FACT SHEET

Module 4.1 Rollover Crash Information STAR Rating System

The following information was obtained from the National Highway Traffic Safety Administration:
http://www.nhtsa.dot.gov/cars/problems/Rollover/pages/RolloCharCauses.htm
Home page:
http://www.nhtsa.dot.gov

Causes
Rollovers are complex crash incidents and are particularly violent in nature. Rollovers, more so than other types of crashes, reflect the interaction of the driver, road, vehicle, and environmental factors. So while vehicle type does play a significant role, other factors such as driver behavior and road and environmental conditions can also cause a vehicle to roll over.

Vehicle Type
All types of vehicles can rollover. However, taller, narrower vehicles such as SUVs, pickups, and vans have higher centers of gravity, and thus are more susceptible to rollover if involved in a single-vehicle crash.

Speed
Fatal rollover crashes are speed-related more often than fatal non-rollover crashes. Some **40%** of fatal rollover crashes involved **excessive speeding**. Additionally, **nearly ¾** of fatal rollovers took place where the posted **speed limit was 55 miles per hour or higher.**

Alcohol
Nearly **half** of all fatal rollover crashes **involve alcohol** . Impairment can result from **any** blood alcohol concentration **(BAC) above .00**. Even a small amount of alcohol will negatively affect your judgment, muscular coordination, and vision, making you more likely to lose control of your vehicle.

Location
Rural roads tend to be undivided and without barriers. They are thus more likely to be the scene of a fatal rollover. **Almost ¾** of fatal rollovers **occur in rural areas** where the posted speed limit is typically 55 miles per hour or higher.

Routine Driving
NHTSA data also suggest that over **90%** of the vehicles in fatal, single-vehicle rollover crashes were involved in **routine driving** maneuvers (going straight or negotiating a curve) at the time of the crash. This further suggests that driver behavior (distraction, inattentiveness, speeding, and impaired driving) plays a significant role in rollover crashes.

Single-vehicle Crashes
NHTSA data show that nearly **85%** of all rollover-related fatalities are the result of **single-vehicle** crashes. This means that the majority of rollover crashes and fatalities do not involve any other vehicle besides the one that rolled over, further suggesting that driver behavior plays a significant role in rollover crashes.

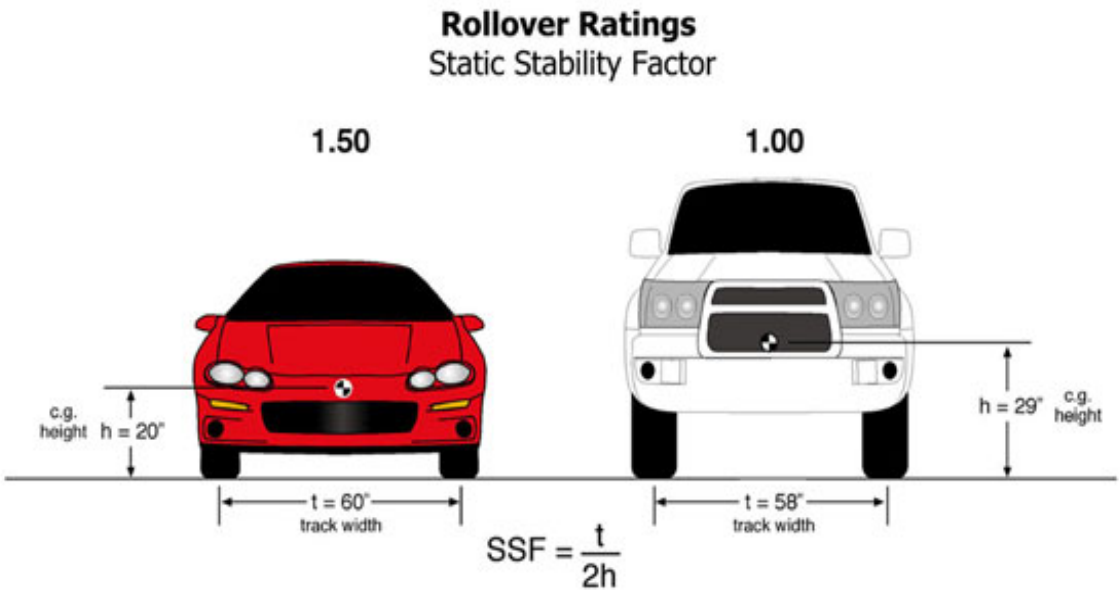
Types
Rollovers occur in one of two ways: tripped or un-tripped.

Tripped Rollovers
NHTSA data show that **95%** of single-vehicle rollovers are **tripped**. This happens when a vehicle leaves the roadway and slides sideways, digging its tires into soft soil or striking an object such as a curb or guardrail. The high tripping force applied to the tires in these situations can cause the vehicle to roll over.

- **Soft Soil** Curbs, soft soil/shoulders, guardrails, pavement surface discontinuities, snow banks, or other objects can cause tripping.
- **Guardrail** Tripping can also occur when a vehicle is traveling forward, typically at a high speed. If one side of the vehicle rides up on an object, like a guardrail, it may be forced to roll over.
- **Steep Slope** Tripping can also occur on severe slopes in off-road situations. If an incline's slope is too steep to keep the vehicle upright, it can topple over.

Un-tripped Rollovers
Un-tripped rollovers are less common than tripped rollovers, occurring less than 5% of the time, and mostly to top-heavy vehicles. Instead of an object serving as a tripping mechanism, un-tripped rollovers usually occur during high-speed collision avoidance

What is a good Static Stability Factor (SSF)?
A higher SSF value equates to a more stable, less top-heavy vehicle. SSF values across all vehicle types can range from around 1.00 to 1.50. Most passenger cars have values in the 1.30 – 1.50 range. Higher-riding SUVs, pick-up trucks, and vans usually have values in the 1.00 – 1.30 range. Many of the higher-riding vehicles of previous model years are being redesigned to ride lower and with a wider track width, thus improving their rollover resistance and yielding a higher SSF rating.



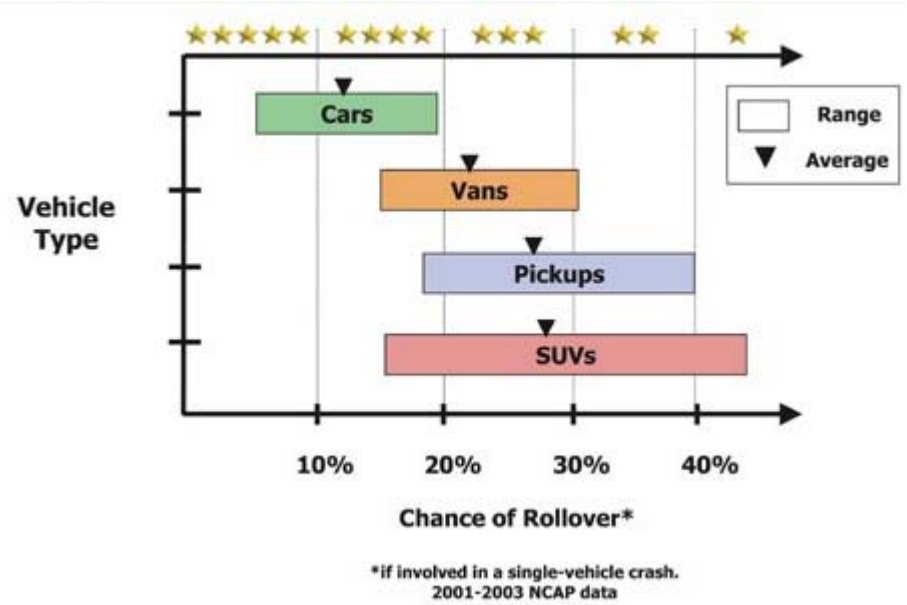
The Rollover Ratings On 2004 Model Year Cars Are Different From Those For Earlier Models
Starting with 2004 model year vehicles, rollover ratings will combine both the stationary (at-rest) measurement known as the Static Stability Factor (SSF) and the tip or no-tip results of the dynamic maneuvering rollover test. These results are then combined for one overall star rating. However, individual test results, where available, can be viewed on the test details web page for each vehicle in the 5-Star Crash Test and Rollover Ratings section of **www.safercar.gov**. For model years 2003 and earlier, rollover ratings will still have star ratings, but will be based on the SSF rating only. Consumers making cross-year comparisons of vehicles' rollover ratings need to be aware of this difference.

Interpreting Ratings
A vehicle's rollover resistance rating is an estimate of its risk of rolling over in a single-vehicle crash, not a prediction of the likelihood of a crash. As the chart below indicates, the lowest-rated vehicles (1 star) are at least four times more likely to roll over than the highest-rated vehicles (5 stars) when involved in a single-vehicle crash.

Has a risk of rollover of less than 10%
Has a risk of rollover between 10% and 20%
Has a risk of rollover between 20% and 30%
Has a risk of rollover between 30% and 40%
Has a risk of rollover greater than 40%

NHTSA's rollover ratings reflect the real-world rollover experience of vehicles involved in over 86,000 single-vehicle crashes. A vehicle's rollover star rating may be viewed by visiting the 5-Star Crash Test and Rollover Ratings section of **www.safercar.gov**.

Vehicle Class Comparison
This chart helps consumers make comparisons across vehicle classes. The information is based on data from all vehicles tested under NHTSA's 2001-2003 rollover resistance ratings system (**Static Stability Factor, SSF**, only). For example, the passenger cars that were tested have 4- or 5-star ratings, and an average chance of rollover of approximately 12% if involved in a single-vehicle crash. The range for passenger cars is approximately 6%



Understanding the Star Rating System

Why Are We Using the Star Ratings?
In response to Congress' request to provide consumers with easily understandable vehicle safety performance information, the National Highway Traffic Safety Administration (NHTSA) developed the "star" scoring system. The results are reported in a range of one to five stars.

How Do I Interpret the Different Levels of Protection?
Five stars indicate the best protection for vehicles within the same weight class. Head and chest injury data are combined into a single rating and reflected by the number of stars. The ratings represent a vehicle's relative level of crash protection in a head-on collision. Vehicles should be evaluated against other vehicles within their own weight class.

What Do the Stars Mean?

★★★★★ = 10% or less chance of serious injury
★★★★ = 11% to 20% chance of serious injury
★★★ = 21% to 35% chance of serious injury
★★ = 36% to 45% chance of serious injury
★ = 46% or greater chance of serious injury

A serious injury is considered to be one requiring immediate hospitalization and may be life threatening.

Have Crash Test Procedures Changed?
NHTSA's crash test procedures remained unchanged, and the results compare frontal crash protection only. Vehicles are crashed into a fixed barrier at 35 miles per hour (mph), which is equivalent to a head-on collision between two identical vehicles, each moving at 35 mph. Instrumented dummies in the driver and front seat passenger seats register forces and impacts during the crash. These measures form the basis for the "Star Ratings" chart.

2000 Medium Passenger Cars

Make & Model	Frontal Star Rating		Side Star Rating		Side Impact Protection			
	Driver's	Passenger's	Front Seat	Rear Seat	Side Air Bag		Side Head Bag	
					Front	Rear	Front	Rear
2000 Buick Century 4-DR.	★★★★	★★★	★★★	★★★	No	No	No	No
2000 Buick Regal 4-DR	★★★★	★★★	★★★	★★★	No	No	No	No
2000 Chevrolet Camaro 2-DR.	★★★★	★★★★★	★★★	★★★★	No	No	No	No
2000 Chevrolet Impala 4-DR	★★★★★	★★★★★	★★★★	★★★★	No	No	No	No

2000 Subaru Legacy Station Wagon 4-DR.	★★★★	★★★★	★★★★	★★★★★	No	No	No	No
2000 Toyota Avalon 4-DR.	No test planned	No test planned	★★★★	★★★★★	Yes	No	No	No
2000 Toyota Camry 4-DR.	★★★★	★★★★★	★★★	★★★	No	No	No	No
2000 Toyota Camry 4-DR.	★★★★	★★★★★	★★★★	NO DATA	Yes	No	No	No
2000 Toyota Camry Solara 2-DR	No test planned	No test planned	★★★	★★★★★	No	No	No	No
2000 Volkswagen Passat 4-DR.	★★★★★	★★★★★	★★★★	★★★★	Yes	No	No	No
2000 Volvo S70 4-DR.	★★★★★	★★★★★	★★★★	NO DATA	Yes	No	No	No

Understanding the Star Rating for Side Impact Crash Tests

How Do I Interpret the Different Levels of Protection for Side Impact Crash Tests?

Drivers and passengers in the side crash rating receive a one to five star rating, with five stars indicating the best performance. The side crash star ratings are assigned based on the chance of a life threatening chest injury for the driver, the front seat passenger, and the rear seat passenger. Head injury is not measured in the side crashes. For every vehicle in a severe side crash there are two vehicles in severe frontal crashes.

What Do the Side Impact Stars Mean?

★★★★★ = 5% or less than chance of serious injury

★★★★ = 6% to 10% chance of serious injury

★★★ = 11% to 20% chance of serious injury

★★ = 21% to 25% chance of serious injury

★ = 26% or greater chance of serious injury

A serious injury is considered one requiring immediate hospitalization and may be life threatening.

Rollover and Side Collisions Crash Tests.
Some sport utility vehicles (SUVs) tipped over when struck in a side impact collision during testing. Since the NCAP test was not designed to measure how likely a vehicle is to rollover, NHTSA does not know if these vehicles are more prone to rollover in side impact crashes than other SUV models. Nonetheless, the tests do reinforce real-world crash experience that shows that, when struck in a side impact collision, SUVs are more prone to roll over than other vehicle types.
It should be noted that the vast majority of rollovers do not occur during side impact collisions.

Most rollovers occur when a single vehicle runs off the road and is tripped by a curb, ditch, or other object or surface. Sport utility vehicles generally have higher ground clearance and narrow width (useful when operating off-road). Because of these features SUVs tend to be top-heavy, making them more likely to roll over in a crash, especially if they are carrying roof loads.

Side Crash Test Procedures.
The test configuration represents an intersection type collision with a 3015-pound deformable barrier moving at 38.5 mph into the stationary struck vehicle. In the stationary vehicle, instrumented dummies in the driver and rear seat passenger seats register forces during the crash. These measures form the basis for the "Star Ratings" chart.