Bennett, Sara (NHTSA)

From: Bennett, Sara (NHTSA)
Sent: Tuesday, January 17, 2023 9:08 AM
To: Hoang Ngo
Subject: Follow-up questions re GM's petition for exemption for the Origin

Dear Hoang Ngo,

The National Highway Traffic Safety Administration (NHTSA) is in the process of evaluating GM's petition for exemption and public comments received in response to the notice of receipt published on July 21, 2022. Some comments identify certain safety concerns that NHTSA must evaluate to determine whether GM's petition meets the requirements set forth in 49 CFR part 555. To help assess GM's petition for exemption for the Origin, NHTSA requests the additional information below. We request your responses in writing, at your convenience. Please note that we will submit any information you provide us to the docket unless you request confidential treatment under 49 CFR part 512.

- GM stated in its petition that "the Origin will be operated by the same automated driving system that operates the Cruise AV." To clarify, is the Automated Driving System (ADS) stack used on the Cruise vehicles currently operating in San Francisco the same ADS stack that GM intends to use in the Origin vehicles? If not, please describe the differences and how the performance of the Origin's ADS will be validated.
- What types of testing does GM use to build confidence in operating at higher speeds? Is GM confident that there is no greater risk to safety as the speed of the vehicle increases? Please document the risk differences GM views for operations at maximum speeds of 30mph, 45mph, 60mph, and beyond (if the vehicle is capable of operating beyond 60mph).[1] Please document the histogram of real-world experiences accumulated in miles of operation for each category in the ODD. Please document how real-world experiences are used to extrapolate potential safety performance to other categories.
- Are the Origin vehicles driving on San Francisco streets noncompliant with any FMVSS? If so, please list the FMVSS to which they do not comply. How do these vehicles differ from the Origin vehicles that GM requests to be exempted, if at all?
- Please provide the reasons why the cluster of 13 Cruise vehicles to which San Francisco refers in its comment stopped in the same place.[2] What remedies or software/hardware modifications has GM made to prevent this from occurring again?
- GM states in its petition that the Origin's ADS will achieve a minimal risk condition (MRC) when appropriate, which includes performance-related faults and detection of hazardous failures in its hardware and software systems. Name and describe all the MRCs that may be achieved by the system. Please provide documentation for all occurrences of MRC engagement from the ongoing testing and evaluation program for the period 1/1/2022 and 12/31/2022 with sufficient details that explain the circumstances (e.g., was it service that has a human driver, or was it driverless service? Did it stop in lane or pulling over to a safe stopping location?), and causes (e.g., performance related? Sensor obstruction?) Include videos captured from the vehicles. Please provide all possible MRCs and the decision tree showing which was selected for the particular failure type or location of failure.
- What other behavior can NHTSA expect the Origin vehicle to take when entering a safe state/minimal risk condition?
- Please provide information on Cruise's incident response timing between:
    - MRC occurrence to crew reaching to the vehicle, and
    - MRC occurrence to clearing the vehicle off the road.
- GM indicates in its petition that the Origin will pull over to the nearest available safe stopping location, or execute a controlled stop in lane when the vehicle enters a MRC.[3] It seems from San Francisco's comments that

executing a controlled stop in lane happens frequently. Is GM working with the city to establish specific pick-up/drop-off points? Please provide information on how often the Origin stops in lane versus pulling over to the nearest available safe stopping location. Please also provide information about how many of the stops in the lane were performance-related vs. due to detection of hazardous failures in hardware and software systems.

- Please provide information on GM's process for deciding how it will respond when a vehicle enters a MRC by stopping in a travel lane. For example: in what circumstances it will contact authorities or first responders, in what circumstances GM/Cruise may dispatch field staff without being alerted by an occupant or observer, how long that response takes to commence, and what metrics it uses to determine when such actions are needed.
- Is stopping in a traffic lane the primary way Origin vehicles will respond to emergency response vehicles? If not, please describe other potential responses expected from the Origin vehicles.
- Does GM/Cruise have a plan for deployment of specific Origin vehicles, if exempt, to geographic areas or customers in need of accessible transportation?
- Is GM tracking all of the Cruise vehicle operations centrally in real time? What is the mechanism for tracking the vehicles in operation? What happens when the tracking mechanism fails (at central monitoring and at vehicles)? Do vehicles need central connection to continue operating in ADS control? Within the calendar year 2022, document all occurrences of central link to operating vehicles being lost, and what actions the vehicles and GM took. Include timestamps of occurrences and specific response actions taken. How often does GM learn about a vehicle needing to be cleared from emergency responders? In reporting the above, include timestamps and notification information received to Cruise Critical Response Line related to the occurrence as well.
- Please provide a list of and documentation for all vehicle retrieval events from 1/1/2022 and 12/31/2022 with sufficient details that explain the circumstances that required vehicle retrieval.
- What is GM/Cruise's plan to ensure that all passengers, including any passengers with disabilities, can safely enter and exit its vehicles and without imposing risk to other road users, such as bicyclists?
- Has GM explored potential sensor interference possibilities for sensors used on their vehicles and other vehicles in near proximity such as lidars, radars, infrared cameras, thermal cameras, etc.? If so, please provide documentation of the findings. If GM/Cruise uses any interference mitigation methods, please explain.
- Did GM/Cruise encounter any real-world circumstance where the company may have considered sensor interference may have played a role? If so, please provide documentation including the details of the circumstance even if it was concluded not to be a factor.
- Please provide documentation to verify that the Origin's sensors will correctly sense and classify objects and humans (e.g., pedestrians and cyclists) near the vehicle? Please explain how different sensors complement each other and the approach taken if conflicting information is received from different sensors.

Note that the email including these questions will be docketed in Docket No. NHTSA-2022-0067. Thank you in advance for the information requested above.

Respectfully,
Sara Bennett

NHTSA

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Footnotes:
1 NHTSA expects that these vehicles would not be permitted to operate above legal speed limits. However, the agency is interested in knowing if the ADS has been tested or trained above speed limits, through either physical testing or simulation.

2 City and County of San Francisco, Docket No. NHTSA-2022-0067-0070, at 3.
3 Pages 27-28.

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[2] City and County of San Francisco, Docket No. NHTSA-2022-0067-0070, at 3.
[3] Pages 27-28.