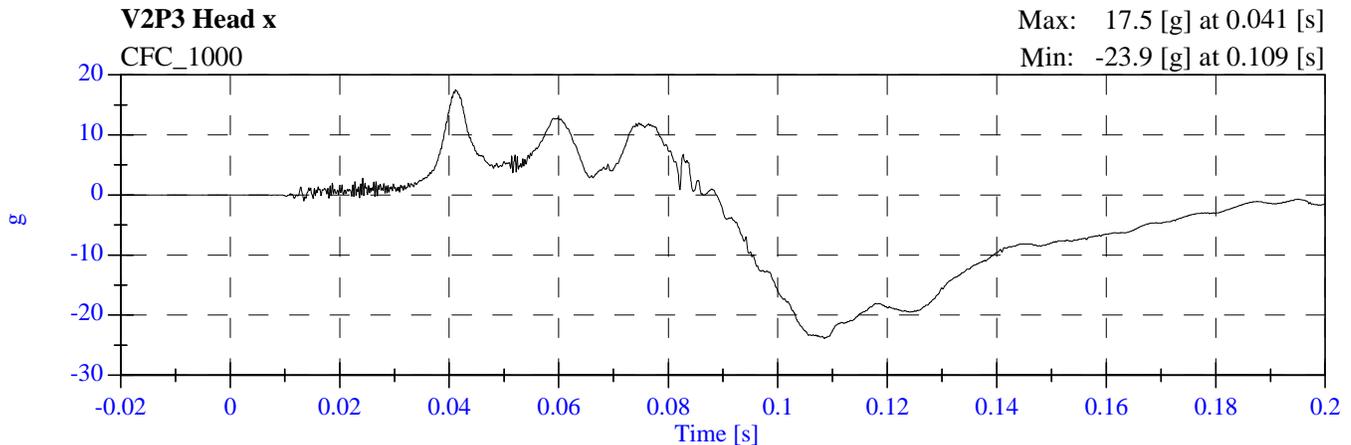
SECTION 4

CHILD DUMMY RESPONSE AND CRS DATA TRACES

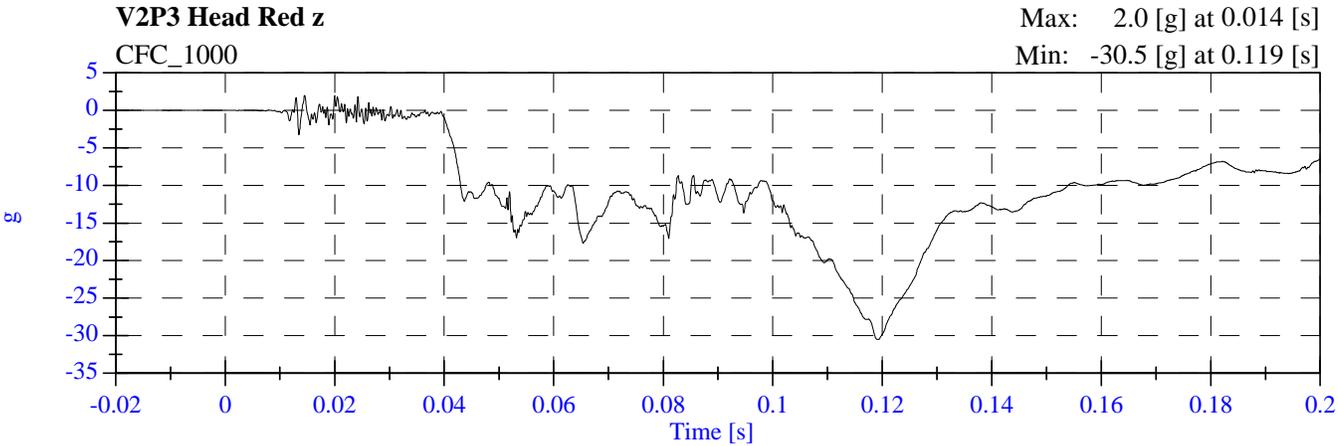
TABLE OF DATA PLOTS

PLOT	PLOT NAME [UNITS, FILTER CLASS]	PAGE
1	P3 Head x [g, CFC_1000]	4-3
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5	P3 Head Red z [g, CFC_1000]	4-4
6	P3 Chest x [g, CFC_180]	4-5
7	P3 Chest y [g, CFC_180]	4-5
8	P3 Chest z [g, CFC_180]	4-5
9	P3 Chest Resultant [g, CFC_180]	4-5
11	P3 Child Seat x [g, CFC_60]	4-6
12	P3 Child Seat y [g, CFC_60]	4-6
13	P3 Child Seat z [g, CFC_60]	4-6
14	P3 Child Seat Resultant [g, CFC_60]	4-6

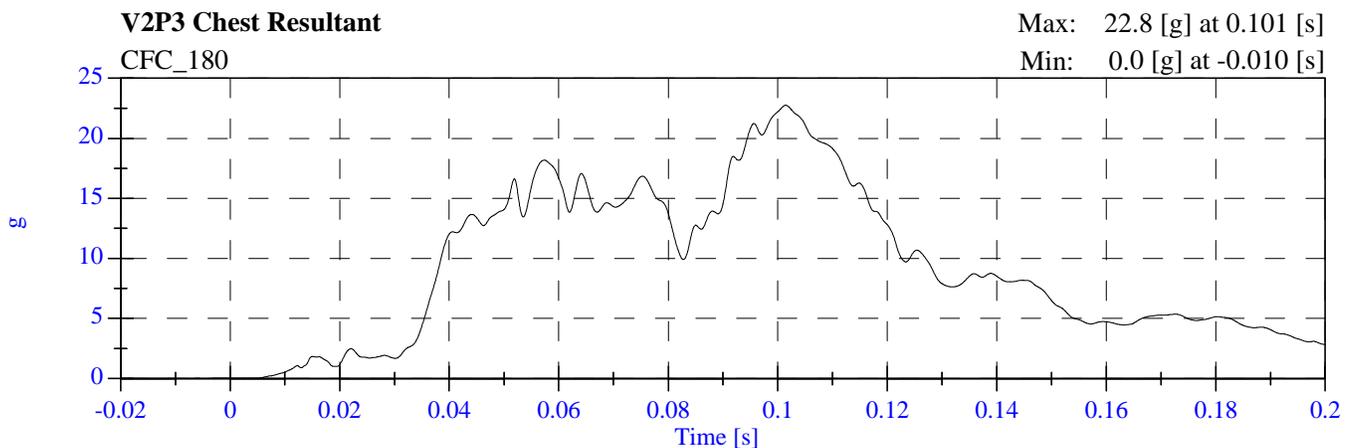
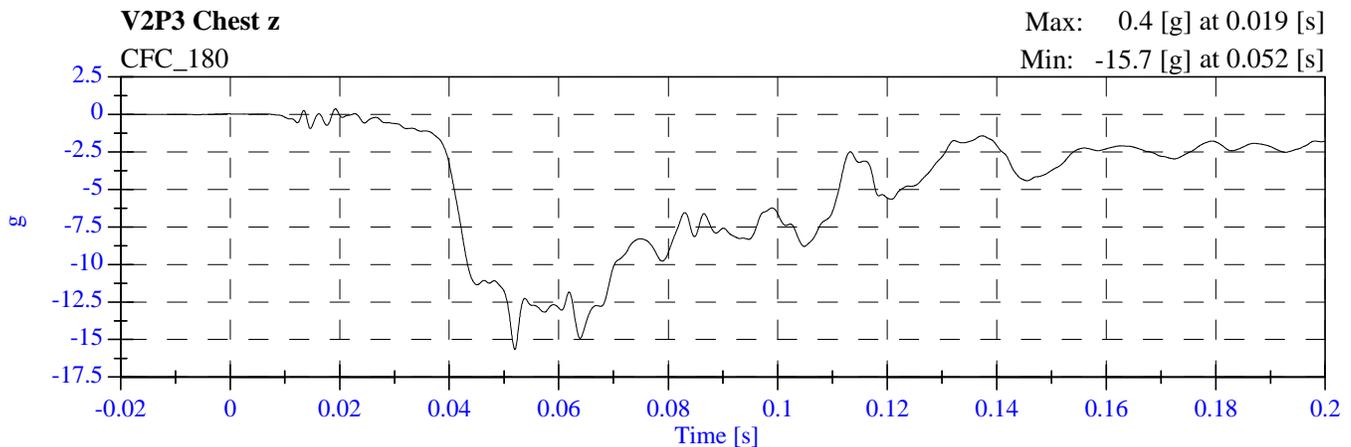
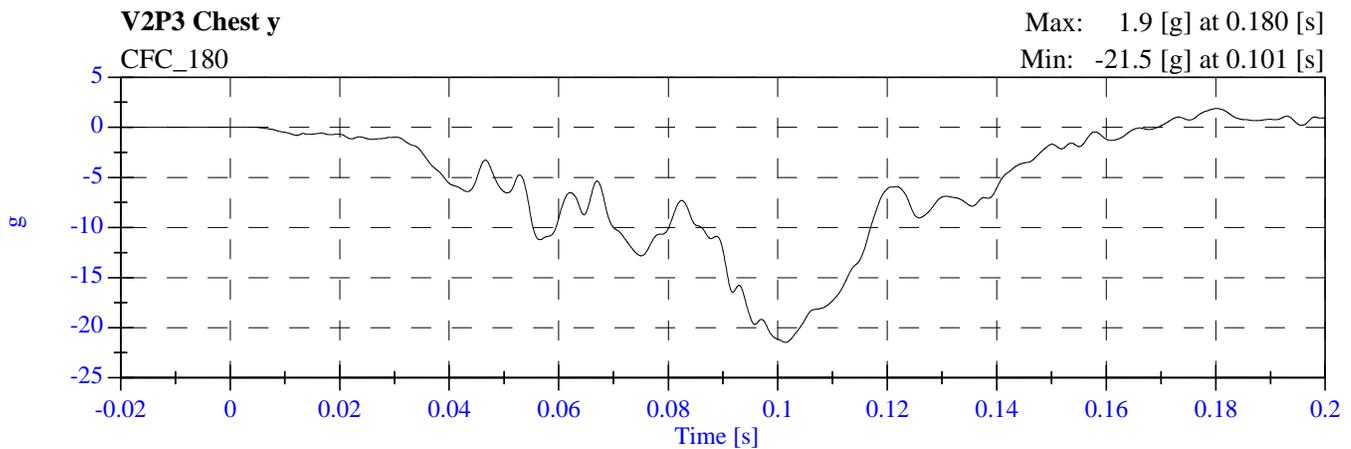
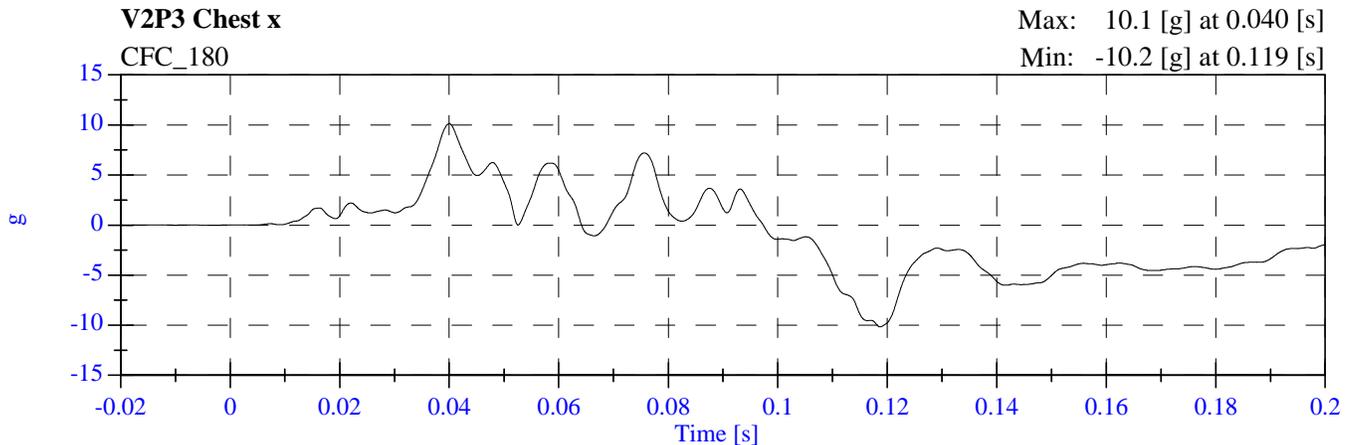
2008 SNCAP Test 1 2008 Subaru Imperza M85501 - September 13, 2007



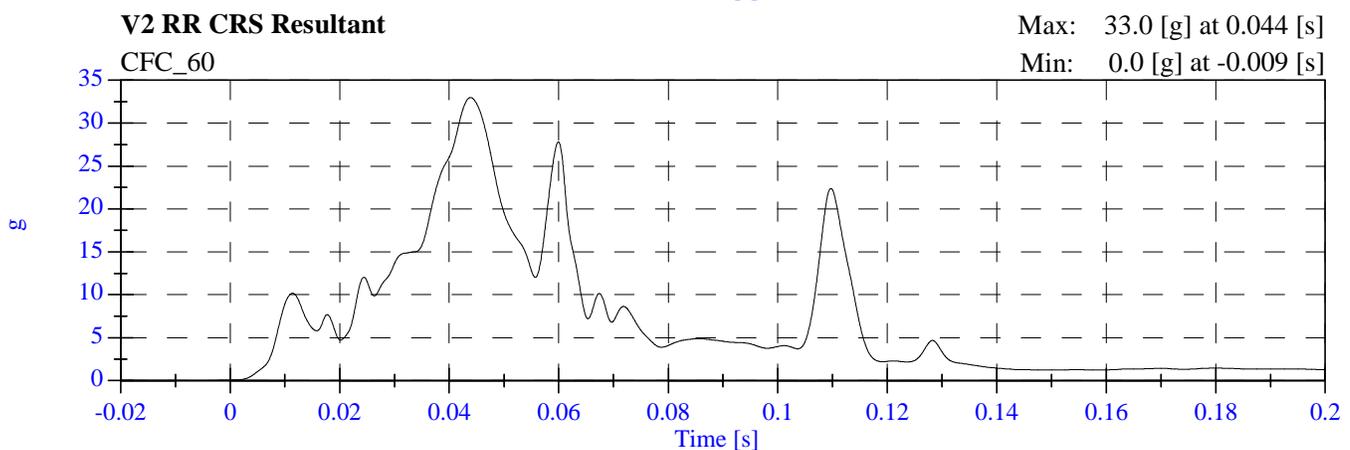
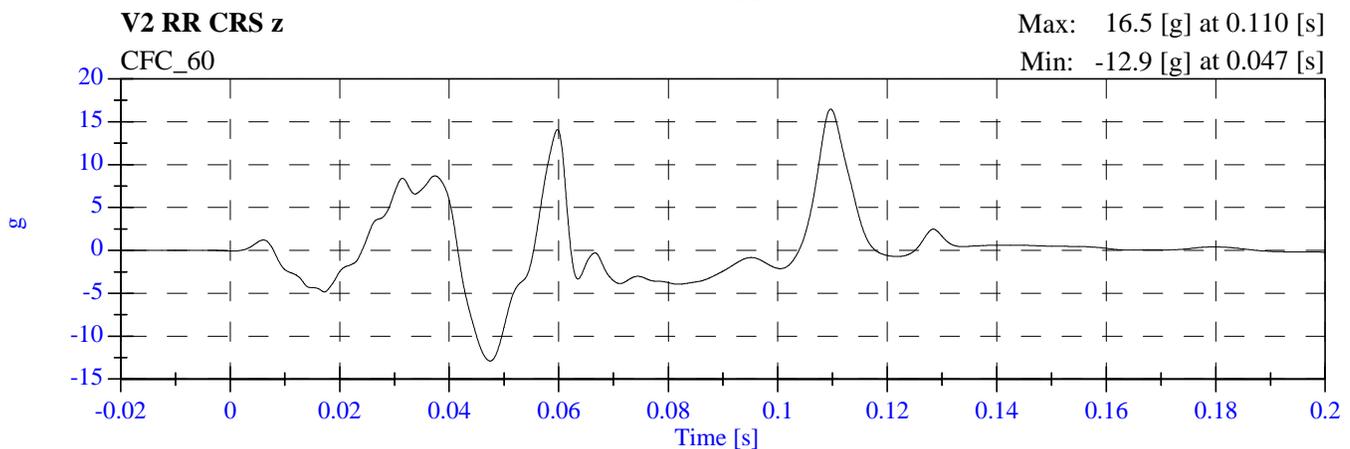
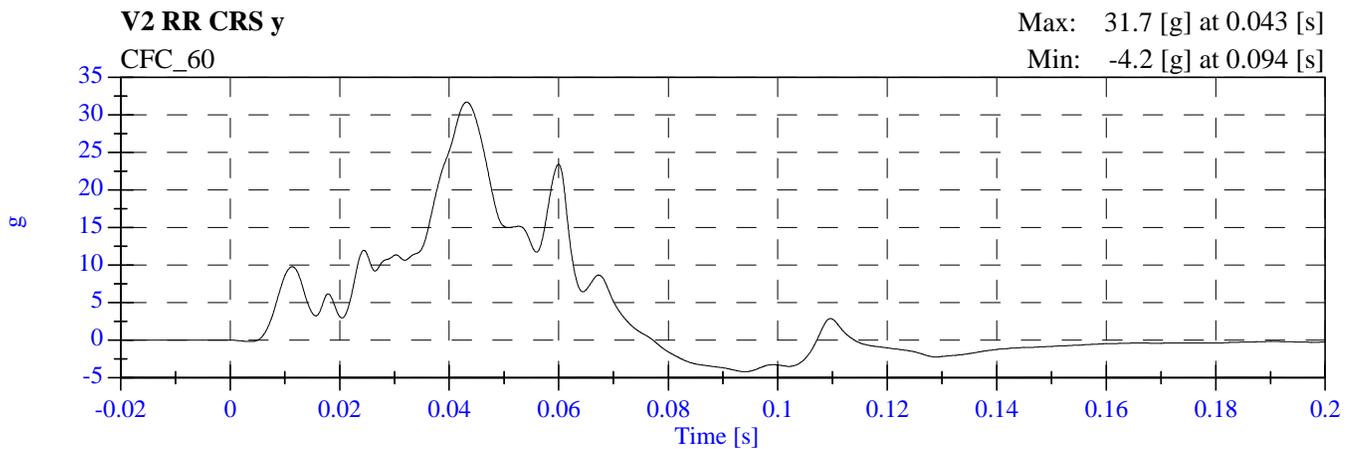
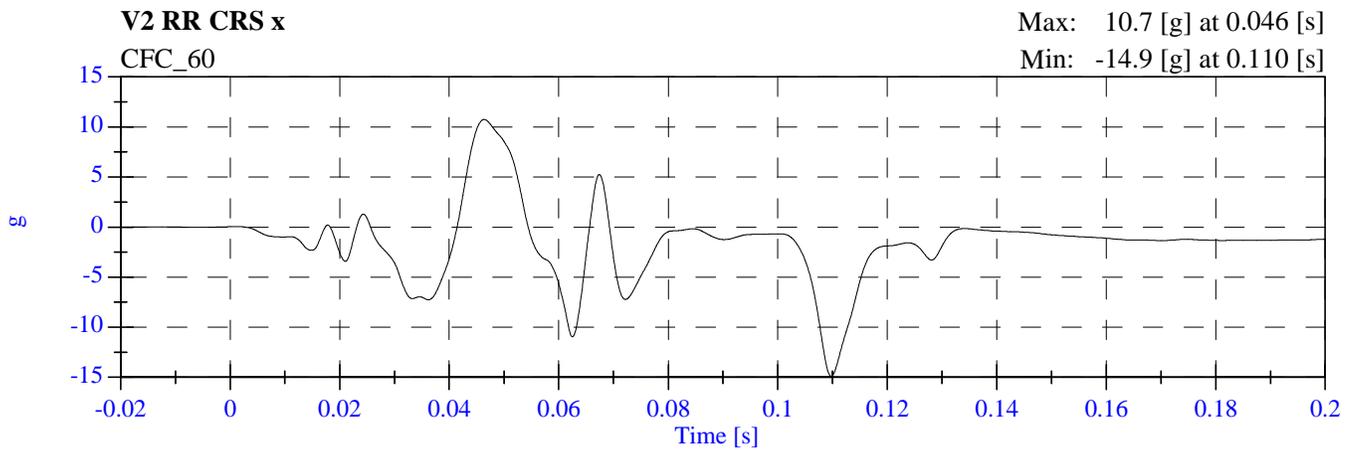
**2008 SNCAP Test 1 2008 Subaru Imperza
M85501 - September 13, 2007**



2008 SNCAP Test 1 2008 Subaru Imperza M85501 - September 13, 2007



2008 SNCAP Test 1 2008 Subaru Imperza M85501 - September 13, 2007



SECTION 5

CHILD DUMMY CALIBRATION INFORMATION

Head Drop Frontal

Part 572R Frontal Head Drop

Calibration Date: 01-15-07

Serial No: 102

Work File: Crabi_102_HD1_01-15

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

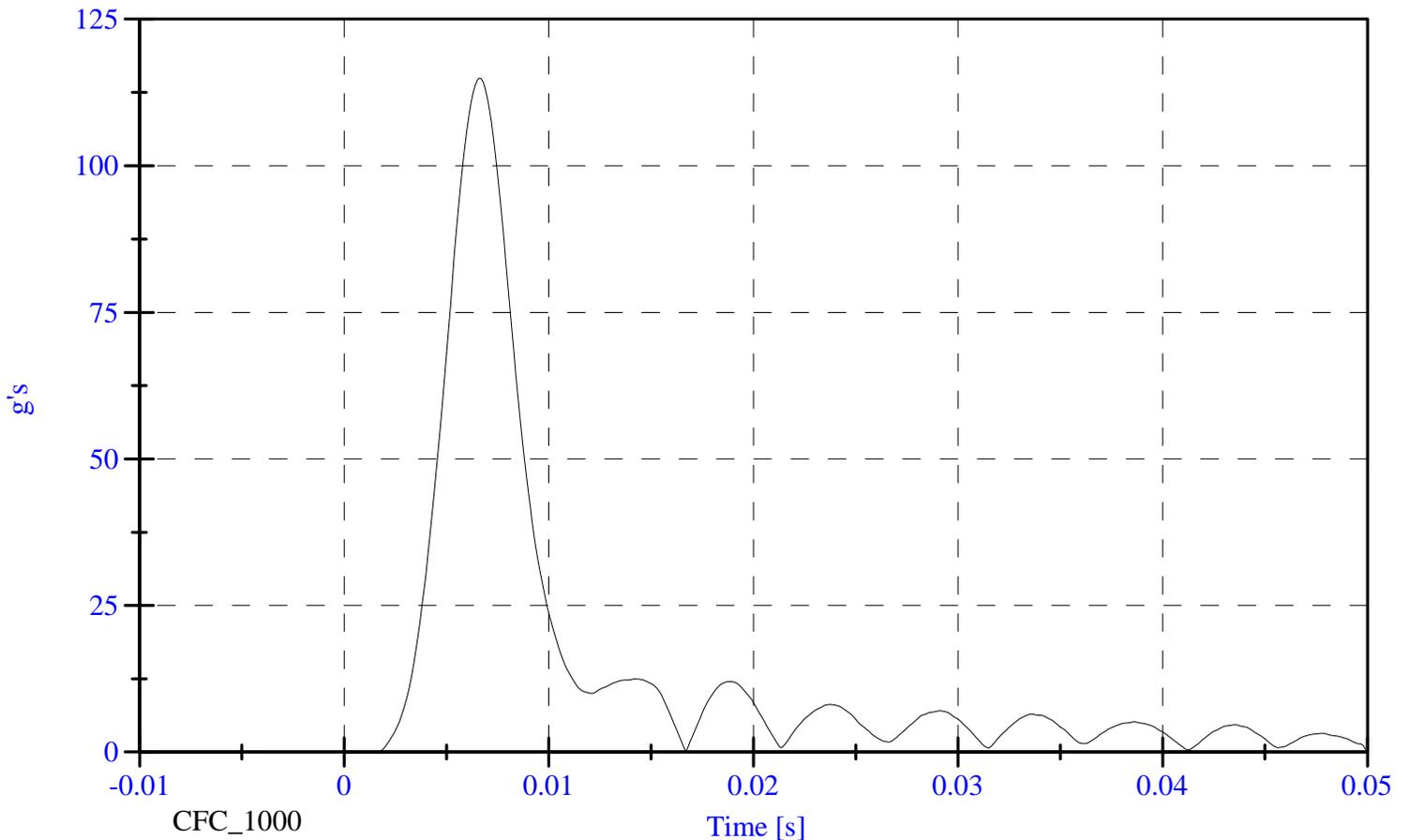
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.1 C	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Peak Resultant Accel.:	100-120 Gs	114.95 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	13.62 Gs	Passed
Curve PerCent NonModal:	< 17%	10.85 %	Passed

Head Drop Frontal

Head Resultant

Max: 114.9 [g's] at 0.007 [s]

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



Head Drop Rear

Part 572R Rear Head Drop

Calibration Date: 01-15-07

Serial No: 102

Work File: Crabi_102_HD_Rear_01-15-07

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

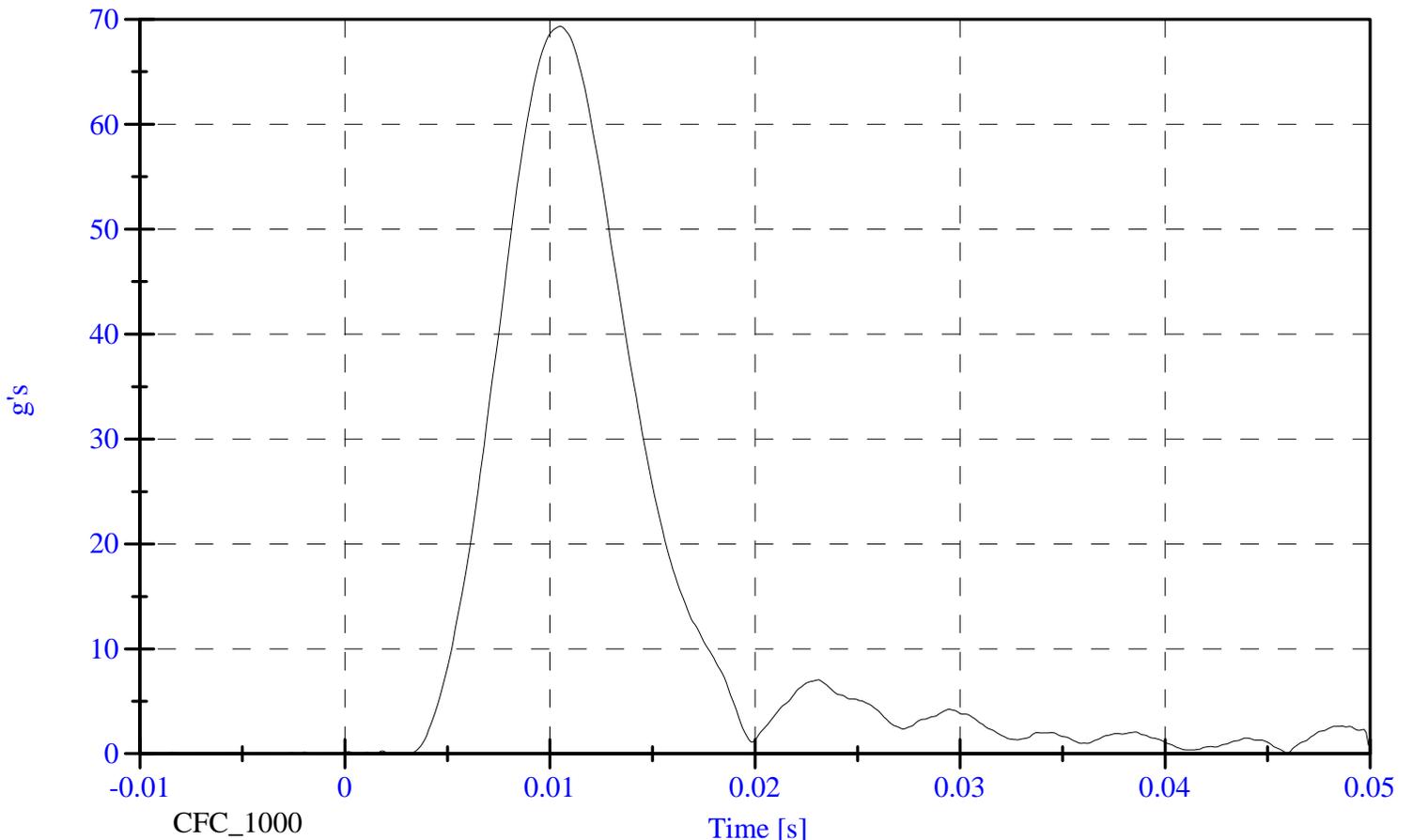
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	36.00 %	Passed
Peak Resultant Accel.:	55-71 Gs	69.35 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	7.02 Gs	Passed
Curve PerCent NonModal:	< 17%	10.15 %	Passed

Head Drop Rear

Head Resultant

Max: 69.3 [g's] at 0.011 [s]

Min: 0.0 [g's] at 0.001 [s]



Neck Flexion

Part 572R

Neck Flexion Test

Calibration Date:

01-15-07

Serial No:

102

Work File:

Crabi_102_NF1_01-15-

-----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	5.25 m/s	Passed

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

Pulse at 10 ms:	1.60- 2.30 m/s	1.79 m/s	Passed
Pulse at 20 ms:	3.40- 4.20 m/s	3.77 m/s	Passed
Pulse at 25 ms:	4.30- 5.20 m/s	4.58 m/s	Passed

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

Maximum Rotation:	75.0-86.0 Deg	85.14 Deg	Passed
-------------------	---------------	-----------	--------

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

Max Occipital Moment:	36.00- 45.00 N-m	42.67 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	74.00 ms	Passed

FM-ATDLAB-572.143E-0005-R00

Neck Extension

Part 572R

Neck Extension Test

Calibration Date:

01-15-07

Serial No:

102

Work File:

Crabi_102_NE_01-15-0

-----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 %	36.00 %	Passed
Test Pendulum Speed:	7.90- 8.50 ft/s	7.95 ft/s	Passed

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

Pulse at 6 ms:	2.60- 3.90 ft/s	2.80 ft/s	Passed
Pulse at 10 ms:	4.90- 6.90 ft/s	5.28 ft/s	Passed
Pulse at 14 ms:	7.20- 9.50 ft/s	8.02 ft/s	Passed

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

Maximum Rotation:	80.0-92.0 Deg	80.60 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	-23.00--12.00 N-m	-12.85 N-m	Passed
Occipital Moment Decay:	76.0-90.0 ms	86.10 ms	Passed

FM-ATDLAB-572.143E-0005-R00

Thorax Impact

Part 572R Thorax Impact

Calibration Date: 01-16-07

Serial No: 102

Work File: Crabi_102_T2_01-16-07

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

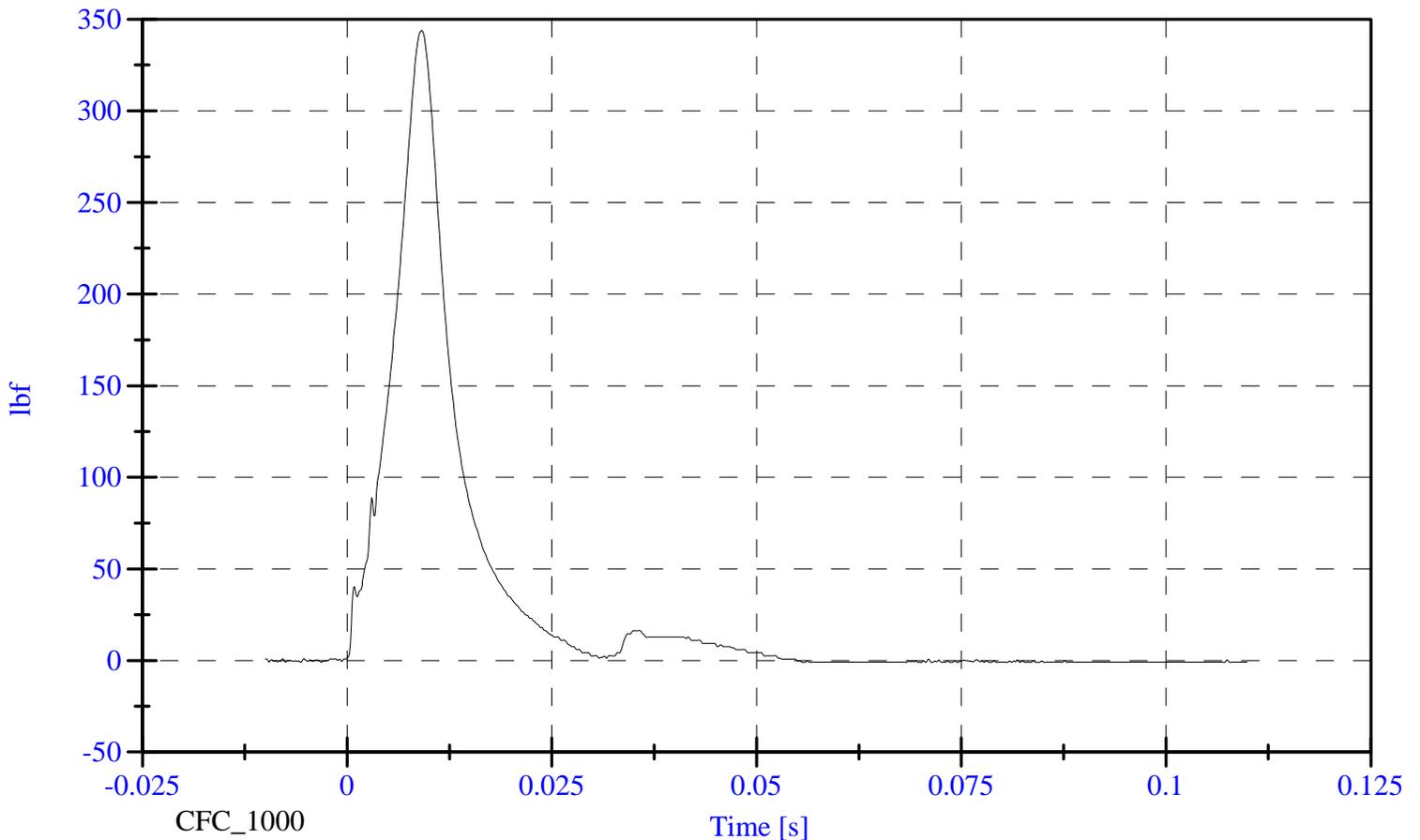
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	69.0-72.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Pendulum Velocity:	16.20-16.80 ft/s	16.42 ft/s	Passed
Maximum Res. Force:	340.70- 404.10 lbf	344.01 lbf	Passed

Thorax Impact

Probe Force vs. Time

Max: 344.0 [lbf] at 0.009 [s]

Min: -1.1 [lbf] at 0.082 [s]



SECTION 6

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572R INSTRUMENTATION

	POSITION #3 (RIGHT) SERIAL NO.: 102		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
HEAD AX	AC-P51288	ENDEVCO	24-Jul-07
HEAD AY	AC-P51295	ENDEVCO	24-Jul-07
HEAD AZ	AC-P51282	ENDEVCO	24-Jul-07
HEAD RAZ	AC-P51298	ENDEVCO	24-Jul-07
UPPER NECK FX	LC-231Fx	DENTON	24-Jul-07
UPPER NECK FY	LC-231Fy	DENTON	24-Jul-07
UPPER NECK FZ	LC-231Fz	DENTON	24-Jul-07
UPPER NECK MX	LC-231Mx	DENTON	24-Jul-07
UPPER NECK MY	LC-231My	DENTON	24-Jul-07
UPPER NECK MZ	LC-231Mz	DENTON	24-Jul-07
CHEST AX	AC-B02A18-N21	ENTRAN	24-Jul-07
CHEST AY	AC-99H30-Z14	ENTRAN	24-Jul-07
CHEST AZ	AC-00L13-F39	ENTRAN	24-Jul-07

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

VEHICLE AND MDB INSTRUMENTATION

	VEHICLE AND CRS INSTRUMENTS		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
P3 CRS (X)	AC-P18948	ENDEVCO	09-Aug-07
P3 CRS (Y)	AC-P14965	ENDEVCO	09-Aug-07
P3 CRS (Z)	AC-P17563	ENDEVCO	09-Aug-07

REMARKS: None