The two photographs above show one of the two staged collisions which were conducted at the Special Problems in Accident Reconstruction seminar at I.P.T.M. in Jacksonville, Florida, in April of this year. The photograph on the left was taken just after the instant of first contact. The photograph on the right was taken a fraction of a second later.

The purpose of this and a virtually identical staged collision was to demonstrate the validity of applying conservation of linear momentum principles to collisions in which the pieces leaving the collision are larger in number than the pieces going into the collision. The bullet vehicle for this collision was a 1999 Chevrolet Cavalier LS, weight 2617 pounds. It was traveling at a speed of 42.42 mph at the instant of impact. The target vehicle was a 1999 Pontiac Grand Am SE towing a Continental trailer with a Sea Doo 951XP personal watercraft (PWC). Weight of the Pontiac, trailer, and PWC was 4131 pounds. It was traveling at 23.36 mph at the instant of impact. The collision was staged so that the left side of the front of the Cavalier would contact the extreme rear of the left side of the Grand Am, continuing along its path to strike the trailer, which separated the trailer from the Grand Am and the PWC from the trailer. As you can see in the photograph on the right, the PWC became significantly airborne at impact. The delta-v for the Cavalier was 18.16 mph; the delta-v for the Grand Am was 2.40 mph. Analysis of the details of this collision as documented by instruments and high-speed cameras showed that conservation of momentum calculations would provide solutions to vehicle speed consistent with the known speeds and weights. In other words, the stuff works!

There was a second staged collision using similar vehicles The results of that analysis further validated the use of conservation of momentum principles in situations where parts leaving a collision are greater in number than parts going into a collision, if the weights and trajectories are known or can be accurately determined.

Another series of tests involved using a mannequin and a ramp to validate values used in pedestrian-throw equations applied by accident reconstructionists seeking to determine the speed of the striking vehicle when point of impact and point of ground contact or point of rest of the pedestrian are known. This series of tests involved a ramp which was constructed to be able to provide a ten-degree to twenty-degree upward trajectory (the range in which some sources suggest that most pedestrians are thrown after impact by most motor vehicles) to a mannequin dressed in conventional clothing and thrown onto the ramp from the bed of a passing pickup truck. A radar gun was used to document the speed of the mannequin as it left the ramp, and a steel measuring tape documented the distance from the end of the ramp to the final position of the mannequin.

This photograph shows a typical experiment. The man in the green shirt under the ramp is using a radar gun to measure the speed of the mannequin as it leaves the ramp. The two men in the blue truck have, only moments before, thrown that mannequin onto the ramp from the back of the passing pickup truck. One purpose of these experiments was to determine a value for coefficient of friction to be used when the pedestrian has been thrown onto and slides over a grassy surface. Numerous previous studies have involved pavement, and these experiments showed that values used for pavement will give erroneous results when the projection has been onto and over grass. These experiments also provided a friction value which would produce results corresponding to the known departure speed of the mannequin. Remember that, in most pedestrian collisions, the pedestrian's speed upon departing from the striking vehicle is generally less than that vehicle's speed.

Staged collisions and other experiments are necessary for the advancement of the science and art of accident reconstruction. Although most, perhaps all, of the numerical analysis conducted during a reconstruction is based on established laws and principles of physics, which do not change, there are unknowns in virtually every collision. For example, collision analysis