



Tire Pressure Special Study Vehicle Observation Data

Twenty seven percent of passenger cars with regular passenger car tires have at least one tire that is underinflated by 8 psi or more.

“Tire Pressure Special Study: Vehicle Observation Data” is the third in a series of research notes containing results from the Tire Pressure Special Study (TPSS) conducted by the National Highway Traffic Safety Administration (NHTSA) in 2001. The focus of this research note is on results from the vehicle inspections and tire measurements. Previous topics of TPSS research notes included the study methodology and the results from the driver interview data.

Background

In 2000, Congress passed the Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act. Section 13 of this act directed the Department of Transportation to complete a rulemaking within one year, requiring implementation of a warning system in new motor vehicles indicating significantly under-inflated tires.

In response to Section 13 of the TREAD Act, NHTSA’s National Center for Statistics and Analysis (NCSA) conducted the TPSS. The TPSS was designed to assess to what extent passenger vehicle operators are aware of the recommended tire pressures for their vehicles, the frequency and the means they use to measure their tire pressure, and how significantly actual measured tire pressure differed from the manufacturer’s recommended tire pressure. The data collected are being used to support various

rulemaking actions including an upgrade to the placement and contents of the vehicle placard and the development of an onboard tire pressure measuring sensor. (These data were presented at a public meeting on July 26, 2001, and were placed in Docket Number NHTSA-2000-8572, “Tire Pressure Monitoring System”.)

Data Collection Methodology

Field data collection was conducted through the infrastructure of the National Automotive Sampling System Crashworthiness Data System (NASS CDS). The NASS CDS consists of teams of researchers located at Primary Sampling Units (PSUs) throughout the United States. The PSUs are located in urban, suburban, and rural settings with nationally representative populations.

The population surveyed by the researchers in the TPSS represents a sample frame consisting of drivers who used gas stations to fill up their vehicles between the hours of 8:00 am and 5:00 pm. Data collection was conducted from February 1, 2001 through February 14, 2001.

Vehicles surveyed included passenger cars and light trucks. NHTSA classifies light trucks as sport utility vehicles, pickup trucks and vans with a Gross Vehicle Weight Rating of less than 10,000 pounds. A total of 11,530 vehicles were included in the survey, of which 6,442 were passenger cars, 1,874 were sport utility vehicles, 1,376 were vans, and 1,838 were pickup trucks. The distribution of vehicles was consistent with national estimates of vehicle registration.

Data collected during the TPSS included daily site information, driver interview and profile data, vehicle profile data, and tire data for all four tires on the vehicle. The vehicle information collected included vehicle profile data and the manufacturer's recommended tire pressures. Tire information collected included tire profile data as well as air pressure, sidewall temperature and tread depth measurements. A complete description of the data collection process was presented in the previous research note "Tire Pressure Special Study: Methodology."

Analysis of the Vehicle Observations

Survey data were analyzed for the following three categories of vehicles:

- 1) Passenger Cars with P-Metric Tires (Cars w/ P Tires);
- 2) Pickup Trucks, Sport Utility Vehicles (SUVs), and Vans with P-Metric Tires (Light Trucks w/ P Tires);
- 3) Pickup Trucks, SUVs, and Vans with Other Type Tires (Light Trucks w/ Other Tires).

P-Metric tires are regular passenger car tires and the labeling has the format "P205/75R14." Other Type tires include LT tires, which are light truck tires with the format "LT235/85R15/D," and High Flotation tires that have the format "31X10.50R15LT/C." Information on standard tire labeling formats can be found in the "2000 Tire Guide" courtesy of the Rubber Manufacturers Association.

Estimates and Sampling Error

The observations were weighted to represent national estimates. Because estimates from the TPSS are based on a sample, they are statistically weighted according to the sample design and are subject to sampling error. When calculated, estimates in the tables are

shown with their corresponding sampling error in parentheses. Adding and subtracting twice the sampling error from the corresponding estimate will produce an approximate 95 percent confidence interval for the estimate. This means that one can be 95 percent confident that the true value for the quantity being estimated lies within this interval.

Results of the Vehicle Observations

Figures 1 through 3 show the cumulative percentage of the measured pressure for each tire for each category of vehicles analyzed. The corresponding tables show the measured pressures for given percentiles as well as the means and standard errors for the vehicle categories with P-Metric tires.

Table 1 shows that for passenger cars with P-Metric tires the average front tire pressure was approximately 31 psi and the average rear tire pressure was approximately 29 psi. The fifth percentile for left rear tires had a measured pressure of 18.8 psi or below and the fifth percentile for left front tires had a measured pressure of 22.3 psi or below.

Table 2 shows that for pickup trucks, SUVs, and vans with P-Metric Tires the average front tire pressure was approximately 31.5 psi and the average rear tire pressure was approximately 31 psi. The fifth percentile for right rear tires had a measured pressure of 21.9 psi or below.

The average pressure for pickup trucks, SUVs, and vans with LT-Metric or High Flotation tires could not be calculated because of the small sample size (around 900 vehicles) and because of the limitations of the gauge used to read tire pressures. (The gauges used in the survey could not read above 60 psi.) However, the fifth percentile for right rear tires (Table 3) had a measured pressure of 19.8 psi or below, compared to around 24 or 25 psi for all of the other tires.

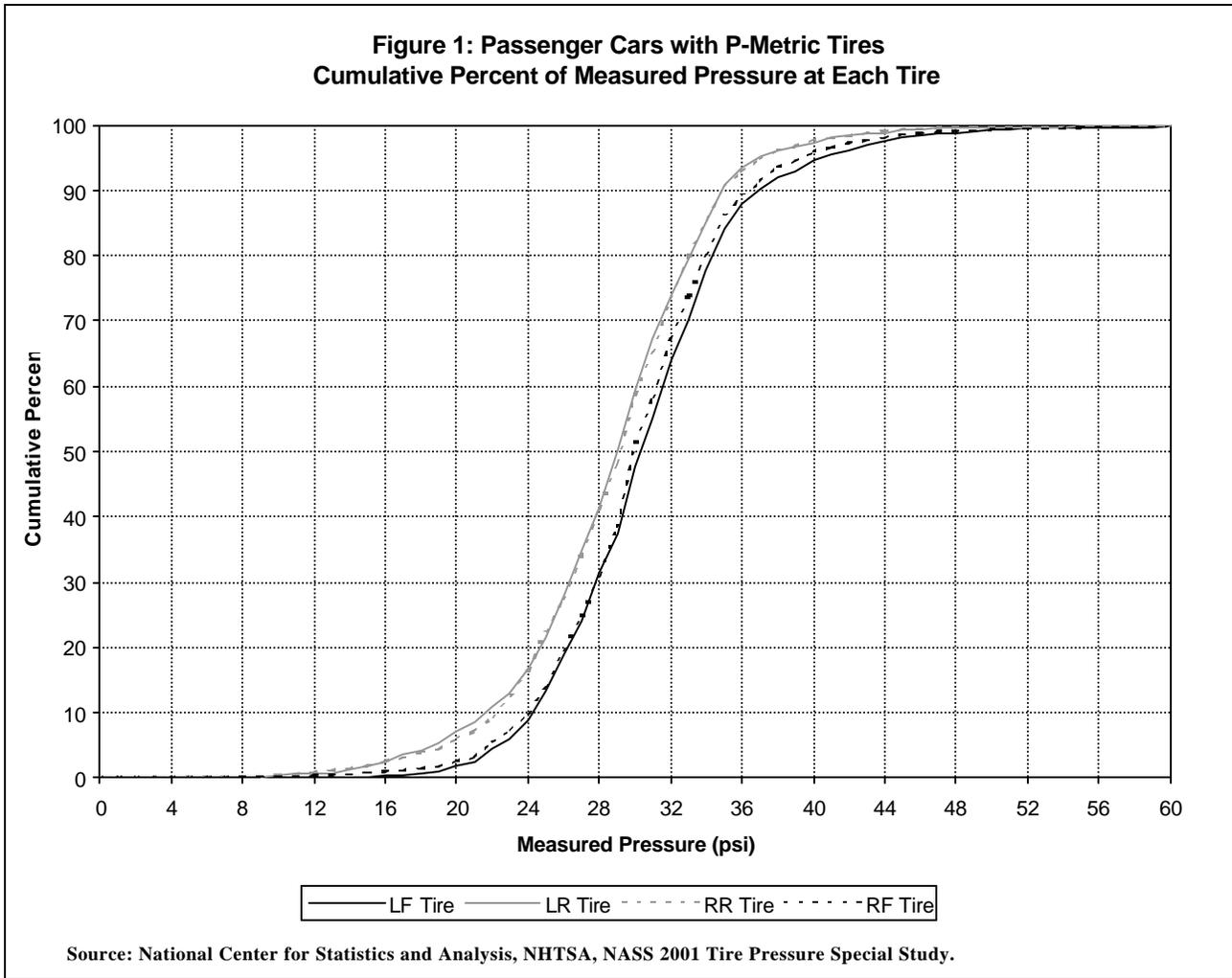
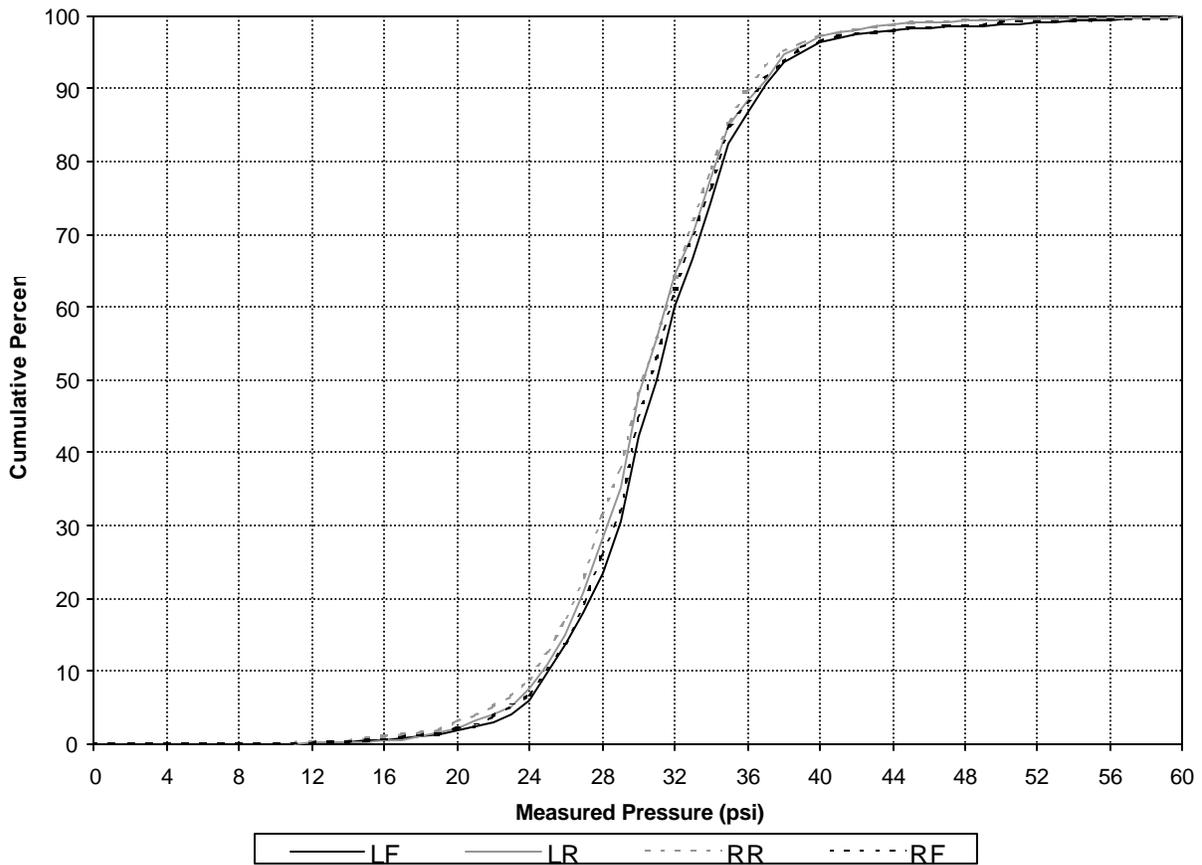


Table 1
Measured Pressure for Passenger Cars with P-Metric Tires
by Tire Position and Percentile
(Measured Pressures in psi)

Tire Position	Percentile or Mean				
	5th Percentile	25th Percentile	Mean	50th Percentile	75th Percentile
Left Front	22.3	27.1	31.1 (0.2)	30.3	33.6
Left Rear	18.8	25.5	29.2 (0.2)	29.0	32.2
Right Rear	19.4	25.5	29.3 (0.2)	30.2	33.2
Right Front	21.8	27.0	30.8 (0.2)	29.9	33.2

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

**Figure 2: Pickup Trucks, SUVs, and Vans with P-Metric Tires
Cumulative Percent of Measured Pressure at Each Tire**



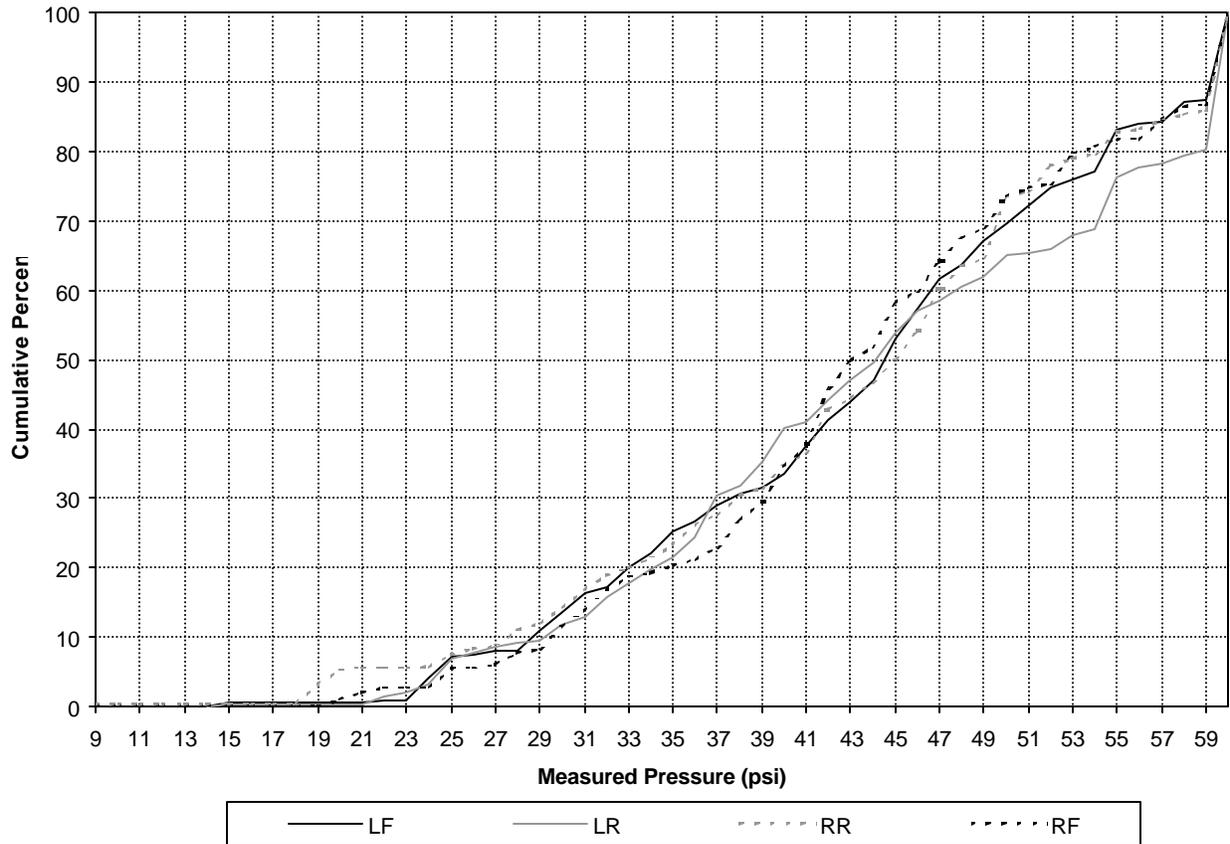
Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

**Table 2
Measured Pressure for Pickup Trucks, SUVs, and Vans with P-Metric Tires
by Tire Position and Percentile
(Measured Pressures in psi)**

Tire Position	Percentile or Mean				
	5th Percentile	25th Percentile	Mean	50th Percentile	75th Percentile
Left Front	23.5	28.2	31.7 (0.3)	31.0	34.1
Left Rear	22.9	27.6	31.1 (0.2)	30.3	33.7
Right Rear	21.9	27.3	30.8 (0.2)	30.2	33.4
Right Front	22.9	27.9	31.4 (0.3)	30.6	33.8

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

**Figure 3: Pickup Trucks, SUVs, and Vans with LT-Metric or High Flotation Tires:
Cumulative Percent of Measured Pressure at Each Tire**



Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

**Table 3
Measured Pressure
for Pickup Trucks, SUVs, and Vans with LT-Metric or High Flotation Tires
by Tire Position and Percentile
(Measured Pressures in psi)**

Tire Position	Percentile or Mean			
	5th Percentile	25th Percentile	50th Percentile	75th Percentile
Left Front	24.3	34.9	44.5	52.0
Left Rear	24.5	36.1	44.1	54.8
Right Rear	19.8	35.6	45.0	51.2
Right Front	24.8	37.5	43.0	51.3

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

Figure 4 and Table 4 show the cumulative percent of the difference between the measured pressure for each tire on the vehicle and the manufacturer's recommended cold tire pressure for that tire for passenger cars with P-Metric tires. The figure shows that rear tires were more underinflated with respect to the recommended cold tire pressure than front tires. Almost 10 percent of left front tires were underinflated by 8 psi or more and 16 percent of left rear tires were underinflated by 8 psi or more.

Figure 5 and Table 5 show the cumulative percent of the difference between the measured pressure for each tire on the vehicle and the manufacturer's recommended cold tire pressure for pickup trucks, SUVs, and vans with P-Metric tires. The figure shows that rear tires were more underinflated than front tires. Eleven percent of left front tires were underinflated by 8 psi or more and 18 percent of left rear tires were underinflated by 8 psi or more.

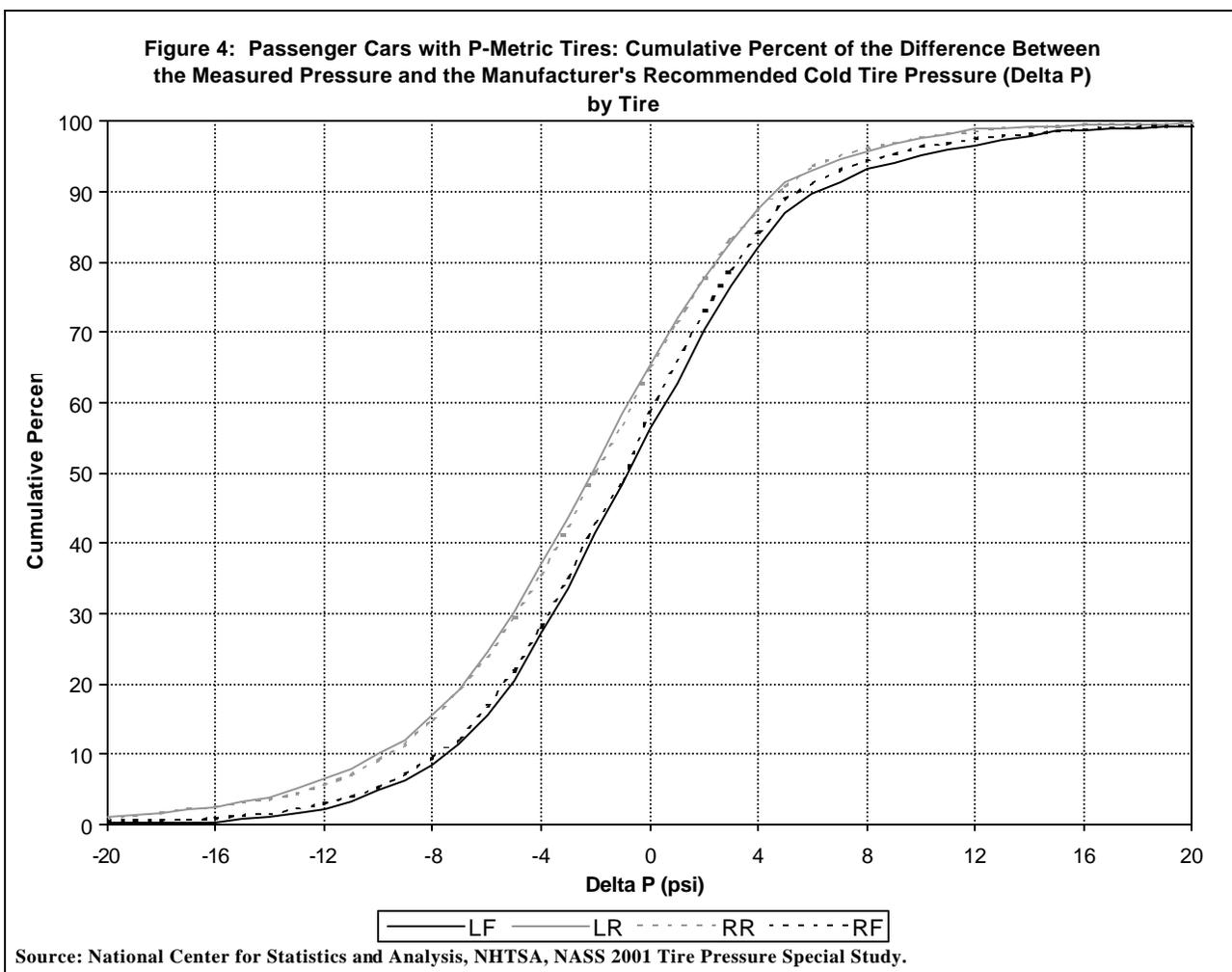
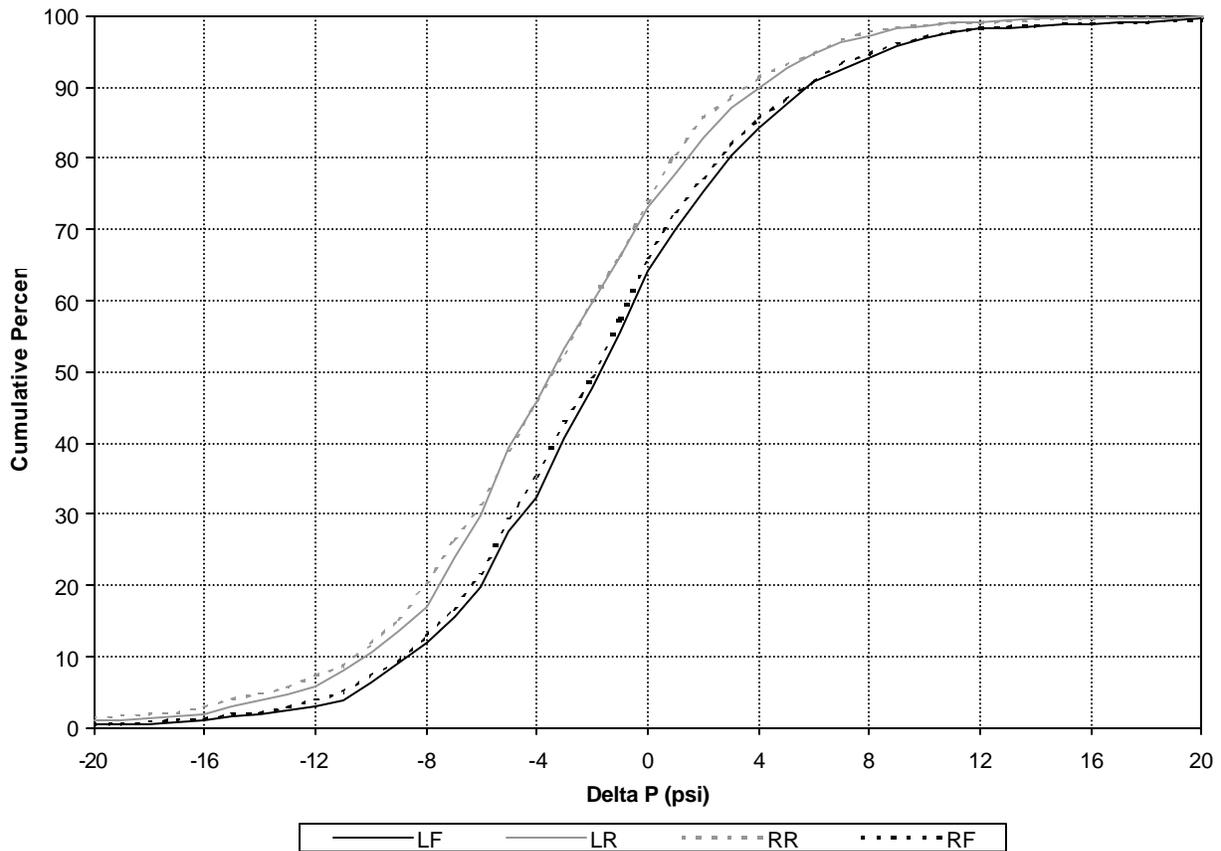


Table 4
Differences Between the Recommended and the Measured Pressure (Delta P),
for Passenger Cars with P-Metric Tires
by Tire Position and Percentile
(Delta P in psi)

Tire Position	Percentile or Mean				
	5th Percentile	25th Percentile	Mean	50th Percentile	75th Percentile
Left Front	-9.9	-4.3	-0.2 (0.2)	-0.8	2.7
Left Rear	-13.0	-5.9	-1.9 (0.2)	-2.1	1.5
Right Rear	-12.5	-5.8	-1.8 (0.2)	-2.0	1.6
Right Front	-10.1	-4.5	-0.6 (0.2)	-0.9	2.3

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study .

Figure 5: Pickup Trucks, SUVs, and Vans with P-Metric Tires: Cumulative Percent of the Difference Between the Measured Pressure and the Manufacturer's Recommended Cold Tire Pressure (Delta P) by Tire



Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

Table 5 Differences Between the Recommended and the Measured Pressure (Delta P) for Pickup Trucks, SUVs, and Vans with P-Metric Tires by Tire Position and Percentile (Measured Pressures in psi)					
Tire Position	Percentile or Mean				
	5th Percentile	25th Percentile	Mean	50th Percentile	75th Percentile
Left Front	-10.5	-5.3	-1.1 (0.4)	-1.7	1.9
Left Rear	-12.7	-6.8	-2.8 (0.2)	-3.4	0.4
Right Rear	-13.7	-7.2	-3.1 (0.2)	-3.4	0.2
Right Front	-11.0	-5.6	-1.4 (0.4)	-1.9	1.5

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

Table 6 shows the percentage of tires that deviated from the manufacturer's recommended cold tire inflation pressure (Delta P) by 8 psi or more by the age of the vehicle. Categories were broken down by age of vehicle and extent of misinflation. Most

tires were within 8 psi, but more tires were underinflated than overinflated. With underinflation, there was a correlation between the age of the vehicle and the amount of deviation in pressure, with older vehicles deviating more than newer vehicles.

Table 6 Percentage of Tires Deviating from the Manufacturer's Recommended Pressure by Vehicle Type, Delta P and Age of Vehicle (Estimates and Sampling Errors in Percentages)									
Vehicle Type	Delta P (psi)								
	Underinflated by 8 or more			Inflated Within 8			Overinflated by 8 or more		
	Vehicle Age (y) in Years			Vehicle Age in (y) Years			Vehicle Age (y) in Years		
	y £ 3	3 < y £ 6	y > 6	y £ 3	3 < y £ 6	y > 6	y £ 3	3 < y £ 6	y > 6
Cars with P-Metric Tires	8 (1)	11 (2)	15 (1)	86 (1)	82 (1)	78 (1)	6 (1)	7 (1)	7 (1)
Pickup Trucks, SUVs, and Vans with P-Metric Tires	12 (1)	15 (2)	24 (2)	82 (1)	80 (3)	71 (2)	6 (1)	5 (1)	5 (1)

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

Table 7 shows the percentage of vehicles by number of tires that were underinflated by 8 psi or more from the recommended cold tire inflation pressure. More than one-quarter of the passenger cars with P-Metric Tires had at least one tire underinflated by 8 psi or more.

For pickup trucks, vans, and SUVs with P-Metric tires, almost one-third had at least one tire underinflated by 8 psi or more. The proportion of pickup trucks, SUVs and vans with all four tires underinflated by 8 psi or more was twice that of passenger cars.

Table 7					
Percentage of Vehicles by Vehicle Type and Number of Tires Underinflated by 8 psi or More (Estimates and Sampling Errors in Percentages)					
Vehicle Type	Number of Tires Underinflated by 8 psi or More*				
	0	1	2	3	4
Passenger Cars with P-Metric Tires	73 (2)	14 (1)	7 (1)	3 (0)	3 (0)
<i>Cumulative Percent</i>	<i>100</i>	<i>27</i>	<i>13</i>	<i>6</i>	<i>3</i>
Pickup Trucks, SUVs, and Vans with P-Metric Tires	68 (2)	13 (1)	10 (1)	4 (1)	6 (1)
<i>Cumulative Percent</i>	<i>100</i>	<i>33</i>	<i>20</i>	<i>10</i>	<i>6</i>

Source: National Center for Statistics and Analysis, NHTSA, NASS 2001 Tire Pressure Special Study.

*Percentages may not add to 100 percent due to rounding.

For additional copies of this research note, please call (202)366-4198 or fax your request to (202)366-3189. For questions regarding the data reported in this research, contact Nancy Bondy [202-366-5353] or Kristin Thiriez [202-366-2837] of the National Center for Statistics and Analysis. This research note and other general information on highway traffic safety may be accessed by internet users at <http://www.nhtsa.dot.gov/people/nca>.

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