



**REPORT NUMBER: TWG-MGA-2013-002**

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

**MAZDA MOTOR CORPORATION  
2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV  
NHTSA No.: MD5400TWG2**

**TEST DATE: JANUARY 2, 2013**

**FINAL REPORT DATE: FEBRUARY 13, 2013**

**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 2013 Mazda CX-5 Sport All Wheel Drive 5-Dr SUV with an out-of-position Hybrid III 6-Year-Old child dummy were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on January 2, 2013. Pre-test and post-test photographs of the vehicle and dummy can be found in Appendix A.

Three 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 6-Year-Old child dummy (Serial Number 144) was placed in the right front passenger seat situated in the inboard-facing position along the outboard edge of the seat per Section 3.3.5.1 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 6-Year-Old child dummy's visible contact points were as follows:

- Curtain airbag to top and back of head
- Torso bag to left shoulder and left torso

The Hybrid III 6-Year-Old child dummy was placed in the right front passenger seat along the outboard edge of the foam block, facing inboard with its legs extended and arms hanging at its sides. The seat track was positioned forward to maximize the cushion to head interaction. The dummy's pelvis was slid outboard until the dummy's back contacted the door trim panel or armrest and the center of gravity of the head was centered in the deployment trajectory of the airbag. The head remained in its neutral orientation. A vertical plane through the centerline of the dummy's shoulder bolts was parallel to the vehicle centerline. The dummy's arms were bent at the elbow until the fingertips contacted the foam block.

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 3.3.5.1 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	3.3.5.1*	Inboard-facing child dummy
Curtain Airbag	Roof-Rail Mounted	Side Airbag
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	Hybrid III 6 Year Old / 144	Child Dummy

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

Number of Dummy Data Channels	15
Number of Airbag Channels	4
Number of High-Speed Videos	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to top and back of head
Left Shoulder Contact	Torso bag
Left Torso Contact	Torso bag
Left Pelvis Contact	None

## DATA SHEET NO. 2

### TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an  
NCAP Frontal Impact on July 5, 2012.

#### TEST VEHICLE INFORMATION

#### TEST VEHICLE OPTIONS

Manufacturer	Mazda	Driver Front Airbag	Yes
Model	CX-5 Sport	Driver Side Curtain Airbag	Yes
Body Style	SUV	Driver Side Torso/Pelvis Airbag	Yes
NHTSA No.	MD5400TWG2	Rear Passenger Side Curtain Airbag	Yes
VIN	JM3KE4BE7D0120336	Rear Passenger Side Torso/Pelvis Airbag	No
Color	Sky Blue Metallic	Force Limiter	Yes
Delivery Date	06/12/2012	Pretensioner	Yes
Odometer Reading (mile)	8	Power Steering	Yes
Dealer	Brown Mazda	Power Door Locks	Yes
Transmission	Automatic	Tilt Wheel	Yes
Final Drive	AWD	Air Conditioning	Yes
Number of Cylinders	4	Anti-lock Brakes	Yes
Engine Displacement (L)	2.0	Traction Control	Yes
Engine Placement	Lateral	All-Wheel Drive	Yes
Automatic Door Lock (ADL)	Yes	Power Seats	No
Owner's Manual Details Instructions on Disabling ADLs	Yes		
Bucket Seats	Yes		

#### DATA FROM CERTIFICATION LABEL

Manufactured By	MAZDA MOTOR CORPORATION	GVWR (kg)	2024
Date of Manufacture	04/12	GAWR Front (kg)	1016
		GAWR Rear (kg)	839

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				45

**DATA SHEET NO. 3**  
**DUMMY POSITIONING IN VEHICLE**

Measurement		Value
Seat Position		7 of 26 Detents from Full Forward
Seat Height Position		Non-Adjustable
Placed in Position No. 2		---
Seat Back Angle (at headrest post)	SA (°)	2.0
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	286
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	115
Head CG to Door Window	HD (mm)	134
Head to Seat Back Centerline	HSC (mm)	286
Chest to Dash	CD (mm)	447
Chest to Seatback	CS (mm)	270
Right Arm to Seat Back Centerline	RACL (mm)	380
Left Arm to Seat Back Centerline	LACL (mm)	168
Right Arm to Door Panel	RA (mm)	77
Left Arm to Door Panel	LA (mm)	73
Knee to Knee	KK (mm)	118
Toe to Toe	TT (mm)	94
Right Knee to Seat Cushion Centerline	KSCR (mm)	13
Left Knee to Seat Cushion Centerline	KSCL (mm)	14
Right Toe to Seat Cushion Centerline	TSCR (mm)	313
Left Toe to Seat Cushion Centerline	TSCL (mm)	309
Nose to Dash	ND (mm)	523
Nose to Headrest	NS (mm)	290
Top of Head to Headliner	HH (mm)	116

**DATA SHEET NO. 4**  
**DUMMY INJURY CRITERIA VALUES**

**NHTSA No. MD5400TWG2**

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	24.7	25.5	-7.6	13.7
Head Y	g	29.0	13.1	-38.5	13.5
Head Z	g	48.1	13.2	-13.9	15.5
Head Resultant	g	56.4	13.2		
Upper Neck Fx	N	5.7	1.4	-405.8	48.4
Upper Neck Fy	N	384.7	67.6	-151.1	17.4
Upper Neck Fz	N	234.0	9.7	-1172.6	26.6
Upper Neck F Resultant	N	1221.4	26.6		
Upper Neck Mx	Nm	19.8	17.4	-11.5	10.7
Upper Neck My	Nm	3.2	113.6	-14.9	30.5
Upper Neck Mz	Nm	2.3	8.5	-21.9	65.9
Upper Neck M Resultant	Nm	24.8	65.8		
Lower Neck Fx	N	47.7	11.6	-182.7	158.7
Lower Neck Fy	N	275.3	9.8	-110.3	15.9
Lower Neck Fz	N	253.5	9.9	-1165.5	27.4
Lower Neck F Resultant	N	1167.1	27.4		
Lower Neck Mx	Nm	42.8	74.2	-4.1	6.2
Lower Neck My	Nm	66.0	62.0	-2.7	9.7
Lower Neck Mz	Nm	9.8	10.0	-10.5	59.7
Lower Neck M Resultant	Nm	78.0	62.7		

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

**NHTSA No. MD5400TWG2**

HEAD INJURY CRITERIA (HIC)						
HIC15						
HIC36						
ATD position	HIC	T <sup>1</sup> (msec)	T <sup>2</sup> (msec)	HIC	T <sup>1</sup> (msec)	T <sup>2</sup> (msec)
No. 2 Right Front	17.07	12.9	27.9	21.16	12.9	32.5

**Position 2 Neck Injury Summary (6-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	0.01	1.0	29.08	-13.13	0.06
Nte	0.13	9.7	214.68	-45.44	-2.65
Ncf	0.22	14.1	-607.70	-80.52	-1.32
Nce	0.61	27.9	-1142.14	-330.91	-13.19
<b>Peak Tension (CFC1000)</b>		<b>234.0 N</b>	<b>Peak Compression (CFC 1000)</b>		<b>-1172.6 N</b>

**Critical Values**

Nij Intercepts				Peak Limits	
Tension (CVt)	2800 N	Extension (mCVe)	37 N-m	Tension	1490 N
Compression (CVc)	2800 N	Flexion (mCVf)	93 N-m	Compression	1820 N
<b>Condyle Offset</b>	<b>0.01778 m</b>				

**APPENDIX A  
PHOTOGRAPHS**

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Right ¾ Front View of Vehicle, As Received

MFD. BY MAZDA MOTOR CORPORATION

DATE 04/12	GWR/PNBV 4462 LB 2024 KG
FRONT GAWR/PNBE AV 2240 LB 1016 KG	REAR GAWR/PNBE AR 2229 LB 1011 KG
WITH/AVEC P225/65R17 100H TIRES/PNEUS	WITH/AVEC P225/65R17 100H TIRES/PNEUS
17X7J RIMS/JANTES	17X7J RIMS/JANTES
230 KPA/34 PSI COLD/A FROID	230 KPA/34 PSI COLD/A FROID

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: JM3KE4BE7D0120336 TYPE:MPV COLOR CODE:41B MADE IN JAPAN

**MD5400**

Vehicle Certification Label



Pre-Test Vehicle Left Side View



Post-Test Vehicle Left Side View



Pre-Test 6-Year-Old Child Dummy Left Side View



Post-Test 6-Year-Old Child Dummy Left Side View



Pre-Test 6-Year-Old Child Dummy Left Side Closeup View



Post-Test 6-Year-Old Child Dummy Left Side Closeup View



Pre-Test 6-Year-Old Child Dummy Left 3/4 Front View



Post-Test 6-Year-Old Child Dummy Left 3/4 Front View



Pre-Test 6-Year-Old Child Dummy Left  $\frac{3}{4}$  Front Closeup View



Post-Test 6-Year-Old Child Dummy Left  $\frac{3}{4}$  Front Closeup View



Pre-Test 6-Year-Old Child Dummy Front View



Post-Test 6-Year-Old Child Dummy Front View



Pre-Test 6-Year-Old Child Dummy Front Closeup View



Post-Test 6-Year-Old Child Dummy Front Closeup View



Pre-Test 6-Year-Old Child Dummy Right 3/4 Front View



Post-Test 6-Year-Old Child Dummy Right 3/4 Front View



Pre-Test 6-Year-Old Child Dummy Right Side View



Post-Test 6-Year-Old Child Dummy Right Side View



Post-Test 6-Year-Old Child Dummy Right Side View With Door Open



Post-Test Curtain Airbag Left Side View



Post-Test Curtain Airbag Left 3/4 Front View



Post-Test Curtain Airbag Front View



Post-Test Curtain Airbag Right Side View With Door Open

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**DUMMY RESPONSE DATA TRACES**

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