February 12, 2002

Mr. Kirk K. Van Tine
General Counsel
U.S. Department of Transportation
400 Seventh Street, S.W., Room 10428
Washington, DC 20590

Dear Mr. Van Tine:

The Office of Management and Budget (OMB) has been conducting an expedited review under Executive Order No. 12866 of the draft final rule prepared by the National Highway Traffic Safety Administration (NHTSA) entitled "Tire Pressure Monitoring Systems." In accordance with recent legislation passed by Congress, the draft final rule addresses an important public safety issue: the traffic crashes, injuries and fatalities that result from operating a vehicle with underinflated tires.

OMB supports NHTSA's establishment of a safety standard in this area. However, the analysis NHTSA has performed to date does not adequately demonstrate that NHTSA has selected the best available method of achieving the regulatory objective: enhanced highway safety. Therefore, we are returning this rule to NHTSA for reconsideration of two analytic concerns related to safety. First, we have identified a regulatory alternative – one that NHTSA has not explicitly analyzed – that may provide more safety to the consumer than the draft version of the final rule. In order to analyze this alternative with care, NHTSA needs to consider the impact of regulatory alternatives on the availability of anti-lock brake systems (ABS). Second, the technical foundation for NHTSA's estimates of safety benefits needs to be better explained and subjected to sensitivity analysis. My staff is available and eager to work with NHTSA to complete this analysis and the rulemaking as expeditiously as possible.

Many vehicles on the road do not have any tire pressure monitoring system. For these vehicles, the owner or driver must take the initiative to periodically check the pressure of the vehicle's tires to ensure that each of the tires is inflated to the proper pressure level. The available evidence suggests that many people do not regularly check their tires, or at least do not take the steps to achieve optimal tire inflation. As envisioned by Congress, the draft final rule would establish a Federal Motor Vehicle Safety Standard under which tire pressure monitoring systems would have to be installed in all new passenger cars, light trucks, multi-purpose vehicles and buses weighing up to 10,000 pounds.

There are two types of tire pressure monitoring systems, both now used in some vehicles, that NHTSA believes are possible compliance choices for vehicle manufacturers. "Direct" systems monitor pressure by means of instruments installed in each wheel. Indirect systems infer tire pressure from information already available in vehicles that are equipped with anti-lock brake systems. In particular, the indirect system detects pressure differences between wheels by sensing differences in their rotational speeds. Underinflated tires have smaller diameters and thus rotate faster.

The draft final rule would establish, over a four-year phase-in period, a standard under which all new vehicles would be required to have some tire pressure monitoring system. During the phase-in period, compliance could be achieved with either indirect or direct systems. However, after the phase-in, the performance standard would be altered in a way that effectively prohibits compliance with a purely indirect system. The vehicle manufacturer would instead be compelled to comply with a direct system. NHTSA believes a so-called "hybrid" system, which would combine elements of direct and indirect tire pressure monitoring, could also meet the rule's performance standard. However, no such hybrid systems have yet been installed in vehicles and the public record provides little information about their likely performance or cost.

OMB believes that a rule permitting indirect systems may provide more overall safety than a rule that permits only direct or hybrid systems. This additional safety may be available at a lower total cost to the public. Although direct systems are capable of detecting low pressure under a greater variety of circumstances than indirect systems, the indirect system captures a substantial portion of the benefit provided by direct systems. Moreover, allowing indirect systems will reduce the incremental cost of equipping vehicles with anti-lock brakes, thereby accelerating the rate of adoption of ABS technology. About one-third of new vehicle sales currently lack anti-lock brakes necessary for an indirect system. Both experimental evidence and recent real-world data have indicated a modest net safety benefit from anti-lock brakes. Before NHTSA finalizes a rule that disallows indirect systems, OMB believes that the potential safety benefits from more vehicles with anti-lock brakes need to be considered. In a preliminary analysis attached to this memorandum, OIRA staff show that a rule permitting indirect systems may provide more overall public safety at less cost to the consumer than NHTSA's preferred alternative.

OMB is also concerned that NHTSA's estimates of the number of crashes, injuries and fatalities prevented by direct systems are based on limited data and/or assumptions that have not been fully explained or analyzed. For example, NHTSA assumes that 95% of consumers would respond promptly and effectively to a warning light indicating that the vehicle has a tire inflation problem. No data, such as estimates of driver response rates to existing safety-related warning lights, are provided to support this figure. While the safety benefit estimates stemming from reduced skidding and better control are based on a well-done study, that study unfortunately was published in 1977, before the widespread existence of front-wheel drive, radial tires and SUVs and minivans. It also appears that NHTSA's use of experimental data on shorter stopping distances from proper tire inflation was based on insufficient consideration of all of the available data. In light of the limited data and insufficiently supported assumptions, OMB suggests that NHTSA's regulatory analysis should include more sensitivity analysis of the type that is found in many previous regulatory analyses prepared by NHTSA. NHTSA should also provide additional explanation of the data choices and uncertainties underlying its analysis.

In conclusion, OMB believes that, before issuing a final rule, NHTSA needs to provide a stronger analysis of the safety issues and benefits, including a formal analysis of a regulatory alternative that would permit indirect systems after the phase-in period. Moreover, NHTSA could analyze an option that would defer a decision about the ultimate fate of indirect systems for several more years, until the potential impact on installation of anti-lock brake systems is better understood. In addition to representing sound public policy, the consideration of the suggested regulatory alternative is required under Sections 202 and 205 of the Unfunded Mandates Act (2 U.S.C. 1532 and 1535) and under Section 1(b)(5), (8), and (11) of E.O. 12866.

Accordingly, I am returning the draft final rule for reconsideration. My staff and I are available to work with the agency in the reconsideration of this matter and in the prompt promulgation of an important safety rule.

Sincerely,

/s/

John D. Graham, Ph.D.
Administrator
Office of Information
and Regulatory Affairs

Enclosure

cc: Dr. Jeffrey W. Runge

OIRA Enclosure (2/12/2002)

This enclosure describes in detail our concerns with the draft Final Economic Assessment (FEA). It presents - for illustrative purposes - an analysis of an option that has the potential to achieve substantially greater safety at lower cost than the draft final rule. The enclosure also includes a discussion of some of the major uncertainties and potential biases associated with key assumptions in the FEA and suggests possible ways to address them.

Background

After a four-year phase-in, the draft final rule would require that tire pressure monitoring systems (TPMS) be able to detect when up to four tires are 25 percent or more underinflated. The FEA includes analysis of direct and "hybrid" TPMS. Direct systems monitor tire pressure directly by means of sensors installed in each wheel. Hybrid systems would monitor tire pressure by combining elements from a direct system with elements from an indirect system. Indirect systems infer tire pressure from information already available in vehicles equipped with anti-lock brake systems (ABS). They detect pressure differences between tires by sensing differences in wheel rotational speeds. Underinflated tires have smaller diameters and thus rotate faster. No indirect systems currently available can meet a four-tire standard. The rulemaking record is also unclear on whether hybrid systems could do so.[1] Nevertheless, we assume for the sake of argument that NHTSA is correct in its belief that hybrid systems could meet a four-tire requirement.

The FEA presents quantified estimates of two components of cost: "vehicle" (e.g., hardware) and maintenance costs for each system. The benefit estimates include the value of fuel savings and reduced tire tread wear that would result from each system. The FEA presents the difference

[1] We were unable to locate anything in the rulemaking record indicating that hybrid systems would be able to detect four simultaneously low tires. The rulemaking record on the performance and cost of hybrid systems appears to be limited to two paragraphs in one comment. That comment stated, "The current releases of indirect TPMS will require the equivalent of the addition of two direct tire pressure sensors and a radio-frequency receiver to meet the requirement to detect ***two*** simultaneously low tires under ***alternative 2*** [emphasis added]." Under the proposed rule, "alternative 2" would have required the detection of up to three, not four, simultaneously low tires. That comment also asserted, "...the maximum cost to implement these changes to be about 60% of the cost of a full direct TPMS for vehicles already equipped with an ABS." The commenter provided no further information on the performance or cost of such a system. To date, no such system has ever been produced or installed on a vehicle.

between costs and the fuel and tire wear savings as "net costs." The FEA also includes three categories of quantified safety benefits: reduced skidding and better control, shorter stopping distances, and fewer flat tires and blowouts. For direct systems, the FEA estimates a net cost (i.e., total cost minus the value of fuel economy and tire tread wear benefits) of $1,240 million per year and safety benefits of 10,271 injuries and 141 fatalities averted per year when applied to the entire on-road fleet. For hybrid systems, the FEA estimates a net cost of $862 million per year with safety benefits of 8,722 injuries and 124 fatalities averted per year.

1. Evaluation of Alternatives

The FEA does not meaningfully compare viable alternatives. Specifically, NHTSA did not analyze the benefits and costs associated with an alternative requirement that would allow indirect systems to continue to be used indefinitely (i.e., a 30 percent underinflation, 1-tire standard). There are in excess of 2 million TPMS-equipped vehicles on the road today, the vast majority of which are indirect systems.

Based on information in the Preliminary Economic Assessment (PEA) and the FEA, a requirement that allowed indirect systems indefinitely could achieve comparable and, quite possibly, substantially greater safety benefits at lower cost than those associated with the final rule. An option that allows indirect systems will provide an inducement to install anti-lock brakes (ABS) on more vehicles. We present the following analysis for illustrative purposes only. We believe that the example shows that indirect systems warrant a complete and careful analysis. At the same time, we do not consider our example to be definitive. Further refinements by NHTSA may be necessary.

A. Costs and Benefits of an Indirect System

Based on information contained in the PEA, and consistent with assumptions in the FEA, we estimate that an indirect system would cost an average of about $30 per vehicle in "vehicle" (e.g., hardware) costs and an additional $13 in maintenance costs, or a total of about $720 million per year. Indirect systems would result in about $200 million in fuel and tread wear savings combined for a net cost of about $520 million per year. We estimate this option could achieve safety benefits of about 5,000 injuries and 70 fatalities averted per year when applied to the entire on-road fleet.

B. The Anti-lock Brake Effect - Induced ABS

Indirect versus direct systems - Allowing indirect systems likely would induce vehicle manufacturers to equip a greater percentage of the new vehicle fleet with ABS.[2] This is because

[2] For model year 2000 about 68 percent of new cars and light trucks were equipped with ABS. Although the percentage of new vehicles equipped with ABS generally has increased in recent years, it appears to be leveling off. In 1999, 68.3 percent of the fleet was equipped with ABS.

vehicles not equipped with ABS will need a more-expensive, direct system to comply with the rule. For direct systems, the FEA estimates vehicle cost of $66.50 per vehicle. For vehicles already equipped with ABS, the vehicle cost of an indirect system would be $13.29 per vehicle.[3] Thus, a manufacturer who decided to install ABS in a vehicle that would not have ABS otherwise can reduce the (vehicle) cost of compliance by about $53 per vehicle. In other words, a rule that would allow indirect systems would reduce the incremental cost of adding ABS by $53, since the manufacturer could avoid the cost of a direct system.[4]

According to NHTSA, the average cost of ABS is about $240. Therefore, a manufacturer could save about 22 percent ($53/$240) of the cost of equipping a vehicle with ABS by avoiding the cost of a direct TPMS. Assuming a price elasticity of demand for ABS of 1[5] (i.e., each 1 percent decline in the price of ABS induces a 1 percent increase in quantity demanded), a 22 percent reduction in the cost of ABS would result in a 22 percent increase in the number of new vehicles equipped with ABS. Thus, we could reasonably expect about 7.4 percent of the new vehicle fleet (22 percent of the 33 percent of the new vehicle fleet without ABS), or about 1.1 million vehicles, to be equipped with ABS as a direct result of this option.

A recent study in a peer-reviewed journal[6] estimated that light-duty vehicles equipped with ABS are between 4 and 9 percent less likely to be involved in fatal crashes of all types. (These estimates are not statistically significant. However, they appear to represent the best estimates available at this time.) Overall, there are about 40,000 fatalities per year involving these vehicles. Thus 7.4 percent of the fleet accounts for about 2,960 fatalities per year. Reducing these by 4 to 9 percent would mean 118 to 266 fatalities[7] averted per year as a result of additional ABS induced by the rule. Adding these to the 70 fatalities averted from indirect systems without the

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[3] The average cost of $30 mentioned above is higher because it is a weighted average of both direct and indirect systems, since vehicles without ABS would require direct systems.

[4] The remainder of this analysis assumes that the consumer does not correctly perceive the difference in maintenance cost. If he or she did, the effective "discount" on ABS would be substantially *greater* -- an additional $40 or so when comparing direct with indirect systems.

[5] We do not have an empirically-based estimate of the price elasticity of demand for anti-lock brakes. However, NHTSA reported in the draft preamble to the final rule that one vehicle manufacturer said it would add ABS to an additional 400,000 vehicles if indirect systems are permitted. This alone accounts for more than 1/3 of the additional ABS our illustrative example assumes. In public comments, all vehicle manufacturers supported a 30%, 1-tire standard. Thus it does not appear that this manufacturer made this statement in the context of a standard that today's indirect systems cannot meet.

[6] Farmer, Charles M., "New evidence concerning fatal crashes of passenger vehicles before and after adding antilock braking systems," Accident Analysis and Prevention, 33 (2001), 361-369.

[7] The study we relied upon did not estimate ABS effectiveness rates for injuries. We estimated injury reduction benefits attributable to ABS by assuming that injury reduction benefits would occur in the same proportion to fatalities (i.e., between 70 and 75 injuries per fatality) as NHTSA estimated in the FEA.

additional ABS yields a total of 188 - 336 fatalities averted or between 47 and 195 *more* than with direct systems.

We calculated the nationwide aggregate cost of the additional ABS systems as follows: About 1.1 million (7.4% x 15 million new vehicles/yr.) more vehicles would be equipped with ABS. Since the FEA already accounted for these vehicles having to install direct systems, the increment to the FEA aggregate cost estimate is about $206 million per year (1.1 million vehicles x $187 ($240 - $53)). This brings the net cost of the indirect system approach (including the cost of additional ABS systems) to about $726 ($520 + $206) million per year, or about $514 million per year *less* than the net cost of direct systems.

Indirect versus hybrid systems - The FEA estimated the vehicle cost of a hybrid system to be $39.90 per vehicle. This is about $26.50 less than the vehicle cost of a direct system, or about half of the savings per vehicle associated with indirect systems. Following the approach we used for indirect systems, manufacturers who choose a hybrid option over a direct system can also effectively capture the savings as a cost reduction for providing ABS. Under the same assumptions we used above, this would result in an additional 3.7% of the new vehicle fleet (about 550,000 vehicles) being equipped with ABS. This, in turn translates into an additional 59 - 133 more fatalities averted and about $117 million additional net cost compared with hybrid systems with no ABS effect. The total benefits for hybrid systems would then be 183 - 257 (124 + 59 and 124 + 133) fatalities averted per year and the net cost would be about $979 million per year. Including the ABS effect, allowing indirect systems would avert between 5 (188-183) and 79 (336 - 257) *more* fatalities and about $250 million in cost per year than would hybrid systems. The table below summarizes these estimates.

		National Estimates (without ABS Effect)[8]			National Estimates (with ABS Effect)		
System	Cost per vehicle	Annual Net Cost ($millions)	Annual Injuries Averted	Annual Fatalities Averted	Annual Net Cost ($millions)	Annual Injuries Averted	Annual Fatalities Averted
Direct	$66.50	$1,240	10,271	141	$1,240	10,271	141
Hybrid	$39.30	$ 862	8,733	124	$ 979	12,888-18,099	183-257
Indirect	$13.29	$ 520	5,000	70	$ 726	13,429-24,000	188-336

[8] The estimates for the direct and hybrid systems are take from the draft FEA. The estimates for an indirect system are OMB estimates based on information in the PEA and, to the maximum extent possible, consistent with assumptions NHTSA made in its draft FEA.

Because of this possibility, NHTSA should carefully evaluate the benefits and costs of an option that would allow indefinite use of today's indirect systems. We hope that the illustrative example we provide here will serve as a useful starting point for such an analysis. As a longer-term project, NHTSA should also evaluate the on-road performance of current direct and indirect systems.

2. Safety Benefit Estimates

The quantified safety benefits in the FEA are divided among 3 categories: reduced skidding and better control, shorter stopping distances, and fewer flat tires and blowouts. The magnitude of each is directly related to vehicle owners' responses to low pressure warning lights. This section describes some assumptions about several uncertain or unknown key parameters that affect the magnitude of the safety benefit estimates. Each assumption warrants some empirical grounding and/or sensitivity analysis.

A. Vehicle Owner Response to Warning Light

The safety benefits from a TPMS system depend critically on how vehicle owners respond when the low pressure warning light comes on. There can be no benefit if owners ignore the warning light. The FEA assumes that 95 percent of all vehicle owners will respond to the warning light promptly and appropriately. In the Preliminary Economic Assessment, NHTSA assumed 60 percent of vehicle owners would respond to a light that did not specify which tire(s) was low by inflating their tires to the correct pressure and 80 percent in cases where the dashboard light indicated which tire was low. Neither the PEA nor the FEA provides an empirical basis for any of these response rates. At the same time, it is also likely that some vehicle owners will come to rely exclusively on the warning light to inform them of tire pressure and will reduce the frequency with which they normally check their tires. To the extent that this occurs, the benefits of the rule may decline, and may do so at different rates depending on the technology.

To provide a stronger foundation for its analysis, NHTSA should provide some empirical basis for this critical component of the analysis. NHTSA could, for example, perform an analysis of responses to other dashboard warnings. In any event, NHTSA should perform sensitivity analyses using alternative response rates. We believe that a carefully conducted survey and analysis of driver behavior and corresponding tire pressures in TPMS-equipped vehicles currently on the road would go a long way toward refining the estimates based on this parameter.

B. Reduced Skidding and Better Control

In the PEA, NHTSA stated it was not able to quantify this category of benefits. No commenters disagreed or suggested ways that NHTSA might do so. In the FEA, NHTSA estimated the benefits from reduced skidding and better control using a 1977 study, "Tri-Level Study of the Causes of Traffic Accidents, Final Report (Report)." This Report provides great detail on the circumstances associated with 420 crashes. It was well-done and for a long time served as a useful data source for understanding the causes of crashes. Unfortunately, because of changes in the nature of vehicles on the road, the report's value has diminished with the passage of time. The skidding and control component of the benefit estimates for this rule appears to stem from analysis of about six of the 420 crashes analyzed in the report. The small sample size alone is enough to warrant a sensitivity analysis.

Perhaps more importantly, though, the relevance of the vehicles and tires involved to the fleet of vehicles that this rule will affect is not clear. For example, none of the six vehicles in the Report had front-wheel drive, none were sport-utility vehicles (SUVs) or minivans, and, in all likelihood, none were equipped with radial tires. The newest of the vehicles involved in these crashes was a 1972 Pontiac. One of the six involved a 1960 Ford Falcon - a vehicle produced more than 45 years before the final rule will be fully effective. NHTSA should also provide more support for the assumption that these crashes are directly relevant to this rule.

C. Shorter Stopping Distances

Stopping distances vary greatly among vehicles and road and tire conditions. They also vary from test to test under the same vehicle, road, and tire conditions. All of the improved stopping distance benefits were based on tests of two vehicles: a Dodge Caravan minivan and a Ford Ranger pickup truck. The FEA appears to rely exclusively on the Caravan test results to estimate benefits for the passenger car fleet (but not for the minivan or SUV fleet). The FEA also appears to rely exclusively on the Ford Ranger test results to estimate benefits for the light truck fleet (including minivans and SUVs).

NHTSA chose not to continue to use results from a passenger car tested on a NHTSA test track. These results had formed part of the basis for benefit estimates in the PEA. They showed little, if any, effect of reduced pressure on stopping distances. This result is not surprising, for the same reason that the rule is expected to yield fuel economy and tread wear benefits - reduced pressure increases rolling resistance, and could be expected to *improve* stopping distances under at least some conditions. Although NHTSA received no comments suggesting these results were unrepresentative, it did not use them because of a belief that the test road surface was not sufficiently worn to be representative.

NHTSA does not explain why it believes the minivan test results better represent passenger car performance than NHTSA's own passenger car results. NHTSA also does not explain why it believes the pickup truck test results better represent minivan and SUV performance than the minivan test results.

Given the small sample size and variability of stopping distances, it is unclear whether any of the test results available to NHTSA are representative of much more than those particular vehicles. NHTSA should estimate benefits using its passenger car test results to represent passenger cars, the minivan test results to represent minivans and SUVs, and the pickup truck test results to represent pickup trucks. NHTSA should also perform some sensitivity calculations around the corresponding benefit estimates.

D. Flat Tires and Blowouts

In the PEA, NHTSA stated it did not have sufficient data to reliably estimate the magnitude of this category of benefits. Commenters agreed that there will be some benefits in this area.

However, no commenters disagreed with NHTSA's initial assessment that they could not be quantified. As was the case with skidding and control, none suggested ways NHTSA might estimate them. In the FEA, NHTSA produced an estimate of these benefits by assuming that 20 percent of blowouts are caused by low tire pressure. This new assumption warrants further justification and a sensitivity analysis, at the least.