

The Ford-Firestone Case

1. The Recall

In July 1998, Sam Boyden from State Farm Insurance received a call from a claims adjuster inquiring about Firestone tread separation. Sam began to research this issue and he found that there were 20 more such cases going back to 1992. All 21 cases involved Firestone ATX tires and 14 of them involved the Ford Explorer. He then sent an unsolicited e-mail to the National Highway Traffic Safety Administration (NHTSA) describing the 21 Firestone cases. In return, The NHTSA thanked him but did not follow up on the complaint. Sam Boyden proceeded to track the problem and during 1999 noticed another 30 such cases. He continued passing on the information to the NHTSA.

In February 2000, Houston's KHOU TV station aired a segment on tread separation. The station's report on tire problems prompted several dozen people in Texas to report similar trouble to regulators. Immediately thereafter, the NHTSA began studying the problem of Firestone tires. In May 2000, after accumulating 90 complaints involving four deaths, the agency opened a formal investigation. The investigation encompassed all 47 million AT, ATX and Wilderness tires made by Firestone over the last decade (1990-2000). By the beginning of August 2000, the NHTSA had recorded 68 fatalities in rollovers of Ford Explorer SUVs caused by sudden tread separation of Firestone tires. All except two dozen of the complaints came in year 2000, even though the Explorer had been on sale since 1990 and a handful of lawsuits citing tire failures were filed as early as 1993. By August 16, 2000, the government data included public complaints of 52 deaths in Explorers that rolled over after Firestone tires failed, and five more deaths in Explorers for which the complaints did not mention whether rollovers occurred. By September 19, there were 2,200 complaints involving 103 deaths and more than 400 injuriesⁱⁱⁱ.

On August 9, 2000, Bridgestone-Firestone announced a recall of 6.5 million Firestone Wilderness, AT, ATX and ATX II P235/75R15 tires (15" tires). Firestone Tires included in the recall were installed as original equipment on Ford Explorer (model years 1991-2000), Mercury Mountaineer (model years 1996-2000), Ford Ranger (pick-up truck model years 1991-2000), Ford F-series Light Trucks (model years 1991-1994), Ford Bronco (model years 1991-1994), Mazda B-series (pick-up truck model years 1994-1996), and Mazda Navajo (model years 1991-1994). Firestone suggested a three-phase recall procedure since Bridgestone-Firestone did not have the production capacity to do it faster. In the first phase, customers in the southern most states (Florida, Texas) would get their tires replaced (most accidents had occurred in these states); the second phase consisted of the states Georgia, North Carolina, etc., and the last phase would deal with the northern most states, e.g., New York. The entire recall process was expected to take

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more than 6 months. The Chief Executive Officer (CEO) of Ford, Jacques Nasser, thought that this recall format was too slow and unacceptable. He insisted that customers be allowed to replace their tires with tires from other manufacturers and that they be reimbursed for the costs by Firestone. Firestone agreed. In order to speed up the process, Bridgestone began to fly in tires from Japan and Ford idled one of its Explorer assembly plants for two weeks in order to free up more tires for the recall process. The recall was a major blow to Firestone, which was once one of the most admired corporations in the United States. It had planned to celebrate its 100th anniversary in year 2000 (a brief history of Firestone is given in Appendix A).

2. The Accidents

An analysis of federal data on deaths in tire-related accidents from 1990 to 1997 (the most recent year available) shows that 91 percent of the deaths of occupants in Ford Explorers involved rollovers. In comparison, "Only 28 percent of tire-related deaths in cars involved rollovers," said Leon Robertson, a retired Yale University epidemiologist who analyzed the data and who has worked over the years for plaintiff lawyersⁱⁱⁱ.

A typical rollover accident occurs when an Explorer is driven at a fairly high speed (55 mph or faster) and suddenly a tire disintegrates. Before the driver has any chance to react, the vehicle rolls over. "The rollover typically occurs while the vehicle follows a straight line and is not going through a curve. The basic handling, center of gravity and all of the components fail when the tire tread begins to peel off, act in one direction, and (this) pulls the vehicle off its normal travel path.^{iv}" "The insidious problem with this is that these tires fail without warning," said Richard Baumgardner, head of Tire Consultants in Alpharetta, GA., who was a tire engineer at Firestone for 27 years. "There's no bulge, there's no bubble, there's nothing that the person can see until they're driving down the road at high speed and the tread starts peeling off" (see Figure 1).

Government data shows that while front as well as rear tires are subject to failure, rear tire failures caused all but 2 of the 131 rollovers reported to regulators. Not all rollovers result in death. It is almost impossible to calculate the frequency of rollovers caused by tire failure for several reasons: no one knows for sure how many tire failures there are, the government does not collect the necessary data and tire makers are unwilling to share their data on their own brands.

According to tire consultant Dick Baumgardner the tires in question are, "four times more likely to cause an accident on the rear tires as on the front. In the back, when the tire starts to fail, the driver is unable to control the pull of tire, whereas on the front, with power steering in most cases, they can control and respond to the pulling and pushing of the tire," he said. "My feeling is that it's a combination of the vehicle and the tire. It appears that when the tire fails on a Ford Explorer, the vehicle's more likely to go out of control," Baumgardner added. Mr. Baumgardner noticed another pattern. About 80% of the time, the accidents occurred after the failure of a rear tire, and about 50% of the time, it was the left rear tire that failed. Possible explanations why Ford Explorers' left rear tire treads blew off more frequently than other tires' treads are:

- The fuel tank is by left rear tire.
- Drive shaft movements tend to load the left, rather than the right rear tire.

- 'Reflective energy': Grass or gravel on the right hand side of the road keeps that side cooler than the concrete or asphalt on the left. High temperatures put more stress on a tire^v.

After a significant amount of research, it appears that the primary cause of the tire malfunction is tread separation. Investigators have found it hard to identify the cause of malfunction on tread separation. Typically, after an accident the tire involved is completely shredded and it is difficult to determine whether the tread separation is spontaneous or caused by some other event, such as a puncture. However, in one accident in Saudi Arabia, the tire remained fully inflated after the tread separated and the vehicle rolled over. It was clear in that accident that the tread separation was not caused by a puncture.

3. Early Warnings?

The problem of tread separation was noticed much earlier in a number of countries, notably in Venezuela in 1997 and in Saudi Arabia in 1998. The Ford Motor Company acknowledged that in response to customer complaints in the past year it replaced Firestone tires on 46,912 of its sport-utility vehicles in the Middle East – including Saudi Arabia – and in Venezuela, Thailand and Malaysia. This was done as a 'customer satisfaction issue' in hot climates where the tires might be more vulnerable to problems^{vi}. Federal regulators in Washington were unaware of these overseas recalls, even though some U.S. and British government-operated Explorers were among those getting free new tires in the Gulf.

Why didn't the overseas recall set off warning lights in the U.S.? Ford spokesman Mike Vaughn said the company considered tire failures in the overseas markets a reflection of driving conditions unique to those countries and didn't immediately suspect similar issues in the U.S. However, Ford appears to have been responsive to the complaints. Jon Harmon, a Ford spokesman, stated that when Ford learned of the problems overseas, it obtained some Wilderness tires from American customers who had driven them 30,000 to 40,000 miles, by giving them new tires in exchange. Ford engineers then drove them in Arizona in February, trying to duplicate the tire failures, but the tires did not fail. Mr. Harmon said that Ford concluded that the tires were fine and that the problem lay in how the tires were used overseas, particularly in Saudi Arabia.

It appears that Firestone was also aware of these overseas complaints. Firestone company officials stated that all the tires they had been able to examine showed signs of under inflation, overloading, exterior damage from road debris, improper repair or other abuses. And that Firestone considers driving conditions in the Middle East to be 'extreme and unusual.' But they acknowledged that all tires produced by all manufacturers were subject to those conditions.

Ford consulted Firestone about the tire failures overseas. It says that it accepted Firestone's assurances that conditions in the Gulf were unique. However, it appears that there were still doubts within Ford. In January 1999, a memo shows that a Ford official questioned whether Firestone was hiding something "to protect them from a recall or lawsuit." The memo, from Ford's service manager for Saudi Arabia, reads, "We owe it to our customers and our shareholders to make our own analysis of the tires." A separate Ford memo recounts a plan to install higher-grade tires on new Explorers the company shipped to Saudi Arabia and to offer recent Explorer buyers the option of upgrading their original tires from Ford's World-wide

export division^{vii}. Firestone balked at sending Explorer owners a letter, for fear that U.S. authorities would have to be notified and that the Saudi government would “react dramatically.”

Jacques Nasser, Ford’s CEO testified at a House subcommittee meeting hearing that even after replacing tires in Saudi Arabia, Malaysia and Venezuela, Ford held off taking action in the United States in the previous year because its review of various databases assured the company – wrongly, as it turned out – that there was not a problem here. “We are a data-driven company,” he said. When asked by Representative Bart Stupak, a Democrat from Michigan, what information the company had to support its actions overseas, Mr. Nasser replied: “Anecdotal data.” He added, “There is no data in those countries.”^{viii}

4. Issues Concerning Tire Design and Testing^{ix}

Tires are highly engineered products. Each company keeps its particular curing temperature, tread design and cocktail of rubber compounds a closely held trade secret. Tires can be made up of as many as 200 different materials, from rubbers to plastics to steel, amalgamated into more than 30 components. Some parts, like the tread or sidewall, are visible. Others, like the steel belts for reinforcement, or the butyl rubber interliners to keep air from leaking are on the inside. There are layers (called plies) of polyester, rayon and other materials. Most tires have high-tensile steel wires, called beads that keep tires seated against the metal wheels.

All tires are manufactured to specifications laid out by the Tire and Rim Association, a trade group that decides the minimum and maximum amount of air the tire should hold and the size of car or load it should carry. The Department of Transportation, ‘DOT’ stamp that appears on tires is a certification that the tires conform to the association's standards and have passed its tests for resistance to puncture, endurance, stability and etc. According to William M. Hopkins, Goodyear's vice president for technical planning, “every manufacturer makes their tires compatible expressly so consumers can move between Brand A and Brand B and Brand C.” However, Ted Neuhaus, a tire consultant at Laser Technology Inc. in Norristown, PA believes that there are qualms today that cost pressures could have resulted in low quality: “The truck industry X-rays 100 percent of their tires, but the margins aren’t in passenger tires to be able to X-ray each one. “Now, though, the fear is that if it happened to one company, it could also happen to others.”

“Suresh Sethi, an executive at Modi, a tire equipment company in India, said that makers of autos and tires around the world were overly concerned about price and market share. Not enough thought had been given to safety, he said. “You buy a \$30,000 vehicle,” he said, “and what does the tire cost? The companies were trying to save \$1 per tire because \$1 per tire adds up to a lot. That is responsible for this.”^x

One of the important components of a tire is the belt package; see Figure 2. Steel belted tires were invented in the sixties. It was at that time a major breakthrough because it enhanced the durability of the tire significantly and also improved ride comfort. However, steel belted tires are hard to make. Steel and rubber are like oil and water. All the major tire companies have ongoing research on how best to join steel and rubber.

In Europe, some tire manufacturers have added extra nylon reinforcement to make tires more durable. Joan Claybrook, director of Public Citizen, the consumer rights group, has frequently suggested that American tire manufacturers do the same. But most American tire experts say the nylon does not add anything to tire performance. Goodyear has used such reinforcement in response to tread failures as recently as 1996, see Section 8.

Recent reports^{xi} speculate that the tread separation is due to a local separation between two layers of steel that is “almost explosive” in nature *and* that the separation is caused due to excessive heat. Dick Baumgardner, a tire expert, said the treads on certain of the recalled tires are too wide and the corners too squared off. With a wider tread, more rubber comes in contact with the pavement, which tends to heat up the tire. If the corners are squared off, there is more stress -- and again heat -- on the edges of the steel belts. The depth and width of the tread grooves also affect how heat is dissipated and, thus, temperature as well. Heat accelerates the breakdown of the bond between the steel belts, particularly if that bond already seems to be vulnerable to heat, as in the case of the recalled tires. Similarly, as Firestone's Greer Tidwell said that even when sitting still, the left rear tire on the Explorer experiences a greater weight load. The load on the tires can affect the temperature of the materials inside the tire, which Firestone measured with an internal thermometer. In the same vein, during those same tests, the company found that lower tire inflation generated excessive heat.

In testing, carmakers typically don't provide a test car for the tire makers to use in their design process. Instead, the tire makers rely on their own knowledge of what type of tire works on what types of cars. Tire makers run their own in-house tests, or contract the testing to an independent lab. The tires are placed on machines that measure tread wear, durability, load capacity and air retention. Indoor labs run tires on a flat glass surface to mark the “footprint” of the tire. Road wheels, big circular-running tire-mounts that simulate moving tires on pavement, can run a tire for days to test how soon it will fail. The tires are also taken out of the labs and placed on cars to test real-road conditions, including inclement weather simulations. Tire companies then receive detailed reports about the performance of test tires, which they use to compare to performance expectations.

At this point, the carmaker essentially takes over testing to see how the new tire performs in concert with the entire vehicle, see Figure 3. The testing includes driving the car around test tracks, attaching sensors in the car to test the noise the tire makes, making abrupt stops at high speeds to measure how the tire holds up, and seeing how the car grips the road while zigzagging around cones. Using feedback from the carmaker's test, the tire manufacturer may tweak the tire. Several generations of prototypes are usually sent to the automaker for additional testing before the tire enters production. The carmaker has the last word on how the tire is used, though it is heavily influenced by the recommendations of the tire maker^{xii}.

6. Tire Manufacturing at Bridgestone/Firestone

Bridgestone/Firestone produces the tires for the Explorer in various plants, namely Decatur (IL), Wilson (NC) and Oklahoma City. Data shows that the rate of damage claims per million tires built in Decatur is more than double the rate for tires made in Wilson and nearly 10 times the rate of Oklahoma City, see Tables 1 and 2. An internal engineering review within the Decatur plant is underway. Bridgestone claims there was a problem with just 2 out of every 100,000 tires at its Decatur (IL) plant, which made the bulk of the problem tires^{xiii}.

Based on interviews with more than two-dozen current and former employees, some suspect that a strike in the Decatur plant, poor process control and non-standard operating procedures could have led to tread separation. “The mystery that everyone is trying to crack, though, seems far less of a mystery in Decatur, where about 40 percent of the recalled tires were made, in a process that still depends largely on workers building tires by hand,^{XIV}” see Figures 4 and 5.

In August, 2000 “when four former Decatur plant employees gave depositions¹ criticizing the plant’s operations, Firestone dismissed the accusations as those of disgruntled former employees. But now, other retired employees and workers still in the plant are saying similar things. Though many workers insist that they followed the rules and produced the best tires they knew how, several say that the rubber was allowed to sit too long, that solvents were used haphazardly to try to improve the rubber’s adhesive properties and that efforts to speed up the vulcanization process may have led to flawed tires.^{XIV}”

After the strike the company started a schedule of 7 days a week and 12 hour shifts. Production workers voiced complaints and maintained that with the new work schedule it was very hard to do good quality work^{xiv}.

As mentioned earlier, a Firestone tire has two steel belts that are separated from one another by a wedge. The suspicion is that a failure in a Firestone tire occurs in between the two belts. This is where the highest stresses in the tire occur. Many experts say that the critical bond between the steel and the rubber, aided by the use of brass and other material may be flawed. Investigators are trying to determine what solvents were used to aid the adhesive process. Workers at Decatur say they commonly ‘gassed’ or sprayed a chemical solvent on the rubber to make it tackier. Several workers say they were told to stop using the solvent in the ‘last’ year. “During the strike of 1994-1995 they were using it all the time” said Jared Thompson, a tire builder “because the quality of the material going from one department to another was not that good.”

7. History of Bronco II - Explorer

The Ford Explorer (and its sister the Mercury Mountaineer) is a very successful member of the Ford line-up. Since its introduction in 1990 Ford has sold 3.6 million Explorers. The profit margin on SUVs is significantly higher than on cars and according to some estimates each Explorer sold delivers a profit exceeding \$5000.

The Explorer SUV is a descendent of the Ford Bronco II. The Bronco II had attracted in the 1980s already unfavorable publicity concerning its tendency to roll over. In 1988 the NHTSA had contacted Ford about statistical data that the Bronco II had led all its competitors in ‘first event roll-overs’ (roll-overs in which collisions with other vehicles or objects were not a contributing cause). In 1989 Consumer Reports published an attack on the Bronco’s safety performance (the report included a photo of a Bronco with two wheels in the air as it made a sharp emergency turn at 42 mph). One of the reasons of this propensity to roll over lies in the

¹ The article was written by a New York Times reporter based on interviews with more than two-dozen current and former employees of Firestone at the Decatur Plant.

heavy-duty 'twin I-beam' that Ford had employed since the sixties in its trucks and later in its SUVs. This required the company to mount its engines slightly higher than with other suspension systems and apparently that raised the height and center of gravity of the Ford vehicles.

In 1989, Ford engineers had documented that a prototype Explorer has a higher risk of rolling over when the tires are inflated at 30 psi. Therefore, they recommended as a partial antidote to the handling and ride-comfort problems a tire pressure of 26 psi.

Ford assembles its Explorers in two plants, namely Hazelwood (MO) and Louisville (KY). Until model year 1996 Ford equipped all its Explorers with Firestones. However, in model year 1996 Louisville equipped its Explorers with Goodyear and in model year 1997 it switched back to Firestones. Hazelwood, on the other hand, equipped its Explorers in model year 1996 with Firestones and in model year 1997 with Goodyear's. Table 3 displays the frequencies of tire related fatal accidents involving Explorers built at each factory by model year. From model year 1998 all Explorers were again equipped exclusively with Firestones. Notably, Goodyear was not used as a supplier from 1998 because Goodyear could not match Firestone's price.

In mid September 2000 Ford officials disclosed that the automaker and regulators had received complaints about possible defects in the Explorer's front sway bar. Ford and regulators stated that they have not heard of any serious crashes related to the bar. But this is the suspension component that limits how much the vehicle tilts from side to side while going around curves, and it is considered one of the most important components in preventing rollovers^{xv}.

The Ford Explorer 2001 is completely redesigned. Many new features have been introduced to reduce its propensity of rolling over.

8. Is it just the Explorer Equipped with Firestone Tires?

Based on available aggregate data, an observer could conclude that the Explorer and the Firestone tires showed better than average performance with regard to safety. For example, in 1998, based on the U.S. Department of Transportation database the fatality rate per 100 million miles of vehicle travel is 1.6 for passenger cars, 1.3 for all compact SUVs and 1.0 for the Explorer². Similarly, in 1999, NHTSA received reports of 240,000 light-truck rollovers. Those accidents were responsible for 10,000 of the 40,000 deaths on the nation's roads. The Explorer averages 1,600 rollovers a year. According to Ward's Automotive Reports, that is only six-tenths of a percent of total number, whereas Explorers account for 2% of the light-truck market. As a third example, approximately 9,500 people are killed every year in rollover crashes, a total that includes all causes and not just tire failure. According to the Institute for Highway Safety, among large SUVs, the Explorer registered 26 rollover fatalities per 1 million registered vehicles between 1995 and 1998. That compares with 34 for the GMC Jimmy and 45 for the Chevy T10. In the midsize category, the two-door Explorer ranked worse at 51, compared with 23 for the Jeep

² In 1998, the fatality rate per 100 million vehicle miles of travel remained at its historic low of 1.6, the same as in 1997 and down from 1.7, the rate from 1992 to 1996.

Grand Cherokee and 112 for the two-door T10 Blazer. By NHTSA's count, Explorers with Firestones were involved in 101 deaths, but the fatalities occurred over a decade. Since seatbelts weren't used in about two-thirds of those deaths, some could have been avoided if the drivers and passengers had buckled up.

Similar examples for Firestone tires: From 1990 through January 2000, NHTSA received 46 complaints about Firestone tires. Over the same period, the agency logged 970 complaints about Goodyear tires and 725 gripes about Michelins. (Goodyear and Michelin did have a much higher share of the tire market but the complaints are still out of proportion.) In fact, Goodyear has faced tread separation problems. Goodyear Tire & Rubber Co. announced on October 27, 2000, that it has told federal safety regulators that its light-truck 16-inch Load Range E tires have been linked to accidents involving at least 15 deaths and 125 injuries. There are about two-dozen lawsuits against the company. The lawsuits blame tread separation, virtually identical to the problems experienced by Bridgestone/Firestone. To study tread-separation problems, Goodyear officials acknowledged in a deposition testimony that spiraling liability claims caused the company to appoint a team of in-house experts in 1995. Goodyear made a design change to make the tires stronger, but it did not recall the older tires, millions of which are still on the road, including the popular Goodyear Wrangler AT and HT. Several teams of engineers, one called the Tread Throw Team, began studying the problem in 1996 and determined there was no defect. But to add a margin of safety to the tires, the company began adding the nylon layer. A company spokesman said the extra layer of nylon over the steel belts was added to make them more "robust." But he said this doesn't mean the tires were faulty without that added layer^{xvi}.

These examples do not preclude the fact that utility vehicles had the highest rollover involvement rate of any vehicle type in fatal crashes — 36 percent, as compared with 25 percent for pickups, 20 percent for vans, and 15 percent for passenger cars. Utility vehicles also had the highest rollover rate for passenger vehicles in injury crashes — 11 percent, compared with 6 percent for pickups, 4 percent for vans, and 3 percent for passenger cars^{xvii}.

However, conversations with tire makers reveal that Firestone's focus on the "small but wide" 15-inch SUV tire at least partly explains why the reported accidents have been limited mostly to Ford vehicles. "... the smaller the tire the higher is the stress." Officials of other auto makers whose vehicles are equipped with tires similar to the Firestone models – General Motors Corp., Toyota Motor Corp. and Nissan Motor Co. – said the specifications for their tires in most cases differed from Ford's^{xviii}.

Ford has noted that there have been no reports of accidents or fatalities linked to tread separations among 500,000 Explorers made in the mid-1990s and equipped with Goodyear tires. Federal records show that through the end of 'last' year, there were only three tire-related deaths in 1996 and 1997 involving Ford Explorers equipped at the factory with Goodyear tires, compared with 26 such deaths involving Explorers from those two model years equipped with Firestone tires^{xix}.

9. What about Tire Pressure?

The tire maker and the carmaker gave slightly different advice to owners of Explorers that have the tires. Ford said the tires should be inflated to 26 to 30 pounds per square inch, and

Firestone said 30. And though Ford first heard reports of a problem in 1999, a top Ford executive complained that it had taken until late July 2000 for Firestone to turn over data on its warranty experience with the tires provided on new Fords. On September 23, the Ford Motor Company recommended that “owners of Ford Explorers sport utility vehicles inflate their tires to 30 pounds per square inch, instead of the 26 pounds that the automaker has recommended for the last 10 years^{xx}.” Ford started posting maximum payload information on the door of SUVs in its 2001 models (NYT, 11/7/00).

10. What about the Customer?

For customers, there are several reasons why even higher gas prices won't likely damage the SUV momentum. As a group, SUV buyers tend to be wealthier than average; the vast majority of SUVs sold in the United States cost more than \$25,000, and many can be considered luxury vehicles^{xxi}. In November 2000, consumer attention was being drawn to both the load bearing capacity of SUVs as well as the relatively high center of gravity of these vehicles. For example, local television stations in the New York area aired a segment documenting the load bearing capacity as well as the “correct way to load an SUV (not too high and well centered within the vehicle)”.

Some analysts mention that the SUV is designed for suburban driving. Most SUVs are tall and heavy for their size. Their portly weight and a high center of gravity are not conducive to handling around obstacles or other accident avoidance maneuvers. An SUV's road holding and acceleration figures are always inferior compared to a similarly sized/engined car. This means that the SUV is much less adept at avoiding accidents, which of course is the best means of preventing injury. Some SUV drivers have responded by claiming that it is not so much the vehicle you drive, but the abilities of the driver that truly matter for safety. This is partly true, but even the best driver can be unsafe if he doesn't have the right equipment.

11. Data and Experiments Prior to the Investigations

“In fact, out of the 14.4 million tires in the lines Firestone recalled, only about 80 have been involved in fatal crashes. We've got to remember how extremely small the numbers are here,” says AEI's Calfee.^{xxii}

In 1989 Ford enlisted an independent research lab (the Arvin/Calspan Tire research facility) to measure the performance of 17 Firestone tires. The Calspan 1989 report said there were problems with the Firestone tires experiencing belt edge separation on five of the 17 test runs.

In 1990 Ford tested the Firestone tires on a vehicle that mimics the suspension and load bearing capabilities of the Explorer. (The results were not disclosed.) This vehicle was a pickup truck; such a vehicle is also called a ‘mule’. The Explorer at that time was not ready for production. Testing on mules - simulated vehicles - seems to be an accepted practice in industry. The vehicle was run for 200 miles at a minimum of 90 miles per hour at ambient temperatures of 90 degrees Fahrenheit. The tire pressure on both front and rear tires were 26 psi.

In 1996 Firestone performed a test at its Decatur plant. During this experiment 239 tires were tested. The tires tested included prototypes as well as production run tires. There were 129 production run tires. Of these production run tires investigators said 15 failed (the company said 11 failed). Out of the failed tires, 6 tires had tread separations. The executive VP of Firestone stated in Congressional hearings that this was not that bad, because the tests were 'very abusive'. But he did not say in testimony what the company did about the problem, other than test additional tires^{xxiii}.

The Ford Motor Company released documents showing that in 1997 Bridgestone/Firestone began receiving numerous complaints of injuries and property damage involving certain Firestone tires that were not recalled until August 2000. Some of the recalled tires have rates of injury and damage claims up to 100 times greater than for tires not recalled, Ford disclosed today. Vehicle owners sent many of those claims to Bridgestone from 1997 to 1999, but the tire makers did not tell Ford, the company said. Ford's new automobiles, particularly Ford Explorer sport utility vehicles, are equipped with two-thirds of the recalled tires. Bridgestone officials did not dispute Ford's data but said the problem had not caught their attention until Ford began reviewing Bridgestone's files in July 2000. The overall rate of complaints on tires from all Bridgestone factories has not been unusually high, and Bridgestone did not conduct the detailed review of tire quality by factory that Ford undertook, said Bob Wyant, Bridgestone's vice president of quality assurance^{xxiv}.

Internal documents produced during the congressional investigation in August-September 2000 from Bridgestone/Firestone show that officials of the company were briefed as early as February 2000 about rising warranty costs for the tires that the company retailed the previous month. The Congressional investigators' documents also included charts prepared for the sales staff's annual meeting in February 2000 that repeatedly and prominently mention the high cost of warranty claims for tread separation in light truck tires. Other charts analyzed patterns in tread separations and emphasized tires for light trucks, a category that includes the Ford Explorer. One of those charts, labeled "separations," showed that the number of separations involving Wilderness tires, on sale since 1996, had risen 194 percent in 1999 from the level a year earlier^{xxv}.

A State Farm spokesperson said that the insurer had repeatedly collected money from Firestone over the last three years (1996-99) after contending that manufacturing defects in the tires made the tire maker, and not State Farm, responsible for covering the cost of claims. Firestone paid the first of these claims, for \$9,700, in October 1997, he said. As stated on page 1 of this case, State Farm had an inkling that there was a problem as early as 1998. The nation's largest auto insurer said...that it had sent out an e-mail message to regulators in July 1998, alerting them that it had received 21 claims involving Firestone tire failures over the previous six and a half years. The insurer's officials also mentioned the problem during a routine telephone discussion of pending safety issues with regulators a year ago, said Stephen Witmer, State Farm spokesman^{xxvi}.

"Yet, Claybrook, a former NHTSA administrator, concedes that the case against the Firestone-Ford combination remains unproven... 'It is really hard to evaluate these statistics,' she says." (Business Week, October 16, 2000, Stan Crock.) Among the limitations of the federal database is that it records only vehicle type, not tire type. The data points to a problem with Firestone tires only because the vast majority of new Explorers were equipped with Firestone tires. Moreover, "fatals are investigated very thoroughly," according to Stephanie Faul, a

spokeswoman for the American Automobile Association Foundation for Traffic Safety, but “Property damage crashes are hardly investigated at all.” One source for such data is insurance companies. Representative Billy Tauzin, the Louisiana Republican who presided at the congressional hearing, suggested that the government agency should make better use of insurance data^{xxvii}.

12. The Investigation after the Recall

Facing mounting complaints and the NHTSA investigation, Ford officials obtained data from Firestone on July 28, 2000 and spent eight days entering it into Ford's computers. Within several days, Ford had concluded that there was a problem with all Firestone ATX and ATX II tires of the P235/75R15 size, and with Firestone Wilderness AT tires of the same size that were produced in Decatur only. Firestone and Ford then decided on a recall.

Ford's analysis of the data shows that:

For Wilderness AT tires from Decatur, the rate of injury and property damage claims was more than 50 per million tires produced in 1996 and close to that level for tires produced in 1997. While there have been very few claims for Decatur-made Wilderness tires produced since 1998, these have not been on the road long enough for many claims to be received.

The claims rate was far higher for ATX tires, all of which are being recalled in the P235/75R15 size regardless of where they were produced. For factories other than the Decatur plant, the rate approached 100 claims per million tires for tires produced from 1993 to 1995.

At the Decatur plant itself, the claims rate soared to between 350 and 650 claims per million ATX tires produced in 1994, 1995 and 1996. There have been virtually no claims for any of the recalled tires in New York, New Jersey and Connecticut, with almost all problems occurring in hotter states.

The claims rate for Wilderness tires made in Decatur began to fall in 1997 and is now virtually equal to the claims rate for Wilderness tires made elsewhere. But Bridgestone is recalling all Wilderness tires made in Decatur since 1996 as a precaution^{xxviii}.

It thus turns out that the rate of damage claims per million tires built in Decatur was more than double that rate for the tires made in Wilson and nearly 10 times the rate of Oklahoma City, see Tables 1 and 2.

Federal data show that the rate of fatal accidents involving tires grew faster on Explorers than on other SUV's in the late 1990's and that the 1996 model year was particularly bad for these types of accidents. Other data from two Ford factories that build Explorers show that when either factory used Firestone tires instead of Goodyear tires, it had more tire-related fatalities, see Table 3.

In September 2000, Firestone hired a professor from the University of California at Berkeley, Sanjay Govindjee to investigate the problem. On October 18 Dr. Govindjee presented his first

report. According to Dr. Govindjee small cracks develop inside the tires in a narrow strip of rubber known as the belt wedge which runs between the edges of the two steel belts. Over time, these cracks grow and spread through to the entire layer of rubber between the steel belts - known as the skim layer - eventually leading to the separation of the tread and the upper steel belt from the rest of the tire. Dr. Govindjee writes: "All evidence to date points to a slowly developing fatigue crack that propagates through the belt wedge material and then subsequently into the belt skim between the steel belts."

13. Crisis Management and Congressional Hearings

The initial reaction of Bridgestone/Firestone to the investigations was cautious:

"Officials at Bridgestone/Firestone could not immediately be reached for comment, but the company defended the tires earlier this week, saying properly inflated and maintained they are "among the safest tires on the road. (New York Times Company Aug 5, 2000)"

"Firestone's parent company, Nashville, Tenn.-based Bridgestone/ Firestone, and some other suppliers are still selling the tires and expressed confidence in their safety. (Houston Chronicle, Aug 5, 2000)"

Ford on its part threw the entire blame on Firestone: "It is a tire problem, not a vehicle problem." Ford backed up this conclusion with data comparing Goodyear tires and Firestone tires. Firestone admitted that it had made some bad tires in the past, but that Ford is also partly to blame since the Explorer has a propensity to roll over. Moreover, that Ford should recommend the tire pressure that Firestone recommends, which is 30 psi and not 26 psi. (In mid September 2000 Ford officially changed its recommendation regarding the tire pressure and announced that it was recommending 30 psi).

Once the congressional investigations were announced, the Japanese CEO, Masatoshi Ono immediately agreed to appear before Congress (despite not being fluent in English). Nasser initially did not plan to appear. However, one week before the hearing Nasser changed his mind and scheduled an appearance. Some members of Congress believe that Ford was not straightforward with Congress about test data. First, Ford never told Congress that its 1990 tests were done with a mule rather than an Explorer; Congress found out only through a third party that the vehicle was not an Explorer (afterwards Ford stated that the tires in such test "think that they are mounted on an Explorer"). Second, in the Ford documents a memo was found stating that no written reports should be made with regard to test results concerning the Explorer and/or its tires and when such experiments were made it was imperative that always a Ford employee is present.

After the initial reactions by Bridgestone/Firestone, both Mr. Kaizaki and Bridgestone/Firestone's top executive, Ono, came under criticism for not responding more quickly and forcefully to consumer fears in the U.S.. Bridgestone CEO Masatoshi Oni stepped down on Oct. 10, 2000, and the Firestone subsidiary named John Lampe chairman of the operation that made the recalled tires.

In contrast, Ford's handling of the crisis has drawn praise in the press. It was widely reported how Ford mobilized over a 1,000-person team to handle customer calls and to investigate the cause of the problem.

14. Impact on the Two Firms

The recall has proved to be extremely costly to Firestone. Industry experts say SUV tires typically cost auto makers about \$40 each, indicating that the wholesale cost of four replacement tires and a spare could come to \$200 a vehicle. However, product-liability lawyers estimate that the tire maker could face damages and legal costs of \$1 billion or more^{xxix}.

Acknowledging that sales had fallen after the recall, Bridgestone/Firestone Inc. announced on October 17, 2000 that it would lay off, indefinitely, 450 workers at its factory in Decatur, IL, and would close the Decatur factory and two other plants for two to four weeks. Furthermore, CNW Marketing/Research in Bandon, Ore., found in a survey after the recall that the number of people considering Firestone for replacement tires dropped to 4 percent from 21 percent of all people surveyed before the recall. On the other hand, Goodyear has seen its numbers rise to 54.8 percent from 37 percent, and Michelin to 36.5 percent from 18 percent. Recent "sales of Firestone replacement tires for cars and light trucks fell about 40 percent in the United States in September and October compared with a year earlier, Kaizaki, the president of the Bridgestone Corporation said. He also told reporters that the company had raised the expected cost of the recall by nearly 29 percent, to \$450 million." (Sales of Replacement Firestone Tires Post 40% Decline, NYT, November 13, 2000)

To compound its woes, Firestone's inventory of unsold tires was 50 percent larger than usual at the end of October 2000, partly because of the slower sales but also because the company stockpiled tires in summer 2000 in preparation for a possible strike by union workers that did not take place. In addition, the company has found saddled itself with large numbers of tires in smaller sizes as more Americans chose vehicles that use larger tires^{xxx}.

15. Changes in the Future

As was nicely summarized in an article in the Business Week the challenges ahead are^{xxxi}:

- For Firestone to identify the root cause of the failures of its ATX and Wilderness AT tires
- For Ford to restore confidence in the overall Ford name and in particular its popular Explorer.
- To limit the financial fallout from lost sales and settlements in product liability suits.
- To regain the momentum that earned Ford a reputation as the best-run Detroit automaker.

Ford had repeatedly said during the first week of August 2000 that it would continue to use tires made by Firestone. Then according to a Reuters' release on September 28, Ford Motor Co.

said that a majority of its new 2002 Explorer sport utility vehicles will come equipped with Michelin tires. Michelin of France was scheduled to get 55 percent of the business when the contracts were signed in 1997; well before Firestone's tire problems came to light.

In fact, beyond the Explorer, Ford will begin offering consumers the option of choosing tires on all its vehicles. Ford Chief Executive Jacques Nasser said at the Paris Auto Show that, beginning with the new Explorer, customers would gradually be able to choose an alternative to Firestone tires on many new vehicles^{xxxii}.

It is worth noting that Ford sold the Explorer with Firestone tires (the consumer did not have a choice). Ford establishes the specifications for the tires and the supplier has to meet the specifications. Usually if a part in a vehicle breaks, a consumer typically will not go to the supplier, but will file a complaint with the car company. However, according to Ford a tire is not just any part. The tires have their own identity and the warranty is covered by the tire manufacturer and not by Ford. This practice has not changed.

Ford has also started posting the maximum load bearing capacity of the SUV on the door of the SUV and made changes in the vehicle design. It still appears to have retained the smaller wheel size of 15”.

Bridgestone/Firestone might have to suspend operations at its Decatur, IL, factory, which produced a high percentage of the tires involved in the tread-separation accidents, if improvements have to be made to equipment or facilities there. Moreover, Firestone officials didn't rule out the possibility of a permanent shutdown of the Decatur plant, noting that such a decision would depend on how Firestone tire sales perform in the wake of the crisis^{xxxiii}.

The Congress & the Regulators

Congress passed a legislation that requires auto companies that replace motor vehicle parts in a foreign country for safety reasons to notify American regulators and would require tire manufacturers to give regulators data on warranty claims^{xxxiv}.

Moreover, regulators have noticed that the standards used for SUV certification are a bit outdated. Many of the complaints involving the Firestone tires, which were certified to the off-road standard, involved incidents that occurred during highway driving where the *minimum* speed is 55 miles an hour. A federal official, Mr. Kratze said that he was studying a requirement that off-road tires and possibly heavy-duty tires meet the same standards as car tires, and that all of these tires pass a test of at least 100 miles an hour^{xxxv}.

Because of the crisis, regulators have also started to publish rollover ratings. To devise these new rollover ratings, safety regulators calculated stability scores for many models through the 1998 model year. The method for calculating the ratings – comparing the width between a vehicle's tires to the height of its center of gravity – is controversial. Automakers complain that it does not take into account the electronic stability systems now available on a few luxury models, nor does it reflect seat belt use, the best way to avoid dying or being paralyzed in a rollover crash^{xxxvi}.

Discussion Questions.

1. Draw a fishbone diagram that shows all the factors that play a role in the overall quality and safety of the Explorer.
2. Do you think Ford used a Pareto analysis when they were trying to identify the problem? Explain why and how.
3. Do you think there is a problem with the design of the tire and/or the design of the Explorer? Do you think there is a problem with the quality control in the production process?
4. What type of quality control processes do you think should be in place in the production process?
5. How would you design a regular (stress) testing program of tires that are coming of the line?
6. How would you design (with perfect hindsight) a testing program for SUVs?
7. What would you do if you were management of Ford in 1998 (when the first complaints came from overseas), 1999 (when the number of claims in the U.S. started to go up), and in 2000 (before and after the recall)?
8. What would you do if you were management of Firestone in 1998 (when the first complaints came from overseas), 1999 (when the number of claims in the U.S. started to go up), and in 2000 (before and after the recall)?

APPENDIX A: Firestone

Extracted from: Donald N. Sull "The Dynamics of Standing Still: Firestone Tire & Rubber and the Radial Revolution" (Business History Review 73 (Autumn 1999): 430-464. Copyright 1999 by The President and Fellows of Harvard College.)

The US tire industry provides a striking example of market dominance lost in the face of aggressive foreign competition and technological change. After French tire manufacturer Michelin introduced radial tires in the late 1960 most US tire makers suffered costly setbacks while trying to close the technological gap and lost significant market share. Of the five original firms in the 1930s by 1988 only Goodyear remained an independent tire company. In the span of three years, foreign firms have acquired Firestone, Uniroyal, B.F. Goodrich and General tire each a household name for half a century (since 1930s). In the early 1970's Bridgestone of Japan began exporting radial tires to the US. In the decades prior to the introduction of radial tires, Firestone Tire and Rubber was viewed by some observers as the best managed US tire company. Firestone's crash involvement in radials contributed to quality problems with the Firestone 500 radial tire, which resulted in the costliest recalls in history, and delays in closing bias tire plants (older technology plants) brought the company closer to bankruptcy than any of its competitors.

Firestone's formula for success during the 1930s-1960s involved several initiatives, including maintaining a clear focus on its core tire market, close tracking of strategic and tactical moves of its competitors, fierce rivalry due to long-standing rivalry and close geographic proximity with its four main rivals, "a bias for action" i.e., doing something rather than overanalyzing, incremental design changes that could create a product differentiation but not overly tax its manufacturing facilities, a bottom-up capital budgeting process, emphasize family value, and maintain the best relationship with Ford and its loyal dealers. The ties that bound the two companies were knotted more tightly when Harvey Firestone's granddaughter married William Clay Ford, Henry Ford's grandson.

The radial tire has almost completely replaced bias tires over a span of 33 years, i.e., since 1967. Following Goodyear's lead Firestone's initial response was to introduce the belted bias tire. The belted bias tire could be manufactured with minor modifications of existing equipment. In fall 1972, however, the auto industry switched to radials. In December 1972 Firestone decided to manufacture radial tires using modified bias equipment. This allowed them to meet automakers requirements quickly and match their competition. It also contributed to quality problems with the tire's steel cords, which failed to adhere to the rest of the tire. In 1978, the company agreed to a voluntary recall of 8.7 million Firestone 500 tires at a cost of \$150 million after taxes -- an action that constituted the largest consumer recall in US history. Despite the losses in their bias plants Firestone's managers closed only a single plant in the seven years after their entry into radials. Sull writes, "Reluctance to harm the interests of employees and host communities offers a more persuasive explanation of Firestone's managers delays in plant closure. (p. 446)"

In the early eighties, the newly hired CEO, John Nevin, announced that Firestone would close five of its 17 North American plants. He also terminated or sold several overseas tire subsidiaries. This resulted in 24,000 workers leaving the payroll. This also resulted in

immediate turnaround of the company. In this process, Nevin dismantled the bottom-up investment process, and took steps to dissolve historical relationships with customers and employees. He also instituted a pay-for-performance culture versus the implicit contract of loyalty for lifetime employment that had prevailed. However, Firestone faced a tough market and had to improve ongoing performance to survive. Sull concludes, "In this Nevin failed." Firestone liquidated most of its non-tire business related portfolio, retaining only domestic passenger tires and company controlled retail outlets. Nevin introduced a top-down capital budgeting process. After the initial turnaround, Firestone lagged the tire industry returns during 1981-1988 by 15.9 percent and the S&P by 15.1 percent. In March 1988 the Japanese tire maker Bridgestone offered \$80 per share for Firestone, which was a 167 percent premium over the stock's 1987 closing price.

Bridgestone Annual Report 1999 for the America's reports

"Continuing growth in North American sales. Further gains in market share. Rising productivity in manufacturing operations. We are becoming a true industry leader in the Americas. We posted generally strong sales in the Americas in 1999. In dollars, sales at our companies in the region were up 1.5%, to \$7.6 billion, and production volume increased 3.4%, to 610,000 metric tons of rubber, reflecting solid demand. Growth in unit volume in North America offset a downward trend in prices there and slumping demand in Latin America. Yen-denominated sales were down 11.7%, to 865.2 billion yen, due to the appreciation of the Japanese currency. Earnings were flat in the Americas. Our operating profit there was unchanged in dollars, at \$543 million, and slipped 13.5% in yen, to 61.9 billion yen. Among the factors that affected earnings adversely were start-up costs at our plant in Aiken County, South Carolina; market turbulence in Latin America; and weakening tire demand in the agricultural and mining sectors.

We increased our market share in North America in 1999 in both the replacement market and the original equipment market. Our North American operations are approaching a market share of 20%, and we have become the continent's second-largest supplier of tires. That is in keeping with our goal of being No. 1 or at least a strong No. 2 in every large market.

Continuing gains in productivity have strengthened our competitive position greatly in the Americas, but we need to become more productive still. As in Japan and other regions, we are working to reduce non-operating time 50% at our plants in the Americas. And we are well on the way to attaining that goal.

Trends and Topics

Our North American business in passenger car tires is about three-fifths replacement tires and two-fifths original equipment tires. In the replacement market, we promote our tires through diverse channels, including 1,550 company-owned stores, our Family Channel network of some 13,000 independent dealers, and supply arrangements with national mass merchandisers. In original equipment tires, our North American business includes close working relationships with the leading automakers and with leading manufacturers of large trucks, mining and civil engineering equipment, agricultural machinery, and commercial aircraft.

In the aftermarket

We raced to keep up with demand in the replacement market in 1999. Our products have captured the attention of North American consumers in premium-grade and middle-market tires alike. The Firestone FT70c, for example, has been the market pacesetter in upscale tires, thanks to superior handling on both wet and dry surfaces.

Our multibrand strategy--centered on the Bridgestone, Firestone, and Dayton brands--raised our market profile further in 1999. Sales were up for all three brands and also for our Road King and private-label house brands. Years of awareness building have earned a faithful following for the top-of-the-market tires that we offer under the Bridgestone brand. Meanwhile, aggressive product development and strategic marketing have re-established the Firestone name as a vigorous brand in premium-grade tires, as well as in large-volume, middle-market tires. And we have built the Dayton brand into a formidable contender in value-oriented tires.

In original equipment

Demand for original equipment tires continued to grow in 1999 in the booming North American automobile market. A notable trend was the shift to larger, 16- and 17-inch rim sizes. Our success in expanding production capacity in those sizes helped us capture an increased share of the market.

Ford Motor Company is our oldest customer in North America, where we mark the 100th anniversary of the Firestone brand in 2000. We also have become a major supplier to General Motors Corporation, which recently honored us with its Supplier of the Year award for the fifth consecutive year. As a major supplier to leading European automakers, we have developed business with the North American operations of those automakers, too. We also supply tires to nearly all the Japanese-owned vehicle plants in North America.

In truck and bus tires, we expanded our North American sales volume and market share further in 1999 in cooperation with our growing network of dealers. The role of the dealer is especially important in truck and bus tires. Large fleet operators, for example, require continuous, nationwide support in road service, maintenance, and retreading, as well as consultative marketing.

We have strengthened our position in fleet sales by equipping our dealers to support fleet customers effectively. That includes supplying the dealers with the best truck and bus tires in the industry. Retreadability is a crucial indicator of lifetime cost performance in truck and bus tires. And our products continue to rank at the top in third-party surveys of retreadability."



Figure 1

Anatomy of a Radial Tire

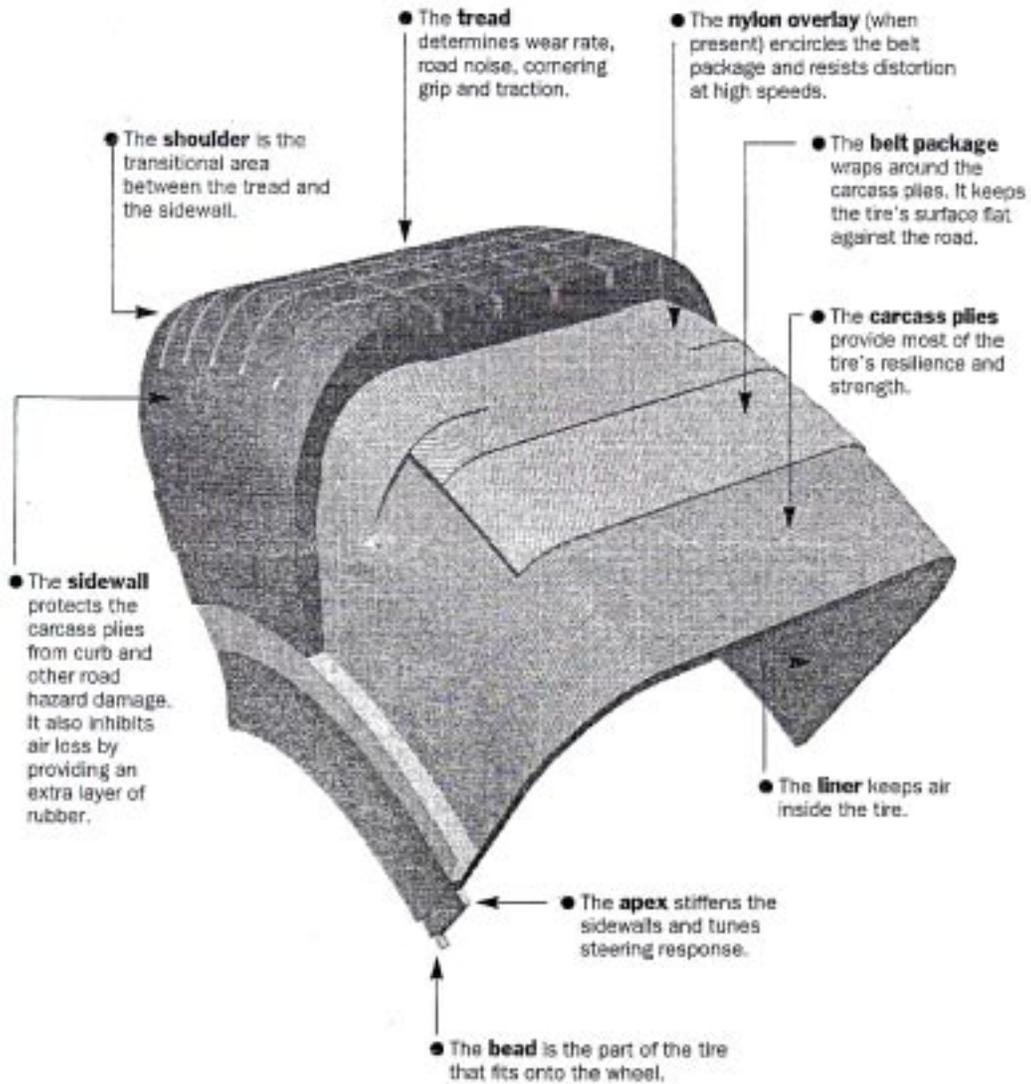


Figure 2

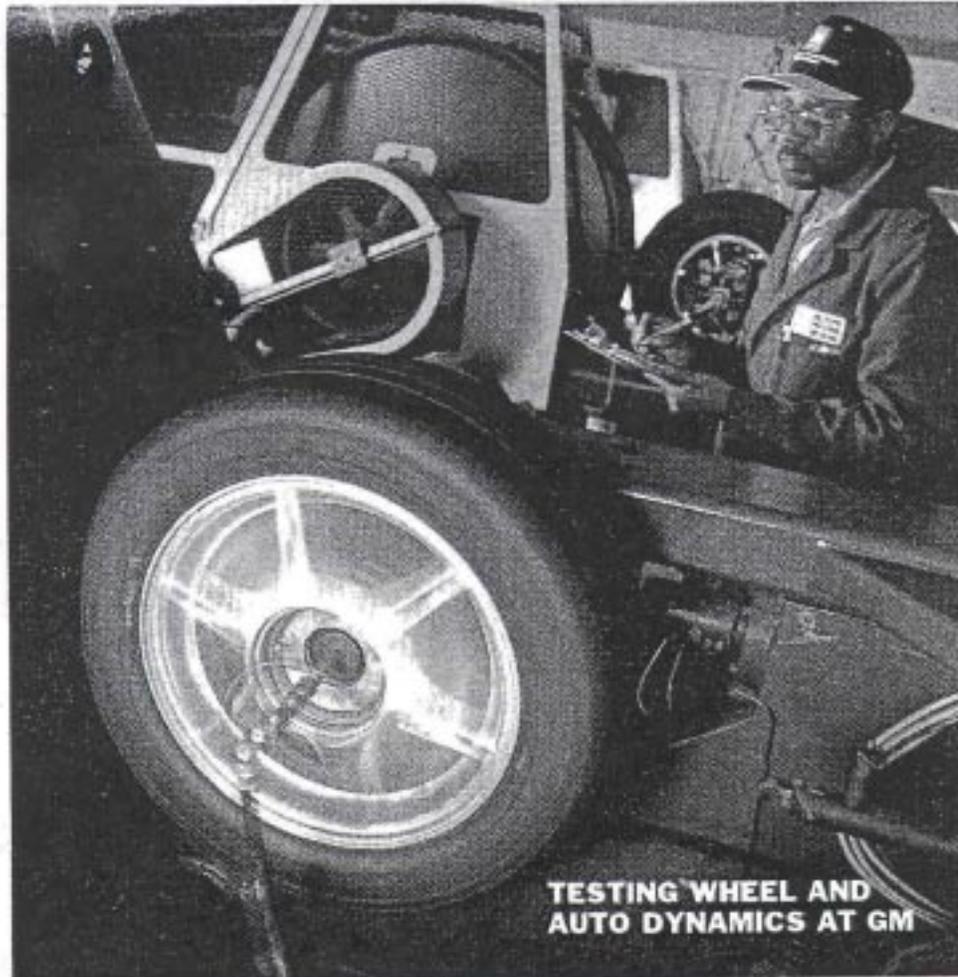


Figure 3

How the Rubber Eventually Meets the Road

Tires are made out of rubber, steel, textiles and chemicals. How those ingredients are combined varies from manufacturer to manufacturer, but the process is the same.

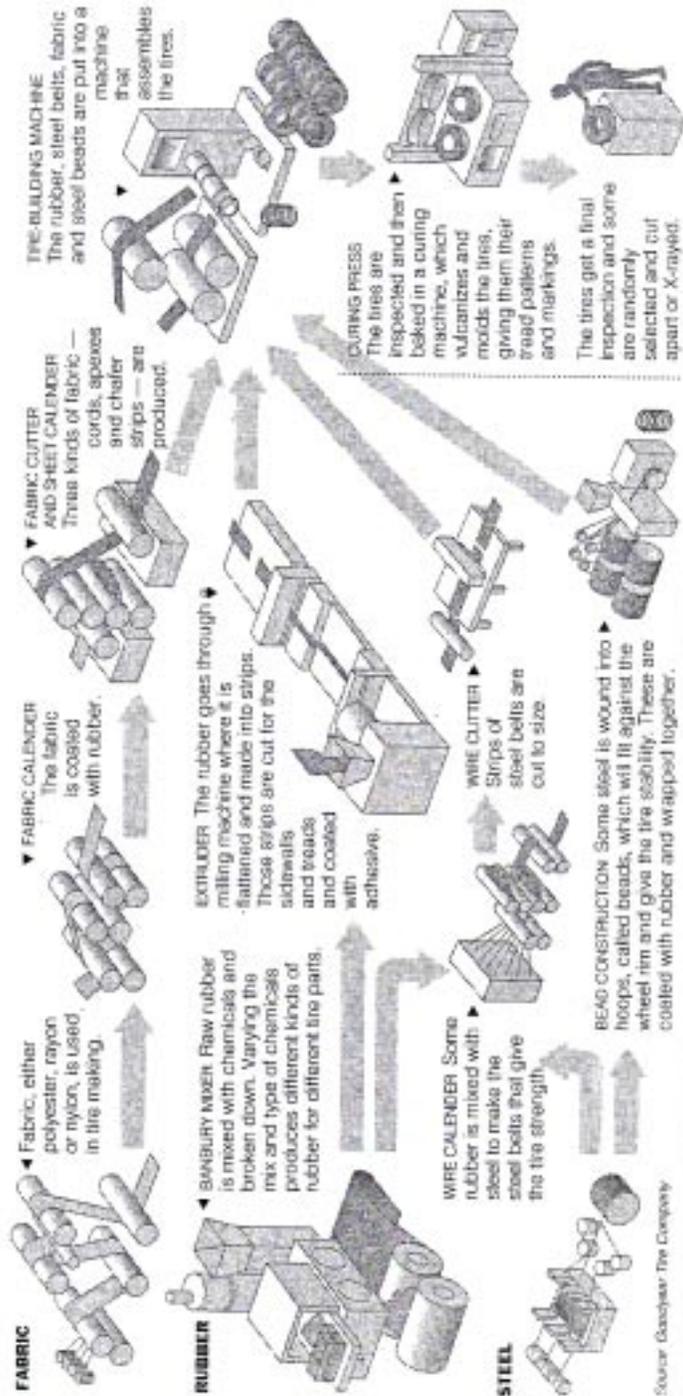


Figure 4

How to Make a Tire

http://www.goodyear.com/autotire_school/howtomake.htm

GOODYEAR PRODUCTS REARPS RACING COMMERCIALS CONSTRUCTION

HOME EMAIL

Tires

Care & Maintenance
FAQs

Tire Wear Problems

Tire Specifications

How to Make a Tire

Tire Ingredients

Tire Catalog

How to Make a Tire

Radial Tire Production

1 Radial tire manufacturing starts with many kinds of **raw materials**: pigments, chemicals, some 30 different kinds of rubber, cord fabrics, bead wire, etc.

The process begins with the mixing of basic **rubbers** with process **oils**, **carbon black**, **pigments**, **antioxidants**, **accelerators** and **other additives**, each of which contributes certain properties to the compound.

These ingredients are mixed in giant blenders called **Banbury** machines operating under tremendous heat and pressure. They blend the many ingredients together into a hot, black gummy compound that will be milled again and again.

2 The cooled rubber takes several forms. Most often it is processed into carefully identified slabs that will be transported to breakdown mills. These mills feed the rubber between massive pairs of rollers, over and over, feeding, mixing and blending to prepare the different compounds for the feed mills, where they are slit into strips and carried by conveyor belts to become sidewalls, treads or other parts of the tire.

Still another kind of rubber coats the **fabric** that will be used to make up the tire's body. The fabrics come in huge rolls, and they are as specialized and critical as the rubber blends. Many kinds of fabrics are used: **polyester**, **rayon** or **nylon**. Most of today's passenger tires have polyester cord bodies.

3 Another component, shaped like a hoop, is called a **bead**. It has high-tensile steel wire forming its backbone, which will fit against the vehicle's wheel rim. The strands are aligned into a ribbon coated with rubber for adhesion, then wound into loops that are then wrapped together to secure them until they are assembled with the rest of the tire.

Radial tires are built on one or two tire machines. The tire starts with a double layer of synthetic gum rubber called an **innerliner** that will seal in air and make the tire tubeless.

4 Next come two layers of ply fabric, the **cords**. Two strips called **apexes** stiffen the area just above the bead. Next, a pair of **chafer strips** is added, so called because they resist chafing from the wheel rim when mounted on a car.

The **tire building machine** pre-shapes radial tires into a form very close to their final dimension to make sure the many components are in proper position before the tire goes into the **mold**.

Figure 5

1 of 2

10/4/2000 5:20 PM

figure 5 continued

5 Now the tire builder adds the **steel belts** that resist punctures and hold the tread firmly against the road. The **tread** is the last part to go on the tire. After automatic rollers press all the parts firmly together, the radial tire, now called a **green tire**, is ready for inspection and curing.

6 The **curing press** is where tires get their final shape and tread pattern. Hot molds like giant waffle irons shape and **vulcanize** the tire. The molds are engraved with the tread pattern, the sidewall markings of the manufacturer and those required by law.



Tires are cured at over **300 degrees for 12 to 25 minutes**, depending on their size. As the press swings open, the tires are popped from their molds onto a long conveyor that carries them to **final finish and inspection**.

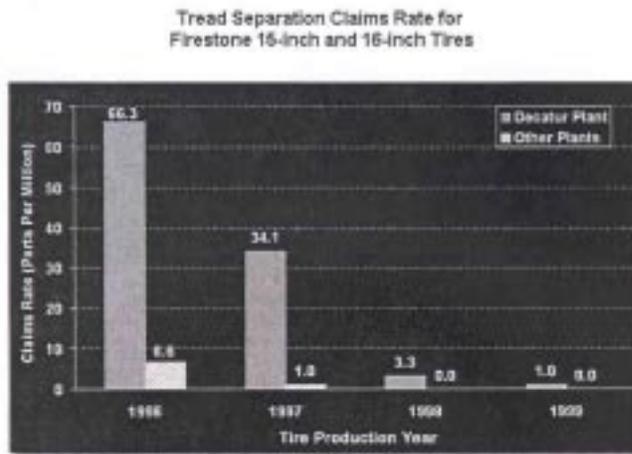
7 If anything is wrong with the tire – if anything even *seems* to be wrong with the tire, even the slightest blemish – it is rejected. Some flaws are caught by an inspector's trained eyes and hands; others are found by specialized machines.

Inspection doesn't stop at the surface. Some tires are pulled from the production line and **X-rayed** to detect any hidden weaknesses or internal failures. In addition, quality control engineers regularly cut apart randomly chosen tires and study every detail of their construction that affects performance, ride or safety.

8 This is how all the parts come together: the tread and sidewall, supported by the body, and held to the wheel by the rubber-coated steel bead. But whatever the details, the basics are fundamentally the same: steel, fabric, rubber, and lots of work and care, design and engineering.



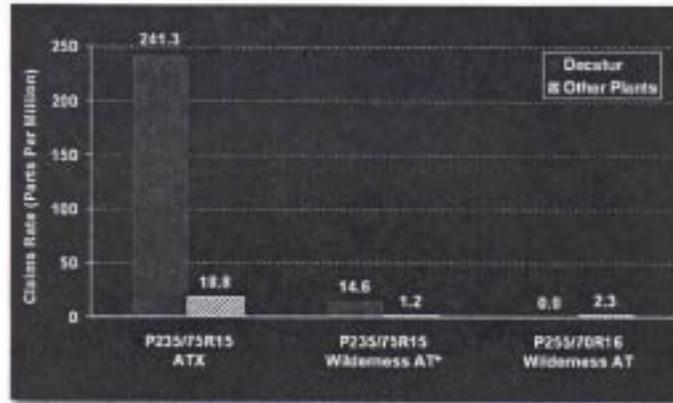
Copyright © 2000 The Goodyear Tire & Rubber Company, Akron, Ohio.
[On-Line Privacy Policy](#)



- P235/75R15 Firestone tires, especially the ATX version produced at the Decatur plant and used during the 1991-1995 model years have experienced a much higher incidence of tread separation. ATX tires were discontinued as original equipment on Explorer in 1996, replaced by 185/45mm P235/75R15 Firestone tires. www.firestone.com

Table 1

Tread Separation Claims Rate for Firestone 16-inch and 16-inch Tires Production Years 1995-1999 and Claims Years 1995-1999



- Tread separation claims on the P235/75R15 produced at Decatur in 1996 occurred at a rate of 66 per million and while steadily declining have been significantly above the rate on tires produced at other plants
- Tires built at plants other than Decatur have been involved in much fewer

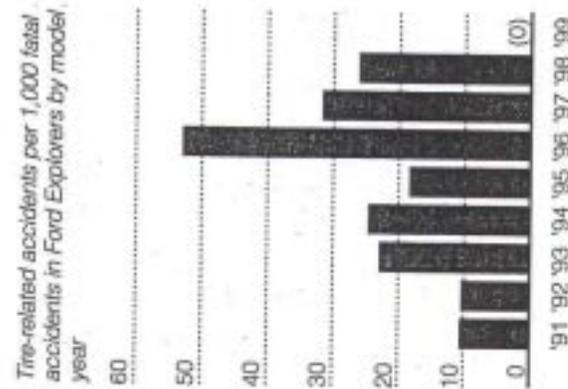
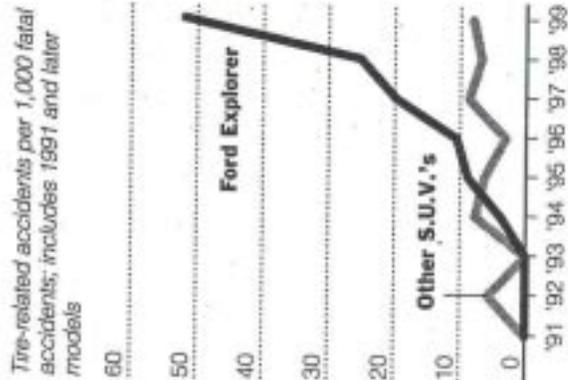
Table 2

THE NEW YORK TIMES, TUESDAY, SEPTEMBER 19, 2000

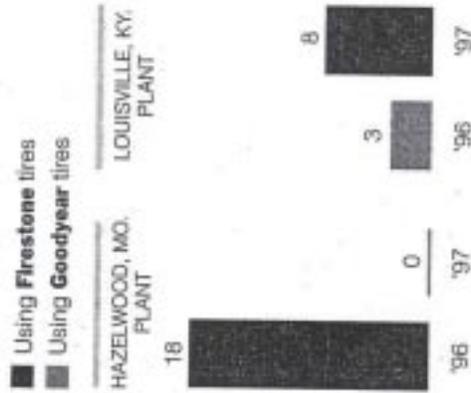
More Red Flags?

Federal data show that the rate of fatal accidents involving tires grew faster on Explorers than on other S.U.V.'s in the late 1990's and that the 1996 model year was particularly bad for these types of

accidents. Other data from two Ford factories that build Explorers show that when either factory used Firestone tires instead of Goodyear tires, it had more tire-related fatalities.



Tire-related fatal accidents involving Ford Explorers built at each factory by model year



Sources: New York Times analysis of National Highway Traffic Safety Administration fatal accident data; Ford Motor Company

Table 3

¹ Federal Officials Say They Will Toughen Standards for Tires. Keith Bradsher. New York Times, Aug. 17, 2000

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- ⁱⁱ Firestone Announces Production Cutbacks in 3 Plants, By Keith Bradsher, Detroit, New York Times, Oct. 17, 2000.
- ⁱⁱⁱ Tire Deaths Are Linked To Rollovers. By Keith Bradsher. New York Times, Aug. 16, 2000.
- ^{iv} Firestone Tires Probed in 46 Roadway Deaths: Safety: The case escalates quickly as more complaints pour in. The manufacturer says the tires are safe, but offers replacements. The LA Times, LA, CA, Aug 8 2000, Edmund Sanders and Terril Yue Jones.
- ^v More Tires on Ford Vehicles Could Be Recalled by Timothy Aepfel, Stephen Power, and Norihiko Shirouzu, the Wall Street Journal, Sept. 19, 2000.
- ^{vi} More retailers pull 3 Firestone tires from stock. Safety of ATX, Wilderness brands under scrutiny. Lorrie Grant. USA Today, Arlington, Aug 7, 2000.
- ^{vii} Firestone Plans Sweeping Recall of Tires -- Millions of Ford Vehicles Could End Up Affected Amid reports of Death, N. Shirouzu and K. Lundegaard, The Wall Street Journal, Aug 9, 2000 and "Last August, Ford started offering its Saudi Arabian customers free replacement tires, amid complaints about tread separation. And earlier this year, Ford expanded that campaign to customers in five countries." USA Today, Arlington, Aug 10, 2000.
- ^{viii} In Testimony, Firestone Says Ford is to Blame by Matthew L. Wald, The New York Times, Sept. 22, 2000.
- ^{ix} Tire Technology Has Bred Consistency and Compatibility. By Claudia H. Deutsch. New York Times, Aug.11, 2000.
- ^x In Akron, the Talk is About Treads by David Barboza, The New York Times, Sept. 13, 2000.
- ^{xi} Firestone Finds More Problems In One Line and Left Rear Tire Wall Street Journal; New York, N.Y.; Nov 7, 2000; By Clare Ansberry
- ^{xii} How Rubber Meets the Road by Robert Guy Matthews, The Wall Street Journal, Sept. 8, 2000.
- ^{xiii} Bridgestone May Restaff its U.S. Unit by Phred Dvorak and Michael Williams, the Wall Street Journal, Sept. 19, 2000.
- ^{xiv} Firestone Workers Cite Lax Quality Control by David Barboza, The New York Times, Sept. 15, 2000.
- ^{xv} Ford Raises Recommended Tire Pressure by Keith Bradsher, The New York Times, Sept. 23, 2000.
- ^{xvi} Goodyear Tells Regulators of Tire Failures; Autos: Tread problems have been linked to 15 deaths. Firm says accidents could be attributed to 'outside factors.' The Los Angeles Times; Los Angeles, Calif.; Oct 27, 2000; Davan Maharaj; and Goodyear Delayed Improving Tires On Light Trucks Wall Street Journal; New York, N.Y.; Nov 2, 2000; By Timothy Aepfel.
- ^{xvii} Business Week 10/16/00, Tire Recall not expected to affect SUV sales, August 12, 2000, Jim Suhr, Associated Press, Traffic Safety Facts 1998, National Highway Traffic Safety Administration, National Center for Statistics & Analysis, Research and Development, 1998.
- ^{xviii} Firestone Plans Sweeping Recall of Tires --- Millions of Ford Vehicles Could End Up Affected Amid Reports of Deaths, the Wall Street Journal, by Norihiko Shirouzu and Karen Lundegaard, August 9, 2000.
- ^{xix} Bridgestone May Restaff its U.S. Unit by Phred Dvorak and Michael Williams, the Wall Street Journal, Sept. 19, 2000.
- ^{xx} Ford Raises Recommended Tire Pressure by Keith Bradsher, The New York Times, Sept. 23, 2000.
- ^{xxi} SUV Sales Still on Course, Justin Hyde, The Associated Press, March 31. 2000.
- ^{xxii} Business Week, October 16, 2000, Stan Crock.
- ^{xxiii} In Testimony, Firestone Says Ford is to Blame by Matthew L. Wald, The New York Times, Sept. 22, 2000.
- ^{xxiv} Ford Says Firestone Was Aware of Flaw In Its Tires by 1997. By Keith Bradsher. New York Times, Aug. 14,2000.
- ^{xxv} Documents Show Firestone Knew of Rising Warranty Costs by Keith Bradsher, The New York Times, Sept. 8, 2000
- ^{xxvi} Federal Officials Say They Will Toughen Standards for Tires. By Keith Bradsher. New York Times, Aug. 17,2000.
- ^{xxvii} Link Between Tires and Crashes Went Undetected in Federal Data Matthew L. Wald and Josh Barbanel, The New York Times, Sept. 8, 2000
- ^{xxviii} Ford Says Firestone Was Aware of Flaw In Its Tires by 1997. By Keith Bradsher. New York Times, Aug. 14, 2000.
- ^{xxix} 'They Just Don't Have a Clue How to Handle This' by Irene M. Kunii and Dean Foust, Business Week, Sept. 18, 2000. A Bridgestone/Firestone top executive stressed, however, that only a fraction of Bridgestone/Firestone's sales would be directly affected by the recall – at most \$1.3 billion of the company's
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\$5.6 billion in U.S. tire sales. Bridgestone May Restaff its U.S. Unit by Phred Dvorak and Michael Williams, the Wall Street Journal, Sept. 19, 2000.

^{xxx} Firestone Announces Production Cutbacks in 3 Plants, By Keith Bradsher, Detroit, New York Times, Oct. 17, 2000.

^{xxx1} A Crisis of Confidence by Joann Muller, David Welch, Jeff Green, Lorraine Woellert , and Nicole St. Pierre, Business Week, Sept. 18, 2000

^{xxxii} Michelin Tires for Most New Explorers by Ben Klayman, Thursday September 28.

^{xxxiii} Bridgestone May Restaff its U.S. Unit by Phred Dvorak and Michael Williams, the Wall Street Journal, Sept. 19, 2000

^{xxxiv} House Passes Bill on Tire and Car Defects by Matthew L. Wald, the New York Times, October 11, 2000

^{xxxv} Federal Officials Say they Will Toughen Standards for Tires. By Keith Bradsher. New York Times, Aug. 17, 2000.

^{xxxvi} Safety Agency Will Rate Vehicles for Rollover Tendencies by Keith Bradsher, The New York Times, Oct. 3, 2000