



Coordinated Remedy Program Proceeding: What is the status? (Part II) **Scott Yon**

The reason it matters when an air bag inflator ruptures is because of the people whose lives are forever changed when it happens to them, or their loved one. So far, 7 people have been killed in the United States because their air bag ruptured. All 7 of those people were sitting in the driver seat. As Mr. Borris stated, the agency is aware of 89 driver and 32 passenger inflator rupture events, with 98 alleged injuries as a result of a rupturing Takata inflator. Some of these injuries have been serious including broken and fractured bones and hearing loss. People have lost an eye. People have been cut when the metal fragments from the inflator, similar to shrapnel, shot out of the air bag at them. As Mr. Borris mentioned, so far, a rupture of the passenger inflator seems less likely to cause the same severity of injury that the driver inflator causes since not 1 of the 32 passenger inflator ruptures has resulted in death. In round numbers, almost 1 in 10 driver inflator ruptures has resulted in death.

Any time an inflator ruptures, the consequences for the people in the car, van, or truck are extremely serious.

Right now there are 12 car, van, and truck manufacturers in the United States that are involved in the Takata air bag inflator recalls. They are BMW, Fiat Chrysler, Ford, General Motors, Honda, Mazda, Mitsubishi, Nissan, Subaru, and Toyota, and 2 smaller companies that produce vans and large trucks called Daimler Trucks North America and Daimler Vans.

All together, these 12 companies have made approximately 19 million vehicles that need to have the air bag inflator replaced. But more than 4 million of those vehicles have a defective part on both the driver side and the passenger side and so they need 2 inflators replaced. That means that for the 19 million vehicles, the vehicle manufacturers need approximately 23 million replacement inflators. And these numbers are just for the United States – they don't include any of the vehicles in other countries around the world that need replacement inflators also.

Not all of the manufacturers are in the same position or have the same problems in trying to fix all of these vehicles. One manufacturer needs about 10 million replacement inflators for their 6.5 million recalled vehicles. Obviously, that manufacturer has a significant portion of all the vehicles and inflators that need to be fixed. Another manufacturer has just 2500 vehicles that need to have 1 inflator replaced.

With such big differences in the number of vehicles that need to be fixed, it turns out that most of these vehicles and inflators are covered by just 5 of the manufacturers who have vehicles affected by both driver and passenger inflator recalls. Those 5 manufacturers are BMW, Fiat Chrysler, Ford, Honda, and Mazda. Those 5 manufacturers cover about 18 million of the 23 million inflators that need to be replaced and about 14 million of the 19 million vehicles that need to be repaired.

While we have been gathering information in the Coordinated Remedy Proceeding, we have also continued our normal work in our ongoing investigation of the Takata inflators. During that investigation the agency has learned of a new potential safety concern involving an air bag inflator Takata produces that has not been included in any of Takata's recalls, though some vehicle manufacturers are recalling parts. This additional inflator, called an SSI-20, is primarily used in side air bags and has been added to our investigation.

Since June of this year, both General Motors and Volkswagen have reported SSI-20 rupture incidents to the agency. Currently, General Motors has a recall for 395 model year 2015 vehicles. Those vehicles, all model year 2015, are the Buick LaCrosse, the Cadillac XTS, the Chevrolet Camaro, the Chevrolet Equinox, and the Chevrolet Malibu.

To make sure that the agency is learning about all ruptures as quickly as possible, on July 27th of this year NHTSA issued a standing General Order to 25 vehicle manufacturers and 9 inflator manufacturers, requiring each company to report to NHTSA any credible report of an inflator rupture, including those that happen during routine lot acceptance testing. This will help us to know about, and keep track of, as many inflator ruptures as possible.

Based on these events, the SSI-20 inflator is now part of the Takata investigation, and NHTSA will continue to keep a close eye on this matter to make sure that all SSI-20 inflators that could have this problem are taken out of vehicles.

So what causes these inflators to rupture? Many different people and groups have been studying this problem, including skilled scientists and engineers from all around the world. And so far, no one can say for sure.

Takata has been studying this problem for several years. In addition to normal product testing, they have done a variety of tests to better understand how the propellant ignites and burns. One way Takata has been testing is using inflators that have been taken out of vehicles when they were replaced as part of recalls and repair programs. They take these returned inflators and do what's called "ballistic testing."

In ballistic testing they intentionally send an electrical signal to set off the inflator, the same as if it was in a car crash. The tests are done in a special chamber with instruments that record data on what happens. So far, Takata has done more than 115,000 of these ballistic tests on returned inflators and is now doing between 4,000 and 5,000 tests each week. Out of those 115,000 total tests, approximately 450 inflators have ruptured.

Something that's been seen in those tests but is not yet understood, is that driver inflators and some types of passenger inflators rupture at a rate of about 1 to 2 ruptures for every 1,000 ballistics tests but other passenger types are rupturing at rates of 10 to 20 ruptures for every 1,000 ballistics tests, roughly 10 times more often.

Takata has also hired third-party research and testing companies to aid in its investigation, including the High Pressure Combustion Laboratory at Pennsylvania State University, and the Fraunhofer Institute, a well-respected engineering research center in Germany. While the Fraunhofer Institute believes that age of the inflator and long-term exposure to high temperatures and high absolute humidity are important factors leading to inflator rupture, they have not determined the definitive cause of the ruptures.

NHTSA has also been doing testing. As a first step, the agency wanted to independently verify the test results reported by Takata. So far, NHTSA's testing has provided similar failure rates as those reported by Takata. This seems to verify the Takata results and the data Takata's testing is producing.

Several vehicle manufacturers have formed a group called the Independent Testing Coalition, or the “ITC”. The ITC is paid for by those vehicle manufacturers and has contracted with Orbital ATK, in Utah, which is another leading testing and research company. Orbital’s work is primarily focused on establishing the cause of the inflator ruptures.

Several vehicle manufacturers have also conducted their own testing to try to definitively determine the problem and/or to confirm Takata’s testing data.

Despite these many efforts by some of the best and brightest minds in science and engineering, the “root cause” for the ruptures remains unknown at this time.

Something we have learned, that everyone working on this problem agrees with, is that in the passenger inflators with long-term exposure to the HAH conditions, the propellant wafers are expanding and getting bigger as they age. As the wafers get bigger, they continue to work the way we expect, until they reach a certain size, at which point the ruptures start happening.

From all of this information, what we have learned is that 2 main factors help us predict if an inflator will rupture. Those 2 risk factors are, first, age of the inflator, and second, long-term exposure to high absolute humidity conditions.

Humidity is a measurement of how much moisture is in the air. Most of us know about relative humidity; that’s the number we hear in the daily weather forecast. If the forecast says relative humidity will be 75 percent, that means the air will carry 75 percent of the maximum amount of moisture it can hold. But that maximum changes with air temperature, because hot air can hold more moisture than cold air. Having more moisture is what makes it have high absolute humidity. That’s the basic idea. In terms of places that people might be familiar with, high absolute humidity is why some places feel tropical, like in southern Florida, the Caribbean, or along the Gulf Coast. Now if it’s snowing in Boston or Denver or up in Alaska, there is obviously lots of moisture in that air, and it has relatively high humidity. But that cold air can’t hold as much moisture as hotter air can. High absolute humidity can *only* happen with both high temperatures and high humidity.

These 2 factors—age of the inflator and long-term exposure to high absolute humidity—seem to go hand in hand, since the inflator cannot have long-term exposure to a condition unless

it has been around long-term. In this case “long-term” means something more than 5 years. It’s in the window between 5 and 10 years old that ruptures start happening. And the current evidence shows that the inflators that rupture most often are the ones that have been exposed to high absolute humidity for several years. This is not short term exposure to high absolute humidity like during a 2 week vacation or even for 5 months each winter. It is continued exposure to high absolute humidity year round for multiple years in a row.

Let’s look at a map to better understand this. This map shows a dot for inflators Takata has tested based on where the vehicle was repaired. As part of its study of returned inflators, Takata tracks the ZIP code for where each vehicle was repaired. The white dots show all of the tests where the inflator did not rupture. The red dots show all of the tests where the inflator did rupture and the vehicle was repaired in the HAH region. The red and white dots show the results we expect to see based on the risk factors I just discussed. Each of the vehicle manufacturers defines the HAH region a little bit differently, but they all include this area here along the Gulf Coast, and Florida, and including Puerto Rico. The yellow dots are interesting, because they are ruptures in inflators repaired outside of the HAH region. NHTSA and Takata have researched the vehicles that these inflators came out of. And so far, each vehicle we’ve researched had previously spent several years registered in the HAH region before being repaired in these ZIP codes.

Another factor that can help us understand which inflators are more likely to rupture is test data I mentioned before. In Takata’s ballistic testing of replaced inflators, some types of inflators are more likely to rupture than other types.

A final, separate factor helps us predict how likely it is that a person will die if their inflator ruptures. All 7 of the U.S. motorists who died as a result of an air bag rupture were sitting in the driver seat. And the 1 known death outside of the U.S. was also a person in the driver seat. This could be because there is always someone sitting in the driver seat, but not always in the passenger seat, and so it is simply a matter of increased odds. Or it could be because the air bag inflator, located in the steering wheel, is closer to the driver where instead the passenger’s air bag inflator is located in the dashboard and is farther away from the passenger. Or it could be some other reason. We just know that, so far, being in the driver’s seat has a higher risk of death when the inflator ruptures.

To summarize, the facts continue to change and we are keeping close track of these developments. Approximately 23 million replacement inflators are needed for 19 million vehicles made by 12 vehicle manufacturers. And vehicles with the greatest risk of having an inflator rupture are older vehicles that have been exposed to high absolute humidity, continuously over several years.