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EVALUATION OF A CHILD PASSENGER MONITORING DEVICE
SMALL ONES SAFETY ELECTRONIC MONITOR (SOS)

PREPARED BY:
MGA RESEARCH CORPORATION
11480 ROBERTSON DR.
MANASSAS, VA 20109

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FINAL REPORT

PREPARED FOR:
ALPHA TECHNOLOGY ASSOCIATE, INC.
2810 OLD LEE HWY, SUITE 120
FAIRFAX, VA 22031

SIGNATURE APPROVAL PAGE

Procedure Number: Heat Stroke Technology Evaluation of Small Ones Safety Electronic Monitor (SOS) Rev 1.0 - November 24th, 2014

Prepared by: _____ Date: November 25, 2014
Patrick Smith, Project Engineer

Approved by: _____ Date: December 7, 2014
Steve Fazlovic, Project Engineer

The results presented in this report relate only to the specified test items. MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

Approved by: _____ Date: 3/4/15
Alpha Technology Associate, Inc.

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Project Overview:

MGA Research Corporation (MGA) was contracted by Alpha Technology Associates, Inc. under contract # DTNH22-13-D-00311/TO12 to conduct a series of evaluations on the Small Ones Safety Electronic Monitor (SOS). The SOS system is sold with a transponder chest clip and receiver module. The SOS chest clip replaces an OEM's chest clip on a rear-facing child seat; the receiver module plugs into a 2008 or newer vehicle's onboard diagnostics (OBD-II) port. The two parts of the device communicate and notify the caregiver or driver that a child is in the car seat once the vehicle is turned off.

The procedure for evaluation of this product was written by MGA Research Corporation with input from the National Highway Traffic Safety Administration (NHTSA). The procedure was based upon previous projects conducted by the Children's Hospital of Philadelphia (CHOP) report number DOT HS 811 632, and MGA Research report number C13L4-014.

The SOS chest clips provided for this evaluation were IC: 11740A-SOSR1 / #2 for use with the hybrid vehicle receiver and IC: 11740A-SOSR1 / #1 for use with the non-hybrid vehicle receiver. Both chest clips had an FCC ID number of 2ABS2-SOSR1. A 2014 Ford E-Series van was used to evaluate the non-hybrid unit and a 2013 Toyota Prius was used for the hybrid unit evaluation. All tests were conducted at MGA Research Corporation in Manassas, VA. MGA and NHTSA engineers were present for all testing.

The tests were as follows:

1) Unit Setup Assessment
    a. An evaluation of the initial SOS installation and setup was recorded to identify any difficulties or ambiguities
2) Unit Activation Assessment
    a. After the initial setup, an activation assessment was conducted using anthropomorphic test devices (ATDs) installed in the sample child restraint system (CRS) to determine if the device would activate under various scenarios
3) Unit Notification Assessment
    a. Using a sound meter, decibel (dB) readings were taking to evaluate the systems notification volume
4) Misuse Assessment
    a. A 3mm spacer was used to prevent the chest clip transponder from fully engaging in order to evaluate the system's notification function with an improper closure
5) Mid-Trip Deactivation
    a. The chest clip transponder was unclipped while the vehicle was in-motion to evaluate the system's notification function
6) Liquid Spill Assessment
    a. Saline was poured onto the chest clip transponder to determine if the system would continue to function

Section 1 – Unit Setup Assessment

Procedure: The SOS chest clip was installed on a Graco MyRide 65 convertible child seat (Figure 1). The OEM Graco chest clip (Figure 2) was replaced by the SOS chest clip (Figure 3) per the instructions which reference using the child seat manufacturer's instructions for removal and installation. The SOS receiver was installed in each of the vehicles using their respective onboard vehicle diagnostic port; the hybrid receiver was installed in the Toyota Prius Hybrid (Figures 4, 5, and 6) and the non-hybrid receiver was installed in the Ford E-Series Van (Figures 7, 8, and 9).

The child seat was installed in a rear-facing position in each vehicle for the setup assessment without an ATD. For the Prius, the child seat was installed in the second row right seat using lower anchor attachments (Figure 10). For the E-Series van installation, the child seat was installed in the fifth row right seat using lap and shoulder belts (Figure 11).

For each vehicle, the seat and receiver installation was followed by the chest clip being buckled, the vehicle being started, and the vehicle being driven for 30 seconds over 5mph as stated in the supplied "Peace of Mind in this Busy World" document (Figure 12).

Table 1: Setup Assessment Observations

		Observations
Toyota Prius	Installation	No issues with installation of chest clip or receiver
	Notification on startup	No notification alert received
	Notification after driving for 30 seconds over 5mph	No notification alert received
	Notification when powering off vehicle	Notification alert received when powering off vehicle
Ford E-Series	Installation	Chest clip would not communicate with receiver (1)
	Notification on startup	No notification alert received (1)
	Notification after driving for 30 seconds over 5mph	No notification alert received (1)
	Notification when powering off vehicle	Notification alert received when powering off vehicle with hybrid chest clip (1)

Note (1): The chest clip provided with the non-hybrid receiver did not provide notification when the vehicle was powered off. The installation was repeated several times with the same outcome. The hybrid chest transponder was then used in place of the non-hybrid transponder and it successfully provided notification when the vehicle was powered off. The hybrid chest clip was used for the remainder of the testing in conjunction with both the non-hybrid and hybrid receivers. The two chest clips did not differ in design and were interchangeable with the different OBD-II receivers.

Figure 1: Graco My Ride 65 Convertible Car Seat

Figure 2: Original Graco My Ride 65 Chest Clip Prior to Installing SOS

Figure 3: SOS Chest Clip Installed on Graco My Ride 65 Convertible Car Seat

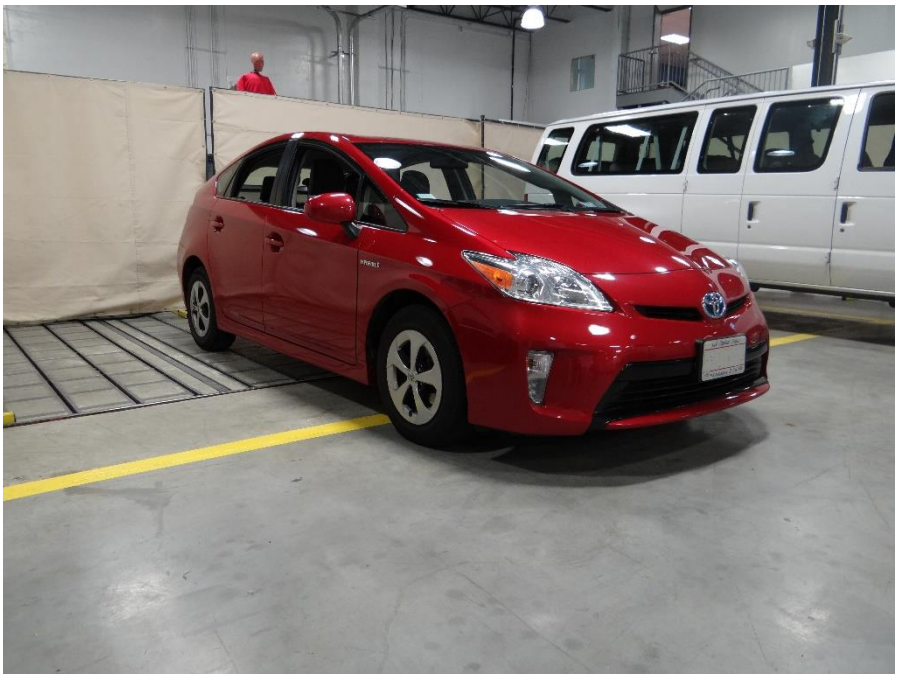

Figure 4: 2013 Toyota Prius Hybrid

Figure 5: SOS Receiver Installed in Toyota Prius Hybrid

Figure 6: SOS “Hybrid” Receiver (Top) and Transponder (Bottom)

Figure 7: 2014 Ford 15 Passenger E-Series Van

Figure 8: SOS Receiver Installed in Ford E-Series Van

Figure 9: SOS “Non Hybrid” Receiver (Top) and Transponder (Bottom)

Figure 10: Graco My Ride 65 Installed in Toyota Prius Hybrid

Figure 11: Graco My Ride 65 Installed in Ford E-Series Van

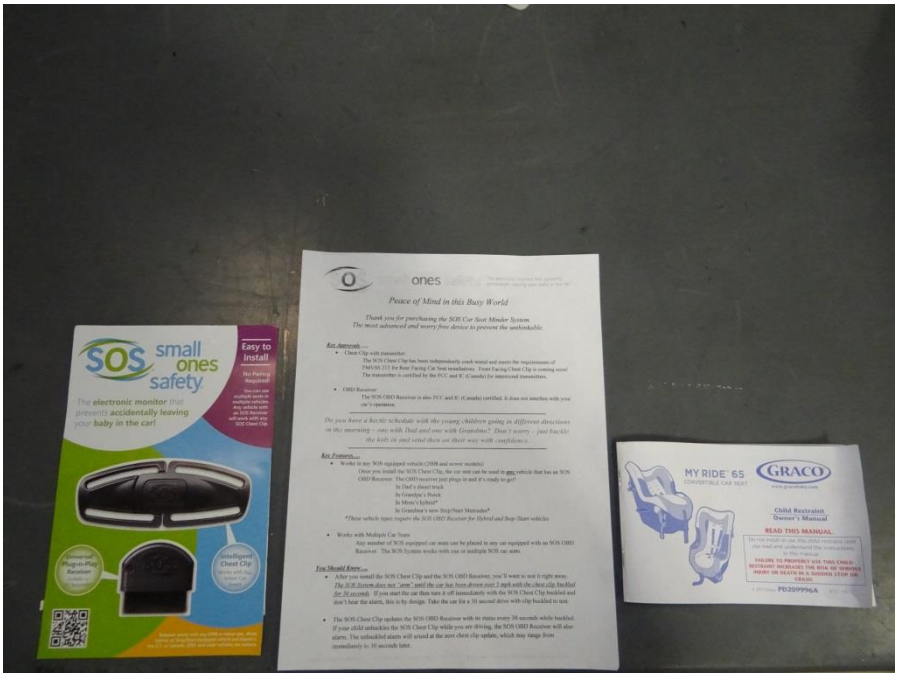

Figure 12: Documentation Provided with SOS System and Instructions for Graco Seat

Section 2 – Activation Assessment

The SOS system activation assessment was evaluated by using both a Hybrid III 3 year old and CRABI 12 month old ATD in each vehicle (Figures 13, 14, 15, and 16). Two scenarios were tested with for each vehicle and are listed below. Modifications made to the test plan are listed in the notes section of the Table 2.

1) Scenario one involved buckling the chest clip prior to powering on the vehicle and then allowing it to run for one minute prior to powering off the vehicle in order to induce a notification. This was repeated three times with each ATD.

2) Scenario two involved allowing the vehicle to completely power on prior to buckling the chest clip; after this, the vehicle would run for one minute prior to powering off the vehicle in order to induce a notification. This was repeated three times with each ATD.

The first four trials using the Toyota Prius with the CRABI ATD were conducted without driving the vehicle over 5mph. All subsequent evaluations were conducted with driving the vehicle over 5mph. The SOS literature stated that the "The SOS System does not 'arm' until the car has been driven over 5mph with the chest clip buckled for 30 seconds."

Table 2: Activation Assessment Results

		Engine Off			Engine Running		
		Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
Prius Hybrid	CRABI	No Notification	No Notification	No **(1)** Notification	Yes Notification	Yes Notification	Yes **(2)** Notification
	3yo	Yes Notification	Yes Notification	Yes Notification	Yes Notification	Yes Notification	No **(4)** Notification
E-Series Van	CRABI	Yes Notification	Yes Notification	No **(3)** Notification	Yes Notification	Yes Notification	Yes Notification
	3yo	Yes Notification	Yes Notification	Yes Notification	Yes Notification	Yes Notification	Yes Notification

Note (1): An additional two trials were performed:

- For trial number four, the vehicle was placed in Drive for several seconds prior to being put back in Park and powering off the vehicle; there was no notification
- For trial number five, the vehicle was driven over 5mph prior to being placed in park and powered off; there was notification

Note (2): Performed an additional trial following trial 3 where the clip was not un-fastened from the previous test; there was notification
Note (3): Performed an additional trial (number 4) which was a repeat; there was notification
Note (4): Performed trial with vehicle driven at 4mph instead of 5mph or above

Figure 13: Graco My Ride 65 Installed in Toyota Prius with 12mo CRABI

Figure 14: Graco My Ride 65 Installed in Toyota Prius with 3yo ATD. The knee stops were removed from the ATD to enable the rear facing position

Figure 15: Graco My Ride 65 Installed in Ford E-Series with 12mo CRABI

Figure 16: Graco My Ride 65 Installed in Ford E-Series with 3yo ATD

Section 3 – Notification Assessment

In order to assess the notification volume coming from the SOS receiver, a sound meter was used in the vehicle. For the Prius Hybrid the reading was taken at ear level towards in the middle of all seating positions (Figure 17). In the E-Series Van, the reading was taken at ear level between the driver and right front passenger (Figure 18). Additional sound levels were recorded with the vehicles off and with the vehicles driving at 5mph.

Table 3: Notification Assessment Results

	E-Series Van			Prius Hybrid		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
Vehicle Off Reading (dB)	35	34	35	39	39	38
Vehicle Running Reading (dB)	55	54	56	63	55	58
Notification Reading (dB)	65	63	64	59	55	55

Figure 17: Sound Meter Location for Evaluation in Toyota Prius

Figure 18: Sound Meter Location for Evaluation in Ford E-Series

Section 4 - Misuse Assessment

The assessment conducted was a misuse where the ATD's t-shirt was used to create an obstruction not allowing the chest clip to be fully closed. The obstruction created a 3mm space in the chest clip (Figures 19, 20, and 21). Activation assessments were conducted using the 3 year old ATD and the Prius Hybrid.

Table 4: Misuse Assessment Results

Improper Clip Closure		
Hybrid III 3 YO and Prius Hybrid		
Trial	Does the system function?	Notes
1	Yes	3.22mm Spacing
2	Yes	3.64mm Spacing
3	Yes	3.11mm Spacing

Figure 19: Improper Clip Closure with Clothing Obstruction Trial #1

Figure 20: Improper Clip Closure with Clothing Obstruction Trial #2

Figure 21: Improper Clip Closure with Clothing Obstruction Trial #3

Section 5 - Mid-Trip Deactivation

The assessment was conducted by unbuckling the chest clip while the vehicle was running (Figure 22). The vehicle reached 5mph prior to the chest clip being unbuckled. Activation assessments were conducted using the 3 YO ATD and the Prius Hybrid.

Table 5: Mid-Trip Deactivation Results

Mid-Trip Deactivation Results		
Hybrid III 3 YO and Prius Hybrid		
Trial	Does the system function?	Notes
1	No	No alert after unbuckling while driving for 10 seconds
2	Yes	Alert after driving for 30 seconds prior to unbuckling
3	Yes	Alert after driving for 30 seconds prior to unbuckling

Figure 22: Mid-Trip Deactivation

Section 6 - Liquid Spill Assessment

The final assessment simulated a spill on the chest clip. The SOS chest clip was placed back-side-up on a terrycloth towel and 4 ounces of saline solution (Figure 23) was poured on the device (Figure 24). A functionality check was immediately conducted and repeated every 5 minutes thereafter for 25 minutes. The activation assessment procedure was followed for each test with the vehicle turned off however the SOS was not installed on a child seat.

Table 6: Liquid Spill Assessment Results

Saline Poured on Transmitter		
Time (minutes)	Does the system function?	Notes
0	Yes	Saline poured on back of transmitter and battery area
5	No	No Alert or functionality
10	No	No Alert or functionality
15	No	Placed chest clip 10” from receiver
20	Discontinued Testing	-
25	Discontinued Testing	-

After testing was discontinued, the circuit board was removed from the chest clip housing for inspection (Figure 25). The day after conducting the liquid spill assessment, after the liquid had dried, the test engineer checked operation of the device and found it to be non-functional.

Figure 23: Saline Solution Used for Liquid Spill Simulation

Figure 24: Saline Solution Applied to Back-Side of SOS Transmitter

Figure 25: Removed Circuit Board from Transmitter where Saline Solution Penetrated

Section 7 – Instrumentation Calibration Data

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Sound Meter	140500209	Tenma	10/21/2014

Section 8 – Appendix 1: Included Instructions

small ones safety

The electronic monitor that prevents accidentally leaving your baby in the car!

Peace of Mind in this Busy World

Thank you for purchasing the SOS Car Seat Minder System.
The most advanced and worry free device to prevent the unthinkable.

Key Approvals…..

- Chest Clip with transmitter:

  The SOS Chest Clip has been independently crash tested and meets the requirements of FMVSS 213 for Rear Facing Car Seat installations. Front Facing Chest Clip is coming soon! The transmitter is certified by the FCC and IC (Canada) for intentional transmitters.

- OBD Receiver:

  The SOS OBD Receiver is also FCC and IC (Canada) certified. It does not interfere with your car's operation.

Do you have a hectic schedule with the young children going in different directions in the morning – one with Dad and one with Grandma? Don't worry – just buckle the kids in and send then on their way with confidence.

Key Features….

- Works in any SOS equipped vehicle (2008 and newer models):

  Once you install the SOS Chest Clip, the car seat can be used in ***any*** vehicle that has an SOS OBD Receiver. The OBD receiver just plugs in and it's ready to go!!

  In Dad's diesel truck
  In Grandpa's Buick
  In Mom's hybrid*
  In Grandma's new Stop/Start Mercedes*

  **These vehicle types require the SOS OBD Receiver for Hybrid and Stop /Start vehicles*

- Works with Multiple Car Seats

  Any number of SOS equipped car seats can be placed in any car equipped with an SOS OBD Receiver. The SOS System works with one or multiple SOS car seats.

You Should Know….

- After you install the SOS Chest Clip and the SOS OBD Receiver, you'll want to test it right away. *The SOS System does not "arm" until the car has been driven over 5 mph with the chest clip buckled for 30 seconds*. If you start the car then turn it off immediately with the SOS Chest Clip buckled and don't hear the alarm, this is by design. Take the car for a 30 second drive with clip buckled to test.

- The SOS Chest Clip updates the SOS OBD Receiver with its status every 30 seconds while buckled. If your child unbuckles the SOS Chest Clip while you are driving, the SOS OBD Receiver will also alarm. The unbuckled alarm will sound at the next chest clip update, which may range from immediately to 30 seconds later.