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**KARCO Response to
SPECIAL ORDER
INCLUDING THE REQUEST FOR THE PRODUCTION OF DOCUMENTS**

In re:

MY 2008 ZAP Xebra
NHTSA Recall
Nos. 09V-177/12V-230 and 09V-385

Interrogatories:

1. *Describe in detail all testing performed by KARCO on a ZAP Xebra, including but not limited to the date the vehicle(s) was tested, the tests performed, the results of the testing, and whether (and, if so, how) the vehicle was modified and/or adjusted in any way during the course of the testing.*

KARCO performed both visual and performance testing on the Zap Xebra relating to FMVSS 122 on two separate vehicles. The vehicle was initially received for testing in January of 2012. At that time a visual inspection of all brake system components, including warning lights, reservoir caps, brake pads and brake rotors was completed. Once the inspection was complete the vehicle moved on the instrumentation check portion of the testing with no issues occurring. After the instrumentation checks were complete the testing moved on to the First Effectiveness testing, which the vehicle failed repeatedly. After the First Effectiveness failure the vehicle was picked up by Zap personnel and taken away from our property.

A different Zap Xebra was received for testing in May of 2012. As far as we know the changes to the vehicle included the addition of a vacuum brake booster and a different type of brake pad on all wheels. At this time the vehicle was again inspected and the instrumentation checks performed. Once the instrumentation checks were performed the testing moved on to First Effectiveness. Initially the vehicle did not meet the First Effectiveness criteria. Zap requested that KARCO make modifications to the vehicle proportioning valve and pedal adjustment to make the vehicle pass. Through trial and error modifications were made to both adjustments and the vehicle passed First Effectiveness. After the First Effectiveness test the vehicle was put through the burnish process, which included 200 miles of driving with stops every mile. At the completion of the burnish the testing proceeded to the Second Effectiveness. The vehicle could not meet the requirements of the Second Effectiveness test and all subsequent testing was halted.

2. *Has KARCO's testing of the ZAP Xebra concluded? If so, when?*

Testing on the Zap Xebra was halted when the vehicle could not meet the minimum requirements of the Second Effectiveness test. Testing was halted on 6/25/12.



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3. *If KARCO's testing of the ZAP Xebra has not concluded, describe in detail the additional testing KARCO will perform on the vehicle, and the anticipated schedule for such testing. When do you expect it to conclude?*

KARCO's testing of the Zap Xebra concluded on 6/25/12.

4. *Has KARCO performed or is KARCO performing any work for ZAP related to the ZAP Xebra other than testing it to the FMVSS No. 122 braking distance requirements? If yes, describe in detail that work, including whether it has concluded or is ongoing and the date when it concluded or is expected to conclude.*

KARCO is not performing any other work for Zap related to the Zap Xebra other than FMVSS 122 testing of the brake system.

Request for the Production of Documents:

1. *Provide a copy of all documents (including all reports, data, and emails) relating to any testing or other work performed by KARCO related to the ZAP Xebra.*

All documents, including a test report, raw data, and emails, relating to the testing of the ZAP Xebra is included on the accompanying CD (2012-2438). The data was compiled and processed by Matthew Hubbard and Kelsey Chiu. Final compilation was completed on 7/30/12.

2. *Provide a copy of all documents (including emails) reflecting or relating to any communications between ZAP and KARCO (including any officers and/or employees of either company) regarding the ZAP Xebra.*

All available emails relating to the ZAP Xebra between KARCO and ZAP have been included on the accompanying CD (2012-2438). The emails were compiled by Kelsey Chiu. Final compilation was completed on 7/30/12.

A handwritten signature in black ink, appearing to be "MMA".



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KARCO Affidavit

I, Michael Dunlap, have undertaken and directed an inquiry reasonably calculated to assure that the answers and production of documents are complete and correct. I have caused the documents of KARCO to be searched diligently for information and documents responsive to this Special Order, and have produced them to NHTSA. The answers to the inquiries provided to NHTSA respond completely and correctly to this Special Order.

A handwritten signature in black ink, appearing to read "MD", written over a horizontal line.

Michael L. Dunlap
Director of Operations, KARCO Engineering, LLC.

7-30-12

Date

A small, handwritten mark or signature in the bottom right corner of the page.

TEST REPORT FOR:

Zap Jonway
2008 Zap Xebra



TESTED TO:

FMVSS 122
Motorcycle Brake Systems

PREPARED FOR:

Zap Jonway
501 Fourth Street
Santa Rosa, CA 95401

TEST REPORT NUMBER:

TR-P32023-01-NC

REPORT DATE:

November 27, 2011

TEST DATE:

May 16, 2012 – June 27, 2012



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Tested By: Matthew S. Hubbard
Mr. Matthew S. Hubbard
Test Engineer

Report By: Matthew S. Hubbard
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Reviewed By: Kelsey A. Chiu
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Approved By: Michael L. Dunlap
Mr. Michael L. Dunlap
Director of Operations

Approval Date: July 27, 2012

REVISION CONTROL LOG

TR-P32023-01

Revision	Date	Description
-NC	07/27/12	Original Test Report

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SECTION 1
PURPOSE AND PROCEDURE

1.1 PURPOSE

Tests were performed on a 2008 Zap Xebra, manufactured by Qingqi Group Motorcycle Co. LTD to determine compliance with Federal Motor Vehicle Safety Standard (FMVSS) 122, "Motorcycle Brake Systems". The purpose of this test is to ensure safe braking performance under normal and emergency conditions.

1.2 TEST PROCEDURE

All tests were conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure TP-122-02, dated August 1, 2006. Procedures for receiving, inspecting, testing and reporting of the test results are described in the test procedures and are not repeated in this report.

The Zap Xebra was subjected to FMVSS 122 testing from May 16 through June 27, 2012. Photographs of the vehicle and the test setup are shown in Appendix A.

SECTION 2

TEST VEHICLE

2.1 TEST VEHICLE DESCRIPTION

The test vehicle is a 2008 Zap Xebra three-wheeled motorcycle, VIN LAEMA24608G200303. This vehicle was provided for testing by Zap Jonway.

The Zap Xebra is powered by an electric motor and is rear wheel driven. The wheel base is 83.5 in.

The braking system on the Zap Jonway Xebra consists of hydraulic split system operated by a foot pedal. Both front and rear wheels employ a hydraulic disc and caliper system. All wheels are fitted with Maxmiler-X GT Radial tires.

2.2 INSPECTION OF THE TEST MOTORCYCLE

An inspection of the vehicle's mechanical condition and brake system was conducted prior to the initiation of the FMVSS 122 brake test series. The speedometer is displayed in mph and km/h. The odometer is displayed in miles. The vehicle appeared to be in used condition, with 478 miles registered on the odometer. The vehicle required no mechanical repairs or adjustments during the course of the FMVSS 122 brake test series. Data Sheet No. 1 summarizes the vehicle performance compared to the requirements of FMVSS 122.

SECTION 3

RESULTS AND DATA SHEETS

3.1 SUMMARY

All data resulting from FMVSS 122 testing on the Zap Xebra is presented in this section. The test vehicle was inspected, paying special attention to the brake system, brake cables, rotors, and brake pads for possible areas of concern and non-compliance due to design or manufacturing defects. All performance tests up to the Second Effectiveness test were completed. The vehicle did not meet the minimum requirements of the Second Effectiveness test and the remainder of the testing was stopped.

3.2 INSPECTION

The brake failure indicator lamp does not meet the minimum height requirement of three thirty-seconds of an inch.

3.3 TEST RESULTS

The Zap Xebra failed to meet the minimum stopping distance requirement on Second Effectiveness. Thermocouple installation and positioning shown in Figures 15 and 20. The instrumentation and data recording system was installed as shown in Figures 9 and 10. The equipment used to conduct this test is listed in Appendix B. Test vehicle identification data is presented in Data Sheet No. 2, brake system inspection results are presented in Data Sheet No. 2, and the test data is summarized in Data Sheet No. 3. The remaining data sheets present test data for each test segment.

DATA SHEETS

Test Vehicle: 2008 Zap Xebra Project No.: P32023
Test Program: FMVSS 122 Test Date: 06/27/12

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	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET 1
SUMMARY OF TESTS

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

TEST SUMMARY	SPEED (mph)	STOP. DIST. (ft.)	CORRECTED STOPPING DISTANCE (ft.)	PEDAL FORCE (lb)		DECEL. (ft/s ²)		PASSED
				Max	Avg	Max	Avg.	
Maximum Speed	37							
1st Effectiveness Test, 30 mph (Service Brake System)	30.23	51.71	50.92	81.10	58.95	- 42.38	-12.49	Yes
1st Effectiveness Test, 60 mph (Service Brake System)	30.09	51.68	51.37	89.71	59.60	- 49.94	-13.35	Yes
2nd Effectiveness Test, 30 mph	30.20	56.36	55.60	95.06	73.24	- 29.62	-13.86	No
2nd Effectiveness Test, 60 mph								
2nd Effectiveness Test, 80 mph								
2nd Effectiveness Test, 120 mph								
1 st Fade and Recovery (Baseline/Recovery)								
Final Effectiveness Test, 30 mph								
Final Effectiveness Test, 60 mph								
Final Effectiveness Test, 80 mph								
Final Effectiveness Test, 120 mph								
Final Effectiveness Test, 30 mph								
Final Effectiveness Test, 60 mph								
Final Effectiveness Test 30 mph (Partial Failure, Rear Wheel)								
Final Effectiveness Test, 60 mph								
Parking Brake								
Water Recovery (Baseline/Recovery)								

DATA SHEET 2
VEHICLE INFORMATION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

Supplier	Zap Jonway
Manufacturer	Qingqi Group Motorcycle Co. LTD

Year	2008	Odometer (Mi.)	478
Make	Zap	No. Cylinders	
Model	Xebra	Displacement	
MFG Date	10/2008	Transmission	
VIN	LAEMA24608G200303	Final Drive	Rear
Color	Copper	Drive Type	Electric
Received Date	05/15/12	Drive Side	
Wheel Base	83.5 inches		

TIRE SPECIFICATION

Front		Rear	
Tire Placard Size	145R12C	Tire Placard Size	145R12C
Tire Placard psi	51	Tire Placard psi	51
On Vehicle Make	Maxmiler-X	On Vehicle Make	Maxmiler-X
On Vehicle Model	GT Radial	On Vehicle Model	GT Radial
On Vehicle Size	145R12C	On Vehicle Size	145R12C
On Vehicle psi	51 max	On Vehicle psi	51 max

WEIGHT SPECIFICATION

GAWR (Front)	400kg (879 lb)	Ballast Added to Driver	10lbs
GAWR (Rear)	799kg (1759 lb)		
GVWR	1275kg (2805lb)		
Delivered Weight (F)	663 lbs	Test Weight (F)	754 lbs
Delivered Weight (R)	1225 lbs	Test Weight (R)	1335 lbs
Delivered Weight (T)	1888 lbs	Test Weight (T)	2089 lbs

DATA SHEET 2 ... (CONTINUED)

VEHICLE INFORMATION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

BRAKE SPECIFICATION

Front		Rear	
Disc, Drum	Disc	Disc, Drum	Disc
Hydraulic, Mech.	Hydraulic	Hydraulic, Mech.	Hydraulic
Lever, Pedal	Pedal	Lever, Pedal	Pedal
Twin Disc	No		

BRAKE COMPONENT DIMENSION

	Front			
Pads	Inboard	Outboard		
Length (in.)	4.020	4.020		
Width (in.)	1.280	1.280		
Thickness (in.)	0.335	0.335		
Temp. Code	None			
Piston Dia. (in.)	1.950 x 1 Piston			
Disc/Drum	Disc			
Diameter (in.)	8.325			
Thickness (in.)	0.385			

	Left Rear		Right Rear	
Pads	Inboard	Outboard	Inboard	Outboard
Length (in.)	4.020	4.020	4.020	4.020
Width (in.)	1.280	1.280	1.280	1.280
Thickness (in.)	0.335	0.335	0.335	0.335
Temp. Code	None		None	
Piston Dia. (in.)	1.950 x 1 Piston		1.950 x 1 Piston	
Disc/Drum	Disc		Disc	
Diameter (in.)	8.325		8.325	
Thickness (in.)	0.385		0.385	

	Parking Brake Left Rear		Parking Brake Right Rear	
Pads	Inboard	Outboard	Inboard	Outboard
Length (in.)	3.995	3.995	3.995	3.995
Width (in.)	1.242	1.242	1.242	1.242
Thickness (in.)	0.350	0.350	0.350	0.350
Temp. Code	None		None	
Disc/Drum	Disc		Disc	
Diameter (in.)	8.325		8.325	
Thickness (in.)	0.385		0.385	

DATA SHEET 2 ... (CONTINUED)

VEHICLE INFORMATION

Test Vehicle: 2008 Zap Xebra

Project No.: P32023

Test Program: FMVSS 122

Test Date: 06/27/12

MASTER CYLINDER RESERVOIR VOLUME

Front	100ml	Rear	100ml
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BRAKE FLUID TYPE

Front	Dot 4	Rear	Dot 4
--------------	--------------	-------------	--------------

VEHICLE INSTRUMENTATION

SPEEDOMETER

Digital, Analog	Analog
km/h, mph	Both
Lighted	Yes

ODOMETER

Digital, Analog	Digital
Km., mi.	Mi.
Lighted	Yes

TACHOMETER

Digital, Analog	None
Lighted	

DATA SHEET 3
VEHICLE BRAKE SYSTEM INSPECTION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
S5.1 - Motor driven cycle shall have either a split service brake system or two independently actuated service brake systems.	Motor driven cycle has split service brake system?	X	
	Motor driven cycle has two independently actuated service brake systems?		X
S5.1.1 - Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle.	If vehicle has a mechanical service brake system, would component failure result in loss of braking in other service brake system?	N/A	
S5.1.2 - Leakage failure in hydraulic service brake system shall not result in a loss of braking ability in other service brake system on the vehicle.	If vehicle has hydraulic service brake system, would leakage failure in one service brake system result in a loss of braking ability in other service brake system?		X
S5.1.2.1 - Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to one and one-half times the total fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where adjustment is a factor, the worst condition of adjustment shall be used for this measurement. (See Appendix 2 for information on reservoir capacity measurement)	Vehicle meets master cylinder reservoir requirements?	X	
S5.1.2.2 - Each motor driven cycle shall have a brake fluid warning statement that reads as follows, in letters at least three thirty-seconds of an inch high: Warning: clean filler cap before removing. Use only --fluid from a sealed container. (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., DOT 3.) The lettering shall be: (A) Permanently affixed, engraved, or embossed (B) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap (C) Of a color that contrasts with its background, if it is not engraved or embossed	Vehicle meets all master cylinder warning statement requirements?	X	
	Type of brake fluid required?	Dot 4	

DATA SHEET 3 ... (CONTINUED)
VEHICLE BRAKE SYSTEM INSPECTION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
<p>S5.1.3 - (A) Each motor driven cycle equipped with a split service brake system shall have one or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated —</p> <p>(1) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 lb of pedal force upon the service brake.</p> <p>(2) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than one-half the fluid reservoir capacity, whichever is the greater.</p> <p>(B) All failure indicator lamps shall be activated when the ignition switch is turned from the "off" to the "on" or to the "start" position.</p> <p>(C) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position. An indicator lamp activated when the ignition is turned to the "start" position will be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system.</p> <p>(D) Each indicator lamp shall have a red lens with the legend "Brake Failure" on or adjacent to it in letters not less than three thirty-seconds of an inch high that shall be legible to the driver in daylight when lighted.</p>	Does vehicle have a brake system failure indicator lamp?		X
	Does failure indicator lamp conform to operational and physical requirements?	X	
S5.1.4 - Each three-wheeled motor driven cycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement.	If vehicle is a three-wheeled motor driven cycle, is vehicle equipped with a parking brake?	X	
S5.1.5 - The brake system shall be installed so that the lining thickness of the drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining may be visually inspected without removing the pads.	Can the drum brake lining thickness or disc brake friction lining thickness be determined without removal of drum or disc brake pads?	X	

DATA SHEET 4
INSTRUMENTATION CHECKS

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12
 Ambient Temperature: 83 °F Wind Velocity / Direction: 2mph / South
 Odometer Reading - Start: 478 Mi. Finish: 484 Mi.

REQUIREMENTS: Check instrumentation by making not more than 10 stops from 30 mph at a deceleration of not more than 10 fpsps, record results, repeat if necessary.

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)	
				MAX.	AVG.	MAX.	AVG.	FRONT	REAR
1	30.73	117.61	112.10	25.70	14.80	43.65	9.62	-	116
2	31.21	127.61	117.90	24.15	13.51	30.53	9.16	-	122
3	31.22	137.82	117.30	16.39	9.91	57.52	8.03	-	130
4	30.63	133.99	128.50	17.94	8.35	30.25	7.94	-	135
5	31.06	119.41	111.40	21.43	12.83	33.44	9.34	-	146
6	31.49	154.24	140.00	15.23	8.21	33.99	7.36	-	153
7	30.66	156.19	149.60	15.23	8.12	25.97	7.04	-	162
8	33.42	151.82	122.40	16.39	8.50	25.51	8.30	-	-
9	32.12	132.26	115.40	18.33	6.76	25.15	8.61	-	-
10	30.50	131.49	127.20	36.55	11.52	35.81	8.36	-	-

MOTORCYCLE MAXIMUM SPEED DETERMINATION —

REQUIREMENTS: Measure the speed that the motorcycle will attain in a distance of one mile from a standing start

M/C SPEED ATTAINABLE IN 1 MILE 37 mph

DATA SHEET 5
FIRST EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12
 Ambient Temperature: 80-97 °F Wind Velocity / Direction: 2-10mph / S.
 Odometer Reading - Start: 478 Mi. Finish: 526 Mi.

REQUIREMENTS:

- A. Utilize both brakes, no wheel lockup, initial brake temperature between 130°F and 150°F.
 Make the following stops: (1) 6 stops from 30 mph (2) 6 stops from 60mph
 B. Compliance to S122 requires 1 stop at each of the following:
 (1) 30 mph within 54 feet (2) 60mph within 216 feet

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	30.46	52.03	50.46	95.33	53.89	-48.48	-16.97	134	140	FAIL
2	30.66	57.18	54.76	91.96	73.13	-42.01	-16.85	144	144	FAIL
3	30.74	51.57	49.12	100.91	69.43	-48.57	-13.46	127	143	FAIL
4	30.33	56.35	55.13	92.99	67.23	-50.31	-13.47	136	120	FAIL
5	29.94	53.96	54.19	85.64	54.70	-42.29	-11.67	142	121	FAIL
6	30.23	51.71	50.92	81.10	58.95	-42.38	-12.49	145	118	PASS

60mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	29.96	48.27	48.40	93.47	38.93	-61.06	-10.28	141	142	FAIL
2	30.53	55.23	53.25	85.53	43.33	-52.68	-15.39	140	136	PASS
3	30.09	51.68	51.37	89.71	59.60	-49.94	-13.35	142	138	PASS
4	30.04	51.59	51.44	79.45	37.16	-43.93	-14.58	137	132	PASS
5	30.12	53.42	52.99	86.47	65.01	-50.31	-13.56	141	136	PASS
6	30.16	53.19	52.63	95.96	61.12	-45.38	-12.71	143	132	FAIL

DATA SHEET 6

BURNISH

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 64-87 °F Wind Velocity / Direction: 2-10mph / S.

Odometer Reading - Start: 526 Mi. Finish: 750 Mi.

REQUIREMENTS

- A. Burnish the brakes by making 200 stops from 30 mph at 12 fpsps deceleration
- B. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130°F and 150°F or 1 mile whichever comes first
- C. Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop
- D. Hand lever and foot pedal force limits do not apply during this procedure

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)	
				MAX.	AVG.	MAX.	AVG.	FRONT	REAR
1	30.62	103.83	99.66	24.23	9.37	-33.26	-9.67	120	153
25	30.70	90.12	86.04	24.32	16.38	-21.23	-8.81	112	144
50	30.53	86.30	83.30	29.21	14.36	-23.97	-7.65	120	177
75	30.28	89.29	87.64	31.39	18.20	-20.60	-9.42	138	245
100	30.77	87.82	83.49	26.63	17.27	-18.04	-10.38	143	254
125	30.25	88.94	87.48	25.09	14.91	-21.69	-9.49	268	319
150	30.23	85.20	83.92	20.23	11.13	-26.79	-8.84	239	269
175	30.81	94.04	89.18	24.90	15.31	-21.96	-8.89	159	146
200	30.76	85.27	81.10	34.28	16.26	-21.96	-9.84	123	140

DATA SHEET 7
SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12
 Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South
 Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

REQUIREMENTS

A. Make stops as follows:

- (1) 6 stops from 30 mph
- (2) 6 stops from 60 mph
- (3) 4 stops from 80 mph
- (4) 4 stops from vehicle maximum speed not to exceed 120 mph

Utilize both brakes, no wheel lockup, initial brake temperature between 130°F and 150°F.

B. Compliance to S122 requires 1 stop at each of the following:

- (1) 30 mph within 43 feet
- (2) 60 mph within 185 feet
- (3) 80 mph within 345 feet
- (4) 120 mph within 861 feet

Maximum vehicle speed 37.0 mph within 5280 feet

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	30.57	59.74	57.54	92.78	66.66	-27.98	-12.87	123	142	FAIL
2	30.20	56.36	55.60	95.06	73.24	-29.62	-13.86	124	136	FAIL
3	30.49	61.44	59.48	89.72	64.79	-28.43	-11.15	131	135	FAIL
4	30.45	61.51	59.71	92.33	55.51	-27.07	-11.30	132	132	FAIL
5	30.61	59.00	56.66	79.85	51.77	-28.80	-11.62	134	134	FAIL
6	30.55	58.04	55.97	88.95	30.95	-28.16	-11.60	136	130	FAIL

DATA SHEET 7 ... (CONTINUED)

SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South

Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

60mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										
5										
6										

80mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										

DATA SHEET 7 ... (CONTINUED)

SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South

Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

120mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										

DATA SHEET 8
FINAL INSPECTION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

REQUIREMENTS

Disassemble all brakes and inspect the following:

- A. The entire brake system for detachment or fracture of any component.
- B. Brake linings for detachment from the shoe or pad.
- C. Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage.

OBSERVATIONS:

- A. No fractures or separation of any brake system components.
- B. No fractures or separation of any brake system components.
- C. No fluid leakage of brake system seals or cylinders.

BRAKE COMPONENT DIMENSION

	Front			
Pads	Inboard	Outboard		
Length (in.)	4.020	4.020		
Width (in.)	1.280	1.280		
Thickness (in.)	0.317	0.316		
Temp. Code	None			
Piston Dia. (in.)	1.950 x 1 Piston			
Disc/Drum	Disc			
Diameter (in.)	8.325			
Thickness (in.)	0.385			

	Left Rear		Right Rear	
Pads	Inboard	Outboard	Inboard	Outboard
Length (in.)	4.020	4.020	4.020	4.020
Width (in.)	1.280	1.280	1.280	1.280
Thickness (in.)	0.332	0.319	0.318	0.323
Temp. Code	None		None	
Piston Dia. (in.)	1.950 x 1 Piston		1.950 x 1 Piston	
Disc/Drum	Disc		Disc	
Diameter (in.)	8.325		8.325	
Thickness (in.)	0.385		0.385	

DATA SHEET 9

MASTER CYLINDER VOLUME CALCULATION

Test Vehicle: 2008 Zap Xebra Project No.: P32023
 Test Program: FMVSS 122 Test Date: 06/27/12

VOLUME REQUIRED: $V_r = (\Delta t_i + \Delta t_o) \times \frac{\pi D^2}{4}$						
WHERE						
$V_r =$			Volume Required Per Wheel			
$\Delta t =$			Total Change In Pad Thickness			
$D =$			Caliper Cylinder Diameter			
FRONT WHEEL VOLUME						
$\Delta t \times$	$\frac{\pi \times (1.950^2)}{4}$	=	CUBIC IN.	X	NUMBER OF PISTONS	
0.670	4		2.0		1	2.0
Total Cubic Inch Displacement		2.0	X	16.39=	Total Master Cylinder Required Volume (ml)	
					32.78	
Master Cylinder Required Volume		32.78	X	1.5=	49.17	Total Wheel System Requirement
REAR WHEEL VOLUME						
$\Delta t \times$	$\frac{\pi \times (0.994^2)}{4}$	=	CUBIC IN.	X	NUMBER OF PISTONS	
0.670	4		2.0		2	4.0
Total Cubic Inch Displacement		4.0	X	16.39=	Total Master Cylinder Required Volume (ml)	
					65.56	
Master Cylinder Required Volume		65.56	X	1.5=	98.34	Total Wheel System Requirement

Master Cylinder Required Volume	Front Wheel	Pass	Fail	Rear Wheel	Pass	Fail
	49.17ml	X		98.34ml	X	
Master Cylinder Measured Volume	100ml			100ml		

APPENDIX A
PHOTOGRAPHS

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FIGURE 1. LEFT FRONT $\frac{3}{4}$ AS RECEIVED



FIGURE 2. LEFT FRONT $\frac{3}{4}$ AS TESTED



FIGURE 3. RIGHT REAR $\frac{3}{4}$ AS RECEIVED



FIGURE 4. RIGHT REAR $\frac{3}{4}$ AS TESTED



FIGURE 5. MANUFACTURER'S LABEL



FIGURE 6. TIRE PLACARD



FIGURE 7. LIGHTS AND GAUGES



FIGURE 8. VEHICLE BEING WEIGHED



FIGURE 9. INSTRUMENTATION INSTALLED ON VEHICLE



FIGURE 10. INSTRUMENTATION INSTALLED ON VEHICLE



FIGURE 11. LOCATION OF BRAKE MASTER CYLINDER



FIGURE 12. BRAKE MASTER CYLINDER LABEL



FIGURE 13. BRAKE PEDAL WITH LOAD CELL



FIGURE 14. FRONT BRAKE DISC



FIGURE 15. FRONT BRAKE WITH THERMOCOUPLE INSTALLED



FIGURE 16. FRONT BRAKE CALIPERS AND PISTON



FIGURE 17. FRONT BRAKE PADS



FIGURE 18. FRONT BRAKE PADS



FIGURE 19. RIGHT REAR BRAKE DISC



FIGURE 20. RIGHT REAR BRAKE WITH THERMOCOUPLE INSTALLED



FIGURE 21. RIGHT REAR BRAKE CALIPERS AND PISTON



FIGURE 22. RIGHT REAR BRAKE PADS



FIGURE 23. RIGHT REAR BRAKE PADS

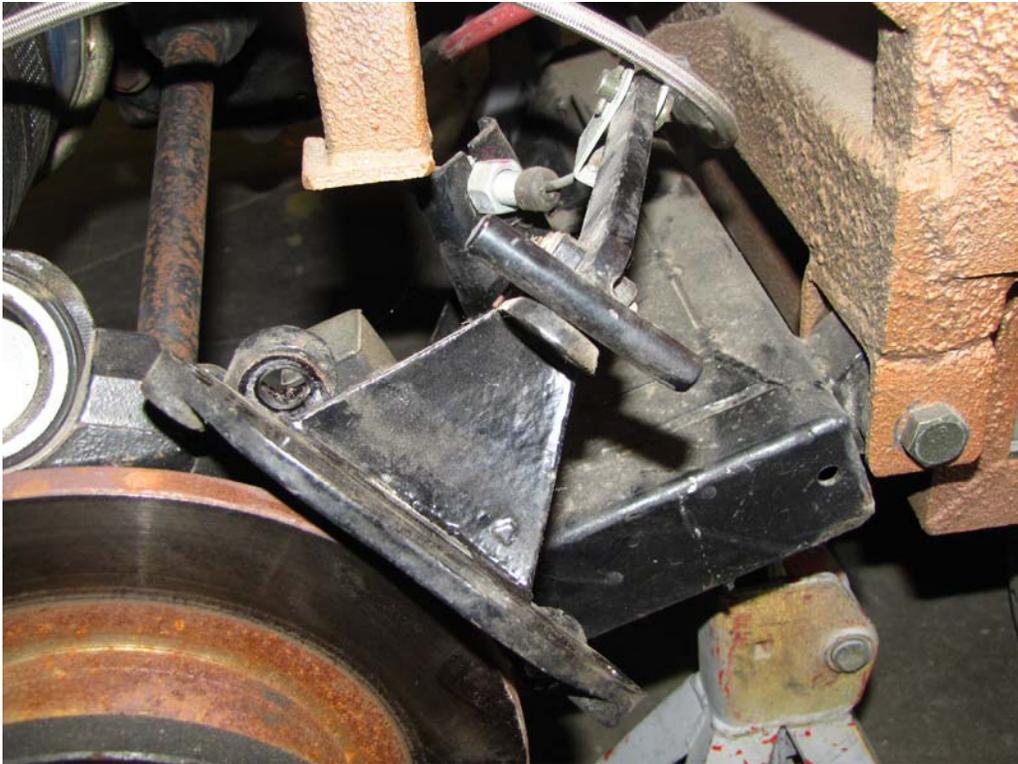


FIGURE 24. RIGHT REAR PARKING BRAKE ASSEMBLY



FIGURE 25. RIGHT REAR PARKING BRAKE PADS



FIGURE 26. RIGHT REAR PARKING BRAKE PADS

APPENDIX B
TEST EQUIPMENT AND CALIBRATION LIST

TEST EQUIPMENT AND CALIBRATION LIST

ITEM	MFR./MODEL	S/N	CALIB. DATE	CALIB. DUE
Data Acquisition System:	Racelogic / VBOX III	030309	05/14/12	05/14/13
Pedal Force Transducer	GSE	183	05/14/12	05/14/13
Two Thermocouples: (2)	Duro-Sense Corporation Type 'K'	N/A	05/14/12	05/14/13
Scale:	Indiana Scale Co. Model 22-10	7098	11/26/11	5/26/12
Scale:	Indiana Scale Co. Model 22-10	7099	11/26/11	5/26/12

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FIGURE 1. LEFT FRONT $\frac{3}{4}$ AS RECEIVED



FIGURE 2. LEFT FRONT $\frac{3}{4}$ AS TESTED



FIGURE 3. RIGHT REAR $\frac{3}{4}$ AS RECEIVED



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FIGURE 18. FRONT BRAKE PADS



FIGURE 19. RIGHT REAR BRAKE DISC



FIGURE 20. RIGHT REAR BRAKE WITH THERMOCOUPLE INSTALLED

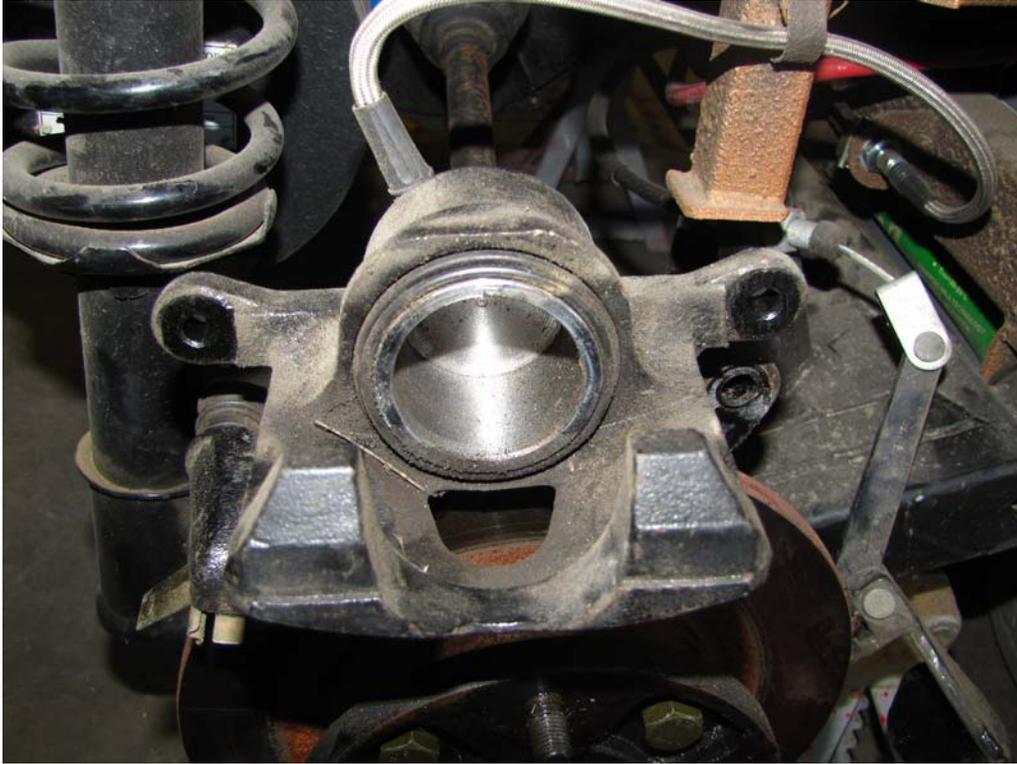


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FIGURE 22. RIGHT REAR BRAKE PADS



FIGURE 23. RIGHT REAR BRAKE PADS

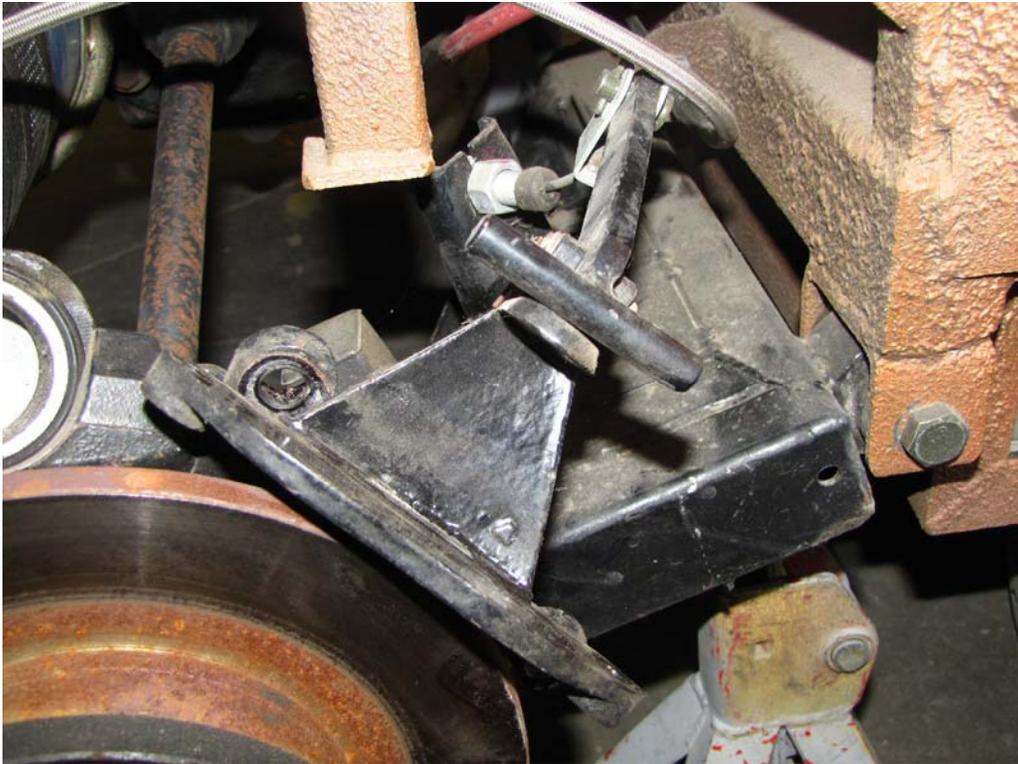


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