p 703.358.2960
f 703.894.4938
Suite 430
1400 Crystal Drive
Arlington, Virginia 22202
www.aluminum.org

The Aluminum Association

January 10, 2020

Submitted to armitage.thomas@epa.gov

Thomas Armitage
Designated Federal Officer
Science Advisory Board
US Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Notification of a Public Meeting of the Chartered Science Advisory Board: (2) The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks

Dear Mr. Armitage –

The Aluminum Association (the "Association") thanks the Science Advisory Board (SAB) for the opportunity to provide comment on the recent Notice *Notification of a Public Meeting of the Science Advisory Board* as noticed at 84 FR 72356 on December 31, 2019.

The Aluminum Association, based in Arlington, VA, represents U.S. suppliers of primary aluminum, aluminum recyclers, and producers of fabricated aluminum products, as well as industry related businesses. The U.S. aluminum industry directly employs 161,000 workers and indirectly employs an additional 551,000 workers. Its economic output directly generates $75 billion and indirectly generates an additional $111 billion in economic output. In total, the U.S. aluminum industry supports nearly 713,000 jobs and $186 billion in economic output, more than 1 percent of the U.S. Gross Domestic Product. Since 2013 in the U.S., aluminum companies have committed to invest over $2.7 billion in new plants and expansions of existing plants, creating thousands of new permanent high-paying jobs that drive investments that strengthen American manufacturing job base and the U.S. economy. This growth has been to support aluminum in automotive market applications and importantly, if automotive materials

market conditions support further aluminum investments, the aluminum industry will invest even more in domestic jobs and related facilities. Aluminum has shown over 40 years of continuous growth in the North American automotive market, and research has confirmed that trend is expected to continue as automakers opt for aluminum as a material of choice not only for its reduced emissions and fuel economy benefits but also for its ability to enhance consumer attributes in areas of handling, braking, and acceleration, crash protection, and corrosion resistance.

Within the Association, the Aluminum Transportation Group (ATG) focuses on aluminum use in transportation applications and has a long history of data-driven technical interaction with automakers in providing safe and cost-effective lightweighting solutions to automakers to help them comply with the EPA greenhouse gas (GHG) emission reduction and NHTSA fuel-efficiency standards. The ATG has also consistently engaged with EPA, NHTSA and the California Air Resources Board (CARB) in the evaluation of vehicle mass reduction solutions as an integral component of these agencies' ongoing regulatory efforts to reduce GHG emissions and improve related fuel efficiency performance. As such, the SAB's request for comment on the SAFE Vehicles Rule is both of significant interest to the ATG specifically, and to the Association more broadly.

The Association has reviewed the proposed SAFE Vehicles Rule from the perspectives of specific references to aluminum and overall vehicle mass reduction in general and based on that review offers the following comments to the SAB:

1. Vehicle Size vs. Mass

The SAFE Vehicles Rule bases its assessments of vehicle safety on an extensive body of research concerning the impact of vehicle size and mass on societal highway safety. That same body of research was used to initially develop CAFE 2012 – 2025. Those studies have been critically reviewed and supported by safety researchers including NHTSA, Dynamic Research Incorporated (DRI) and the Insurance Institute for Highway Safety (IIHS), the University of Michigan Transportation Research Institute (UMTRI) and others. Those studies consistently find

that for most vehicle classes, vehicle size, not mass, is the key indicator of overall fleet safety performance. Overall conclusions from a 2011 review of all available studies on the impact and mass on vehicle safety was summarized by NHTSA (Kahane):

"any reasonable combination of mass reductions that held footprint constant in MY 2017-2021 vehicles – concentrated, at least to some extent, in the heavier LTVs and limited in the lighter cars – would likely be approximately safety-neutral; it would not significantly increase fatalities and might well decrease them"

NHTSA references an updated 2016 study of the relationship between fatality risk, vehicle mass and footprint-based on the latest available vehicle safety data in the SAFE Vehicles Rule. However, a formal report of this analysis has not been issued. Without an available report, it is difficult to judge the assumptions and findings. Overall the conclusions listed in the SAFE Vehicles Rule are similar to the 2012 and 2016 conclusions shown in Table 1. In all vehicle classes, the 2016 study found overall safety improvements over the 2012 study. This finding is consistent with IIHS data indicating the long-term trend in improved vehicle safety over the past 20 years. Below is a summary of the findings from the 2016 NHTSA study:

"Two estimated effects are statistically significant at the 85-percent level. Societal fatality risk is estimated to: (1) increase by 1.2 percent if mass is reduced by 100 pounds in the lighter cars; and (2) decrease by 0.61 percent if mass is reduced by 100 pounds in the heavier truck-based LTVs."

Table 1: Fatality Increase per 100 lb. Mass reduction (Table II-46 from SAFE Vehicles Rule)

Table II-46 - Fatality Increase (%) per 100-Pound Mass Reduction While Holding Footprint Constant

Vehicle Class[306]	2012 Report Point Estimate	2016 Report/Draft TAR Point Estimate	2012 Report 95% Confidence Bounds	2016 Report 95% Confidence Bounds
Lighter Passenger Cars	1.56	1.49	+.39 to +2.73	-.30 to +3.27
Heavier Passenger Cars	.51	.50	-.59 to 1.60	-.59 to +1.60
CUVs and minivans	-.37	-.99	-1.55 to +.81	-2.17 to +.19
Lighter Truck-based LTVs	.52	-.10	-.45 to +1.48	-1.08 to +.88
Heavier Truck-based LTVs	-.34	-.72	-.97 to + .30	-1.45 to +.02

Those studies, and others, concluded vehicle size, not mass, has the strongest impact on vehicle safety. Vehicle size allows OEMs to use "crush space" to absorb collision energy before it transfers to the passenger compartment. Reduction in vehicle mass while holding size constant

was found to improve overall collision safety by reducing total collision kinetic energy. The studies found statistically significant fleet safety improvements resulting from mass reduction of larger, heavier CUVs and trucks. Mass reduction of mid-size vehicles was found to have a "neutral or small positive" impact on safety. Mass reduction of small vehicles (<3,200 Lb. GVW) was found to result in a statistically uncertain small negative impact on safety. These findings appear to remain consistent with current fleet safety performance.

2. Mass Reduction < 3,200 Lbs. GVW Assumptions

The safety performance impact statistics in the SAFE Vehicles Rule are based on a NHTSA assumption that OEMs will apply mass reduction uniformly on all vehicle segments. That assumption is not consistent with actual OEM performance. The SAFE Vehicles Rule summarizes projected reductions in fatalities between the augural standard and Alternatives 1-8 as shown in Table 2. Based on the latest available safety research, prior CAFE technology assessments restricted mass reduction to vehicles above 3,200 Lb. GVW. The current SAFE Vehicles Rule for MY's 2021-26 assumes OEMs will implement mass reduction on all vehicles including vehicles below 3,200 Lbs. That assumption is not consistent with actual OEM new vehicle design strategies since implementation of CAFE 2012-25.

Table 2: Fatality estimates from Table II-71 from SAFE Vehicles Rule

Table II-71 - Change in Safety Parameters from CAFE Augural Standards Baseline Average Annual Fatalities, CY 2036-2045, 3% Discount Rate

Change in Safety Parameters from Augural Standards Baseline								
Average Annual Fatalities, CY 2036-2045. 3% Discount Rate								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
Fatalities								
Mass changes	-22	-19	-17	-17	-16	-6	0	-2
Sales Impacts	-180	-162	-151	-112	-76	-59	-24	-33
Subtotal CAFE Atrb.	-202	-181	-168	-129	-92	-65	-24	-35
Rebound effect	-692	-650	-605	-511	-392	-317	-174	-219
Total	-894	-831	-773	-640	-484	-382	-198	-254
Fatalities Societal $B								

In the interest of meeting CAFE and CO2 regulations, OEMs have consistently pursued mass reduction as a safe and cost-effective vehicle improvement strategy. Mass reduction is widely recognized as one of the most cost-effective technologies available to achieve significant fuel economy and CO2 improvements. Mass reduction efforts continue to be concentrated on larger heavier vehicles where the impact on OEM CAFE is most effective. OEMs use smart design and lighter, highly crash absorbent materials, to reduce mass and improve safety of big trucks like Ford's F150 and larger cars, CUVs and SUVs. Many vehicles in production today maintain, or improve, their NHTSA safety ratings despite shedding hundreds of pounds to boost fuel economy and performance.

The SAFE Vehicles Rule assumes an average passenger car curb weight reduction of 4.8% in all vehicle classes. OEM design trends and new vehicle launches over the past 5 years demonstrate that OEMs are not using weight reduction to improve the fuel economy of small cars. Mass changes for all new vehicle models introduced from 2015 to 2018 are summarized on the following charts. Mass reductions are concentrated on larger, heavier vehicles. Small vehicles (footprint at or below 41 Sq. Ft) have experienced little or no mass reduction. New models in this weight class have consistently increased slightly in weight due to addition of new safety equipment and consumer preference content. In no case has a new sub 41 Sq. Ft. footprint vehicle been introduced at a curb mass below the curb mass of its predecessor model. In most cases, new vehicles in this class are marginally larger and heavier than the model they replaced.

The small vehicle segment is intended to meet the needs of highly price sensitive entry level buyers and cost increases related to mass reduction are typically avoided in this product sector. Assumption of mass reduction of vehicles below 3,200 lbs. results in higher fatality, injury and associated societal cost for regulatory alternatives except Alternative 1 but this assumption is not consistent with historical OEM design trends.

The SAFE Vehicles Rule assumes that due to cost effectiveness of mass reduction, OEMs will pursue mass reduction on all vehicle classes to meet future CAFE requirements. OEMs do not have incentives to pursue mass reduction on vehicles below 3,200 Lbs. and in practice they are not reducing the weight of these smallest of vehicles. Vehicles in this class are designed to meet the needs of the highly price sensitive entry level vehicle market as consumers in this market generally need basic transportation at the lowest possible price. OEMs keep production cost of these vehicles as low as possible while providing safe reliable transportation. Also, vehicles below 3,200 Lbs. represent less than 5% of the new vehicle sales and have relatively high fuel economy. Due to relatively high fuel economy and low market share fuel economy improvements in this market segment have limited impact on OEM CAFE.

Figure 1: Comparison of new model launch curb weights versus the previous generation

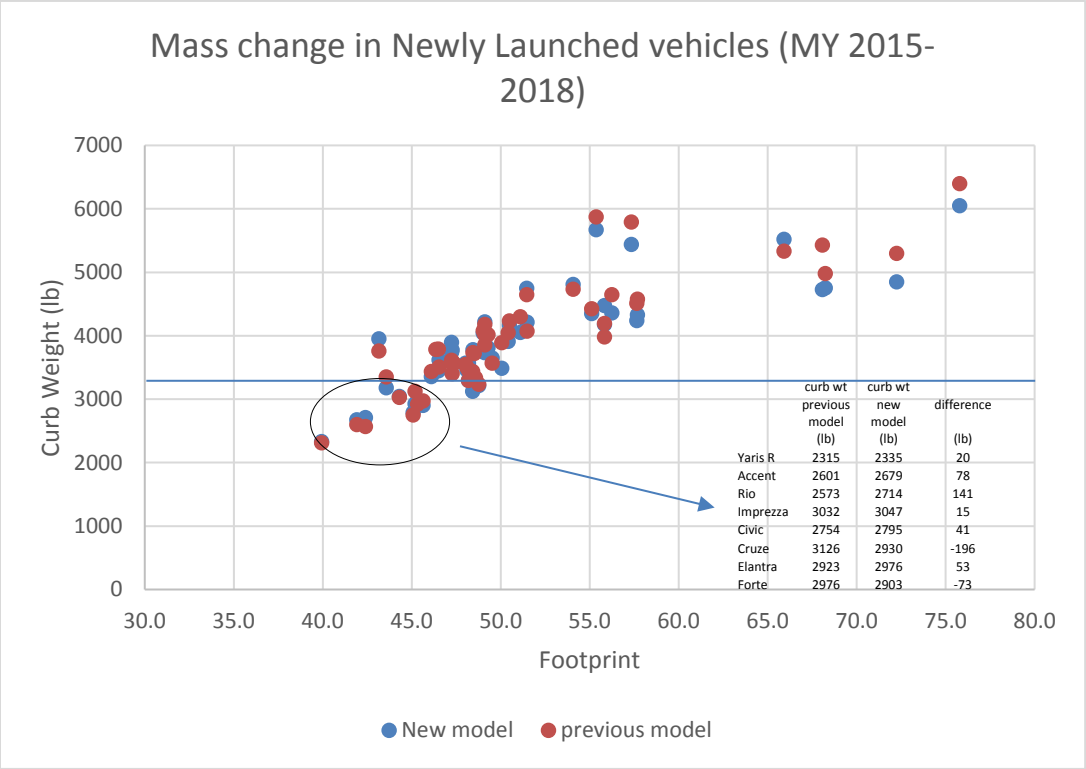
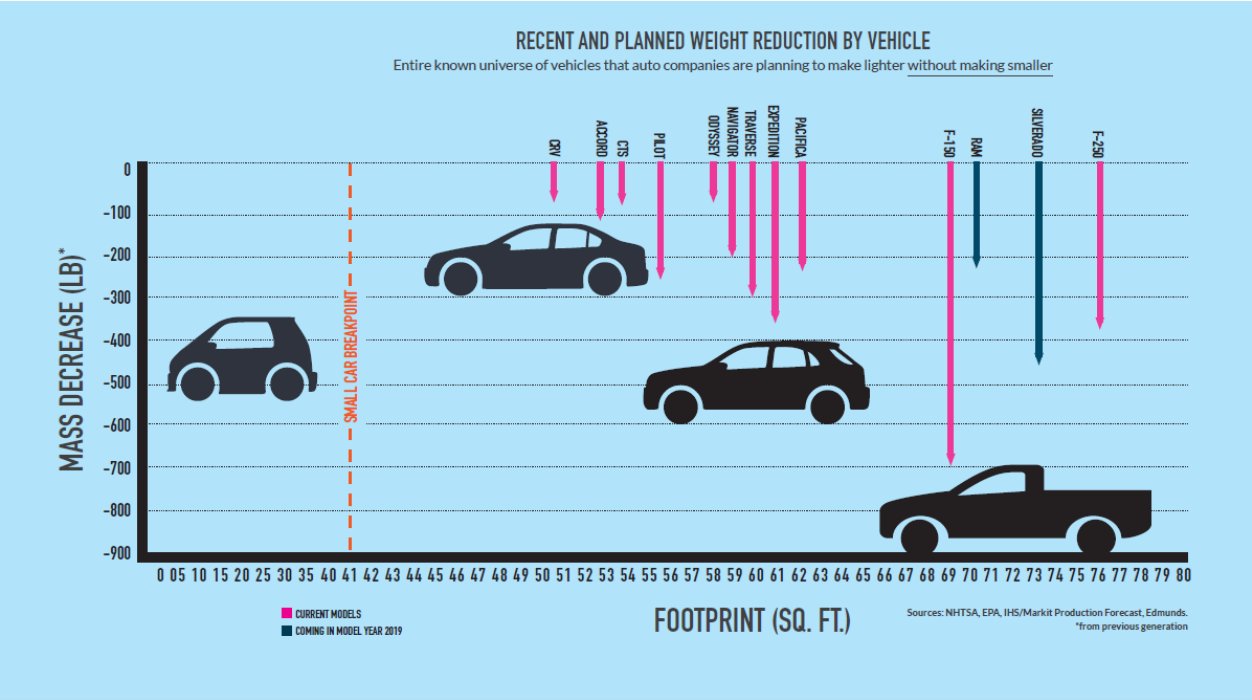


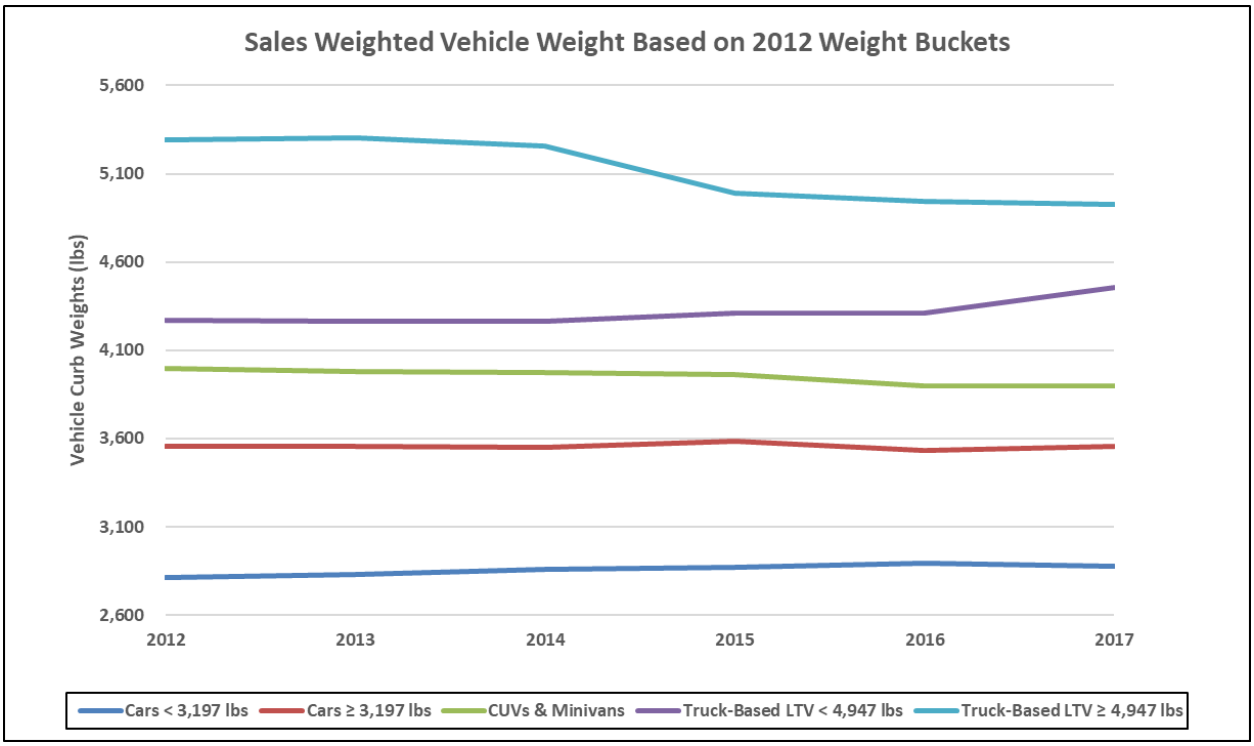
Figure 2: Recent launches and the change in curb weight



Vehicle curb mass changes for vehicles launched from 2012-2017 illustrate OEM lightweighting trends as shown in Figure 1. Figure 2 shows the impact of advanced OEM safety engineering and use of advanced mass reduction materials in reducing vehicle mass without changing the footprint.

For each year, each vehicle nameplate and its associated sales were keyed to nameplate curb weights for the 2012-2017 model years. Sales weighted curb weights were then calculated for each vehicle segment used by NHTSA for fleet safety analysis: Cars < 3197 lb., Cars > 3197 lb., CUVs and minivans, Truck based LTVs < 4197 lb. and Truck Based LTVs > 4197 lb.) and are shown in Figure 3.

Figure 3: Sales weighted average curb weights for vehicles launched in 2012-2017



Since the implementation of the current footprint-based CAFE standards, light trucks > 4197 lb curb weights have decreased significantly (a nearly 7% decrease from 2012 to 2017). The "Truck-Based LTVs < 4,947 lbs" has undergone a 4.4% weight increase since 2012. This increase was driven by new models of the Jeep Grand Cherokee (218 lbs curb weight increase in 2017), Chevrolet Colorado (561 lbs curb weight increase) and Toyota Tacoma (540 lbs curb weight increase). These small pickups have been upgraded to improve the capability and cab size making them truly smaller versions of the popular large pickups. Small car weights (< 3197 lb.) have actually increased by 2.8% from 2012 to 2017. The CUV and minivans have also been light-weighted by roughly 2.5%. These trends support the conclusion that OEMs under the existing CAFE footprint standards are producing a safer U.S. fleet. Note that light trucks have increased significantly as a percentage of U.S. sales in the past few years from a 50/50 to a 70/30 split with cars. Mass reduction in the heaviest vehicles has improved fleet safety as the market shifts

to higher sales of larger heavier trucks and CUVs. The SAFE Vehicles Rule cites an average passenger car curb weight reduction of 4.8% in Table VIII-20. However, the launches to date have demonstrated that OEMs are not using weight reduction to improve the fuel economy of small cars.

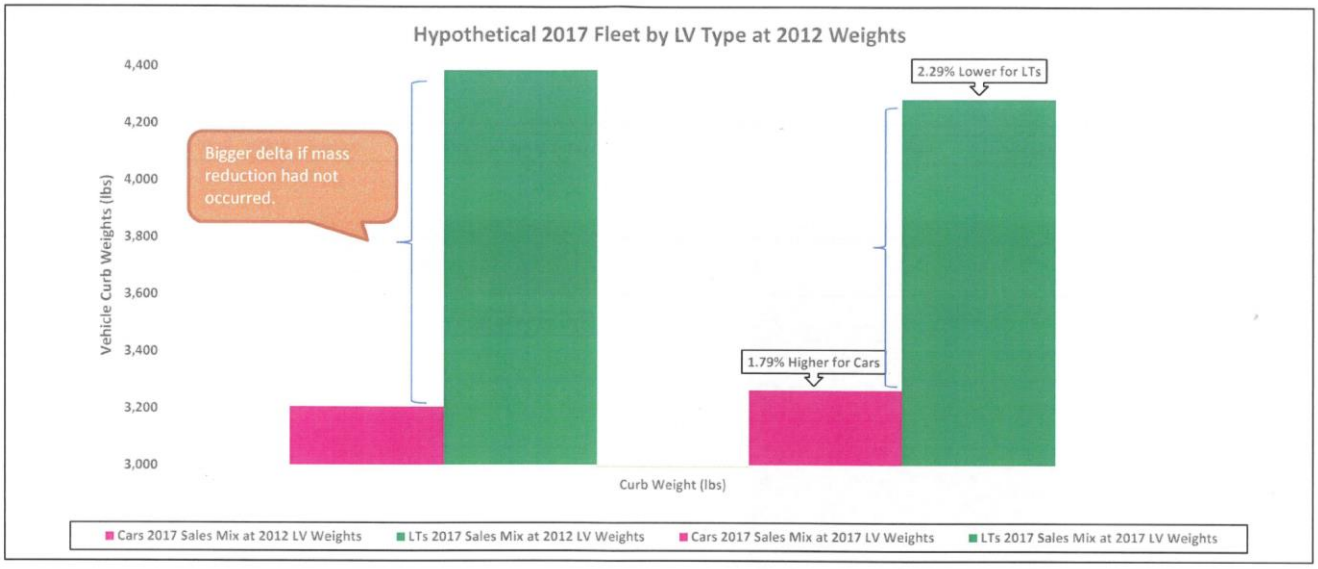
In summary, reducing the mass of larger heavier vehicles as is being accomplished with modern lightweight materials is a proven cost-effective strategy for improving vehicle safety while reducing fuel consumption and CO2 generation. Add to that, every aluminum-bodied vehicle ever tested has earned the highest 5-Star safety rating from NHTSA (Audi A8, Tesla Model S and Ford F150). Other 5-star safety rated, aluminum-intensive vehicles include Ford's Navigator and Expedition, and Audi's A6. And while not crash-tested by NHTSA, the Jaguar XJ, XF, XE, F-Type, F-Pace and Range Rover aluminum-bodied vehicles have 5-Star Euro NCAP ratings and are rated highly by insurance companies.

Thus, the Association has requested of EPA and NHTSA that assumptions regarding vehicle mass reduction be corrected to reflect the marketplace reality that vehicles < 3,200 Lbs. GVW are not being lightweighted.

3. Vehicle Mass Differential

As noted above, the larger vehicles on the road today are being significantly lightweighted while the smaller vehicles have experienced a slight average gain in mass between 2012 and 2017. The basic physics of energy transfer dictates that in an accident between two vehicles, the weight differential between the two vehicles plays a role in vehicle occupant protection. By removing mass from larger vehicles, automakers have been able to reduce the average weight differential between the heaviest and lightest vehicles on the road, actually improving fleetwide safety. As shown in the graph below, between 2012 and 2017 the mass differential between cars and light trucks has narrowed by just over 4% (2.29% + 1.79%).

Figure 4: Hypothetical 2017 Fleet by LV Type at 2012 Weights



Summary

The Association supports a robust and data-driven evaluation of the augural CAFE/GHG emissions standards as extensive additional information is now available to support that evaluation. However, the Association has serious concerns regarding the underlying data, assumptions, and conclusions that were used in the SAFE Vehicles Rule to support a proposed decision that lightweighting of vehicles leads to increases in vehicle fatalities. Therefore, the Association asks the SAB to consider the information provided in this submittal and based on review of it, recommend to both EPA and NHTSA that they delete from the final SAFE Vehicles Rule any conclusion that lightweighting of vehicles leads to increases in vehicle fatalities.

The Association appreciates the opportunity to provide these comments to the SAB as they consider the current status of the SAFE Vehicle Rule. If you have any questions concerning

them or would like to discuss them in greater detail, please do not hesitate to contact me at 703-358-2976 or cwells@aluminum.org.

Sincerely,

Curt Wells

Senior Director of Regulatory Affairs

The Aluminum Association