

REPORT NUMBER: TWG-MGA-2016-004

**SIDE AIRBAG OUT-OF-POSITION INJURY
TECHNICAL WORKING GROUP**

**FCA ITALY S.P.A.
2016 Jeep Renegade Sport 5-Door SUV
NHTSA No.: M20160312TWG2**

TEST DATE: MAY 18, 2016

FINAL REPORT DATE: JUNE 3, 2016

FINAL REPORT

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side air bag deployment. These data constitute part of the general consumer information collected by Alpha Technology Associate, Inc.

SUMMARY

The effects of both a curtain and torso airbag deployment in a 2016 Jeep Renegade Sport 5-Door SUV with an out-of-position Hybrid III 3-Year-Old child dummy were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on May 18, 2016. Pre and post-test photographs of the vehicle and dummy can be found in Appendix A.

Two high-speed cameras (1000 fps) were used to document the side airbag deployment event. The following camera locations were used:

- Left Side Through Removed Driver Door
- Front Through Windshield
- Left Side $\frac{3}{4}$ View Through Windshield

One Hybrid III 3-Year-Old child dummy (Serial Number 082) was placed in the right front passenger seat lying on the seat per Section 3.3.3.4 according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The dummy was instrumented with the following instrumentation:

- Head Accelerations
- Upper Neck Load Cell
- Lower Neck Load Cell

The 15 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces.

The Hybrid III 3-Year-Old child dummy's visible contact points were as follows:

- Torso/pelvis bag to top and left side of head

The Hybrid III 3-Year-Old child dummy was placed in the right front passenger seat lying on its back with its arms at its sides so that its rearmost arm contacts the seatback. The dummy was slid outboard until the CG of the head was aligned with the vertical centerline of the airbag module. The door/side trim did not interfere with the placement of the dummy's head. No foam blocks were placed under the dummy's legs.

The dummy's skullcap seam was taped with 4mm electrical tape to prevent the airbag from getting caught in the seam. The dummy's headskin was cleaned with alcohol and dusted with baby powder to achieve acceptable frictional characteristics.

This orientation complies with Section 3.3.3.4 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group First Revision dated July, 2003.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
TEST SUMMARY

	Test Data	Description
Seating Position	P2	Right Front Seating Position
Test	3.3.3.4*	Lying Child Dummy
Curtain Airbag	Roof-Rail Mounted	Side Airbag
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	Hybrid III 3 Year Old / 082	Child Dummy

*Procedure as defined by Lund, et al and the Technical Working Group dated July, 2003

Number of Data Channels	15
Number of Airbag Channels	4
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Torso/Pelvis Airbag to Top and Left Side of Head
Left Shoulder Contact	None
Left Torso Contact	None
Left Pelvis Contact	None

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an
NCAP Side Impact on January 6, 2016.

TEST VEHICLE INFORMATION

Manufacturer	Jeep
Model	Renegade Sport
Body Style	SUV
NHTSA No.	M20160312TWG2
VIN	ZACCJAAW9GPC47735
Color	Omaha Orange
Delivery Date	12/7/2015
Odometer Reading (mile)	118
Dealer	Palmen Motors
Transmission	Manual
Final Drive	FWD
Number of Cylinders	4
Engine Displacement (L)	1.4
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owner's Manual Details Instructions on Disabling ADLs	No
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	No
All Wheel Drive	No
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA Italy S.P.A.
Date of Manufacture	09/15

GVWR (kg)	1940
GAWR Front (kg)	1050
GAWR Rear (kg)	900

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				435
Cargo Wt. (RCLW) (kg)				95

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		130 of 260mm
Seat Height Position		Non-adjustable
Placed in Position No. 2		---
Seat Back Angle (at headrest post)	SA (°)	0.8
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	734
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	351
Head CG to Door Panel	HD (mm)	79
Head to Seat Back Centerline	HSC (mm)	219
Chest to Dash	CD (mm)	506
Chest to Seatback	CS (mm)	162
Right Arm to Seat Back Centerline	RACL (mm)	N/A
Left Arm to Seat Back Centerline	LACL (mm)	N/A
Right Arm to Door Panel	RA (mm)	195
Left Arm to Door Panel	LA (mm)	224
Knee to Knee	KK (mm)	110
Toe to Toe	TT (mm)	99
Right Knee to Seat Cushion Centerline	KSCR (mm)	378
Left Knee to Seat Cushion Centerline	KSCL (mm)	391
Right Toe to Seat Cushion Centerline	TSCR (mm)	620
Left Toe to Seat Cushion Centerline	TSCL (mm)	624
Nose to Front Seatback	ND (mm)	544
Nose to Seatback	NS (mm)	63
Top of Head to Headliner	HH (mm)	690

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. M20160312TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	22.3	15.1	-8.6	8.9
Head Y	g	16.6	14.7	-10.0	9.2
Head Z	g	19.8	13.4	-7.2	39.0
Head Resultant	g	31.7	13.5		
Upper Neck Fx	N	220.9	13.9	-114.5	35.4
Upper Neck Fy	N	44.4	14.8	-95.4	25.0
Upper Neck Fz	N	62.7	266.6	-646.8	17.4
Upper Neck F Resultant	N	667.7	17.4		
Upper Neck Mx	Nm	4.2	10.5	-10.0	16.6
Upper Neck My	Nm	20.2	17.2	-2.7	124.2
Upper Neck Mz	Nm	2.2	265.1	-2.6	25.9
Upper Neck M Resultant	Nm	22.6	17.2		
Lower Neck Fx	N	221.8	17.0	-12.4	200.6
Lower Neck Fy	N	92.2	16.0	-53.3	10.7
Lower Neck Fz	N	49.5	268.0	-592.2	17.4
Lower Neck F Resultant	N	635.3	17.3		
Lower Neck Mx	Nm	3.5	259.7	-10.8	22.8
Lower Neck My	Nm	19.8	33.7	-6.3	12.9
Lower Neck Mz	Nm	2.0	261.3	-4.5	23.7
Lower Neck M Resultant	Nm	21.7	31.0		

DATA SHEET NO. 4 (continued)
DUMMY INJURY CRITERIA VALUES

NHTSA No. M20160312TWG2

HEAD INJURY CRITERIA (HIC)						
HIC15						
HIC36						
ATD position	HIC	T ¹ (msec)	T ² (msec)	HIC	T ¹ (msec)	T ² (msec)
No. Right Front	20.30	10.0	17.0	20.30	10.0	17.0

Position 3 Neck Injury Summary (3-Year-Old – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.02	7.2	-83.50	41.73	1.68
Nte	0.11	126.7	27.49	24.74	-2.70
Ncf	0.60	17.3	-645.17	168.09	20.24
Nce	0.00	-19.1	-1.47	-0.35	-0.07
Peak Tension (CFC1000)		62.7 N	Peak Compression (CFC 1000)		-646.8 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2120 N	Extension (mCVe)	27 N-m	Tension	1130 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression	1380 N

**APPENDIX A
PHOTOGRAPHS**

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Photo No. 1. Right ¾ Front View of Vehicle, As Received



Photo No. 2. Vehicle Certification Label



Photo No. 3. Pre-Test Vehicle Left Side View



Photo No. 4. Post-Test Vehicle Left Side View



Photo No. 5. Pre-Test 6-Year-Old Child Dummy Left Side View



Photo No. 6. Post-Test 6-Year-Old Child Dummy Left Side View



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Photo No. 9. Pre-Test 6-Year-Old Child Dummy Left $\frac{3}{4}$ Front View



Photo No. 10. Post-Test 6-Year-Old Child Dummy Left $\frac{3}{4}$ Front View



Photo No. 11. Pre-Test 6-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Photo No. 12. Post-Test 6-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Photo No. 13. Pre-Test 6-Year-Old Child Dummy Front View



Photo No. 14. Post-Test 6-Year-Old Child Dummy Front View

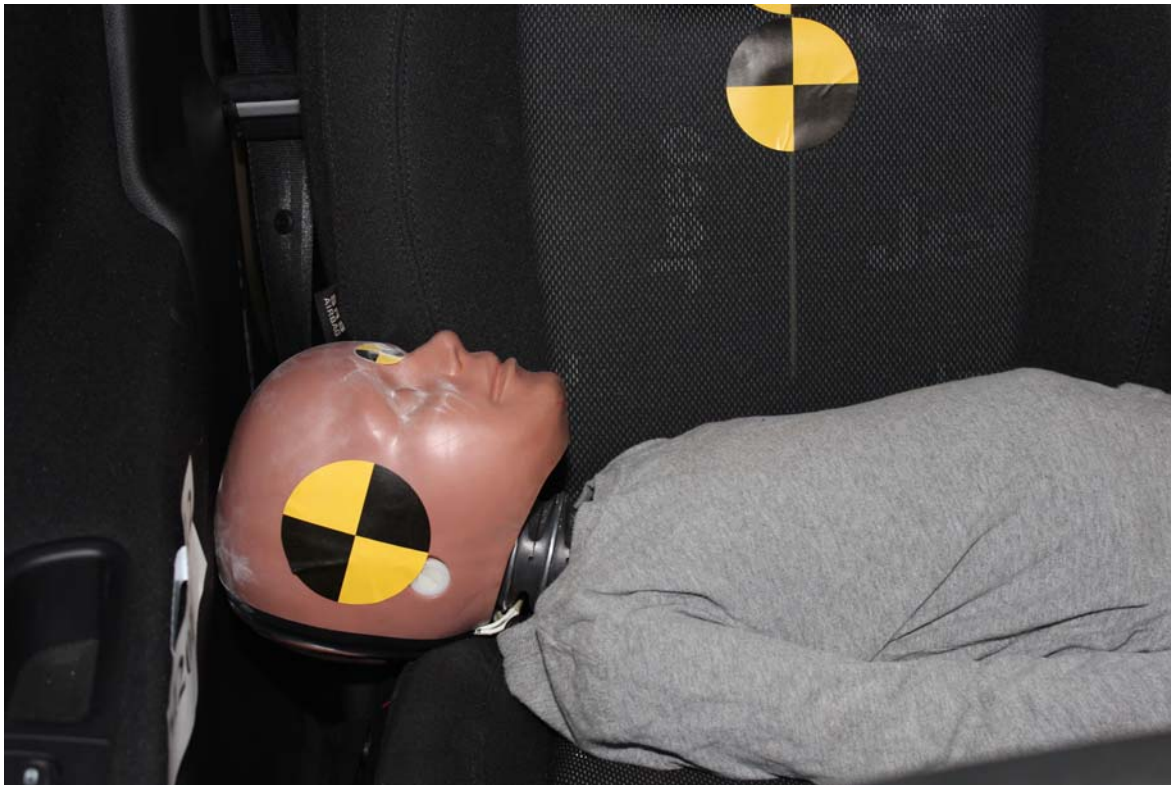


Photo No. 15. Pre-Test 6-Year-Old Child Dummy Front Closeup View



Photo No. 16. Post-Test 6-Year-Old Child Dummy Front Closeup View



Photo No. 17. Pre-Test 6-Year-Old Child Dummy Right $\frac{3}{4}$ Front View



Photo No. 18. Post-Test 6-Year-Old Child Dummy Right $\frac{3}{4}$ Front View



Photo No. 19. Pre-Test 6-Year-Old Child Dummy Right Side View



Photo No. 20. Post-Test 6-Year-Old Child Dummy Right Side View



Photo No. 21. Post-Test 6-Year-Old Child Dummy Right Side View (Door Open)



Photo No. 22. Post-Test Curtain Airbag Left Side View



Photo No. 23. Post-Test Curtain Airbag Left $\frac{3}{4}$ Front View



Photo No. 24. Post-Test Curtain Airbag Front View



Photo No. 25. Post-Test Curtain Airbag Right Side View (Door Open)

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