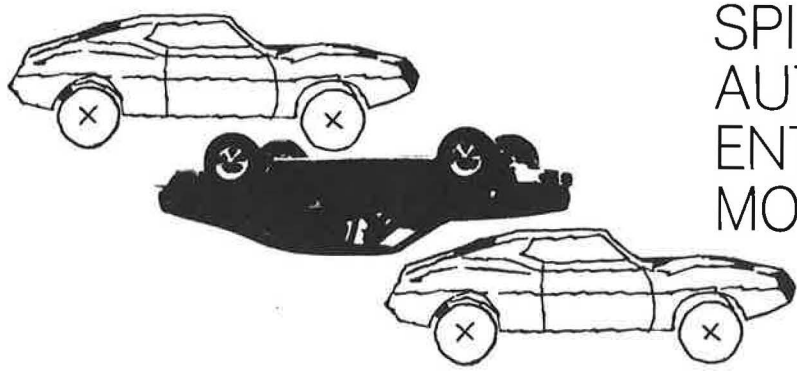


SPIRAL AUTO JUMP ENTERTAINS MOVIEGOERS, MAY RESULT IN SAFER HIGHWAYS

Pursuing the villain in a high-speed car chase, movie hero James Bond speeds up the twisted remains of a broken bridge over a Thailand river, loops his car in a 360-degree barrel roll over a 50-foot gap, and lands safely on the other side in time to catch up with his surprised antagonist.

Viewers of the film, The Man With the Golden Gun, might dismiss this spectacular stunt as being a piece of camera trickery. It was in fact performed exactly as seen on the screen and was made possible by an electronic-age computer program that may eventually make the nation's highways safer.

The sophisticated computer program, developed by Calspan Corporation of Buffalo, New York, was used to design the intricate takeoff and landing ramps, which were fabricated from teakwood to Calspan specifications by native labor in Thailand, where filming took place in the spring of 1974.

The computerized highway safety research program in which the spiral jump has its roots was developed during a 5-year period under the direction of Raymond R. McHenry, assistant head of Calspan's Transportation Safety Department. The program, which is now being applied to various aspects of future highway safety, is aimed at the eventual reduction in damage to cars and injuries to motorists that often occur when cars shoot off the road in accidents involving a single car, a common type of highway mishap.

It was a modification of the same computer program that was used by McHenry, inventor of the spiral jump, in the design of the ramps. A high-speed computer solved the 100+ equations that describe the vehicle motions in fewer than 20 seconds. McHenry noted that it would take years of an engineer's time to work out a single solution by manual calculation.

The "drivers" on 33 computer runs who were "killed" or "injured" were represented by equations—not human beings. Without the computer techniques, a manned spiral jump might never have been attempted, he added.

"One of the big advantages of advanced computers in highway safety research is that, when properly 'taught,' a computer can predict how an automobile will behave in any accident situation—or in the controlled violence of the spiral jump," McHenry explained.

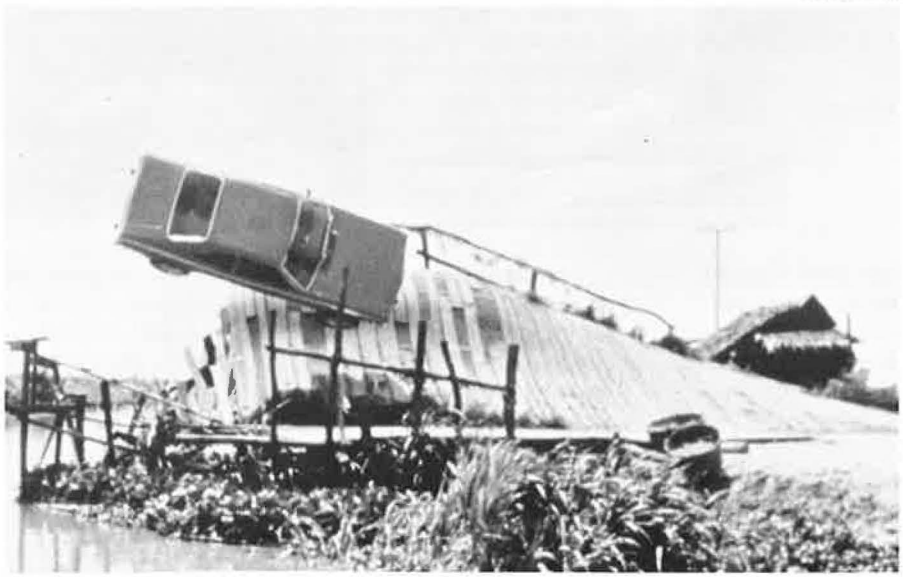
The modified 1974 American Motors Hornet that made the spiral jump in Thailand has its steering wheel in the center of the car to provide even distribution of weight and safety for the driver, who wore a double over-the-shoulder, aircraft type of restraint system. The car is also equipped with a Grand National "roll cage" in case of emergency.

Calspan's computer-prediction technique involves the description of various aspects of the automobile, such as its suspension system, weight, and center of gravity, in terms of complex equations that are fed into a computer for solution. Engineers also formulate equations that describe the roadside environment that a car might traverse in a single-car accident.

With such equations, a computer is capable of predicting how an automobile will behave in various maneuvers while traversing irregular terrain, such as bumps, ditches, and embankments; or while crashing into roadside obstacles, including curbs, trees, utility poles, guardrails, and bridge railings. The equations in this mathematical tool are unique in that they are the first ever to incorporate both a car's ride characteristics, such as bouncing, pitching, and wheel hop, and its cornering motions. Thus, the computer can predict a car's behavior at the outer limits of driver control in violent events such as when a car leaves the road surface or when the car strikes a pothole or other obstacle and its suspension system bottoms out.

In essence, this mathematical description, or model, of the car and the roadside environment is an advanced tool that will enable engineers to design the most effective energy-cushioning roadside barriers and features of the car that will give the motorist a better chance to survive a severe single-car accident.

Driver Lauren Willert crosses a Thailand river in an unconventional manner during a chase scene from the latest James Bond film, The Man With the Golden Gun. The configuration of the ramps at either end and the computation of speed, vehicle weight, and other factors were determined by Calspan Corporation using a sophisticated computer program. The ramps look flimsy, but are actually rigidly constructed of teakwood.



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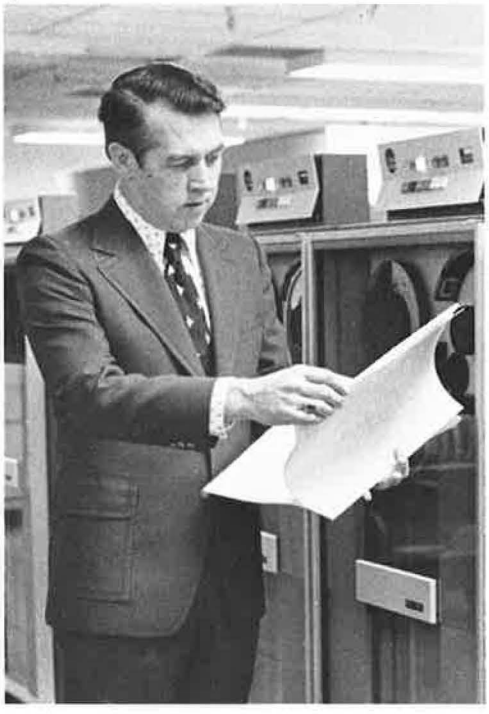

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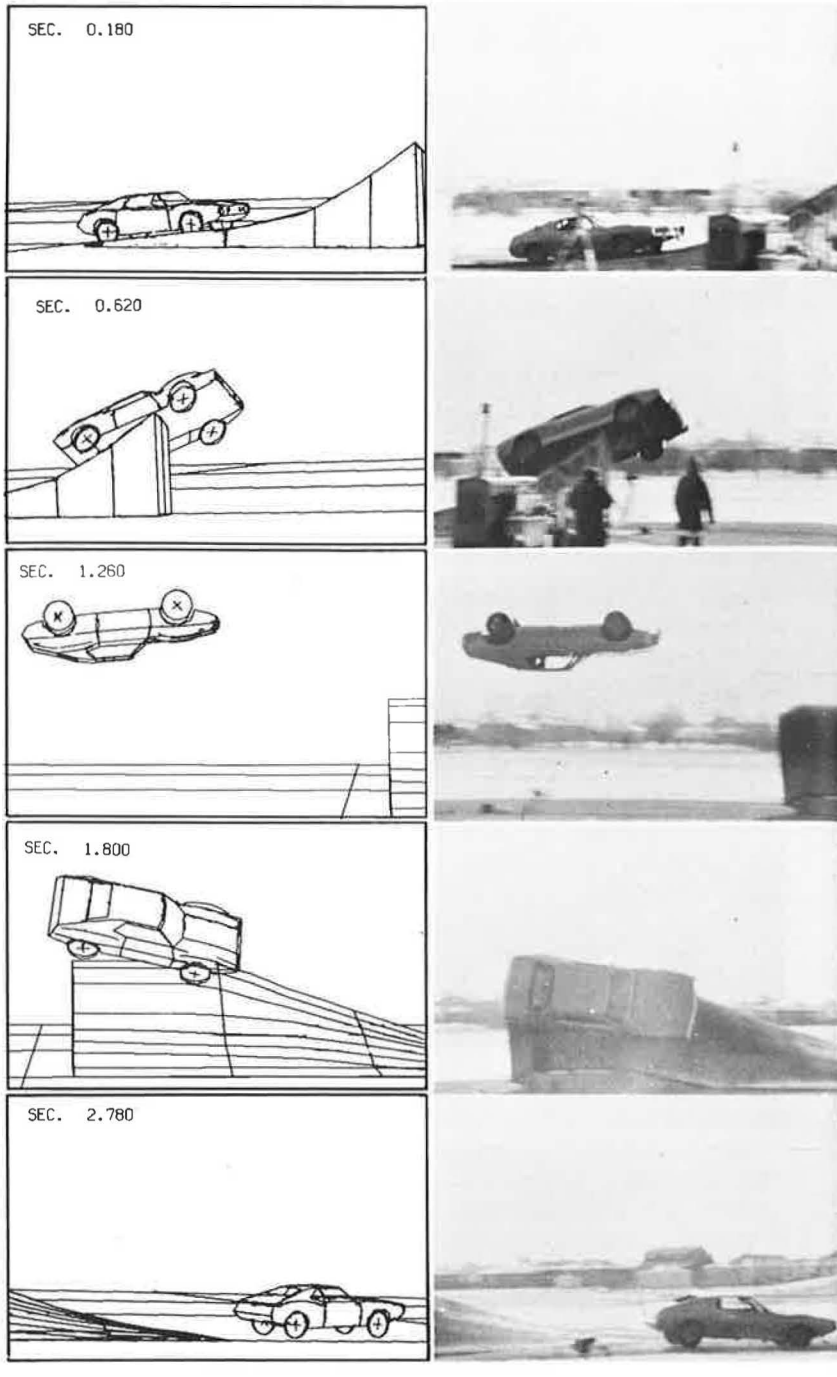

1 Raymond R. McHenry, inventor of the Spiral Jump, and assistant head of Calspan's Transportation Safety Department, examines a computer printout of the jump.

2 Comparison of the computer prediction (left) with an actual test jump shows a remarkably close similarity at each of the 5 stages.

During the course of the research program, Calspan also developed techniques for creating computerized animated cartoons that graphically portray the motions of the car that were predicted by the computer. In making an animated cartoon, which can also be produced in movie form, the computer creates a series of line drawings with tiny dots of light on a cathode-ray tube, which is similar to a TV picture tube. The cathode-ray tube is exposed to motion-picture film and, by advancing the film between drawings, the cartoon is produced, frame by frame.

The safety-oriented computer simulation program has provided Calspan with a powerful new engineering tool for improving automobile handling characteristics and associated driver behavior and for analyzing the effectiveness of various roadside safety improvements. Furthermore, it graphically illustrates the ever-broadening range of applications of computer-simulation technology in automotive safety and transportation, in both the public and private sectors.