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July 10, 2018

Docket Management Facility, M-30
U.S. Department of Transportation
1200 New Jersey Avenue SE
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Submitted electronically via www.regulations.gov

RE: Docket No. NHTSA 2016-124, Notice 3. Notice of receipt of General Motors Third Petition for Inconsequentiality and decision denying request for deferral of determination.

The Center for Auto Safety ("Center") respectfully submits this letter to the National Highway Traffic Safety Administration ("NHTSA") in response to General Motors' ("GM") June 8, 2018, submission titled "GMT900 Takata Airbag Inflator Investigation"[1] ("GMT900 Investigation"). The Center, founded in 1970, is an independent non-profit consumer advocacy organization dedicated to improving vehicle safety, quality, and fuel economy on behalf of all drivers, passengers, and pedestrians.

On May 9, 2018, the Center submitted a comment objecting to GM's Petition for Inconsequentiality regarding the automaker's Takata airbag inflators.[2] Today, the Center continues to urge NHTSA to deny GM's Petition for Inconsequentiality[3] and demands that GM address serious concerns with both the findings within the GMT900 Investigation and the information missing from that document.

Unless and until GM clarifies its findings and results, NHTSA should not consider the GMT900 Investigation in its decision to grant or deny GM's Petition for Inconsequentiality.

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[1] *GMT900 Takata Airbag Inflator Investigation*, General Motors (June 2018), https://www.regulations.gov/contentStreamer?documentId=NHTSA-2016-0124-0163&attachmentNumber=1&contentType=pdf.
[2] *See* https://www.autosafety.org/wp-content/uploads/2018/05/Center-for-Auto-Safety-GM-Inconsequentiality-Petition-Comment-5-9-18.pdf.
[3] 83 Fed. Reg. 15233, 15233-15236 (Apr. 9, 2018). Agency/Docket Number: NHTSA-2016-0124 Notice 3. https://www.gpo.gov/fdsys/pkg/FR-2018-04-09/pdf/2018-07188.pdf.

I. The GMT900 Investigation is substantially flawed.

A. GM fails to explain why or how a recall of GMT900 vehicles would pose an additional risk to consumers.

The problems with the GMT900 Investigation begin as early as the Executive Summary. On page 5, GM writes "A recall of GMT900 vehicles would disrupt original equipment developed and validated as part of a fully integrated safety system in millions of vehicles *creating a risk to consumers* with no corresponding safety benefit based on the findings of GM's investigation" (emphasis added). This statement is concerning for several reasons. First, the only other discussion of risks associated with a recall is in the Conclusions section, where GM argues, without evidence, that equipment installed at the assembly plant is safer than replacement equipment installed in the field. Under this logic, *all* recalls introduce risks to consumers. Second, if GM lacks confidence in its ability to safely recall defective vehicles, then NHTSA should immediately investigate GM's entire recall process. This is a factual allegation that requires proof before it may be reasonably relied upon, and GM has provided none.

Since GM's only rationale for claiming that a recall is more dangerous than allowing these vehicles to retain airbag systems with a potentially fatal defect is an unsupported conclusory supposition, NHTSA should give this statement absolutely no weight in its decision-making process. The current risks are that an airbag will not inflate in a collision and result in avoidable injuries or death, or that an inflator will explode and itself cause harm to the vehicle's occupants while also failing to provide the protection of a properly inflated airbag. If GM lacks the ability to recall and repair vehicles posing these threats without introducing additional risks, then GM's recall processes need serious revision. Unless GM proves that it studied this issue and can demonstrate that its statements are accurate, NHTSA and the public should reject them.

B. The probability of failure ("POF") appears unacceptably high.

The charts and tables on pages 55 and 56 suggest that within 16 and 22 years of being manufactured, at least 1/1000 YP and YD inflators will fail, respectively. Considering that these inflators were installed in tens of millions of vehicles and that a failure so frequently entails tragedy, this failure rate is absolutely unacceptable. While the GMT900 Investigation is generally flawed, if GM's predictions for YP and YD inflator failure are accurate, then NHTSA should immediately require the recall of all vehicles with these inflators.

Further, the charts on page 55 limit the POF domain to 0.1, yet the data clearly shows that POF rapidly increases as it approaches this point. Given that the POF was trending upward, such a low domain likely means one of two scenarios: (1) the study did not evaluate POF above 0.1; or (2) GM is concealing its knowledge of substantial increases in POF following initial failures. Neither scenario is acceptable. If the study did not consider how quickly POF increases after it reaches 0.1, there is no way for GM, NHTSA, or the public to fully understand the scope of the risk posed by these airbag systems. If GM is hiding these datapoints with the knowledge that these airbags will

rapidly fail after a certain date, with no plan to correct them by then, GM is actively deceiving its customers into believing that their vehicles are safer than GM knows them to be and is putting the public at greater risk of serious injuries and death. For consumers to make informed choices and for NHTSA to accurately interpret the findings in the GMT900 Investigation, GM must explain why it limited the POF domain to 0.1 for YD and YP inflators.

C. Conclusions regarding the degree of impact caused by design differences are inconsistent with the data provided, and crucial data is omitted from the findings.

In the span of two pages, the GMT900 Investigation severely contradicts itself and omits data needed to reach meaningful conclusions. On page 74, the study finds that "Small density changes cause large changes in burn rate." This page also includes a chart of different density configurations' apparent burn rates, with 8.1 g wafers ranging from 1.47 g/cc to 1.58 g/cc and 10.8 g wafers ranging from 1.496 g/cc to 1.667 g/cc. Yet on page 75, the document reads, "Inflators show modest differences in the POF Curves versus Density reflecting design differences." Thus, either the authors of the GMT900 Investigation think that "modest" and "large" are equivalent, or they want to deceive readers into believing that the design of a given inflator has little to do with its POF. Of course, either would be problematic.

Worse yet, the critical Density Threshold referenced on page 74 is not provided anywhere in the document. If accepted that density affects POF, it is crucial that the Density Threshold is known. For example, if NHTSA chose to randomly sample GM vehicles in the field and found that inflator density was closer to the threshold than originally thought, it could mean that those inflators are more susceptible to failure. The omission of this datapoint raises at least two questions needing immediate answers: (1) What is the critical Density Threshold? and (2) Why is it omitted from the GMT900 Investigation? Before NHTSA decides whether to grant or deny GM's Petition for Inconsequentiality, GM must answer these questions and interested parties must have time to comment on such answers.

D. The Predictive Aging Model ("PAM") is generally flawed and fails to consider factors specific to GMT900 vehicles.

To accept GM's assertion that airbag inflators within GMT900 vehicles[4] will remain safe for 30 years, the PAM used in the GMT900 Investigation must be unquestionably sound. It is not. As a general matter, the PAM neglects shock and vibration, both of which contribute to airbag system failure.[5] More specifically, the PAM completely ignores GM's rationale for not recalling GMT900 vehicles.

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[4] According to GM, "GMT900" refers to a vehicle platform used for light trucks and SUVs produced during model years 2007-2014 across GM's various brands. *See supra* note 1.

[5] In the Takata Inflator Rupture Root Cause Summary Report (*see infra* note 8), "shock/vibe" are noted as "Carried over to 'Deep Dive' Fault Tree", on the fishbone chart in Figure 1. However no results from, nor additional references to, the Deep Dive Fault Tree are found in either that study or in GM's

i. The PAM does not consider variables known to contribute to inflator disc longevity.

The PAM's scope is defined on page 10 of the GMT900 Investigation. For some unknown and unwise reason, the effects of inflator shock and vibration are missing from this scope. Similar to a vehicle's windshield, an inflator disc may rupture or crack after experiencing shocks from bumps, potholes, collisions, etc., and vehicle vibrations from normal use may accelerate the failure of such discs, especially when combined with the effects of thermal cycles and humidity. On page 74, the "Takata Burn Augmentation Data" chart shows, and the authors conclude, that "Small density changes cause large changes in burn rate." If an inflator disc cracks then the surface area increases, thereby affecting density and consequently the burn rate.

Other studies have shown that "[highly accelerated limit test] also revealed coupled effects between high and low temperature processes and vibration" in degradation of ceramic materials.[6] More than just the windshield example, the negative effects of vibrations on brittle materials, such as ceramic discs, are observed in everyday life. Yet somehow the GMT900 Investigation, which does not contain a single instance of the word "vibration," claims that the PAM "is complete and comprehensive."[7] Unless GM can demonstrate or provide support for the assumption that the airbag systems in GMT900 vehicles are somehow immune to shock and vibration, the PAM certainly is not comprehensive and is far from complete. Thus, all conclusions based on the PAM are unsupported and therefore should not be used in the rationale to grant or deny GM's inconsequentiality petition.

ii. The GMT900 Investigation ignores driving environments that may pose unique threats to airbag systems in GMT900 vehicles.

The PAM derives many of its assumptions from a previous study on the general causes of Takata airbag failures.[8] That study, also performed by Orbital ATK, found that "long-term exposure to repeated high-temperature cycling in the presence of moisture" are the primary environmental factors contributing to Takata airbag failure.[9] However, GM's Petition for Inconsequentiality rests exclusively on the premise that GMT900 vehicles

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inconsequentiality petition. The Deep Dive Fault Tree and results are consequential for the PAM, and therefore affect the validity of the inconsequentiality petition. If a Deep Dive did, in fact, consider shock and vibration, then the results of that analysis should be included in the GM's submission.

[6] Junji Sakamoto, et al., *Potential Failure Mode Identification of Operational Amplifier Circuit Board Using High Accelerated Limit Test*, Microelectronics Reliability, Vol. 85, June 2018, Pages 19-24, https://www.sciencedirect.com/science/article/pii/S0026271418301677.

[7] *See supra* note 1 at page 10.

[8] *Takata Inflator Rupture Root Cause Summary Report*, Orbital ATK (September 2016), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/orbital_atk_research_summary.pdf.

[9] *Id* at page 1.

use different airbag systems than those found in recalled vehicles.[10] Still, only five cities, Miami, Atlanta, Phoenix, Detroit, and Seattle, were modeled. While there is obvious value in studying these cities, there are at least two interrelated issues that suggest more environments should be considered: (1) GM claims that the airbag systems in GMT900 are *designed and integrated differently* from other inflators subject to recalls, particularly with respect to moisture resiliency; and (2) GMT900 vehicles will be exposed to environments drastically different from those studied.

If accepted that the inflators in GMT900 vehicles are designed in such a way that they are more likely to keep moisture out of the propellant material than the otherwise identical airbag systems in other vehicles subject to recalls, then it could very well be the case that the environmental conditions more likely to cause the latter's failure are different from those of the former. In areas like the Mid-Atlantic and Northeast, where a substantial portion of America's drivers reside, temperatures can vary wildly throughout a given week, or even day, and many cities experience relatively high humidity.[11] Alternatively, states like North Dakota, Minnesota, and Alaska experience extremely low temperatures.[12] By excluding these various environments from the PAM, GM ignores tens of millions of drivers' environments and has no way of knowing whether its allegedly different inflator design is resilient to commonly experienced environmental conditions.[13]

II. The GMT900 Investigation concedes that the inflators in GMT900 vehicles will fail over time but provides no plan for how to protect consumers when that time comes.

Even if GM adequately addresses the technical and design flaws of the GMT900 Investigation and shows that its findings are statistically accurate, it still has not provided any plan for replacing these defective airbag systems when they inevitably begin to fail. If the GMT900 Investigation's results are accepted, in most environments for most GMT900 vehicles the airbag systems will begin to fail approximately 30 years after such

[10] "GM has petitioned [NHTSA] for a decision that, because of differences in inflator design and vehicle integration, the equipment defect determined to exist by Takata is inconsequential as it relates to vehicle safety in the GMT900 vehicles, and that GM should therefore be relieved of its notification and remedy obligations." *Supra* note 3 at 15233.

[11] *Northeast Regional Climate Center*, Cornell University, http://www.nrcc.cornell.edu/ (accessed July 6, 2018).

[12] Niall McCarthy, *America's Coldest Cities [Infographic]*, Forbes (Jan. 5, 2018), https://www.forbes.com/sites/niallmccarthy/2018/01/05/americas-coldest-cities-infographic/#4af4d90b1f7a.

[13] This lack of information is especially problematic in light of the lack of consideration for the effects of vibration. For example, it may be the case that a GMT900 vehicle is used along the East Coast and experiences substantial deviations in temperature and humidity in a given year. If that vehicle's inflator disc cracks due to a shock from a minor collision then the variations from very cold to very hot, combined with vibrations, may cause rapid failure. This, of course, is speculation, but without having data there is no way for GM to *disprove* this hypothetical scenario.

systems were manufactured.[14] While GM is assuming that most of the GMT900 vehicles will not survive past this point,[15] GM does not address how it will remedy those vehicles that do. Most concerning, Americans who are less economically fortunate will likely be the ones most frequently exposed to the injurious and deadly results of an airbag failure, as they cannot afford to purchase newer vehicles (for themselves and/or their children) or repair their older vehicles.

The Center would like to believe that GM is not trying to run the clock out on the airbag systems in GMT900 vehicles in an effort to push potentially tragic results of airbag failures onto drivers and passengers 30 years from now. The Center believes that an immediate recall of GMT900 vehicles would make America's roads safer for all, both today and in the future. Though it would be the most effective course of action, the Center recognizes that a recall is not the *only* option available to GM. Since GM could remedy this safety issue in a variety of ways, it is particularly disturbing that no solution has been offered. GM must provide *some* plan for protecting consumers if it knows that its products will pose such a dangerous risk to them in no less than 30 years. Without an opportunity to analyze such a plan, NHTSA is in no position to make an informed decision on whether to grant or deny GM's Petition for Inconsequentiality.

III. GM has not followed a single recommendation provided by the Center in its previous comment.

It is quite clear that GM ignored the Center's May 9th comment in its entirety. Had GM considered in good faith any of the recommendations made or concerns raised by the Center there likely would not have been a need for this response to the GMT900 Investigation.

A. The Center raised concerns over the limited number of variables used in GM's accelerated life testing.

Given the information available at the time, which excluded the data from the PAM in the GMT900 Investigation, the Center recommended using more variables than merely enclosed water and elevated temperature. Considering the variety of unpredictable conditions experienced by individual motor vehicles, it should be common sense to use a wide range of variables when attempting to model failure scenarios. More than just common sense, standards for such testing advise the consideration of conditions that exist outside of the normal range of vehicle use.[16] Given the drastic consequences of an airbag system failure, if GM genuinely cared about protecting consumers from foreseeable harm it would *want* to know *every* condition more or less likely to cause such a failure.

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[14] It is important to note that the airbag system may be manufactured on a date significantly earlier than the year model of the vehicle it is going in. Thus, an airbag system may be manufactured in 2007 and sit on a warehouse shelf for 3 years before being incorporated into a 2010 vehicle, in which case the failure period begins in 2037, not 2040.

[15] *See supra* note 1 at page 4.

[16] See, e.g., Technical Report No. TR-2011-24 Design for Reliability Handbook, August 2011 at 9.2.1. https://www.amsaa.army.mil/Documents/CRG/Design%20for%20Reliability%20Handbook%20(TR-2011-24).pdf.

However, GM appears to be concerned only with saving money in the short-term and therefore considered only the factors known to affect airbag systems designed differently from the ones found in GMT900 vehicles.

B. The Barnett assessment fails to consider operational safety.

The analysis provided by Professor Arnold Barnett, an aviation expert, does not consider factors relevant to operational safety. The Center's May 9th comment highlighted two datapoints needed to determine the operational safety of the relevant airbag inflators: (1) the probability that an airbag will unexpectedly deploy and harm vehicle occupants; and (2) the probability that an airbag will fail to deploy as intended during a collision. For each of these datapoints, a meaningful analysis would include target levels and the probability and confidence that the targets would be met. Instead, Barnett's analysis deals with the abstract issue of inflator rupture.[17] Of course, if an inflator is more likely to rupture then it is probably more likely to result in injuries. However, without predictions regarding injury likelihood there is no way to compare the models to real-world events. For example, if the airbag systems in GMT900 vehicles begin to cause a relatively high number of injuries in 5 years then it will be clear that the findings of the GMT900 Investigation were inaccurate, but to what degree will be completely unknown.

C. GM has yet to provide quality control information.

The Center's May 9th comment requested that GM provide important information on several aspects of quality control, which the company has yet to do. If GM could show that the manufacturing and composition of the inflators' mechanical and chemical components are within tolerances and that no unresolved sourcing or quality control issues exist, particularly concerning the propellant material, the public and NHTSA could have more confidence in allowing these airbag systems to continue to operate on public roads. For similar reasons, GM needs to show that there were no unresolved engineering design or manufacturing issues. Additionally, GM should demonstrate that they employed quality standards for chemical formulation and manufacturing consistent with safety requirements. Considering the delicate nature of the propellant material at issue and the sensitivity of burn rate to density (with potentially catastrophic consequences of nonconformance), such standards require strict adherence. Finally, to assure adequate inflator conformance to quality standards GM must show that Takata control processes were adequate, including incoming inspections and supplier surveillance of materials and manufactured components.

[17] On page 26, Barnett looks at the "probability of an [inflator rupture] with a passenger over the (conservative) projected lifespan of a vehicle in Miami, FL," but this statistic does not provide an estimate of the likelihood of an injury or death caused by an exploding or non-deploying inflator. Further, there are two glaring flaws with Barnett's analysis here: (1) there is no statistical confidence for the probabilities given; and (2) the probabilities given (1/50million and 1/3.4million for YD and YP inflators, respectively) contradict the data provided on pages 54 and 55.

IV. Conclusion

As GM is well aware, a Petition for Inconsequentiality is typically submitted and granted when a vehicle fails to conform to certain safety standards but is at least as safe as if it had conformed. That is not the case here. Instead, GM is trying to avoid a recall for products that it knows are unsafe by arguing that those products are merely less unsafe than its competitors.

To support this argument, GM funded the GMT900 Investigation. That investigation raises more concerns than it alleviates, and NHTSA should not rely on it. The GMT900 Investigation claims that a recall campaign would expose consumers to greater risks than allowing the faulty airbag systems to continue to populate public roads but fails to provide any data whatsoever to support this claim. GM provides the POF for its inflators, but the number given is unacceptably high. In discussing the effects of design differences on failure rates for the inflators, the only difference that matters here, the GMT900 Investigation contradicts itself. More glaringly, it excludes the critical Density Threshold, a datapoint absolutely crucial to evaluating the safety of the subject airbag systems.

The PAM used in the investigation is generally flawed because it does not consider factors certain to affect airbag system integrity. It is concerning that the PAM utterly ignores the entire rationale behind GM's Petition for Inconsequentiality by assuming that the airbag systems in GMT900 vehicles are subject to the same environmental risks as their allegedly differently designed competitors' while simultaneously excluding other environmental conditions that those vehicles are sure to experience. It is unacceptable that even though the GMT900 Investigation admits that these airbag systems *will fail*, GM provides no solution for remedying this dangerous defect when the failures begin.

In short, there are grave consequences if GMT900 vehicles are not recalled and their airbag systems not repaired. The GMT900 Investigation does not provide sufficient grounds for avoiding a recall and is so flawed that NHTSA should not consider it in its decision-making process. The Center urges NHTSA to deny GM's Petition for Inconsequentiality, and to instead force GM to recall these vehicles to ensure the safety of America's drivers and passengers.

Sincerely,

Jason Levine
Executive Director