REPORT NUMBER: TWG-KAR-17-006

SIDE AIRBAG OCCUPANT RISK PROGRAM
OCCUPANT OUT-OF-POSITION TESTS

NISSAN MOTOR CO., LTD
2017 NISSAN FRONTIER CREW CAB 4WD
4-DOOR TRUCK

NHTSA NUMBER: M20175200TWG2

PREPARED BY:
KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
ADELANTO, CA 92301

JULY 28, 2017

FINAL REPORT

PREPARED FOR:
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This final test report was prepared for the U.S. Department of Transportation, Alpha Technology Associate, Inc., in response to Contract Number DTNH22-13-D-00311L.

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TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TWG-KAR-17-006		

4. Title and Subtitle
Final Report of New Car Assessment Program
Side Airbag Out-of-Position Testing of 2017 Nissan Frontier Crew Cab 4WD
NHTSA No. M20175200TWG2

5. Report Date
July 28, 2017

6. Performing Organization Code
KAR

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TR-P37251-01-NC

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10. Work Unit No.

11. Contract or Grant No.
DTNH22-13-D-00311L

12. Sponsoring Agency Name and Address
United States Department of Transportation
National Highway Traffic Safety Administration
Office of Crashworthiness Standards (NRM-110)
1200 New Jersey Ave., SE, Room W43-410
Washington, DC 20590

13. Type of Report and Period Covered
Final Test Report, July 14 - July 28, 2017

14. Sponsoring Agency Code
NRM-110

15. Supplementary Notes

16. Abstract

A side airbag out of position test was conducted on the subject 2017 Nissan Frontier Crew Cab 4WD in accordance with the specifications of the Office of Crashworthiness Standards SAB OOP NCAP Laboratory Test Procedure for the generation of consumer information on vehicle side airbag protection. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on July 28, 2017.

The curtain and torso/pelvis side airbags were deployed and responses were measured on a Hybrid III SID-IIs dummy. Three high speed cameras recorded the event. The ambient temperature at the time of airbag deployment was 21.1°C

Section 3.3.5.3 - SID-IIs Dummy - P2			
Measurement Description	**Units**	**IARV**	**Result**
Head Injury Criteria (HIC_{15})	N/A	723	78.9
Nij	N/A	1	0.6
Neck Tension	N	1490	144.7
Neck Compression	N	1820	-1760.2

17. Key Words
New Car Assessment Program (NCAP)
Side Airbag
Out-of-position
Technical Working Group (TWG)

18. Distribution Statement
Copies of this report are available from the following:
National Highway Traffic Safety Administration
Technical Information Services
1200 New Jersey Ave, SE
Washington, DC 20590
Email: tis@nhtsa.dot.gov
FAX: 202-493-2833

19. Security Classification of this report	20. Security Classification of this page	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	38	

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This occupant out-of-position static side airbag deployment test is part of the Technical Working Group Occupant Injury Risk from Deploying Side Airbags Testing Program sponsored by Alpha Technology Associate, Inc. under Contract No. DTNH22-13-D-00311L. The purpose of this test was to obtain occupant injury data for a side airbag deployment.

The occupant out-of-position (OOP) side airbag test was conducted in accordance with the Technical Working Group Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags.

SUMMARY

The effects of a roof mounted curtain airbag and a seat mounted torso/pelvis airbag deployment in a 2017 Nissan Frontier Crew Cab 4WD 4-door truck with an out-of-position Part 572V (SID-IIs) crash test dummy were evaluated. The test was performed at KARCO Engineering, LLC. on July 14, 2017. Pre- and post-test photographs of the vehicle and dummy can be found in Appendix A.

Three (3) high-speed digital cameras and one (1) real time camera were used to document the deployment of the airbags. Camera locations and other pertinent camera information can be found on Data Sheet No.1 and Data Sheet No.6.

A SID-IIs anthropomorphic test device (ATD) was placed in the right front passenger seating position facing inboard according to the dummy placement instructions (3.3.5.3) in the July 2003 Revision of the Technical Working Group's 'Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags'.

The SID-IIs ATD was instrumented with head tri-axial accelerometers, upper and lower neck force transducers.

The airbags were deployed and fifteen (15) channels of data were recorded using a data acquisition system. Appendix B contains dummy response data traces. Appendix C contains the instrumentation data channel assignments. Appendix D contains ATD calibration sheets.

Orientation of the SID-IIs dummy was with the dummy facing toward the center of the vehicle with its arm against the seatback. The seat track is adjusted forward to minimize the vertical distance between the dummy's head and the roof-rail module and to maximize the airbag to head interaction. The dummy's pelvis is slid outboard until the dummy's back contacts the door trim panel or armrest and the CG of the head is centered in the deployment trajectory of the airbag. This orientation complies with section 3.3.5.3 of the Technical Working Group (TWG) recommendation in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags.

The passenger side door remained closed during the test, and was operable after the airbag deployed.

The SID-IIs dummy's visible contact points were as follows: The ATD's head contacted the curtain airbag. The ATD's abdomen and pelvis contacted the torso/pelvis airbag.

The occupant data is summarized below:

Measurement Description	Units	Passenger ATD (SID-IIs)	
		IARV	Result
Head Injury Criteria (HIC15)	N/A	779	78.9
Upper Neck Nij	N/A	1	0.60
Upper Neck Peak Tension	Newtons (N)	2070	144.7
Upper Neck Peak Compression	Newtons (N)	2520	-1760.2

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in^2	kPa	6.895
Temperature	General Use	^oF	^oC	=(Tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

TEST SUMMARY

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

TEST DUMMY INFORMATION

Description	Passenger Seat
Dummy Type / Serial No.	SID-IIs / 299
Head Contact	Curtain Airbag
Chest Contact	None
Abdomen Contact	Torso/Pelvis Airbag
Pelvis Contact	Torso/Pelvis Airbag
Left Knee Contact	None
Right Knee Contact	None

VIDEO COVERAGE

Description	Quantity
High Speed Digital	3
Real Time	1
Total	4

DATA CHANNELS

Description	Quantity
Head Accelerometers	3
Upper Neck Transducers	6
Lower Neck Transducers	6
Total	15

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20175200TWG2
Model Year	2017
Make	Nissan
Model	Frontier Crew Cab 4WD
Body Style	4-Door Truck
VIN	1N6AD0FV8HN703305
Body Color	Arctic Blue Metallic
Odometer Reading (km / mi)	186 / 116
Engine Displacement (L)	4.0
Type / No. of Cylinders	V6
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	5
Overdrive	Yes
Final Drive	4WD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	No
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensione	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	No

Does Owner's Manual provide instructions to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co,. LTD
Date of Manufacture	Oct-16
Vehicle Type	Truck

GVWR (kg)	2638
GAWR Front (kg)	1495
GAWR Rear (kg)	1511

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				385.2	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				45.0	*A-B*

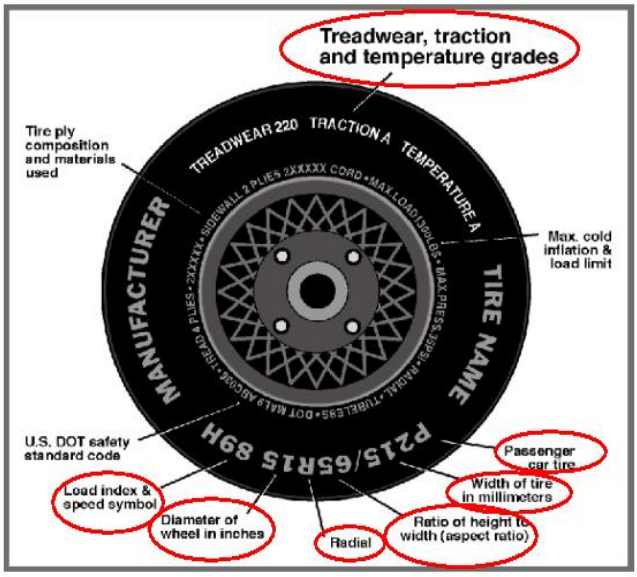
*Vehicle underwent New Car Assessment Program Frontal Impact Testing on February 8, 2017.

DATA SHEET NO. 2 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P265/70R16	P265/70R16
Tire Size on Vehicle	P265/70R16	P265/70R16
Tire Manufacturer	Hankook	Hankook
Tire Model	Dynapro HT	Dynapro HT
Treadware	700	700
Traction Grade	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 2 Nylon	2 Polyester, 2 Steel, 2 Nylon
Load Index/Speed Symbol	111T	111T
Tire Material	2 Polyester, 2 Steel, 2 Nylon	2 Polyester, 2 Steel, 2 Nylon
DOT Safety Code Left	T79M HUH 2416	T79M HUH 2416
DOT Safety Code Right	T79M HUH 2416	T79M HUH 2416

DATA SHEET NO. 3

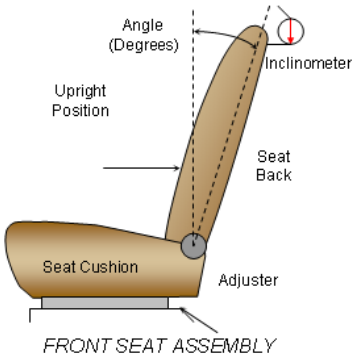
SEAT ADJUSTMENTS

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

SEAT BACK ANGLE

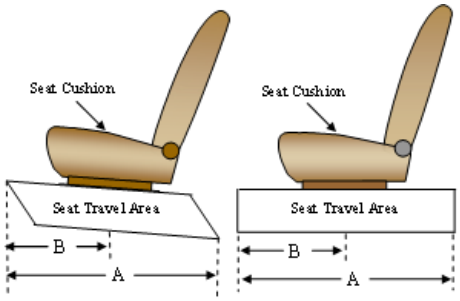
The passenger seat back is positioned per section 3.3.5.3 of the TWG recommendation in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags. Seat back angle is measured at the headrest post.



Seating Position	Degrees
Passenger Seat	3.0

SEAT FORE / AFT POSITIONING

The passenger seat track travel is set per section 3.3.5.3 of the TWG recommendation in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags. The first or forward most position is counted as zero (0).



Seating Position	Total Fore-Aft Travel		Placed in Position	
	mm	Detents	mm	Detents
Passenger Seat	238	21	163	15

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the uppermost position. Position “H” is the uppermost position, followed by position “M1”and “M2”. Position “L” is the lowermost position.

Seating Position	Total No. of Positions	Placed in Position
Passenger Seat	4	H

DATA SHEET NO. 4

DUMMY POSITIONING AND AIRBAG DIMENSIONS

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

DUMMY POSITIONING

Code	Measurement Description	Passenger	
		Length (mm)	Angle (°)
SA	Seat Back Angle		3.0
AN	Top of Airbag Module to Head/Neck Junction	129	90.0
HD	Head CG to Door Panel/ Window	151	0.0
HSC	Head to Seat Back Centerline	172	0.0
HB	Head to B-Pillar (first contact)	50	0.0
HZ	Head to Roof (Z)	221	90.0
HHD	Head to Header (measured from back of head)	396	24.2
ND	Nose to Dash	580	23.3
NS	Nose to Seat Back	158	0.0
NR	Nose to Header	403	32.5
CD	Chest to Dash	527	7.9
CS	Chest to Seat Back	240	0.0
RACL	Right Arm to Seat Back	223	0.0
LACL	Left Arm to Seat Back	225	0.0
RA	Right Arm to Door Panel	157	0.0
LA	Left Arm to Door Panel	91	0.0
KK	Knee to Knee	120	0.0
TT	Toe to Toe	125	0.0
KSCR	Right Knee to Seat Cushion Centerline	223	0.0
KSCL	Left Knee to Seat Cushion Centerline	226	0.0
	Head Level (X Direction)		2.7
	Head Level (Y Direction)		7.5

AIRBAG DIMENSIONS

Code	Measurement Description	Airbag
		Length (mm)
AMW	Curtain Airbag Module Diameter	30
AML	Curtain Airbag Module Length	210
ABL	Curtain Airbag Length	1585
ABW	Curtain Airbag Width	485
AMW	Torso/Pelvis Airbag Module Diameter	20
AML	Torso/Pelvis Airbag Module Length	145
ABW	Torso/Pelvis Airbag Length	745
ABL	Torso/Pelvis Airbag Width	350

DATA SHEET NO. 5

DUMMY INJURY CRITERIA AND PERFORMANCE DATA

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

HEAD PEAK ACCELERATIONS

Location	Axis	Units	SID-IIs			
			Max	Time	Min	Time
Head CG	X	g	40.8	17.1	-12.9	53.1
Head CG	Y	g	11.7	36.2	-23.9	15.7
Head CG	Z	g	20.8	22.4	-3.6	49.6
Head CG Resultant	N/A	g	47.5	15.7		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	SID-IIs			
			Max	Time	Min	Time
Neck Force	X	N	27.0	9.5	-672.1	35.3
Neck Force	Y	N	450.2	31.3	-51.4	144.1
Neck Force	Z	N	144.7	114.3	-1760.2	24.1
Neck Force Resultant	N/A	N	1817.6	24.1		
Neck Moment	X	Nm	16.1	55.9	-18.9	29.3
Neck Moment	Y	Nm	30.3	47.5	-8.6	32.8
Neck Moment	Z	Nm	11.8	45.1	-2.4	88.7
Neck Moment Resultant	N/A	Nm	34.8	47.9		

LOWER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	SID-IIs			
			Max	Time	Min	Time
Neck Force	X	N	250.3	24.2	-201.5	97.9
Neck Force	Y	N	250.6	33.3	-49.8	9.1
Neck Force	Z	N	118.0	120.6	-1668.1	18.6
Neck Force Resultant	N/A	N	1673.2	18.7		
Neck Moment	X	Nm	69.0	51.0	-12.3	143.0
Neck Moment	Y	Nm	129.2	35.6	-0.3	4.6
Neck Moment	Z	Nm	16.7	33.3	-4.2	98.9
Neck Moment Resultant	N/A	Nm	145.1	35.6		

HEAD INJURY CRITERIA (HIC 15)

Location	SID-IIs			
	HIC15	T^1	T^2	Avg G
Head CG	78.9	11.8	26.4	31.0

UPPER NECK NIJ VALUES

Location	SID-IIs			
	Ntf	Nte	Ncf	Nce
Upper Neck	0.08	0.04	0.60	0.01

DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Nissan Frontier Crew Cab 4WD 4-Door Truck NHTSA No.: M20175200TWG2

Test Program: TWG 3.3.5.3 Test Date: 07/14/17

CAMERA LOCATIONS

Camera View	Location (mm)			Angle (Deg.)	Lens (mm)	Speed (fps)
	X	Y	Z			
High Speed Front View	2205	500	-1525	6.1	35	1000
High Speed 3/4 View	1780	1905	-1524	6.7	35	1000
High Speed Left Side View	0	2720	-1140	2.0	20	1000
Real Time	0	2720	-1145	2.0	20	60

Coordinates: +X = forward of vehicle relative to dummy's head CG

+Y = right of vehicle relative to dummy's head CG

+Z = into ground

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

FIGURE 1. Right Front ¾ View, As Received

FIGURE 2. Vehicle Certification Label

FIGURE 3. Post-Test Left Front ¾ View of NCAP Frontal Impact Test

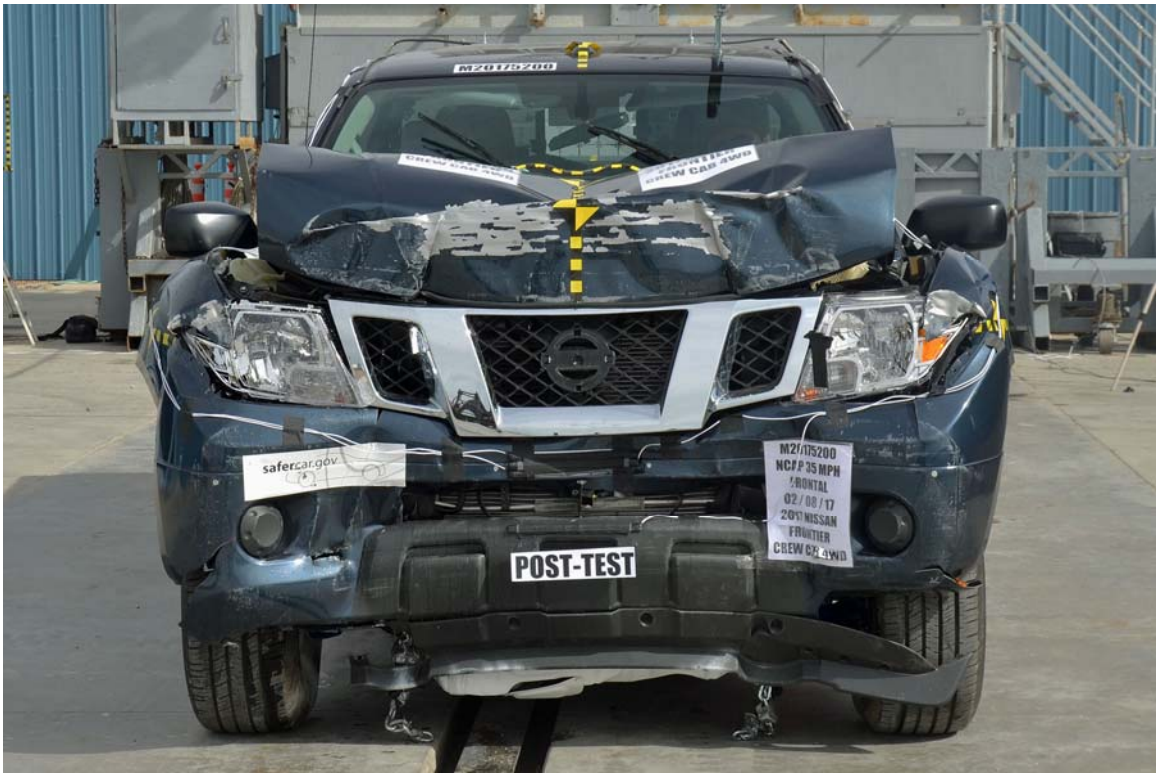


FIGURE 4. Post-Test Front View of NCAP Frontal Impact Test

FIGURE 5. Post-Test Right Front ¾ View of NCAP Frontal Impact Test

FIGURE 6. Post-Test Right Side View of NCAP Frontal Impact Test

FIGURE 7. Pre-Test Dummy Position, Left View

FIGURE 8. Post-Test Dummy Position, Left View

FIGURE 9. Pre-Test Dummy Position, ¾ View

FIGURE 10. Post-Test Dummy Position, ¾ View

FIGURE 11. Pre-Test Dummy Position, Front View

FIGURE 12. Post-Test Dummy Position, Front View

FIGURE 13. Pre-Test Dummy Position, Close-Up Front View

FIGURE 14. Post-Test Dummy Position, Close-Up Front View

FIGURE 15. Pre-Test Dummy Position, Close-Up Rear View

FIGURE 16. Post-Test Dummy Position, Close-Up Rear View

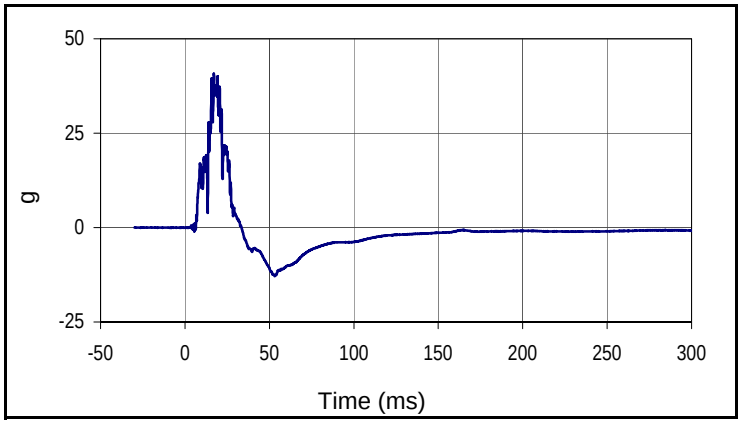
FIGURE 17. Post-Test Airbags, Left Side View

FIGURE 18. Post-Test Airbags, Left Front ¾ View

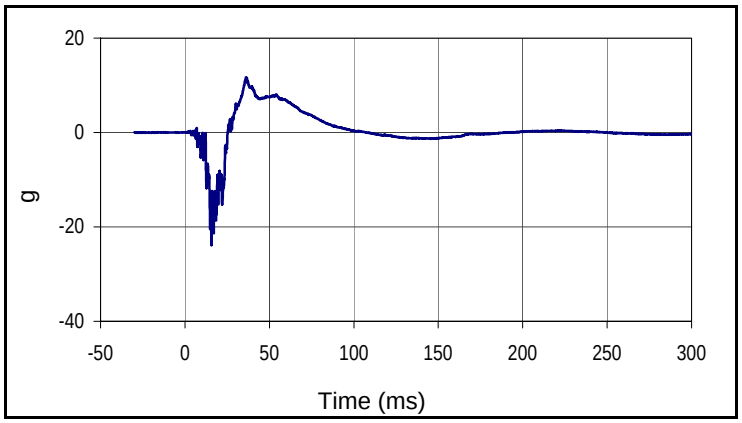
APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

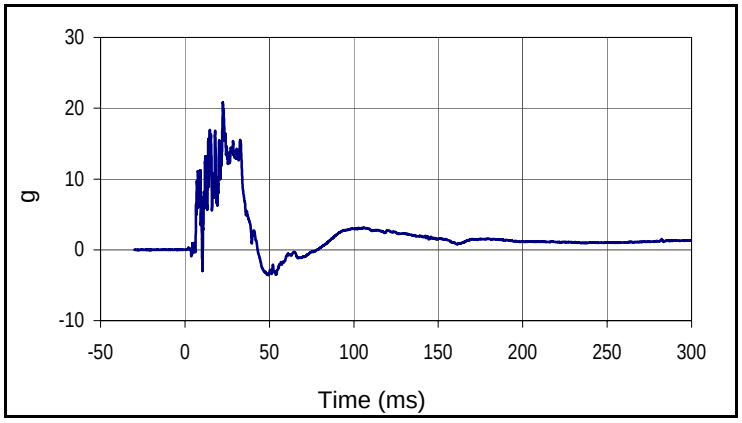
Test Vehicle:	2017 Nissan Frontier Crew Cab 4WD 4-Door Truck	Test Date:	7/14/17
Test Program:	TWG 3.3.5.3	NHTSA No.:	M20175200TWG2



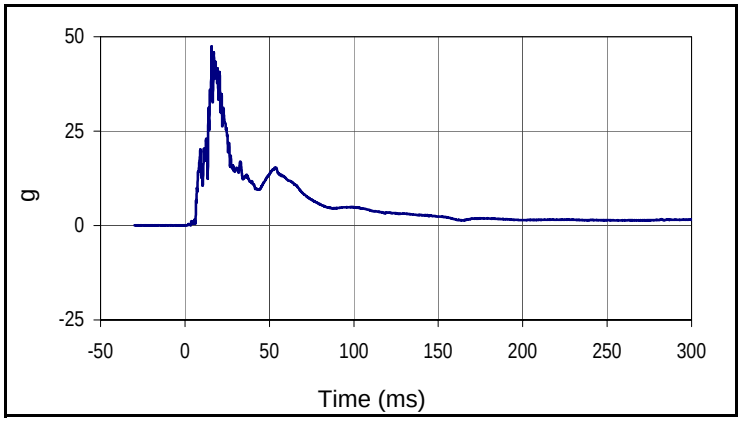
Curve Description			
SID-IIs Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
40.8	17.1	-12.9	53.1



Curve Description			
SID-IIs Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
11.7	36.2	-23.9	15.7

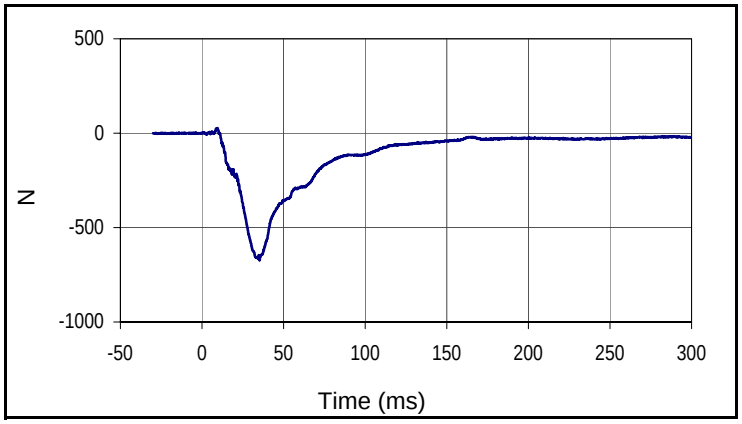


Curve Description			
SID-IIs Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
20.8	22.4	-3.6	49.6

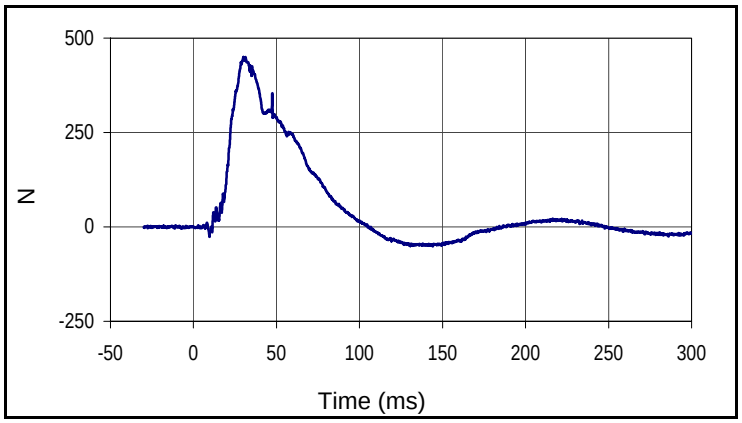


Curve Description			
SID-IIs Head Acceleration Primary Resultant			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
47.5	15.7	0.0	0.7

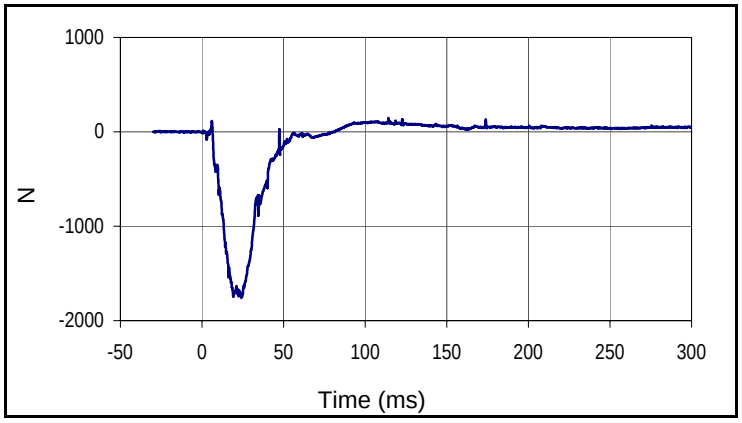
Test Vehicle:	2017 Nissan Frontier Crew Cab 4WD 4-Door Truck	Test Date:	7/14/17
Test Program:	TWG 3.3.5.3	NHTSA No.:	M20175200TWG2



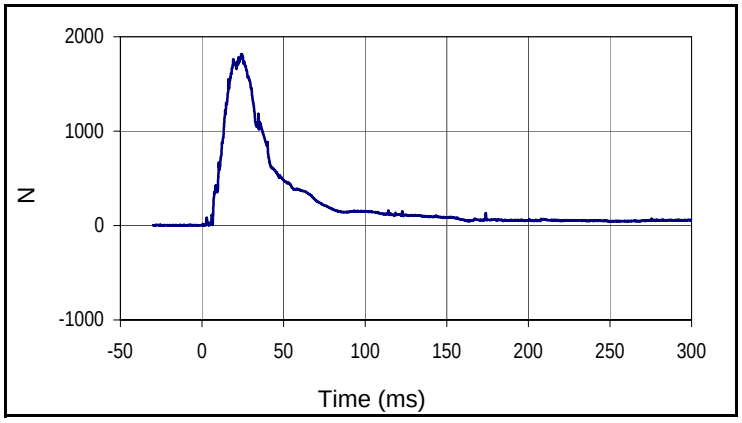
Curve Description			
SID-IIs Upper Neck Force X			
Plot No.		SAE Class	Units
005		1000	N
Max	Time	Min	Time
27.0	9.5	-672.1	35.3



Curve Description			
SID-IIs Upper Neck Force Y			
Plot No.		SAE Class	Units
006		1000	N
Max	Time	Min	Time
450.2	31.3	-51.4	144.1

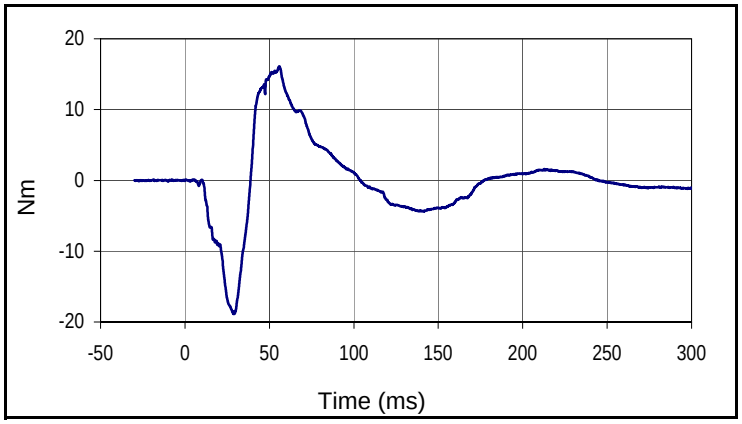


Curve Description			
SID-IIs Upper Neck Force Z			
Plot No.		SAE Class	Units
007		1000	N
Max	Time	Min	Time
144.7	114.3	-1760.2	24.1

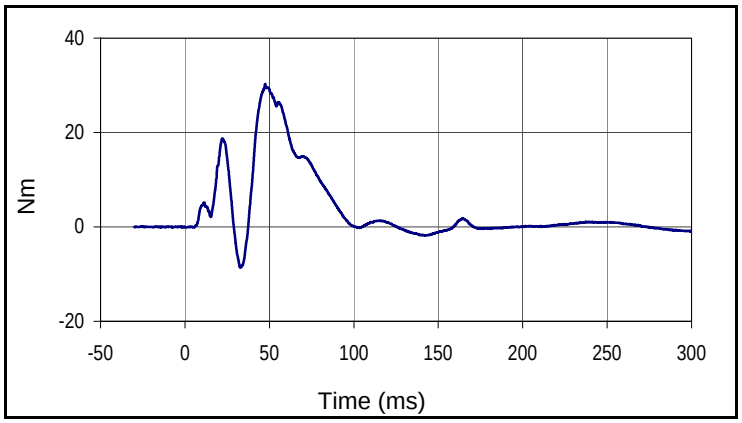


Curve Description			
SID-IIs Upper Neck Force Resultant			
Plot No.		SAE Class	Units
008		1000	N
Max	Time	Min	Time
1817.6	24.1	0.6	0.1

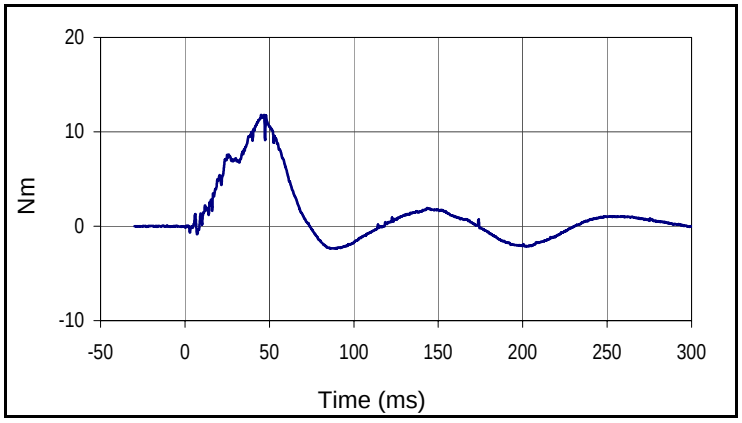
Test Vehicle:	2017 Nissan Frontier Crew Cab 4WD 4-Door Truck	Test Date:	7/14/17
Test Program:	TWG 3.3.5.3	NHTSA No.:	M20175200TWG2



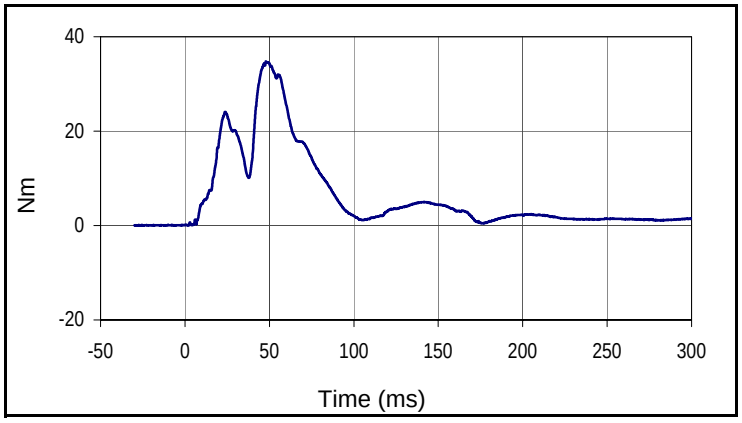
Curve Description			
SID-IIs Upper Neck Moment X			
Plot No.		SAE Class	Units
009		600	Nm
Max	Time	Min	Time
16.1	55.9	-18.9	29.3



Curve Description			
SID-IIs Upper Neck Moment Y			
Plot No.		SAE Class	Units
010		600	Nm
Max	Time	Min	Time
30.3	47.5	-8.6	32.8

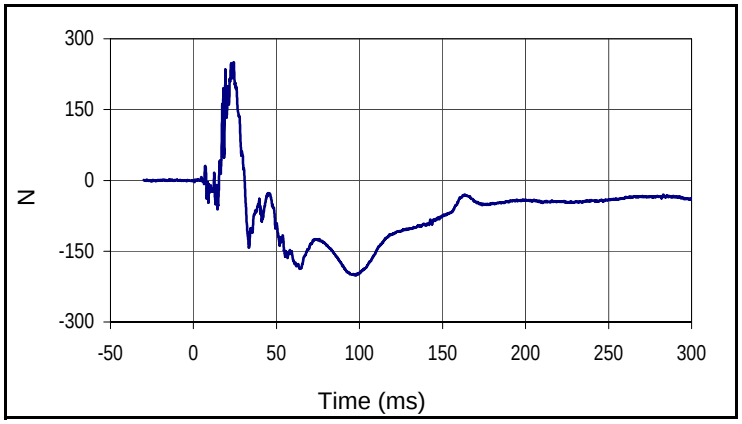


Curve Description			
SID-IIs Upper Neck Moment Z			
Plot No.		SAE Class	Units
011		600	Nm
Max	Time	Min	Time
11.8	45.1	-2.4	88.7

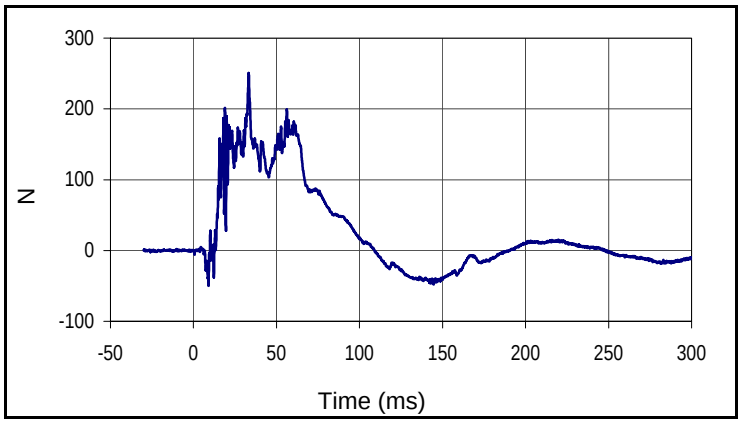


Curve Description			
SID-IIs Upper Neck Moment Resultant			
Plot No.		SAE Class	Units
012		600	Nm
Max	Time	Min	Time
34.8	47.9	0.0	2.2

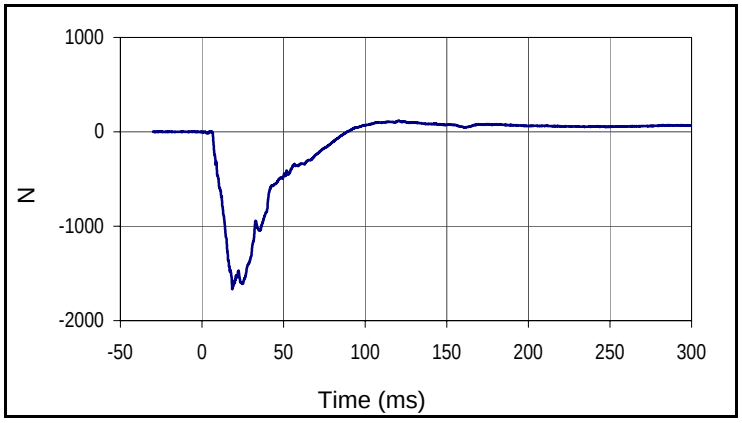
Test Vehicle:	2017 Nissan Frontier Crew Cab 4WD 4-Door Truck	Test Date:	7/14/17
Test Program:	TWG 3.3.5.3	NHTSA No.:	M20175200TWG2



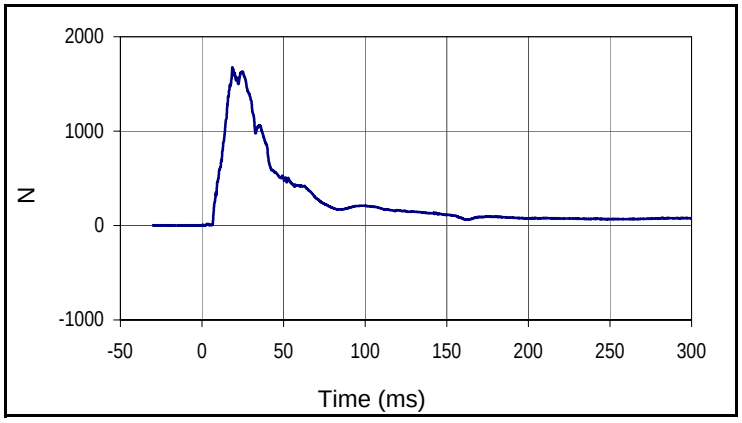
Curve Description			
SID-IIs Lower Neck Force X			
Plot No.		SAE Class	Units
013		1000	N
Max	Time	Min	Time
250.3	24.2	-201.5	97.9



Curve Description			
SID-IIs Lower Neck Force Y			
Plot No.		SAE Class	Units
014		1000	N
Max	Time	Min	Time
250.6	33.3	-49.8	9.1

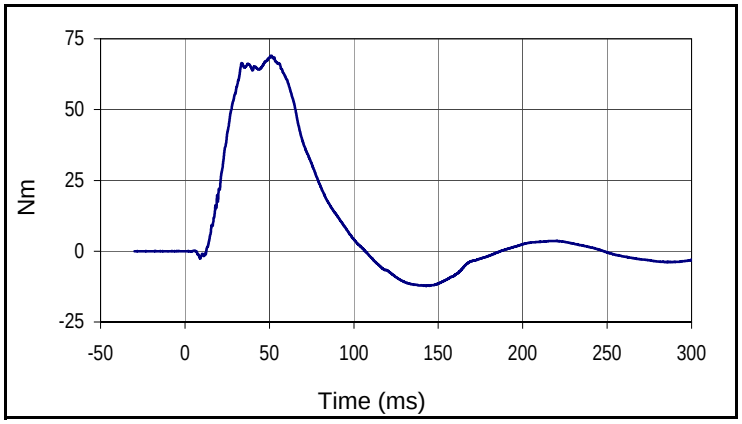


Curve Description			
SID-IIs Lower Neck Force Z			
Plot No.		SAE Class	Units
015		1000	N
Max	Time	Min	Time
118.0	120.6	-1668.1	18.6

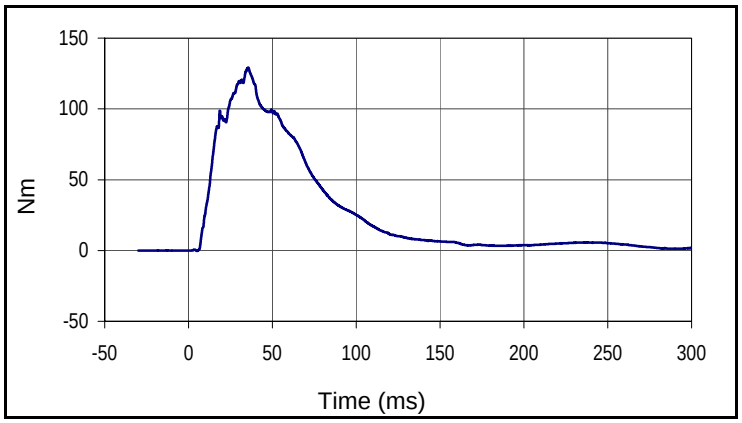


Curve Description			
SID-IIs Lower Neck Force Resultant			
Plot No.		SAE Class	Units
016		1000	N
Max	Time	Min	Time
1673.2	18.7	0.1	1.3

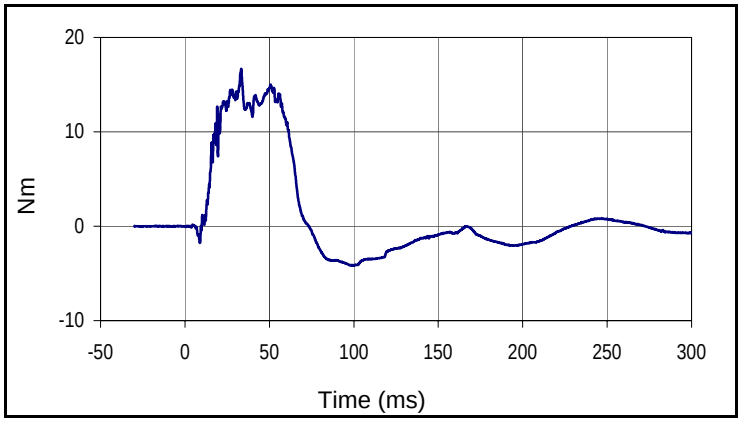
Test Vehicle:	2017 Nissan Frontier Crew Cab 4WD 4-Door Truck	Test Date:	7/14/17
Test Program:	TWG 3.3.5.3	NHTSA No.:	M20175200TWG2



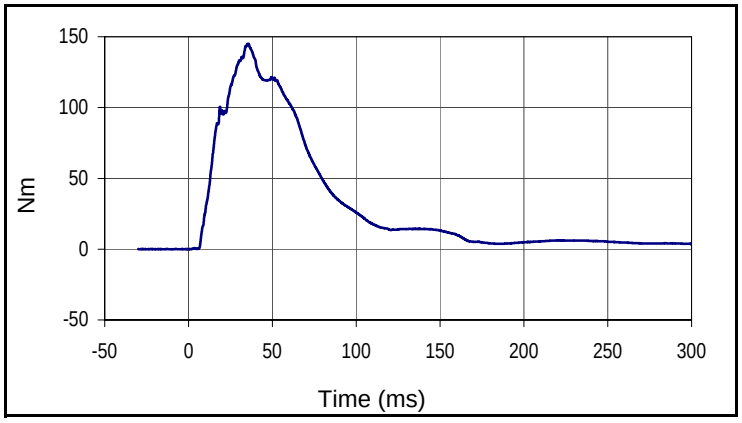
Curve Description			
SID-IIs Lower Neck Moment X			
Plot No.		SAE Class	Units
017		600	Nm
Max	Time	Min	Time
69.0	51.0	-12.3	143.0



Curve Description			
SID-IIs Lower Neck Moment Y			
Plot No.		SAE Class	Units
018		600	Nm
Max	Time	Min	Time
129.2	35.6	-0.3	4.6



Curve Description			
SID-IIs Lower Neck Moment Z			
Plot No.		SAE Class	Units
019		600	Nm
Max	Time	Min	Time
16.7	33.3	-4.2	98.9



Curve Description			
SID-IIs Lower Neck Moment Resultant			
Plot No.		SAE Class	Units
020		600	Nm
Max	Time	Min	Time
145.1	35.6	0.0	0.2

APPENDIX C
INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

TWG 3.3.5.3

Instrumentation Data Channel Assignments

A.T.D. Serial Number 299

7/14/17

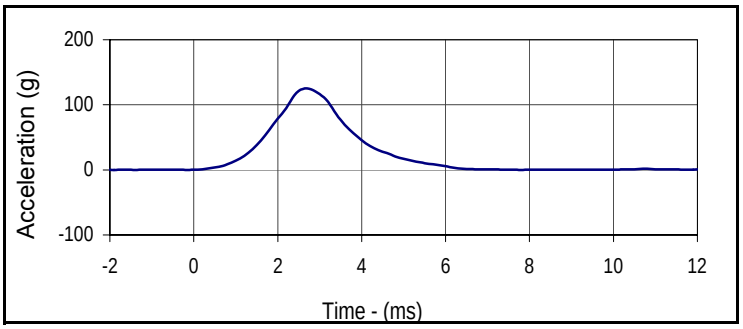
2017 Nissan Frontier Crew Cab 4WD 4-Door Truck

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD	X	P51929	Accel.,full bridge	Endevco	7264C-2K	G
2	HEAD	Y	P50086	Accel.,full bridge	Endevco	7264C-2K	G
3	HEAD	Z	P51931	Accel.,full bridge	Endevco	7264C-2K	G
4	UPPER NECK FORCE	X	287	Load cell, six axis neck	FTSS	IF-205	N
5	UPPER NECK FORCE	Y	287	Load cell, six axis neck	FTSS	IF-205	N
6	UPPER NECK FORCE	Z	287	Load cell, six axis neck	FTSS	IF-205	N
7	UPPER NECK MOMENT	X	287	Load cell, six axis neck	FTSS	IF-205	Nm
8	UPPER NECK MOMENT	Y	287	Load cell, six axis neck	FTSS	IF-205	Nm
9	UPPER NECK MOMENT	Z	287	Load cell, six axis neck	FTSS	IF-205	Nm
10	LOWER NECK FORCE	X	DR8678	Load cell, six axis neck	FTSS	IF-269	N
11	LOWER NECK FORCE	Y	DR8678	Load cell, six axis neck	FTSS	IF-269	N
12	LOWER NECK FORCE	Z	DR8678	Load cell, six axis neck	FTSS	IF-269	N
13	LOWER NECK MOMENT	X	DR8678	Load cell, six axis neck	FTSS	IF-269	Nm
14	LOWER NECK MOMENT	Y	DR8678	Load cell, six axis neck	FTSS	IF-269	Nm
15	LOWER NECK MOMENT	Z	DR8678	Load cell, six axis neck	FTSS	IF-269	Nm

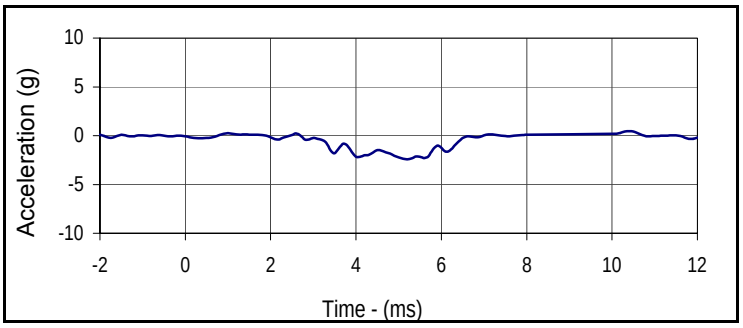
APPENDIX D
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program:	SID IIs Head Drop Test	Test Date:	5/26/17
ATD Serial No.:	299	Test I.D.:	299TWGHD5262017

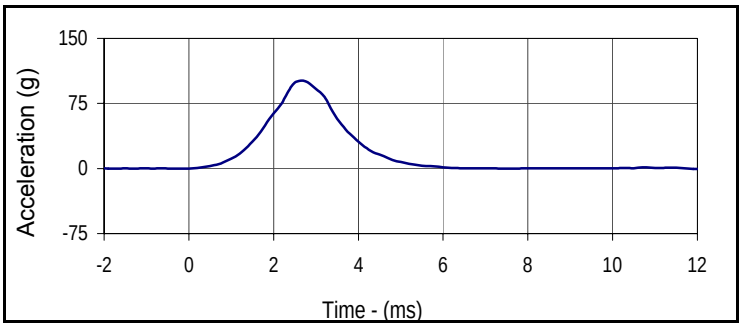
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	296	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.3	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	29.2	Pass
	Min	%		19.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.0	Pass
Peak Head Resultant Acceleration		g	115 to 137	125.0	Pass
Peak Head X Acceleration		g	<15	2.4	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse		%	<15	0.6	Pass
			Overall Test Results		Pass



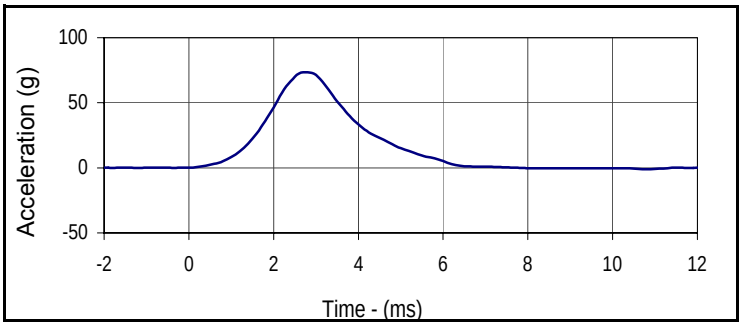
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	g
Max	Time	Min	Time
125.0	2.7	0.0	-18.8



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	g
Max	Time	Min	Time
0.5	10.4	-2.4	5.2



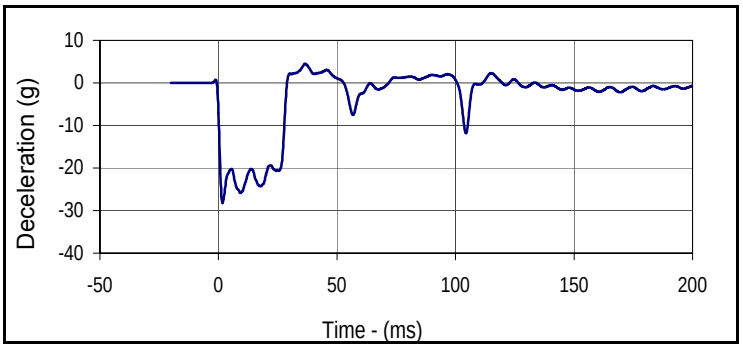
Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	g
Max	Time	Min	Time
101.2	2.7	-0.6	12.0



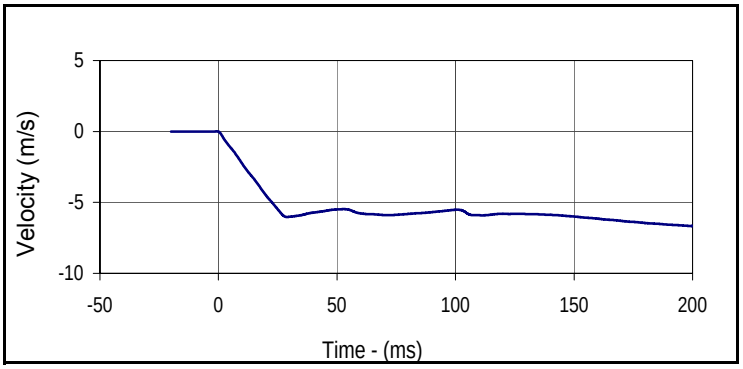
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	g
Max	Time	Min	Time
73.5	2.8	-1.1	10.8

Test Program:	SID IIs Neck Flexion Test	Test Date:	5/26/17
ATD Serial No.:	299	Test I.D.:	299TWGNB5262017

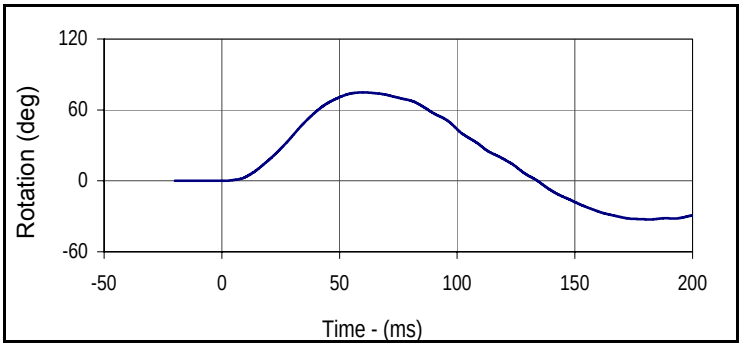
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	361	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.3	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	29.2	Pass
	Min	%		19.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	29.2	Pass
Pendulum Velocity		m/s	5.51 to 5.63	5.63	Pass
Pendulum Deceleration	10 msec	m/s	-2.20 to -2.80	-2.27	Pass
	15 msec	m/s	-3.30 to -4.10	-3.35	Pass
	20 msec	m/s	-4.40 to -5.40	-4.50	Pass
	25 msec	m/s	-5.40 to -6.10	-5.49	Pass
	25-100 msec	m/s	-5.50 to -6.20	-6.03	Pass
D-Plane Rotation	Max	deg	71 to 81	74.8	Pass
	Time	msec	50 to 70	60.1	Pass
Peak Occipital Condyle Moment		Nm	-36 to -44	-42.6	Pass
Decaying Moment Time to Cross 0 Nm		msec	102 to 126	106.5	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	180	g
Max	Time	Min	Time
4.5	0.0	-28.3	0.0

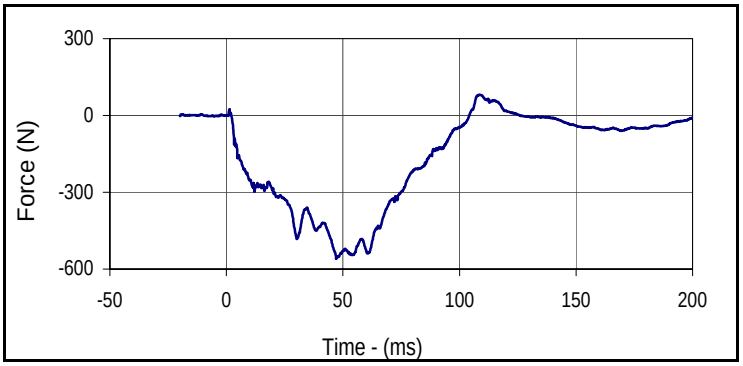


Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
002	FIL	180	m/s
Max	Time	Min	Time
0.0	-0.7	-6.7	199.9

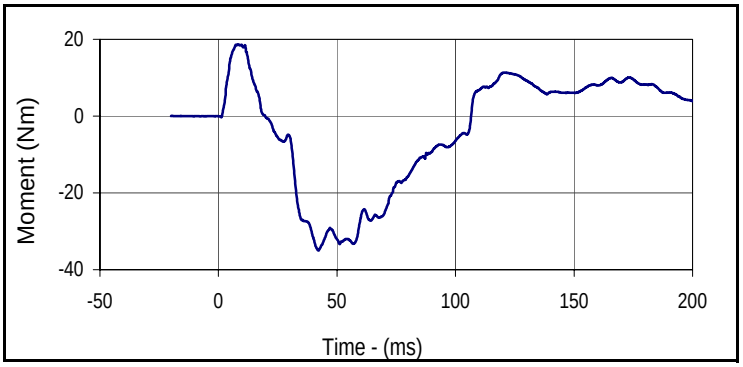


Curve Description			
D-Plane Rotation			
Plot No.	Type	SAE Class	Units
003	FIL	60	deg
Max	Time	Min	Time
74.8	60.1	-32.7	181.8

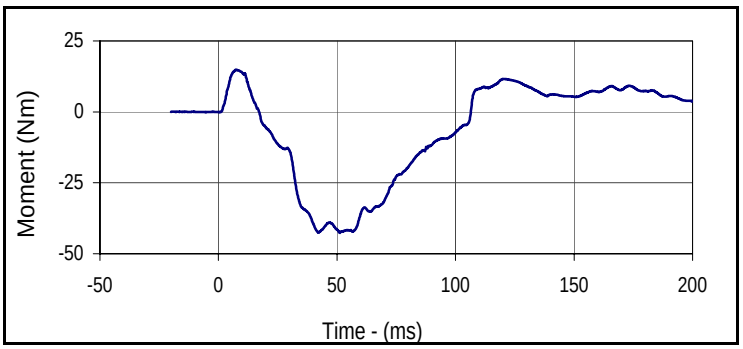
Test Program:	SID IIs Neck Flexion Test	Test Date:	5/26/17
ATD Serial No.:	299	Test I.D.:	299TWGNB5262017



Curve Description			
Neck Force Y			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
81.2	108.3	-559.5	47.1



Curve Description			
Neck Moment X			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
18.6	8.6	-35.0	42.1



Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
006	FIL	600	Nm
Max	Time	Min	Time
14.8	7.4	-42.6	51.2