

**UNITED STATES DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

**In re:**

PE14-016  
Air Bag Inflator Rupture

**GENERAL MOTORS LLC'S REPORT IN RESPONSE TO THE  
GENERAL ORDER DIRECTED TO MANUFACTURERS**

General Motors LLC (“GM”) submits the following report in response to the National Highway Traffic Safety Administration’s (“NHTSA”) General Order dated November 18, 2014 (the “General Order”).<sup>1</sup>

**General Order Requests 1(a) – (e)**

The General Order instructs GM to repeat NHTSA’s requests verbatim above GM’s response. Request 1 provides, in part:

1. File a report that describes, in detail, all completed, ongoing or planned testing of Takata inflators outside of the HAH [High Absolute Humidity<sup>2</sup>] Region. At a minimum, your report must include, but should not be limited to, the following:

- a. All documents regarding or relating to the testing contained in your report;
- b. The location of the testing; the dates of the testing; whether the testing is completed, in progress, or planned; anticipated date of completion of testing; the nature and objective of the testing; and, testing protocols;

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<sup>1</sup> GM today also submits 19,892 documents in response to the General Order in accordance with the accompanying letter from Jeffrey M. Boyer, Vice President, Global Product Development, Purchasing and Supply, dated December 5, 2014. GM’s responses are based upon the information it has reviewed to date and reflect its current information and belief.

<sup>2</sup> Definition Four in the General Order states as follows: “High Absolute Humidity Region (HAH Region)’ means the following states and U.S. territories: Florida; Puerto Rico; Hawaii; Saipan; American Samoa; and, the U.S. Virgin Islands, and the following geographic areas within the United States: Southern Georgia; coastal areas of Alabama; Louisiana; Mississippi; and, Texas.”

c. A roster of all vehicles where the inflator was tested which includes: the model; model year; vehicle build date; VIN; the vehicle's registration history, by location; inflator serial number; inflator type; dealership location with zip code where the inflator unit was returned; whether any deaths, injuries or claims are associated with the inflator in the vehicle; and, product specifications for the air bag and inflator modules in each vehicle.

d. If testing of inflators has been completed, describe in detail the results of the testing and the conclusions you have reached based upon the test results. If your conclusion is that a safety defect does not exist in inflators outside of the HAH Region, describe in detail the basis for that conclusion and when the decision was made and by whom. Provide a copy of all documents to or from any person(s) related to the conclusion that no safety defect exists in inflators outside of the HAH Region.

e. Sub-part (e) is directed to BMW, Chrysler, Ford, GM, Honda, Mazda, Mitsubishi, Nissan, Subaru and Toyota: State in your report whether or not Takata has performed testing of inflators used in your vehicles outside of the HAH Region. If so, describe in detail what Takata has communicated to you about the testing and/or test results. Produce all documents related to Takata's testing, test results and your communications, internal and external, related to the testing. State whether you have requested additional information from Takata concerning its testing of inflators outside of the HAH Region which you believe would assist in your determination of whether a defect exists. Identify and describe any information, documents or categories of information and documents that you reasonably believe that Takata has or reasonably should have concerning inflators or testing of inflators used in your vehicles that Takata has not provided you and which you believe would assist you in testing inflators to determine whether a safety defect exists in inflators outside of the HAH Region.

### **GM's Report in Response to General Order Requests 1(a) – (e)**

#### **I. Preliminary Statement**

Pursuant to our conversations with NHTSA's Office of Chief Counsel and consistent with GM's letter to NHTSA's Office of Chief Counsel dated November 21, 2014, GM's report encompasses completed, ongoing, and planned testing to address safety-related concerns regarding the potential rupture of Takata airbag inflators.

This report also includes information relating to GM's safety investigations of Takata frontal airbag inflators, both completed and ongoing, whether or not related to humidity intrusion

issues. Unless otherwise noted, and based on information received from Takata, Takata has or will conduct the testing related to these field investigations at its Armada, Michigan facility. To the extent that GM has possession, custody, or control of Takata's testing-related documents and information, or to the extent that GM has conducted its own responsive testing, GM has summarized that testing below and produced related documents and information requested in General Order subparts 1(a) – 1(e). The information requested in the General Order subparts 1(f) – 1(g) is attached as **Appendix A**.

## **II. Recalls Relating to Humidity Intrusion**

### **A. Toyota's Recall of the Pontiac Vibe**

The Pontiac Vibe is a vehicle that was manufactured by New United Motor Manufacturing, Inc. ("NUMMI"), a joint venture between General Motors Corporation ("GM Corp.") and Toyota. Under the terms of this joint venture and related agreements, Toyota is responsible for determining the existence of safety defects in the Pontiac Vibe (in concert with safety determinations regarding the Toyota Matrix), including filing safety defect reports with NHTSA under 49 C.F.R. § 573. GM is responsible for executing safety recalls for Pontiac Vibe vehicles after Toyota makes the decision to conduct a safety recall.

Certain Pontiac Vibe vehicles are subject to the following Toyota safety recalls relating to potential humidity intrusion into Takata airbag inflators: (1) NHTSA Recall 13V-133; (2) NHTSA Recall 14V-312; (3) NHTSA Recall 14V-350; and (4) NHTSA Recall 14V-655.

### **B. Subaru's Recall of the Saab 9-2X**

The Saab 9-2X is a Saab-branded hatchback developed and supplied by Fuji Heavy Industries/Subaru ("Subaru") based on the Subaru Impreza.<sup>3</sup> Under the applicable agreements between Subaru and GM Corp., Subaru is responsible for determining the existence of safety defects in the Saab 9-2X (in concert with safety determinations regarding the applicable model year Subaru Impreza), including filing safety-defect reports with NHTSA under 49 C.F.R. § 573. GM is responsible for executing safety recalls for Saab 9-2X vehicles after Subaru makes the decision to conduct a safety recall.

Certain Saab 9-2X vehicles are subject to the following Subaru safety recalls relating to potential humidity intrusion into Takata airbag inflators: (1) NHTSA Recall 14V-471; and (2) NHTSA Recall 14V-763.

### **C. Takata's Testing Related to the Pontiac Vibe and Saab 9-2X**

As GM stated in its letter to Frank Borris, Director, Office of Defects Investigation, dated November 5, 2014, Takata designed and engineered the airbag inflators in the Pontiac Vibe and Saab 9-2X, and is conducting all testing on returned parts for Pontiac Vibe and Saab 9-2X vehicles identified in the above-referenced recalls.<sup>4</sup> Takata has informed GM that it will test

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<sup>3</sup> GM sold the Saab business and brand in 2010.

<sup>4</sup> See GMNHTSATAK100116997-17001.

these returned parts by deploying the inflator and inspecting the inflator after the deployment for ruptures.

On November 6, 2014, and again on December 2, 2014, GM requested that Takata provide GM with an update on the results of inflator testing on parts returned from the recalled Pontiac Vibe and Saab 9-2X vehicles. Initially, Takata could not provide GM with this information because Takata's testing data did not segregate inflators recovered from Pontiac Vibe and Saab 9-2X vehicles from inflators recovered from Toyota Matrix and Subaru Impreza hatchback vehicles. On December 2, 2014, Takata provided GM with a report that summarizes deployment test results for eight Takata PSPI-L inflators recovered from Pontiac Vibe in south Florida and 18 Takata PSPI-L inflators recovered from Pontiac Vibe in north Florida. Out of these 26 test deployments, one inflator—an inflator from south Florida—ruptured.<sup>5</sup> Takata also informed GM during a telephone call on December 2, 2014, that it has conducted deployment tests on 78 inflators recovered from Saab 9-2X and Subaru Impreza hatchback vehicles in north Florida, and that one inflator ruptured during this testing. As of December 2, 2014, Takata could not identify which of these 78 tested inflators originated in Saab 9-2X vehicles, or whether the one ruptured inflator was recovered from a Saab 9-2X or Subaru Impreza hatchback. GM has requested and Takata has promised to provide GM with this information. In addition, Takata has provided GM with summary information regarding inflator testing that it has performed for other automakers.<sup>6</sup>

### **III. GM's Investigations and Recalls Relating to Takata Inflators**

GM has conducted four product investigations relating to Takata front airbag inflator modules. Two of these investigations resulted in safety recalls. None of these investigations or recalls is related to potential humidity-related defects in Takata inflators.

#### **A. GM Investigation N130230 and Related Recall – Airbag Inflator Welding**

GM investigated a Takata airbag inflator welding defect in July 2013 that resulted in a GM safety recall (NHTSA Recall 13V-315).

Specifically, on July 9, 2013, Takata informed GM that, during a periodic airbag module deployment lot acceptance test on June 20, 2013, Takata discovered weld splits in the inflator housing of certain new Takata PDP 3.0 passenger airbag inflators. Takata tested other new inflators and observed nine total splits in 702 follow-up deployments of suspect parts. According to Takata, the weld splits could result in the airbag inflator fracturing during deployment, which could cause some of the inflator gases to vent behind the instrument panel and prevent the airbag from filling completely.

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<sup>5</sup> See GMNHTSATAK000066464-495, GMNHTSATAK000066497-6526, GMNHTSATAK000066540-558, GMNHTSATAK000066571-76, GMNHTSATAK000066591-6613, and GMNHTSATAK000066642-645.

<sup>6</sup> See GMNHTSATAK100237867-881. NHTSA has also provided GM with high-level information from Takata that summarizes Takata's testing for other automakers. See GMNHTSATAK000050427-434 and GMNHTSATAK000066577-581.

As a result of this investigation, GM decided on July 15, 2013, to conduct Recall 13V-315 involving 845 model year (“MY”) 2013–2014 Chevrolet Silverado and GMC Sierra vehicles.

**B. GM Investigation N140305 and Related Recall – Dual-Stage Outer Baffle in Single-Stage Inflator**

GM investigated a Takata airbag inflator defect in May and June 2014 that resulted in a GM safety recall (NHTSA Recall 14V-372).<sup>7</sup> On May 1, 2014, GM learned that it had been named in a lawsuit involving an improperly deployed driver airbag that injured the driver in a 2013 MY Chevrolet Cruze. In May and June 2014, GM and Takata conducted an investigation, during which GM located Takata SDI-X driver airbag inflators in the field produced on or about the same date as the inflator identified in the lawsuit. GM had the driver airbags from approximately 25 vehicles removed and shipped to Takata for testing.<sup>8</sup>

On June 20, 2014, Takata informed GM that it had identified the cause of the improper deployment. In assembling the single-stage inflators used in Chevrolet Cruze vehicles, Takata had installed an outer baffle intended for use in dual-stage inflators. According to Takata, one field sample had a buckled outer baffle, which indicated that Takata had used the wrong baffle in production. When Takata tested this field sample, the inflator ruptured during deployment.<sup>9</sup>

As a result of this investigation, GM decided on June 23, 2014, to conduct Recall 14V-372 which involved 29,019 MY 2013–2014 Chevrolet Cruze vehicles. GM instructed dealers to replace the driver front airbag in affected vehicles and return the undeployed airbags to Takata for examination. According to Takata, as of November 1, 2014, Takata had received 3,366 driver front airbag modules that were collected during the recall, and X-rayed 2,787 for evidence of the inflator containing the wrong outer baffle. Takata informed GM that it had discovered 18 additional incorrect outer baffles in these analyzed parts. Takata also informed GM that Takata had conducted deployment testing on 17 of the defective inflators, and found that 16 inflators ruptured and produced inflator assembly fragments. According to Takata, Takata’s X-ray analysis on the rupture parts showed that the baffles in these inflators had buckled outward, which closed off the gas exit path to the orifice holes.<sup>10</sup>

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<sup>7</sup> See GMNHTSATAK000043131-147.

<sup>8</sup> GM submits today a list of these vehicles’ VINs at GMNHTSATAK000002293-94.

<sup>9</sup> GM submits today the documentation that Takata provided to GM regarding these tests at GMNHTSATAK000002224-258, GMNHTSATAK000002276-292, GMNHTSATAK000052863-887, GMNHTSATAK000052893-2917, and GMNHTSATAK000052937-944.

<sup>10</sup> GM submits today the documentation that Takata provided to GM regarding these tests at GMNHTSATAK000052863-887, GMNHTSATAK000052893-2917, and GMNHTSATAK100117698-7711.

**C. GM Investigation N140474 – Single-Stage Outer Baffle in Dual-Stage Inflator**

During the investigation that led to Recall 14V-372 related to the Chevrolet Cruze (*see* Section III.B, above), GM asked Takata to determine whether Takata could have improperly built a dual-stage inflator by installing an outer baffle designed for use in single-stage inflators. Takata determined that this type of misbuild was theoretically possible and fabricated sample PSDI-X inflators with this condition for testing purposes. Using these samples, Takata conducted inflator deployment testing, while GM conducted sled and low risk deployment tests using the Chevrolet Trax restraint system equipped with Takata's fabricated samples. These tests confirmed that, while this condition could cause an airbag to inflate faster, the condition did not increase the risk of occupant injury. GM closed this investigation without any field action.<sup>11</sup>

**D. GM Investigation N140792 – Cushion and Propellant**

GM is currently conducting an investigation into certain Takata airbag inflators relating to a quality issue found in a returned warranty part from a 2014 MY Chevrolet Cruze vehicle.

Specifically, in October 2014, during inspection of an airbag module from a 2014 MY Chevrolet Cruze that had been replaced after the owner complained of steering wheel rattling, Takata determined that the inflator was missing a cushion<sup>12</sup> and had a reduced quantity of propellant. Takata informed GM that the part was inadvertently installed in a production module after being identified as defective and set aside to be scrapped. Takata further informed GM that Takata has identified only one inflator shipped with this condition, which is the warranty inflator mentioned above.

For testing purposes, Takata has fabricated sample inflators without the cushion and with a reduced quantity of propellant. Takata conducted deployment tests of fabricated SDI-X inflator samples and provided the results of this testing to GM. The results showed a decrease in the peak pressure of approximately 90 kPa (from 200 kPa to 110 kPa) and a slower inflation rate (as shown by the slope of the pressure vs. time plot). Mass flow output of the inflator was also reduced from a peak of 0.73 kg/s to 0.4 kg/s. Based on GM's past experience with testing driver airbags, GM determined that reducing the inflator output by almost 50% would have a significant effect on restraint performance and could result in non-compliance with FMVSS 208

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<sup>11</sup> GM submits today documents relating to GM and Takata's test results at GMNHTSATAK000053404-408, GMNHTSATAK000053411, GMNHTSATAK000053414-465, GMNHTSATAK000053527-553, GMNHTSATAK000053562-569, GMNHTSATAK000061666-1717, GMNHTSATAK000066358-377, and GMNHTSATAK000066383-395.

<sup>12</sup> In this instance, "cushion" refers to a soft, cylindrical element placed inside the inflator's propellant chamber, designed to cushion the propellant from mechanical impact and vibration.

requirements for belted and/or unbelted occupants. GM has asked Takata to test the impact of this condition on the PSDI-X inflator model in addition to the SDI-X model.<sup>13</sup>

Takata has informed GM that, while Takata believes the suspect inflator that prompted this investigation was an isolated occurrence, it has developed a proposed methodology in an attempt to verify that no other inflators lack a cushion or have a reduced quantity of propellant.<sup>14</sup>

Using this methodology, Takata has identified 27 potential inflators that could be further tested to determine whether the returned warranty part was indeed an isolated occurrence. However, Takata has indicated to GM that this methodology is imprecise and Takata is not certain that any of these inflators are suspect parts. GM received the information on these parts from Takata on November 8, 2014, and November 11, 2014, and is currently working with GM dealers and customers to recover a number of these inflators for further testing by Takata. GM presently expects that the part-recovery process will take several weeks to complete, and that it will provide sample inflators to Takata for testing before the end of December 2014. This investigation is still open, pending the results of Takata's testing.<sup>15</sup>

#### **IV. GM's Planned Testing on GMT900 Vehicles**

GM is proactively investigating Takata inflators in GMT900 vehicles.<sup>16</sup> Based on the information it has received and reviewed to date, GM is not presently aware of any reported inflator ruptures in these vehicles. GM began this investigation in light of the recalls conducted by other automakers relating to Takata airbag inflators. GM initiated this investigation through its new Safety Field Investigation process as part of GM's renewed commitment to safety.<sup>17</sup>

GM shared its preliminary, internal investigation plan for GMT900 vehicles with NHTSA on November 25, 2014, including GM's proposal to seek GMT900 passenger airbag inflators proactively from the field to understand the effect of the environment (vehicle and external) and humidity on these Takata inflators over time. In those discussions, NHTSA acknowledged that GMT900 vehicles are outside the specific vehicle population at issue in the current NHTSA investigation. NHTSA expressed support for GM's preliminary proposal to obtain Takata passenger airbag inflators from the field but suggested that, given Takata's limited testing capacity, GM identify a third party to test these inflators to allow Takata to focus on

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<sup>13</sup> GM submits today documents relating to Takata's test results at GMNHTSATAK000053190-3362.

<sup>14</sup> GM submits today documents relating to Takata's proposed methodology at GMNHTSATAK000053267-285.

<sup>15</sup> GM submits today a list of affected VINs at GMNHTSATAK000053373.

<sup>16</sup> The GMT900 platform is a GM full-size pickup truck and SUV platform that includes certain Chevrolet Silverado, Silverado HD, Tahoe, Avalanche, and Suburban vehicles; certain GMC Sierra, Sierra HD, Yukon, and Yukon XL vehicles; and certain Cadillac Escalade, Escalade ESV, and Escalade EXT vehicles.

<sup>17</sup> See GMNHTSATAK000043210-225, GMNHTSATAK000043251-270, GMNHTSATAK000043353-372, GMNHTSATAK000043590-3614, GMNHTSATAK000043622-658, and GMNHTSATAK000048775-794.

higher-risk inflator populations from other automakers. GM will work with NHTSA to identify a third party to conduct Takata inflator component analysis and testing; however, GM will require Takata's assistance in developing test protocols for a third party to follow with respect to these inflators.

At this time, GM's testing plans are preliminary and subject to change in both timing and content. GM will refine its testing plans as the investigation continues; testing referenced in the documents produced by GM today may or may not be performed as described, depending on how the investigation proceeds including, without limitation, information received from the field. In addition, the testing timeline will be impacted by Takata's testing capacity, which is currently consumed with higher-priority testing. As noted above, GM is working with NHTSA to identify an appropriate third party that may conduct testing.<sup>18</sup>

#### **V. Takata's Testing of a Ruptured Prototype Inflator**

In September 2013, Takata advised GM that a prototype Takata SDI-X2 model inflator, manufactured using prototype equipment in a non-production facility, ruptured during development testing designed to simulate accelerated aging—*i.e.*, thermal shock, high-temperature exposure, and high-humidity conditions. According to Takata, the inflator was not properly hermetically sealed and did not undergo the required helium-leak test. Takata also advised GM that other prototype SDI-X2 inventory contained defective shims and/or deteriorated propellant.

These prototype SDI-X2 inflators were similar to the driver airbag inflator used in certain GM prototype D2UB vehicles. These vehicles were owned by GM and in GM's possession; nonetheless, out of an abundance of caution, GM disconnected the driver airbags in the affected prototypes until Takata could produce replacement inflators. Takata confirmed that its production lines use shims of verified quality, and that all production inflators are subjected to a helium-leak check.<sup>19</sup>

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<sup>18</sup> GM submits today documents relating to GM's preliminary, internal investigation plan for the GMT900 vehicles at GMNHTSATAK000000535, GMNHTSATAK000043466, GMNHTSATAK000043505-512, GMNHTSATAK000043556-564, GMNHTSATAK000066582-587, GMNHTSATAK000066590, GMNHTSATAK000066614-641, and GMNHTSATAK000066646-659.

<sup>19</sup> GM submits today the testing-related documents that Takata provided to GM at GMNHTSATAK000066660-61 and GMNHTSATAK100240996.