Tire Pressure Monitoring System – Special Study (TPMS-SS)
Supporting Statement for Information Collection Request

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SUPPORTING STATEMENT

Tire Pressure Monitoring System – Special Study (TPMS-SS)
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Approval is requested to conduct the *Tire Pressure Monitoring System – Special Study*.

A. Justification

A.1. Explain the circumstances that make the collection of information necessary. Identify any legal or administrative requirements that necessitate the collection. Attach a copy of the appropriate section of each statute and regulation mandating or authorizing the collection of information.

a. Circumstances necessitating the data collection.

Improperly inflated tires pose a safety risk, increasing the chance of skidding, hydroplaning, longer stopping distances, and crashes due to flat tires and blowouts. Section 13 of the Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act (Attachment A1), which Congress passed on November 1, 2000, directed NHTSA to conduct rulemaking actions to revise and update the Federal motor vehicle safety standards for tires, to improve labeling on tires, and to require a system in new motor vehicles that warns the operator when a tire is significantly underinflated.

Tire Pressure Monitoring Systems (TPMS) were mandated in Federal Motor Vehicle Safety Standard (FMVSS) No. 138 (Attachment A2), so that drivers are warned when the pressure in one or more of the vehicle's tires has fallen to 25 percent or more below the placard pressure, or a minimum level of pressure specified in the standard, whichever pressure is higher, and may be informed about which of the four tires is underinflated. As of September 1, 2007, after a phase-in period beginning on October 5, 2005, TPMS was required on all new light vehicles (i.e., passenger cars, trucks, multipurpose passenger vehicles, and buses with a gross vehicle weight rating of 10,000 pounds or less, except those vehicles with dual wheels on an axle).

Executive Order 12866 (Attachment A3) requires Federal agencies to evaluate their existing regulations and programs and measure their effectiveness in achieving their objectives. However, since the phase-in of TPMS, there has not been any evaluation of TPMS. The Tire Pressure Monitoring Systems – Special Study (TPMS-SS) is being planned in order to evaluate FMVSS 138 effectiveness, as well as to obtain information for use in decreasing the underinflation of tires via revisions to current regulations and/or consumer education.

To minimize data collection and training costs and to ensure accuracy of the data, the TPMS-SS is being conducted as a special study through the infrastructure of the National Automotive Sampling System (NASS). Trained NASS crash investigators will be the data collectors for the TPMS-SS. NASS collects nationally representative data on motor vehicle crashes for the National Highway Traffic Safety Administration (NHTSA). The collection of crash data that support the establishment and enforcement of motor vehicle regulations that reduce the severity of injury and property damage caused by motor vehicle crashes is authorized under the National

Traffic and Motor Vehicle Safety Act of 1966 (Public Law 89-563, Title 1, Sec. 106, 108, and 112) (Attachment A4). The OMB Control Number for the NASS is 2127-0021.

In addition to the safety risk posed by underinflated tires, vehicles traveling with underinflated tires use more fuel than similar vehicles traveling with properly inflated tires. Therefore, the proper inflation of vehicle tires is not only a safety concern but also one related to fuel economy. The Secretary of Transportation is required by the Energy Policy and Conservation Act, as amended by the Energy Independence and Security Act (EISA) of 2007 (P.L. 110-140) to prescribe annual fuel economy increases for automobiles (Attachment B). Information such as the reasons that passengers travel by passenger vehicles, and the time and methods used to refuel vehicles is used in the calculations needed to analyze the effect of EISA on fuel economy.

b. Statute authorizing the collection of information

Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act, Section 13, directs NHTSA to conduct rulemaking actions to revise and update the Federal motor vehicle safety standards to require a system in new motor vehicles that warns the operator when a tire is significantly underinflated. (See Attachment A1 for full text.)

Federal Motor Vehicle Safety Standard (FMVSS) No. 138 mandates Tire Pressure Monitoring Systems (TPMS). (See Attachment A2 for full text.)

Executive Order 12866 requires Federal agencies to evaluate their existing regulations and programs and measure their effectiveness in achieving their objectives. (See Attachment A3 for full text.)

The National Traffic and Motor Vehicle Safety Act of 1966, Title 15 United States Code 1395, Section 106 (b), gives the Secretary authorization to conduct research, testing, development, and training as authorized to be carried out by subsections of this title. The Vehicle Safety Act was subsequently re-codified under Title 49 of the U.S. Code in Chapter 301, Motor Vehicle Safety. Section 30168 of Title 49, Chapter 301, gives the Secretary authorization to conduct research, testing, development, and training to carry out this chapter. (See Attachment A4 for full text.)

The Energy Act of 2005 (P.L. 109-58) directs the Secretary to set, by regulation, average fuel economy standards by model year for automobiles manufactured by manufacturers. The Energy Act was subsequently revised by the Energy Independence and Security Act of 2007, ESIA, (P.L. 110-140). ESIA provides additional and modified guidance as to how the Secretary is to set these average fuel economy standards. (See Attachment B for full text.)

A.2. Indicate how, by whom, and for what purpose the information is to be used. Except for a new collection, indicate the actual use the agency has made of the information received from the current collection.

Results from the TPMS-SS will be used by NHTSA analysts and engineers to assess the extent to which tire pressure monitoring systems improve the situation of under-inflated tires for passenger vehicles in the United States. Current estimates of the effectiveness of TPMS will be used by NHTSA's Rulemaking body to determine if revisions to the standard are necessary. Information about consumers' purposes for travel and refueling habits and preferences, as well as

the time spent in refueling, will be used by NHTSA analysts in calculations needed to analyze the effect of EISA on fuel economy. In addition, data on the drivers' familiarity with the type of warning given by their TPMS and the action(s) that they have taken after being warned will be used to assess current consumer knowledge, as well as the benefits of increased consumer education and other outreach efforts concerning tires, tire pressure, and tire pressure monitoring systems.

The information obtained from the 2001 Tire Pressure Special Study (TPSS) and the 2003 Tire Pressure Monitoring System Study (TPMSS) were used by the agency in the developing Federal Motor Vehicle Safety Standard (FMVSS) No. 138, which mandates Tire Pressure Monitoring Systems (TPMS) in all new light vehicles.

A.3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology. Also describe any consideration of using information technology to reduce burden.

This collection of information does not involve the use of technological collection techniques. NHTSA feels the use of simple paper and pencil forms is cost effective (because of not having to purchase the design, software or equipment to collect the data electronically), and provides a less formal and more comfortable environment for the interviewed motorists. While the data collectors will not use electronic devices such as Personal Data Assistants, the collected data will be entered into an electronic database and NHTSA will receive 100 percent of the results of the data collection in electronic files.

A.4. Describe efforts to identify duplication.
Show specifically why any similar information already available cannot be used or modified for use for the purposes described in Item 2 above.

Although a one time Tire Pressure Special Study (TPSS) was conducted in 2001 to collect trial data, the study sample included too few vehicles equipped with tire pressure monitoring systems to perform thorough analyses. A second study was begun in 2003 but was truncated. In addition, this second study and the initial 2001 study were conducted in advance of the mandate's effective dates. The vehicles equipped with TPMS, primarily trucks/SUVs and high-end passenger cars, were not representative of the overall on-road vehicle fleet. It is also possible that the widespread application of TPMS has resulted in technological changes and adaptations in driver behavior. Hence, this data collection entails no duplication, since this study will generate data for which no similar information is available. In regard to the questions dealing with refueling, we are not aware of any other set of data that would be applicable.

A.5. If the collection of information impacts small businesses or other small entities, describe methods used to minimize burden.

The collection of information involves drivers of selected vehicle types, not small businesses. Potential survey sites, gas stations, will be contacted in advance to see if they would be willing to voluntarily grant permission to conduct the survey at their establishment. Businesses will be fully informed as to the nature of the survey operations, as well as the amount of time required for the data collection activities.

A.6. Describe the consequence to Federal program or policy activities if the collection is not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.

NHTSA knows of no previous study that has nationally representative estimates of the effectiveness of a tire pressure monitoring system. Consequently, if this study is not conducted, real-world data to evaluate Federal Motor Vehicle Safety Standard (FMVSS) 138 would not be available. In addition, if NHTSA does not collect this information, it will not have scientifically-based information from actual motorists on the use of TPMS with which to better target Agency outreach efforts. Finally, without data on refueling, the calculations needed to be made for EISA will need to be made based upon assumptions.

A.7. Explain any special circumstances that would cause the information collection to be conducted in a manner inconsistent with the guidelines set forth in 5 CFR 1320.6.

There are no circumstances requiring information to be collected in a manner inconsistent with the guidelines in 5 CFR 1320.6.

A.8. Provide a copy and identify the date and page number of publication in the Federal Register of the agency's notice, required by 5 CFR 1320.8 (d), soliciting comments on the information collection prior to submission to OMB. Summarize public comments received in response to that notice and describe actions taken by the agency in response to these comments. Describe efforts to consult with persons outside the agency to obtain their views.

FEDERAL REGISTER NOTICES:

A copy of the 60-Day Federal Register Notice is provided in Attachment C1. The Notice appeared in the Federal Register, Volume 74, Number 92, pages 22800-22801, Thursday, May 14, 2009. The closing date for comments was July 13, 2009. No comments were received.

A copy of the 30-Day Federal Register Notice is provided in Attachment C2. The Notice appeared in the Federal Register, Volume 74, Number 138, pages 35904-35905, Tuesday, July 21, 2009.

EXPERT CONSULTATION: Experts within NHTSA played vital roles in the design of the baseline survey instrument.

A.9. Explain any decision to provide any payment or gift to respondents, other than remuneration of contractors or grantees.

No payment will be made to respondents in the survey.

A.10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy.

Respondents are informed in the survey introduction that their answers will be kept private, used only for statistical purposes, and the data will be protected to the full extent of the law. Participation in the survey is voluntary. No identifying information for interviewees will be obtained during data collection or entered into any system of records for all of the interviewees surveyed on-site. A small sub-set of interviewees (i.e., those who have TPMS, do not have time to answer the questions on the supplemental form on-site, and who volunteer to be contacted at a later date) will have contact information recorded so that the researcher can contact them later to administer the supplemental survey form off-site, but identifying information for the interviewees will be destroyed and will not be entered into the final data file.

A.11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private.

The survey does not contain any questions related to matters that are commonly considered sensitive or private.

A.12. Provide estimates of the hour burden of the collection of information on the respondents. Provide estimates of annualized cost to respondents for the hour burdens for collections of information, identifying and using appropriate wage rate categories.

Consultation with a sample (fewer than 10) of potential respondents was completed. In addition, averages from the previous tire studies were used to determine the time it would take to collect vehicle, tire, and driver data.

While there are seven forms, only three of them (i.e., Interview Form-Fuel, Interview Form-TPMS, and Supplemental Form) will place burden on the respondents (i.e., the vehicles' drivers). Two of the forms (i.e., Daily Site Information-Refueling and Daily Site Information-Tallies & Inspections) are used to observe the flow of vehicles at the gas stations and do not require any interaction with the drivers of the vehicles. Two other forms (i.e., Vehicle Form and Tire Form) are completed via observation by one NASS researcher while another researcher conducts an in-person interview with the driver to collect driver information on one or the other of the two different Interview Forms. It is estimated that the burden for the Interview Forms will be slightly

over 10 minutes for each interview (or a total of 1750 hours) for 10,000 respondents (i.e., 5,000 respondents for the Interview Form-Fuel and 5,000 respondents for the Interview Form-TPMS). In addition, there will be an additional 10 minutes for each of the 1,050 respondents (or a total of 175 hours) who have TPMS in their vehicles and who volunteer to answer a few additional questions (i.e., the Supplemental survey form) about their tire pressure monitoring system. Consequently, the total respondent burden hours is estimated to be 1,925 hours for both of the Interview Forms and for the Supplemental Form.

If cost to the respondents of their voluntary hours is looked at in terms of an hourly wage based upon the average income level in the United States, the Mean Hourly Wage Estimate of $20.32 per hour (U.S. Dept. of Labor, Bureau of Labor Statistics, 2009) can be used to estimate annualized costs to respondents at 1750 hours x $20.32 = $35,560 for the Interview Form alone; 175 hours x $20.32 = $3,556 for the Supplemental Form alone, and 1,925 hours x $20.32 = $39,116 for both forms together. (See Table 1 below)

Additionally, each respondent will receive a card on which the NASS Data Collectors will have recorded the Manufacturers Recommended Tire Pressure and the Tire Pressure the Data Collectors read for each of the vehicle's tires. Consequently, the respondent is receiving benefit in return for his/her participation.

Table 1. Cost Burden on Respondents

Survey Form	N	Cost per Hour	Hours	Total Cost
Interview	10,000	$20.32	1,750	$35,560
Supplemental	1,050	$20.32	175	$3,556
TOTAL	**11,050**	**$20.32**	**1,925**	**$39,116**

*From http://www.bls.gov/oes/current/oes_nat.htm#b00-0000, all occupations, Mean Hourly Wage Estimate; viewed May 13, 2009.

A.13. Provide an estimate of the total annual [non-hour] cost burden to respondents or record keepers resulting from the collection of information. (Do not include the cost of any hour burden shown in Items 12 and 14).

There are no costs to respondents or record keepers associated with participating in this survey.

A.14. Provide estimates of annualized cost to the Federal government.

Estimated Cost of this one time survey is $700,000. This includes $600,000 for data collection and $100,000 for data processing, file procurement and quality control.

A.15. Explain the reasons for any program changes or adjustments reported in Items 13 or 14 of the OMB Form 83-1.

Since this is new survey, there will be a program change of increased burden hours of 1,925 to NHTSA's overall burden hour amount.

A.16. For collections of information whose results will be published, outline plans for tabulation, and publication.

NHTSA plans to publish an evaluation report, which includes the findings and the methodology used. The main focus of the report will be to evaluate the effectiveness of FMVSS 138--to determine if the tires of vehicles with TPMS are properly inflated more often than the tires of vehicles without TPMS. Data from the 10,000 inspected vehicles (i.e., data from the Vehicle Inspection Form and the Tire Inspection Form) will be used for this analysis. In addition, data from the interview and supplemental forms will be analyzed to try to determine why tires are underinflated in some vehicles and not in other vehicles (e.g., driver lack of knowledge about the importance of and/or the ways of maintaining the proper tire pressure, driver lack of knowledge about the displays used in their TPMS and/or how to reset their TPMS). These secondary analyses will be primarily done to identify areas in which additional research, consumer education and/or rulemaking might be of value. The methodology portion of the report will include information on the sampling frame, the survey participation rate, and copies of the questionnaires in both English and Spanish.

The planned data collection period is 32 weeks. It was determined that it would be best not to collect the data during the extremely cold weather that can be had during the winter months, based upon the experience of attempting to collect data during the 01 TPSS. Therefore, the initial schedule was for data to be collected February 2010 to September/October 2010 with the report being published January/February 2012. If approval to conduct the survey is not received early enough to proceed, data collection might have to be split into two periods of data collection (i.e., beginning in the summer of 2010 and continuing through October; beginning in the spring of 2011 and continuing until all data is collected). If this latter data collection time frame is used, the publication of the report would have to be delayed until the end of 2012 or the beginning of 2013.

In addition to this published report, the data from the refueling portion of the survey will be used in the calculations needed to analyze the effect of the Energy Independence and Security Act of 2007 on fuel economy.

A.17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons that display would be inappropriate.

The expiration date for OMB approval will be displayed on all survey forms. NHTSA is not seeking approval to not display the expiration date.

A.18. Explain each exception to the certification statement identified in Item 19, Certification for Paperwork Reduction Act Submissions," of OMB Form 83-1.

No exception is requested to any of the items in the certification statement.

B. Collections of Information Employing Statistical Methods

The proposed study will employ statistical methods to analyze the information collected from respondents. The following sections describe the procedures for respondent sampling and data tabulation.

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

The potential respondent universe consists of passenger vehicles from model years 2004 to the present. This should comprise approximately 90 to 100 million vehicles[1]. Other factors that will influence which drivers are interviewed are the drivers willingness to be interviewed and the researchers being available to conduct an interview at the time that the driver arrives at the gas station (i.e., is not already conducting another interview).

The response rate should not greatly reduce the total amount of data gathered. In most cases, researchers will simply not approach drivers of vehicles which appear to be older than model year 2004. Although the researchers will not be able to determine with 100% accuracy if 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 refuse, e.g., because they are in a hurry. The amount of time invested in identifying ineligible vehicles should be relatively small in proportion to the time required to perform tire pressure measurements and driver interviews. As discussed in the previous paragraph, old vehicles will reduce the eligible vehicle pool by approximately one-third. Some amount of driver lack of cooperation is also reasonable. Including both sources, it is estimated that 50% of vehicles entering a gas station can be surveyed during times when the researchers are not already occupied with an interview. As stated in A12 above, the goal is to collect tire pressure readings from 10,000 vehicles.

Data collection will be conducted in three levels. First is the PSU, second is the gas station(s) within each PSU, and third are the vehicles at each gas station. More details are provided in Section B.2.

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

1 Based on vehicle registration counts provided by R.L. Polk & Co., there were 91 million registered passenger vehicles of model years 2001 and newer in the calendar year 2007 – this range of years is compatible with the present study conducted on model year 2004 and newer passenger vehicles in calendar year 2010.

The criterion measure of interest is the operating target of TPMS – the percentage of vehicles with at least one tire under-inflated by at least 25%. Other information collected through the Interview and Supplemental forms will be used to imply causality of why TPMS does (or does not) have the effect intended by the mandate.

To provide population estimates and standard errors, the data will be weighted based on the probability of each sampled vehicle being selected. The stages of selection are defined as follows:

1. Selection of the PSU – 24 will be selected out of 1195 total;
2. Selection of the gas station within the PSU – twenty-one gas stations per PSU, with the precise sampling population varying according to PSU (e.g., based on size and ease of travel for the researchers, availability of cooperating gas stations);
3. Selection of the vehicle at the gas station – consideration will be given to the vehicle body type, model year, and TPMS status, as discussed below.

The base sampling weight (BW) for each vehicle is thus defined as follows:

$$BW_{ijk} = \frac{1}{P(PSU_i) \times P(GS_{j|i}) \times P(vehicle_{k|j})}$$

where BW_{ijk} is the sampling weight for each vehicle in the study
$P(PSU_i)$ is the probability of selecting PSU indexed *i*
$P(GS_{j|i})$ is the probability of selecting Gas Station indexed *j* in PSU *i*
$P(vehicle_{k|j})$ is the probability of selection vehicle *k* at Gas Station *j* in PSU *i*

The final sampling weight (FW) will be adjusted for non-response, according to the following:

$$FW_{ijk} = BW_{ijk} \times \frac{1}{R_{j|i}}$$

where FW_{ijk} is the Final Sampling Weight
$R_{j|i}$ is the response rate for Gas Station *j* in PSU *i*

The response rate will be calculated using the data from the Daily Site Information Form, which contains tallies for both the number of vehicles who participated and the number who refused or were unable to participate.

The selection of each PSU is straightforward – there are 1195 total PSUs within the National Automotive Sampling System (NASS) sampling structure[2] and 24 of these have been selected. The mechanism for selecting gas stations may vary by PSU. Prior to data collection, cooperation will be sought from the gas stations. Therefore, pre-established cooperation will facilitate the process. This affects the sampling probability in terms of the number of pre-arranged gas stations

2 The NASS system covers all areas of the United States and includes urban, suburban, and rural localities. Although the system was organized in 1979, it is considered representative of the overall vehicle population in the United States and continues to be used in determining nationwide crash statistics.

that can be identified within each PSU. In some cases, it may be necessary for contact to be made between NHTSA and individual station managers, possibly aided by the researchers.

The vehicle selection procedure will attempt to control for two characteristics likely to influence tire inflation pressure – vehicle age and body type. The 2001 Tire Pressure Special Study found vehicle age to be an important factor in the amount of under-inflation. For example, cars over six years old were nearly twice as likely to have underinflated tires as vehicles less than or equal to three years old. This could be due to both structural characteristics of the tires and the maintenance habits of the drivers. By contrast, the percentage of over inflated tires was nearly identical across age groups. The likelihood of underinflation depended on the body type as well – 32% of pickup trucks, SUV's, and vans had at least one tire underinflated by 8 psi or more, compared to 27% of cars.

Data collection will take place with the expectation that both body style *and* vehicle age need to be accounted for. The TPMS status for a large number of make-models was determined from internet resources, on model years back to 2000. It was noted whether the make-models were equipped with Direct TPMS, Indirect TPMS, or no TPMS, and whether this equipment was optional or standard. The number of vehicle registrations for these make-models was obtained using data from R.L. Polk & Co. To make efficient use of data collection hours, model years will be restricted to 2004 and newer. It was during these model years that the percent of vehicles equipped with Direct TPMS increased from around 5% to a large majority of vehicles. Vehicles from MY 2008 and newer should all be equipped with Direct TPMS, per the mandate.

The model year restrictions and body type composition will be estimated to determine the probability of individual vehicle selection ($P(vehicle_{k|j})$ above). Researchers will count the number of vehicles entering the gas stations for each of the body styles (car, truck, SUV, van). Observational data is preferable because it approximates the eligible vehicle pool at each location. Counts obtained from outside sources (e.g., vehicle registration rolls) are unlikely to account for variability at a level that matches the customer base for a certain gas station.

The probability of selection vehicle *k* is defined as follows:

$$P(vehicle_{k|j}) = \frac{n_{t|j}}{E(N_{t|j})}$$

where $n_{t|j}$ is the number of vehicles of type *t* surveyed at Gas Station *j*

$E(N_{t|j})$ is the expected number of vehicles of type *t* at Gas Station *j* during the entire survey period

The sample size target will be identified such that statistically significant differences can be found for a given model year for each of the two body style categories (cars and non-cars). Rather than seek an analytical solution to the minimal sample size, hypothetical datasets were generated to approximate the anticipated sample. Vehicles are randomly assigned to one of five model years with equal probability. The probability of assignment to one of the body style categories is varied such that 8 PSU's have 30% cars and 70% non-cars, another 8 PSU's have 50% each cars and non-cars, and the final 8 PSU's have 70% cars and 30% cars. The percentage of vehicles with TPMS varies by model year. For cars, Model Year 1 has 10% TPMS, Model

Year 2 has 10% TPMS, Model Year 3 has 20% TPMS, Model Year 4 has 67% TPMS, and Model Year 5 has 100% TPMS. These hypothetical Model Years 1 to 4 represent passenger vehicle model years 2004 to 2007, and hypothetical Model Year 5 represents passenger vehicle model years 2008 and newer. At this time, it is not possible to precisely estimate the proportion of passenger vehicles from these model years which will be in use during the anticipated survey period in 2010. For non-cars, these respective values are 20%, 40%, 50%, 87%, and 100%. These values were determined from the analysis of Polk data of registered vehicle counts and cross-referenced with the TPMS status. The effectiveness of TPMS was varied from 20% to 80% in 10% increments, defined as the reduction in the percent of vehicles with at least one tire under-inflated (e.g., 50% reduction could mean 20% of non-TPMS vehicles have one tire under-inflated, compared to 10% of TPMS vehicles); the effectiveness is assumed constant across vehicle age and body type in these simulations. The percent of non-TPMS vehicles with at least one tire under-inflated was varied by model year (i.e., vehicle age) approximately as found in the 2001 Tire Pressure Special Study. For cars, these values are, for Model Years 1 through 5 (oldest to youngest), 15%, 10%, 10%, 5%, 5%; and for non-cars, 25%, 20%, 15%, 15%, 10%. These values are reasonable based on reporting from the 2001 TPSS, even accounting for the present survey being conducted in 2010 with vehicles a minimum of two years old. Baseline sample sizes per PSU were defined, and a small adjustment was added to introduce sample size variability by PSU – one-third were increased by 25 vehicles, one-third by 50, and the final third by 100. The resulting sample sizes assessed were 5000, 7400, 9800, and 12200. This is the ***total sample size*** for the entire survey, for two vehicle types (cars and non-cars) and five model years. This is ***not*** the sample size for an individual body style and model year. It is also worth noting that inclusion of model year 2008 and newer means that 20% of the data will not be subject to a within-year comparison, because there is no non-TPMS group from 2008 onwards.

For each combination of TPMS effectiveness and total sample size, 50 datasets were generated with model year and body type randomly assigned. Each hypothetical dataset is used to estimate the effectiveness of TPMS. A statistically significant effect is desired at the $\alpha = 0.05$ level, as measured by the Rao-Scott χ^2, which penalizes the usual contingency table χ^2 to account for inflated variance in complex survey designs (i.e., the calculation $\chi^2 \div$ *Design Effect* decreases the likelihood of an effect being termed "significant"). For each body type and model year combination, the 2×2 table is constructed by *TPMS status* and *Underinflation*. It is desired to have approximately an 80% chance of finding a statistically significant effect for all body type and model year combinations.

It is more conservative, statistically, to base desired sample size on the contingency table analyses for cars, because they have lower percentage of vehicles TPMS-equipped *and* a lower percentage of non-TPMS vehicles under-inflated. If TPMS is quite effective (80% reduction), the simulated data estimate an overall 0.850 probability of finding a statistically significant effect across four model years, based on a ***total*** sample size of 5000. By individual model year, it is most difficult to detect the effect for the newer vehicles, which have a lower non-TPMS under-inflation likelihood – the probability of finding a statistically significant effect in favor of TPMS is reduced to 0.620. If TPMS is less effective (50% reduction), the power of the statistical test is reduced. With 12,200 ***total*** vehicles sampled, the probability of detecting a statistically significant difference for cars across the four applicable model years falls to 0.805 and is only 0.580 for the "newest" model year where under-inflation is rare.

A total sample size goal in excess of 10,000 is reasonable in terms of statistical considerations and in comparison with the 11,530 vehicles assessed during the 2001 TPSS.

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

NHTSA has chosen to conduct the Tire Pressure Monitoring System – Special Study through the infrastructure of the National Automotive Sampling System (NASS). NASS sites are located at 24 sites throughout the country, and are staffed with experienced researchers. These researchers have been formally trained to collect and elicit cooperation from such sources as the general public, service stations/tow yards, hospitals and police departments.

The NASS Researchers will use their proven techniques (in the NASS CDS cooperation rates from Hospitals, Tow Yards, and Crash Involved Motorists exceed 80 percent) to garner the cooperation of survey participants. To obtain cooperation with the vehicle owners, the researchers will discuss why the survey is taking place, and explain the need to collect such data. Respondents are informed in the survey introduction that their answers will be kept private, used only for statistical purposes, and the data will be protected to the full extent of the law.

It is expected that the data collected will be reliable and of sufficient quality to be used to generalize to the universe studied. Non-response will be tabulated on the Daily Site Information Form based on the vehicle body type. The distribution of non-responding vehicles can be compared to the distribution of participating vehicles, as well as to the distribution of vehicles which enter the station for refueling during the four daily tally periods. Statistical weights will be adjusted for non-response (page 9). Benchmark comparison will be conducted using vehicle registration counts from R.L. Polk, & Co., to which NHTSA has access. These data can be aggregated by body-type at the county or state level for each PSU.

NHTSA has previously conducted two surveys that were similar to what is currently being proposed. The first of these was in 2001, and the survey was conducted at gas stations just as proposed with the present survey (research notes posted as DOT HS 309 316, DOT HS 309 317, DOT HS 309 318). A second study was conducted in 2003 when NHTSA data collectors visited the homes of participants (research report published as DOT HS 811 086). Based on these findings, potentially influential factors can be identified and attempts will be made to control for non-response along these factors. Some notes follow:

- In 2001, passenger cars were three percent less likely than light trucks & vans to have at least one tire under-inflated, controlling for vehicle age. In the present study, data collectors will note the vehicle body type of non-responding vehicles. When the data are analyzed, NHTSA's analysts will assess the non-response rate by vehicle body type.
- In 2001, driver gender was not analyzed in terms of under-inflation, but it was shown that males & females have different knowledge of how to determine the appropriate inflation pressure. In the present study, data collectors will record the gender of non-responding drivers. When the data are analyzed, NHTSA's analysts will assess the non-response rate by driver gender.

- In 2001, very few vehicles would have had TPMS and therefore it is not possible to infer the effects that TPMS might have across body type and gender based on these findings. The present study is the first opportunity to determine if there is an interaction between TPMS presence, driver gender, and vehicle type.
- The 2003 study reports that the direct type of TPMS is more effective than the indirect type of TPMS and no TPMS. For drivers who are unable or unwilling to participate, it is unfortunately not always possible to visually determine the presence of TPMS. Therefore, it is not possible to determine if the tendency to participate differs for vehicles with TPMS compared to those without TPMS.
- Other factors that may influence tire inflation pressure are age of the vehicle and amount of wear on the tire. It is infeasible to collect these data from respondents who are too busy to participate. Current NHTSA employees who worked on the 2001 survey were consulted to verify this statement.

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 with input from the NASS Field Staff. The data collection forms and procedures will be evaluated in a pilot test of all data collection procedures throughout the country. At numerous locations, a two-person team consisting of contractor staff will pretest the data collection forms and methodology, as part of a one day pretest. This pretest should 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. The data collection forms are included as Attachment D.

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.

Survey Design and Estimation:	Kirk Allen, National Center for Statistics and Analysis (NCSA), NHTSA (NVS-431; 202.366.9308)
Data Analysis:	Kirk Allen, NCSA, NHTSA (NVS-431, 202.366.9308) Charlene Doyle, NCSA, NHTSA (NVS-431, 202.366.1276)
Data Collection:	Gary Toth, NCSA, NHTSA, COTR for Contracts (NVS-411, 202.366.5378)
Data Collection Contractors:	Calspan Corporation. (Contract DTNH22-06-C-00022) KLD Associates, Inc. (Contract DTNH22-06-C-00024).

C. <u>Attachments</u>

C.1. Attachment A.

a. Attachment A1. TREAD Act

b. Attachment A2. FMVSS 138

c. Attachment A3. Executive Order 12866
d. Attachment A2. The National Traffic and Motor Vehicle Safety Act of 1966

C.2. Attachment B. The Energy Independence and Security Act of 2007

C.3. Attachment C. Federal Register Notices
a. Attachment C1. 60-Day Federal Register Notice
b. Attachment C2. 30-Day Federal Register Notice

C.4. Attachment D. Data Collection Forms
a. Attachment D1. Daily Site—Body Types
b. Attachment D2. Daily Site—Refueling
c. Attachment D3. Tire Inspection Form
d. Attachment D4. Vehicle Inspection Form
e. Attachment D5. Interview Form-Tire Pressure
f. Attachment D6. Interview Form-Refueling
g. Attachment D7. Supplemental Form