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16. Abstract <p>Vehicle characteristics suitable for an automobile that might be introduced in the mid-1980's are defined under the specific constraint that the curb weight not exceed 3000 lbs. A "family car" configuration (4 to 5 seating positions plus adequate cargo space) is chosen as the representative of an RSV car model line to be studied. Sizing follows from the selected family model and the weight constraint; and configuration is chosen to obtain high packaging efficiency combined with best potential safety gain.</p> <p>The various components of safety and road performance are reviewed in the light of the economic/accident/usage findings of Volume II. Technical specifications are given for the areas of crash avoidance, crash energy management, primary occupant protection, post-crash safety and pedestrian protection. Corresponding criteria and test methodologies are discussed.</p> <p>Guidelines are developed to insure compliance with realistic manufacturing, producibility and construction material requirements suitable for the mid-1980 time frame. The vital role of recovery (recycling) of the constituent materials of automobiles as a vital solution to energy and material resource limitations is emphasized. Finally, cost implications of the RSV are reviewed and placed in proper context.</p>				13. Type of Report and Period Covered Final Technical Report January 1974 to April 1975	
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There are two primary techniques currently employed to examine occupant retention capabilities of vehicle restraint systems and structural integrity in non-collision rollover accidents. They are the ramp method (SAE J857) and the cart method (FMVSS 208).

In the ramp test, displayed in Figure 5-32, a rapid steering input is introduced just prior to reaching the ramp. This procedure usually results in a rollover, but the results are highly unrepeatable.

The cart method for inducing rollovers is more repeatable than the ramp technique, but it is also less realistic because there is no forward velocity component. Using this test procedure, the vehicle is mounted on an angled cart moving at constant velocity. The cart is suddenly decelerated resulting in the vehicle flipping off the cart in a rolling motion (see Figure 5-33). Since the path of the vehicle is easiest to predict for the cart test method, it apparently is the easiest to photograph.

Both of the above test techniques specifically deal with non-collision rollover simulation. There are presently no available test methods to depict rollover accidents which involve collision with obstacles or other vehicles. This impact mode, rollover with collision, constitutes more than half of all rollover accidents; but, because of the large number of variables involved, it is virtually impossible to devise a representative test for this impact mode.

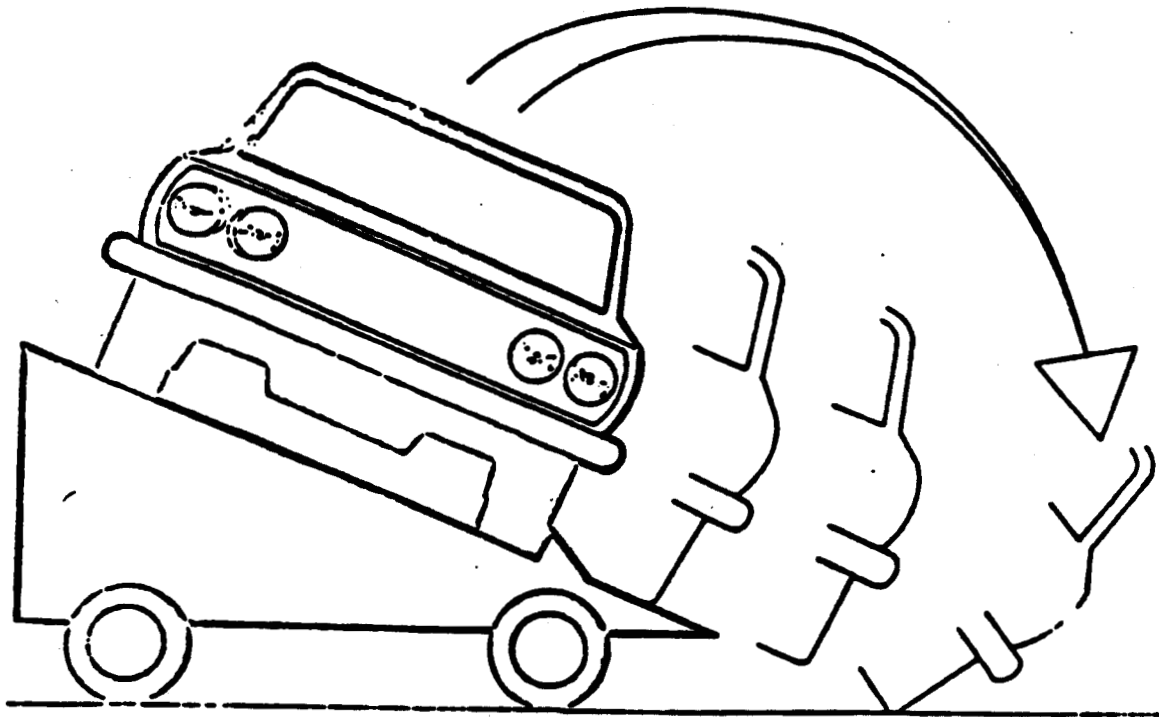
Once retention of the occupant with the vehicle compartment is achieved, maintaining the interior survival space is mandatory. Although it is difficult to correlate roof crush to occupant injury, prudent engineering design would suggest that roof crush be held within tolerable limits. This tolerable limit is totally dependent on occupant positioning and restraint type. With either unrestrained or lap belted occupants, it does not appear that the level of roof crush is significant. In fact, roof crush of as much as 2 feet may have little or no effect on injury level (see discussion of HSRI work in Volume II, Accident Data - Intrusion). However, if a

shoulder belt is used, large roof crush could result in injury because of reduced occupant survival space. Therefore, excessive roof crush should be prohibited. There are a number of tests currently employed to evaluate the roof's integrity. These include the Roof Drop Test (SAE J996) and the roof crush tests as described in SAE J374 and FMVSS 216. They are depicted in Figures 5-34 and 5-35.

In the roof drop test procedure, the vehicle is suspended in an inverted position at a specified compound angle and height and then released. The roof crush tests are quasistatic tests in which the roof structure is loaded up to a specified limit. Neither of these test types involve occupant simulation and are extremely unrepresentative of real accident structural exposure.

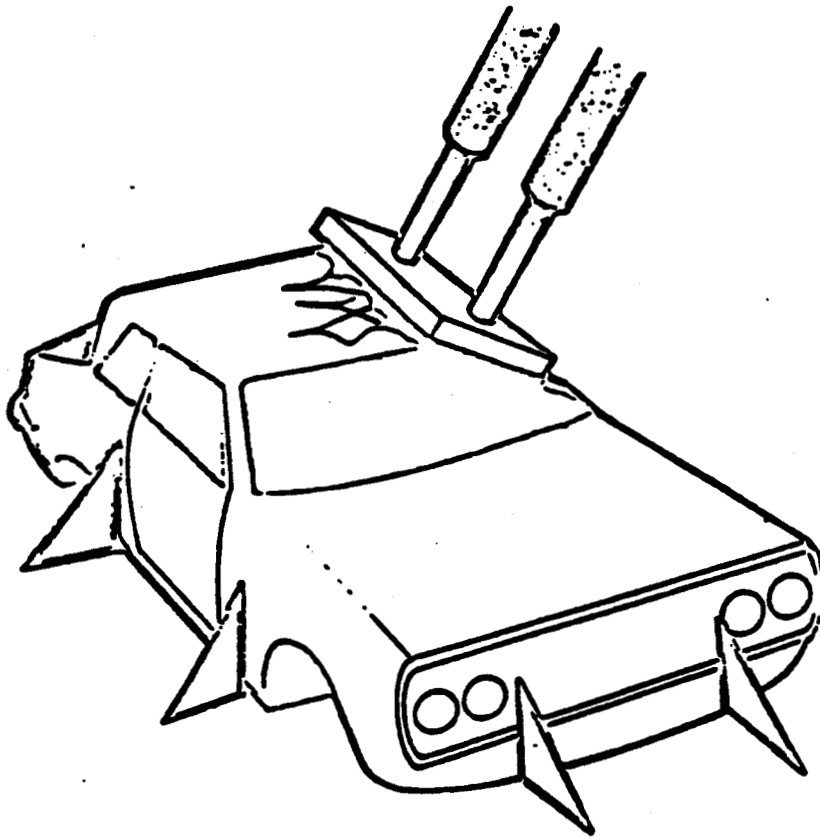
5.8.2 Test Criteria

Present crash test methods and injury criteria approximate real world accident environments in a crude fashion at most. Refinement of injury criteria is being actively pursued in a number of NHTSA programs and should not be duplicated in the RSV program; refinement of crash test methods does lie in the RSV province. Therefore, a number of different test configurations was chosen (Section 5.3) so that a greater confidence could be generated that the RSV would perform adequately in the real world. Goals for crash energy management of the RSV structure were presented in Section 5.3 and the state-of-the-art of crashworthiness testing was presented above (Section 5.8.1). The major function of this subsection is to compliment the discussions on crash energy management by providing additional insight for the choice of test conditions specified.



- REPEATABLE
- EASIER TO INSTRUMENTATE
- TESTS VEHICLE STRENGTH AND DUMMY EJECTION
- NO FORWARD VELOCITY

Figure B-33 SLED ROLL



- REPEATABLE
- MEASURES ROOF STRENGTH
- ONLY BODY SHELL REQUIRED
- UNREALISTIC STRUCTURAL LOADING

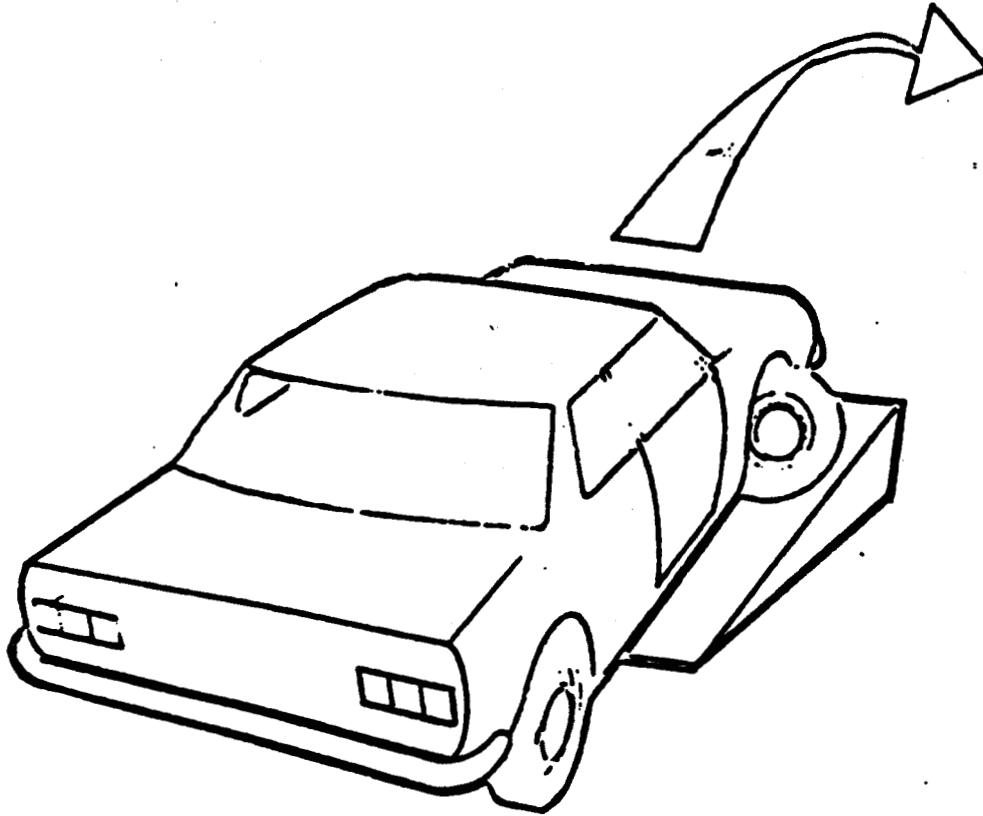
Figure 5-36 ROOF CRUSH

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- UNREPEATABLE
- TESTS VEHICLE STRENGTH AND DUMMY EJECTION
- RELATES TO VEHICLE HANDLING

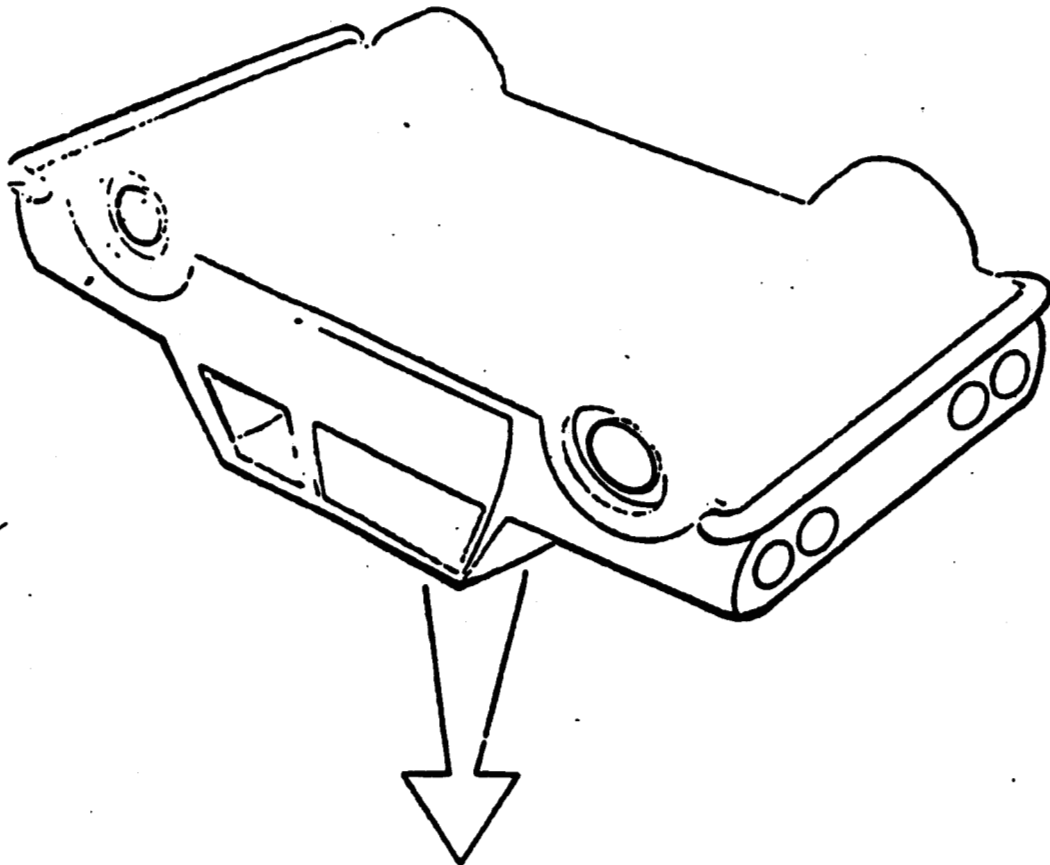
Figure B-32 RAMP ROLL

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- UNREALISTIC STRUCTURAL LOADING
- TEST PROCEDURE DIFFICULTIES
- NO USEFUL DATA
- NO TEST FOR EJECTION

Figure 5-34 ROOF DROP

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