

March 8, 2012

Jennifer T. Timian, Chief
Recall Management Division
Office of Defects Investigation Enforcement
National Highway Traffic Safety Administration
1200 New Jersey Ave, SE, Room W46-409
Washington, DC 20590

N120049

NVS-215aa
EQ12-002

Dear Ms. Timian:

This letter is General Motors (GM) response to your Equipment Query investigation EQ12-002, dated February 23, 2012, in relation to certain Autoliv air bag modules that several vehicle manufacturers have decided contain a safety related defect.

Your requests and our corresponding replies are as follows:

- 1. State whether your company has made, or intends to make, a decision that vehicles it manufactured with these modules contain a safety defect, and will notify its purchasers by conducting a safety recall.**

Prior to receiving this Equipment Query, GM conducted an internal investigation of this issue. As a result of that investigation, GM has not made, nor does it plan to make a decision that vehicles GM manufactured with these modules contain a safety defect. Based on its investigation, GM has determined that the air bag inflators installed in GM vehicles will function properly and do not contain safety defects. The reasons for this determination are set forth in greater detail in response to request 2.

- 2. If your company does not believe that vehicles it manufactured with these modules contain a safety defect, provide all information, such as supporting documents, analysis, and/or test results, that support this opinion.**

The subject roof-rail air bag inflators installed in some GM vehicles are supplied by Autoliv ASP, Inc. (Autoliv). Autoliv refers to them as Autoliv Curtain Hybrid (ACH) inflators and supplies four different designs of these ACH inflators. The designations used by Autoliv for these products are ACH-2.1, ACH-2.1B, ACH-2.4 and ACH-2.0B. GM uses the ACH-2.1B inflator.



All four designs of these ACH inflators share a basic technology. ACH inflators store compressed gas in a central chamber with a small pyrotechnic charge (an initiator) at one end. In the event of a crash, an electrical signal is sent to the initiator, causing it to deploy (fire). Deployment of the initiator causes a sudden increase in the pressure in the initiator base. The increased pressure ruptures the burst disk at the base of the inflator, and a resultant shockwave travels the length of the chamber to rupture a second diffuser burst disk at the other end of the chamber, allowing the stored gas to exit the inflator and fill the air bag cushion.

As Autoliv explained in their February 17, 2012, response to EQ12-002, ACH inflator performance may vary depending on the design of the burst and diffuser disks, the length and diameter of the chamber, and deployment energy of the initiator propellant compound. The four ACH inflator designs produced by Autoliv vary significantly in design characteristics and those engineering differences can greatly affect performance characteristics, including susceptibility to variations in deployment energy of the propellant compound.

Deployment energy of the initiator propellant compound, and consequently ACH inflator performance, can be affected by particle size of the ingredients used to create the initiator propellant compounds. The deployment energy of initiator propellant compounds typically decreases at lower temperatures. The initiators at issue in EQ12-002 were designed to use initiator propellant compounds with 1.8 micron titanium hydride. In October 2011, Autoliv determined that a quantity of inflators (ACH-2.1, ACH-2.1B, ACH-2.4 and ACH-2.0B) were built using initiators with 5 micron titanium hydride mixture rather than the 1.8 micron titanium hydride mixture and began an investigation.

In January 2012, Autoliv was notified by another OEM customer that an ACH-2.1 product had failed a cold temperature (-35 C) deployment test, a lot acceptance test (LAT). Autoliv's inspection of the failed part revealed that, although the initiator deployed (fired), the secondary diffuser burst disk had not opened, indicating that the inflator output was insufficient to rupture the secondary diffuser burst disk.

The ACH-2.1B inflator utilized by GM is designed with a base dome in place of a primary burst disk. The pressure required to break the base dome is higher than with the burst disk design of the ACH-2.1 inflator. The higher breakout pressure creates a stronger shock wave that travels to the other end of the inflator. This stronger shock wave ensures that the secondary diffuser burst disk ruptures and deploys the roof-rail air bag even if the initiator is built using 5 micron titanium hydride.

GM received from Autoliv about 2,800 roof-rail air bag inflators with a 5 micron titanium hydride mixture. In the course of a joint investigation between GM and Autoliv more than 1,100 tests of ACH-2.1B inflators assembled with affected initiators (5 micron titanium hydride), at temperatures ranging from ambient down to -40 C were conducted with no non-deployments. Supporting documentation is provided on the Att_1_GM disk in the folder labeled "Q_02".

In addition, the February 17, 2012, Autoliv response letter to EQ12-012 provides information and supporting documentation.

Based on the results of its investigation, GM has determined that the ACH-2.1B air bag inflators installed in GM vehicles, whether or not assembled with an initiator containing a mixture of 5 micron titanium hydride, will deploy properly and do not contain safety defects.

* * *

This response was compiled and prepared by this office with the assistance of suppliers and upon review of documents produced by various GM locations, and does not include documents generated or received at those GM locations subsequent to their searches.

Please contact me if you require further information about this response or the nature or scope of our searches.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Carmen Benavides". The signature is fluid and cursive, with the first name "M." and last name "Benavides" clearly distinguishable.

M. Carmen Benavides, Director
Product Investigations and Safety Regulations

Attachments