

Jordan Rollover System



Photo of JRS test device, courtesy of the Center for Injury Research

The Jordan Rollover System (JRS) is a device designed to dynamically test the rollover occupant protection performance of motor vehicles. It was designed and built for the Center for Injury Research (CfIR) by Acen Jordan, a leading designer of automotive test equipments, including the crash pulse sleds used by many automakers, and Donald Friedman, founder of CfIR. The JRS consists of:

- A linear track supporting a moving roadbed platform.
- A rotating carriage to hold the vehicle, mounted on vertical supports, straddling the track.
- A mechanism to coordinate the roadbed motion, vehicle rotation and a trigger to release the vehicle so that it can freely drop to strike the roadbed at a prescribed roll angle.

How it Works

When the test is initiated, the roadbed is propelled forward and the vehicle and its carriage begin to roll. As the roadbed moves under the vehicle, a trigger releases the carriage so that the vehicle drops to the roadbed with the near side of the roof striking the leading end of the roadbed. Then, as the vehicle continues to roll, the far side of the roof strikes the trailing end of the roadbed. Tests are typically staged to demonstrate a single roll with impacts on the leading and trailing sides of the roof. Multiple rolls can be carried out by resetting and rerunning the JRS with the same vehicle.

Advantages of JRS Testing

The JRS can accurately emulate the conditions of actual rollovers: its design provides convenient adjustments for roadbed velocity; vehicle roll rate, drop height, pitch, yaw, and roll angle at impact; and vehicle weight and weight distribution. It also features:

- **Reliability.** The JRS has a minimum of moving parts; setup parameters, propulsion rate and coordination triggers are all mechanically linked; and the JRS has shown a high degree of reliability in more than 100 test runs.
- **Repeatability.** Enables consistent, controlled conditions.
- **Compact Size and Low Cost.** The JRS test facility requires a warehouse area of less than 5,000 sq ft to comfortably setup and conduct tests. The cost of the equipment and of

running tests is comparable to other typical vehicle crash test costs. Vehicle can be tested without the engine, tires, and other drive components, which also controls costs.

- **All Weather Testing.** Since the JRS is installed indoors; tests can be conducted without regard to weather conditions or seasons.
- **Safety.** The JRS equipment includes appropriate controls and sensors to ensure the safety of operators and the equipment.
- **Measurement and Evaluation.** The JRS permits extensive instrumentation and high speed photography of tests. It permits the use of dummies to measure injury potential. Roof intrusion and intrusion rate, deformation of vehicle structures, occupant dynamics, belt performance, and glazing integrity can all be carefully observed and measured using string potentiometers, load cells and accelerometers mounted on the vehicle, dummy, and road bed.

More on Repeatability

In 2007, through a grant from the Santos Family Foundation, the Center for Injury Research tested three 2003-2004 Subaru Foresters that were essentially identical in body style and equipment. The results of the three tests showed agreement between the measurements within 10 percent. There is no generally accepted standard for repeatability for automotive crash tests; however, NHTSA and the Insurance Institute for Highway Safety (IIHS) endorse the position that 10 percent agreement is an acceptable level of repeatability.



Photo of three Subaru Foresters used for repeatability testing, courtesy of Center for Injury Research

The Jordan Rollover System is a unique, proven, low-cost device that can be used to accurately assess the safety performance of passenger cars, light trucks and vans in rollovers. It is superior in virtually every way to the static test device required for FMVSS 216, and is only slightly more expensive. It can be used for vehicle development (it can be used to test vehicle bodies in white), compliance with standards and to produce consumer information.

Center for Injury Research
510 South Fairview Avenue, Goleta, California 93117