INSTRUMENT PANEL IMPACTS AND SNUBBING DECELERATION TESTS*

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As part of the automotive industry's presentations at the meeting of the Harvey Cushing Society, Mr. Gandelot showed a motion picture to illustrate the various testing techniques employed through the years in the study of safety of motor vehicles as related to accidents.

This film was comprised of a series of short sequences clipped from the actual films of engineering tests. The first of the series showed a roll-over test made in 1923. The initial roll of the car was induced by means of an involute spiral ramp, constructed with wood planks, and the natural hillside terrain caused the car to continue rolling over.

The next sequence showed a second roll-over technique, used twenty-two years ago, with a driver in the test car who executed a maximum turn, designated as a J-turn, on soft ground so that the front wheels dug into the earth and caused the car to roll. Because of the desire to do roll-over testing at higher speeds, and since this technique then might precariously involve the personnel, it was superseded by the ramp method of inducing roll-overs.

The motion picture included a number of sequences showing cars being rolled by the ramp method. A tow car, by means of a specially designed tow bar with an automatic uncoupling arrangement, pulled the test car along at a speed of 50 miles per hour. The tow car was disconnected automatically as the left front wheel of the test car approached a 4-foot high wooden ramp. As a result of the two left wheels of the test car climbing the ramp, the car was pitched high into the air. This initiated rotation of the car and caused the roll-over. In several of these sequences the test car rolled over a number of times after it landed on the ground.

Four successive film sequences showed roll-over tests made on a 1929, a 1936, a 1941 and a 1956 automobile of the same make which enabled good comparison of the body structures under such punishment. The 1929 car, which had a composite wood and steel body, had the upper portion almost completely disintegrate as a result of the roll-over. The tests on the later models showed that there has been consistent improvement in design.

When the 1956 car went through this ramp type of roll-over test at 50 miles per hour, even the doors in this welded, all-steel body remained fully latched, principally because of the interlocking safety-type door locks

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adoption in 1955. This was a rather dramatic demonstration of the improvement in safety that has been made in the structural strength of automobiles. Had there been occupants in the automobile it was obvious that they would have had substantial protection compared to what the situation might have been with the 1929 car which, at that time, represented good, conventional body construction.

Another illustration of the ramp type of technique showed that even though this method had proven highly successful in causing cars to roll, one or more times, there is no assurance that this technique will always work on present-day designs because it showed that the car rotated only partially, landed on its side and slid along the road.

The next two techniques for testing the safety of automobiles illustrated a method used for crashing an automobile into a concrete barrier and a car traveling at 30 miles per hour being impacted into the right corner quarter of a parked car. Anthropometric dummies and instrumentation for measuring deceleration rates and crash forces and obtaining other test data are used in this type of testing. The various pick-up devices are connected to a multi-channel recording oscillograph in the instrument car by means of trailing electrical cables.

One interesting point was that although the front-end structure of present-day automobiles has greatly increased strength and rigidity it also has good characteristics of absorbing crash energy. In the barrier crash test, it was explained that deformation distance of the front bumper and grille and crumpling of the front end sheet metal, amounting to only slightly over 1 foot, reduced the rate of deceleration in the passenger compartment practically 50 per cent. Compared to that close to the front end of the vehicle, this absorption of energy with reduction in the deceleration for the passengers during impact is of considerable importance in helping to reduce the extent of injury.

The next testing technique illustrated was that of a newly developed snubber-testing procedure by which comparative tests at various predetermined rates of deceleration can be made without structural deformation of the test car. This enables the engineers to obtain good comparative data in the testing of such safety equipment as seat belts and padding of instrument panel.

The test car, which is towed by another automobile, is attached by means of a cable to a huge twin-cylinder hydraulic snubber which is capable of stopping the test car within a distance of less than 2 feet. This snubber has been tested at crash deceleration rates as high as 34 G’s. Anthropometric dummies were used in these tests and the tests were run with and without seat belts and shoulder harnesses in an effort to learn more about their protective value and also the deceleration and force values acting on the instrumented dummies under the various test conditions.

This technique also is a valuable aid in testing anchorages of seat belts under dynamic loading. These tests supplemented the laboratory static