

Tire Pressure Monitoring System – Outage Rates and Repair Costs (TPMS-ORRC)

Supporting Statement for Information Collection Request

Part B

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**Tire Pressure Monitoring System – Outage Rates and Repair Costs (TPMS-ORRC)
Supporting Statement for Information Collection Request**

A. Justification: Please see separate Part A section.

B. Collections of Information Employing Statistical Methods

To assess the frequency and causes of vehicles having a TPMS system that is not functional, as well as the costs associated with repair and maintenance of these systems, as a function of vehicles' age and mileage, NHTSA will conduct three surveys. All three surveys come under the single study, known as "Tire Pressure Monitoring System – Outage Rates and Repair Costs." Throughout this document, the three surveys will be referred to as "field survey", "suppliers survey", or "repair facilities survey." All three surveys are primarily qualitative surveys, with the suppliers and repair facilities surveys providing supplementary information to the information collected from the field survey. The information from these surveys is to be used to supplement the data obtained from a previous study of TPMS effectiveness; it is not intended to be used in a new rulemaking.

B.1. Describe the potential respondent universe and any sampling or other respondent selection method to be used.

There are three separate respondent universes under study in the TPMS-ORRC project: one each associated with the field survey, the suppliers survey, and the repair facilities survey.

Field Survey

The population of interest for the field survey is passenger vehicles equipped with tire pressure monitoring systems for the model years 2004 and newer, but no national probability-based sampling frame is available for this population. Therefore the respondents for the field survey will be a purposefully selected convenience sample of such vehicles. As of calendar year 2013, there were 107,168,909 vehicle registrations in the United States for passenger vehicles of model year (MY) 2004 and newer that are equipped with TPMS. The purposeful sampling consists of choosing states, sites within the states, fueling stations within the sites, and vehicles at the fueling station, as described below.

The data collection for the field survey will be in four states in different climate areas of the country (dry, humid, hot, and cold). Within each state, collection will be conducted in two metropolitan statistical areas (MSA), one of which will be an urbanized area and one a non-urbanized area. An area was defined as urbanized by having an MSA of 1.35 million or more as of 2010. This value was determined by first dividing the population in the United States as of 2010 (308,745,538) in half (154,372,769), then arranging all metropolitan areas from most populous to least populous, and calculating a running total; in conducting this procedure it was found that half of the US population lives in metropolitan areas whose population was 1.35 million or more, and 1.35 million was therefore selected as the dividing point.

The selection of two sites in each of four states is driven by a desire for geographical and climate diversity in respondents. However, we acknowledge that the purposefully selected convenience sample of the eight sites will not be statistically representative of American drivers of vehicles equipped with TPMS and that we will not be able to generalize findings to the American driving population. In spite of this limitation, we expect to uncover useful information on drivers' behavior with regard to TPMS and the operational status of TPMS.

Within each site, fuel stations will be identified and arrangements will be made to operate based on the following criteria:

- A large volume of passenger vehicles visiting the site;
- A limited number of entrances to facilitate recruiting passenger vehicles;
- Adequate visibility and space for safely conducting the interviews and observations;
- Probability that a large portion of the vehicles entering the site will be passenger vehicles of MY 2004 and later,
- Vehicles entering the site would not expect to have more or fewer disabled or malfunctioning TPMS than in the general population of vehicles and
- Permission from the site's proprietor or manager to conduct the survey.

Other factors that will influence which drivers are interviewed are the driver's willingness to be interviewed and the researchers being available to conduct an interview at the time that the driver arrives at the fuel station (i.e., is not already conducting another interview). Researchers will simply not approach drivers of vehicles that appear to be older than model year 2004. Although the researchers will not be able to determine with 100% accuracy whether a vehicle is from a model year 2004 or newer, the researchers will be able to do a rough sorting on this characteristic of the vehicle. In addition, if a driver informs the researchers that the vehicle is 2003 or older, the researchers will then move along to the next vehicle entering the fueling area. Some drivers of eligible vehicles will likely refuse for various reasons, such as being in a hurry. Drivers that refuse will not be followed or further requested to participate. Because we will recruit a purposefully selected convenience sample and not a probability sample, it is not possible to estimate a response rate.

To screen for TPMS operational status, data collection teams will inspect vehicles of MY 2004 or newer. Types of vehicles inspected will be rebalanced as needed during data collection to ensure that a minimum number of vehicle types (passenger cars, and light truck vehicles (LTVs)) and vehicle model years (2004 to present model year) are more or less equally dispersed among the four states within the two population types. The vehicle screener will be used to collect information required to sort the vehicles into the following groups: (1) Vehicles not meeting the selection criteria for inspection; (2) Vehicles meeting the selection criteria for inspection and having a TPMS that is not functioning; (3) Vehicles meeting the selection criteria for inspection and having a TPMS that is functioning. Drivers of vehicles in Group 1 will be thanked for their cooperation, but the vehicle will not be inspected. All willing and knowledgeable drivers of vehicles in Groups 2 and 3 will have their vehicles inspected and be eligible to be interviewed.

From the vehicles screened and eligible, we will proceed as follows: For groups 2 and 3, we desire to interview enough drivers so that a qualitative binary question with a 50% proportion in response (the maximum variability) will give the equivalent of about a 5.25% margin of error in

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a 95% confidence interval, had we drawn a simple random sample. A sample of 350 will achieve this goal as the margin of error would be $1.96 \times \text{Square Root}[(.50)(.50)/350] = 5.24\%$. Questions with lesser variability would have a smaller margin of error. Since Group 2 is rare, the survey contractor will select willing Group 2 drivers until we have 350, rebalancing inspections as previously described to achieve diversity in vehicle type and age. To predict how many vehicles we will need to inspect to reach 350 members of Group 2, we note that from the 2011 TPMS-SS survey data (i.e., data on tire inflation for vehicles with and without TPMS) about 5 percent of the respondents had experienced a TPMS malfunction at some time to their knowledge. (No data currently exist on the rate of malfunctioning TPMS in vehicles on the road determined through inspection.) Applying this 5 percent rate to our desired 350, we will need to inspect $350/.05=7000$ vehicles to get our desired sample in Group 2. For Group 3, we desire a subsample of 350 for the same reason as described for Group 2. To achieve it, as the survey contractor conducts inspections, 350 drivers will be selected from the inspected vehicles that are not part of Group 2, ensuring by purposeful selection, if necessary, that the 350 are diverse in vehicle type and age.

The drivers selected into Groups 2 and 3 will be interviewed to obtain information regarding driver's dependence upon and interactions with the operating status of the vehicle's TPMS. The information obtained will also provide driver knowledge about current or past TPMS malfunctions (e.g., duration and frequency of the TPMS not working, reasons they did not work, actions taken to fix them), as well as current and previous experience with the low tire pressure light being illuminated, needing to recalibrate the TPMS, type and cost of repairs needed. This study will seek a broad understanding of the rate of malfunction in TPMS in diverse areas of the country and different vehicle types and ages, but with the understanding that the results cannot be generalized to the population of American drivers of vehicles equipped with TPMS.

The data collected will provide for a descriptive study without any statistical inference. There are no plans to base any rulemaking on the data collected for this study or to characterize all American drivers of vehicles equipped with TPMS with the results.

Suppliers Survey

The respondent universe consists of all TPMS sensor and system equipment suppliers. This universe consists of 45 TPMS suppliers, which includes Tier 1 and Tier 2 suppliers. There is no selection method for this respondent group, since the goal is to contact and collect information from the entire population.

No statistical methods will be used. All data collection will be based on a 100% sample of the inference population. In all reports and other publications and statements resulting from this work, no attempt will be made to draw inferences to any population other than the set of units that responded to the data collection effort.

Repair Facilities Survey

The respondent universe consists of maintenance and repair facilities. This population has three subpopulations: automobile dealerships or automobile dealership-connected facilities,

chain/franchised brick-and-mortar tire stores (e.g., AutoZone), and independently-owned tire repair facilities. This survey is conducted primarily for qualitative information, providing supplemental information in regards to the information collected from the field survey.

A list frame constructed of North American Industry Classification System (NAICS) codes allows for the three strata to not overlap. The table below provides the NAICS codes and their associated subpopulation.

NAICS Code	Subpopulation Description
441110	New car dealers
441320	Tire dealers
447110, 447190, 811111, 811198	General automotive repair & maintenance

A sample of 501 respondents will be selected and contacted. It is expected that approximately 100 (based on a predicted 20 percent completion rate) will complete the survey. We assume that there will be no differences between the qualitative responses provided by the three sources; for instance, reasons for TPMS failure should not be dependent on the type of repair facility visited; therefore, and because the expected interview number is small, we will draw a simple random sample of equal amount from each source.

B.2. Describe the procedures for the collection of information.

Field Survey

Data will be collected by teams of two data collectors, designated as the “interviewer” and the “inspector.” The team will identify and approach vehicles of model years 2004 or newer to assess the operational status of direct TPMS or second generation indirect TPMS. The interviewer will approach the driver and administer the first part of the driver interview, which is serving as a vehicle screener, while the inspector will check for the existence and operational status of the vehicle’s TPMS and determine, based on status of the TPMS, whether the interviewer should pursue an in-depth interview with the driver. The team will collect a minimal set of information from all approached drivers and vehicles, including, for tracking purposes, from those who refuse or are not eligible for the full interview. Data obtained from the team will be entered via hand-held electronic devices (i.e., tablets) and sent to a FedRAMP approved cloud data storage service; thereby reducing burden on the respondents, as well as the time needed to process the data.

It is assumed that vehicles with a malfunctioning TPMS will be a relatively small group of the overall population. While no data currently exists on the rate of malfunctioning TPMS in vehicles on the road, as determined through inspection, there is data from the 2011 TPMS-SS survey (i.e., survey of tire inflation for vehicles with and without TPMS) that about 5 percent of the respondents, to their knowledge, had experienced a TPMS malfunction at some time. This study will try to get a broad understanding of the rate of malfunction in TPMS in diverse areas of the country with the understanding that the results cannot be generalized to the population of American drivers of vehicles equipped with TPMS.

Suppliers Survey

Given the relatively small number of suppliers, initial interviews may be conducted through a combination of in-person and telephone methods. The peer-to-peer interview, led by the contractor's subject matter experts, will serve to engage the supplier, identify additional contact information, and encourage suppliers to complete a standardized survey via email, mail, or fax.

The contractor will transmit a survey questionnaire to each supplier via the supplier's preferred method—email, mail, or fax. Survey questionnaires will be pre-coded with identification codes that match identification codes from the initial interview (by company). The questionnaires will be sent directly to the identified point of contact at their business address, if possible; however, if direct contact information cannot be identified, the surveys may be distributed through the following channels:

- Suppliers sales departments
- Customer service lines
- Contact links on websites
- Any other means that can be identified
- Main addresses (as the last resort)

The following activities will be performed after the initial survey distribution:

- Follow up to make sure the documents were received
- Maintain communications to ensure the suppliers intend to return the surveys
- Document and track progress

Repair Facilities Survey

This survey will be conducted using a Computer-Assisted Telephone Interviewing (CATI) system, which means that the interviewer will enter the data directly into the response database. If requested by the respondents, the contractor will also allow respondents to submit their data via a mail survey.

B.3. Describe methods to maximize response rates and to deal with issues of non-response.

Field Survey

Several aspects of the data collection are designed to maximize the response rate. The contractor will provide training to the data collectors on all aspects of the data collection forms and the field procedures to be used. Candidate drivers will be approached in a non-threatening way, provided information about the survey, and asked if they would be willing to participate in the study. The design of the survey using two-person data collection teams allows it to be completed in approximately 15 minutes for each vehicle. Data obtained from the interviews will be entered via hand-held electronic devices (i.e., tablets) and sent to a FedRAMP approved cloud data storage service; thereby reducing burden on the respondents, as well as the time needed to process the data.

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We will collect a minimal amount of information from each driver and vehicle that is approached, including, for tracking purposes, those who refuse or are not eligible for the full interview. We will also ensure that a minimum number of vehicle types (passenger cars and LTVs) and vehicle model years (2004 to present model year) are selected for inspection/interview. However, since this survey is using a purposefully selected convenience sample survey and not a probability sample, non-response adjustment will not be conducted.

Suppliers Survey

Since the population size for this survey is small, efforts will be made to include every member. To maximize the response rate for this population, pre-notification letters from NHTSA will be provided prior to contact to introduce the survey and emphasize its purpose and importance. Additionally respondents will be offered the survey in their preferred mode (in-person or telephone) and follow-up attempts will be made following initial contact.

Repair Facilities Survey

A pre-survey notification letter from NHTSA will be sent to each of the selected repair facilities with a known address and telephone number. The letter will be sent to selected facility managers/proprietors one to two weeks prior to the start of data collection to prepare respondents for the telephone survey. This introductory letter will serve several purposes:

- To inform individuals about their inclusion in the repair facilities survey
- To indicate the NHTSA's sponsorship of the study
- To emphasize the importance of the study and their participation
- To be the first step in gaining respondent compliance
- To inform the repair facility, the type of person preferred for interview

In addition to ensure maximum response rate:

- Two types of surveys are offered: telephone or mail survey
- Interviewers will make up to 5 attempts to the target respondent
- Calling will be conducted during normal business hours on a Monday-Friday schedule
- Toll-free or e-mail help desk support will be provided to support respondents who have any survey-related issues or might need more clarification.

Since this survey will draw a simple random sample of equal amount from each source, non-response adjustment will not be conducted.

B.4. Describe any tests of procedures or methods to be undertaken.

Data collection forms and instructions are being developed by staff in NHTSA's Office of Regulatory Analysis and Evaluation and ICF, the contracted vendor. The data collection forms are included as Attachment B in Part A.

Field Survey

At one or more fueling station sites, a pilot test will be conducted for the respondent universe of passenger vehicles by two-person team(s) consisting of contractor staff. The pilot study will assess whether the training provided was adequate in conveying team members their responsibilities; how survey procedures work in the field; and whether the wording, question flow, formatting, and other characteristics of the draft forms work well. This pilot is expected to help refine procedures, forms, and cooperation for the start of the full study. Minor modifications to the data collection forms, as well as some changes in procedures may result.

Suppliers Survey

No pretest has been designed for this survey. The contractor plans to identify individual points of contact for the supplier companies and to maintain regular contact with each supplier representative. Maintaining an up-to-date contact list of potential survey respondents will allow follow-up with them to complete missing responses during survey administration.

Repair Facilities Survey

An operational pretest will be conducted on a maximum of 9 respondents. This pretest will assess whether the wording, question flow, formatting, and other characteristics of the draft forms work well. Minor modifications to the data collection forms, as well as some changes in procedures may result.

B.5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

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