

example, it does not specify which particular existing performance requirements and test procedures should be improved or how much they should be improved. Likewise, it does not specify which particular new requirements should be added or how stringent they should be.

In response to section 10 of the TREAD Act, the agency comprehensively examined possible ways of revising and updating its tire standards. In doing so, it placed particular emphasis on improving the ability of tires to withstand the effects of factors mentioned during the consideration and enactment of the TREAD Act such as tire heat build up, low inflation, and aging. The agency examined the value of modifying the existing tests in its tire standards. In addition, it examined the value of adopting several new tests.

B. Safety Problem

1. Outdated Performance Requirements

Prior to the enactment of the TREAD Act, the Firestone tire recalls in 2000 focused public attention on the agency's passenger car tire standard, FMVSS No. 109. The standard had not been substantively revised since first issued over 30 years ago in 1967. At that time, nearly all (more than 99 percent) of passenger car tires in the U.S. were of bias, or bias belt construction.

Accordingly, the requirements and test procedures in FMVSS No. 109 were developed primarily to address bias tires. Today, bias tires have been almost completely replaced by radial tires on passenger cars and other light vehicles. The use of radial tires has grown to the extent that they represent more than 95 percent of passenger tires in both the U.S. and Europe and are used on most other new light vehicles sold in the U.S.

NHTSA does not require that light vehicles be equipped with radial tires, but regulates radial tire performance through FMVSS Nos. 109 and 119. Radial tires are less susceptible than bias ply tires to most types of failures.⁴

⁴ A radial passenger car tire carcass is typically made up of one or two plies of cord material that run from bead to bead at an angle of approximately 90 degrees to the centerline of the tire. As a result, the cords do not crisscross. Because the cords do not crisscross and because the opposite ends of each cord are anchored to the beads at points that are directly opposite to each other, the radial tire sidewall is more flexible than that of a bias tire and the treadface is less flexible. The radial tire is reinforced and stabilized by a belt that runs circumferentially around the tire under the tread. This construction allows the sidewalls to act independently of the belt and tread area when forces are applied to the tire. This "independent" action is what allows the sidewalls to readily absorb road irregularities without overstressing the cords. Impact breaks caused by cord rupture do not occur

Also, the switch to radial tire designs resulted in significant improvements in tire performance compared with bias ply tires. Given the superior performance of radial tires, it is easier for them than for bias tires to comply with the requirements of FMVSS No. 109.⁵

While the durability and performance of tires have improved, the conditions under which tires are operated have become more rigorous. Higher speeds, greater loads, extended lifetimes of tires, longer duration of travel⁶ and shifting demographics of vehicles sales⁷ have all

in radial-ply passenger car tires. This "independent" action also allows two important things to happen during cornering: (1) The tread of a radial tire remains fully in contact with the road over the entire tread width, and (2) the ply cords and sidewall are able to absorb the cornering forces without exerting the twisting force on the beads that are exerted by bias constructions.

⁵ A bias passenger car tire carcass is typically made up of two or four plies of cord material that run from bead to bead at an angle of approximately 35 degrees to the centerline of the tire. Alternating plies are applied at alternating angles during tire manufacture so that the cord paths of alternating plies crisscross. This type of construction provides a very strong, durable carcass for the tire. However, it has drawbacks. Because the ply cords crisscross and all the cords are anchored to the beads, the sidewall is stiff and treadface is flexible. This type of construction prevents different parts of the tire from acting independently of one another when forces are applied to the tire. As a result, a bias construction is susceptible to impact breaks because it does not easily absorb road irregularities.

⁶ Passenger cars average 12,258 miles per year during the first 6 years after purchase, while light trucks average 12,683 miles per year during the same time period. NPTS data also indicates that minivans make the most person-trips per day, followed by SUVs, passenger cars, and finally pickups. SUVs are estimated to make, on average, 4.6% more person-trips per day than passenger cars. Also, the 1995 Nationwide Personal Transportation Survey (NPTS) data set suggests that the average light duty truck (LDT) (pickup trucks, SUVs, and minivans) is used over longer distances and with more people aboard than passenger cars. Additionally, SUVs are popular for long distance weekend travel.

⁷ Americans have shifted toward a significantly higher use of minivans, pickup trucks, and SUVs for personal travel. (*Journal of Transportation and Statistics*, December 2000). Sales of light trucks have risen steadily for over the past 20 years and now account for almost half of the U.S. light vehicle market—more than twice their market share as recently as 1983. (*Industries in Transition*, 1/01/00; *Journal of Transportation and Statistics*, December 2000). Sales growth of heavier light trucks, those that have GVWRs above 6,000 pounds, increased at a much faster rate than their lighter counterparts, with larger SUVs (6,000–10,000 pounds GVWR) showing an average increase of 38 percent annually between 1990 and 1998.

Approximately 90 percent of these light trucks use passenger car (P-metric) tires. The other 10 percent use light truck (LT) tires load range C, D, or E tires, which are typically used on heavier light trucks with a gross vehicle weight rating (GVWR) between 6,000 and 10,000 pounds. Continued growth in the sales and production of light truck vehicles also drove the number of original equipment light truck (LT) tires to a record high of approximately 8.4 million units or a 25.2 percent increase over 1998's figures. (*RMA 2000 Yearbook*)

contributed to much greater stresses and strains being placed upon today's radial tires than those endured by earlier generation radial tires.

The characteristics of a radial tire construction in conjunction with present usage and purchasing patterns render the existing required minimum performance levels in the high-speed test, endurance test, strength test⁸, and bead-unseating test ineffective in differentiating among today's radial tires with respect to these aspects of performance.

2. Safety Problems Associated With Tires

Essentially, the size of the tire problem has remained the same over the last eight years. With the increasing sales of light trucks, and the fact that light trucks have more tire problems than passenger cars, the problem has shifted more toward light trucks and away from passenger cars. As discussed in the NPRM, several crash files contain information on "general" tire related problems that precipitate crashes. The more recent of these files are the National Automotive Sampling System—Crashworthiness Data System (NASS-CDS)⁹ and the Fatality Analysis Reporting System (FARS).¹⁰

⁸ The FMVSS No. 109 plunger energy or strength test was designed to evaluate the strength of the reinforcing materials in bias ply tires, typically rayon, nylon or polyester, and it continues to serve a purpose for these tires. However, a radial tire is not susceptible to the kind of failure for which this test was designed to prevent. The flexible sidewalls of radial tires easily absorb the shock of road irregularities.

Because of the belt package, radial tires far exceed the strength requirements of the test and many times the plunger bottoms out on the rim instead of breaking the reinforcing materials in the radial tire. During the years 1996 through 1998 RMA members reported conducting nearly 19,000 plunger energy (strength) tests on radial tires. There were no reported failures.

⁹ For the NASS-CDS system, trained investigators collect data on a sample of tow-away crashes around the country. These data can be "weighted up" to national estimates. A NASS-CDS General Vehicle Form contains the following information: a critical pre-crash event, such as vehicle loss of control due to a blowout or flat tire. This category includes only part of the tire-related problems that cause crashes. This coding would only be used when the tire went flat or there was a blowout that caused a loss of control of the vehicle, resulting in a crash.

¹⁰ In FARS, tire problems are noted after the crash, if they are noted at all. The FARS file does not indicate whether the tire problem caused the crash, influenced the severity of the crash, or just occurred during the crash. For example, some crashes may have been caused by a tire blowout, while in others the vehicle may have slid sideways and struck a curb, causing a flat tire that may or may not have influenced whether the vehicle experienced rollover. Thus, while an indication of a tire problem in the FARS file give some indication as to the potential magnitude of the tire problem in fatal crashes, it can neither be considered the lowest