

Status Report

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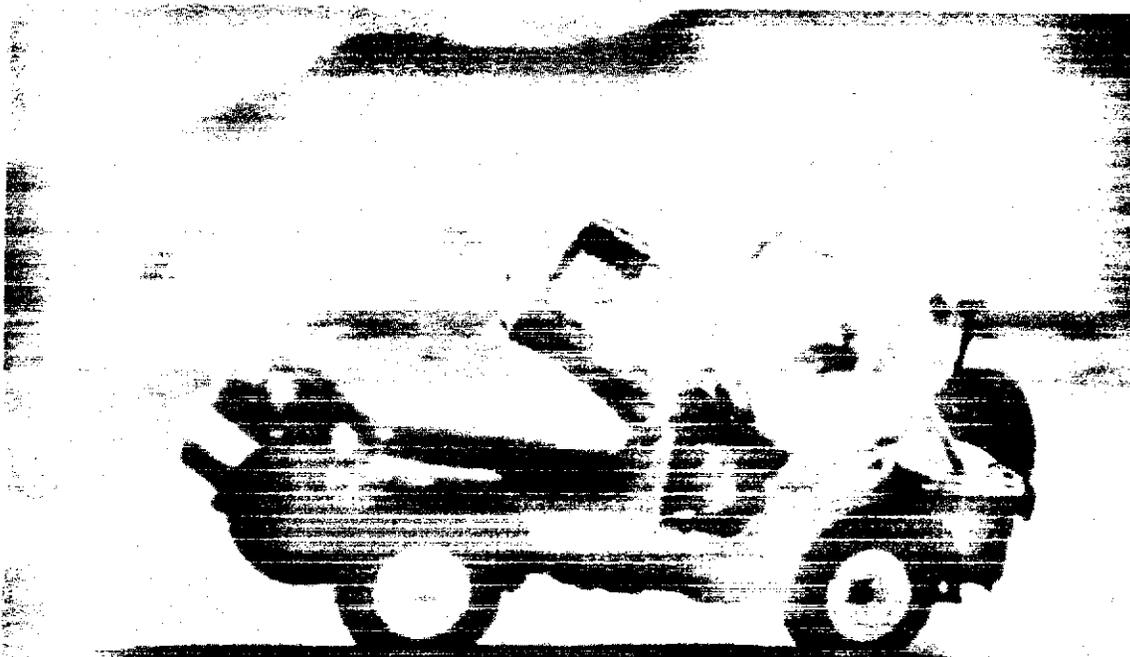
December 22, 1980

Serious Rollover Problems Found In Jeep CJ-5 Utility Vehicles

This issue of *Status Report* is devoted to articles documenting the serious problem of *on-the-road* rollover, with resulting high exposure of occupants to death or serious injury, of the AMC Jeep CJ-5 — a four-wheel-drive, on-off-road vehicle of increasing popularity in the United States.

A body of data and test results, summarized in this issue as well as in an earlier issue of *Status Report* (Vol. 15, No. 7, May 6, 1980), makes it clear that the Jeep CJ-5 is extremely vulnerable to rollover in even moderate-speed driving maneuvers on the highway.

The information in this issue and relevant test films have been transmitted both to AMC Corp. — whose subsidiary, the Jeep Corp., manufactures the CJ-5 — and the National Highway Traffic Safety Administration.



Jeep CJ-5 Rollover Tendencies Demonstrated

The American Motors Corp.'s Jeep CJ-5, an increasingly popular on-off-road four-wheel-drive vehicle, will roll over in highway handling situations — including 22 mph “J-turns” and 32 mph obstacle avoidance maneuvers — that passenger cars can negotiate at these and much higher speeds with no rollover problem whatsoever.

The propensity of the CJ-5 to roll over was underscored by a series of handling tests run earlier this year by Dynamic Science, Inc., an independent testing facility in Phoenix, Ariz., under the sponsorship and technical direction of the Insurance Institute for Highway Safety. (For a detailed description of the test procedures and conditions, see box below.)

Modern Version of Military Vehicle

The CJ-5 is a modern version of the World War II military jeep — a four-wheel-drive vehicle with a high clearance meant to give it off-road as well as highway use. The high clearance, coupled with a relatively narrow tread and short wheelbase, results in a degree of instability that promotes rollover. (Cont'd on page 4)

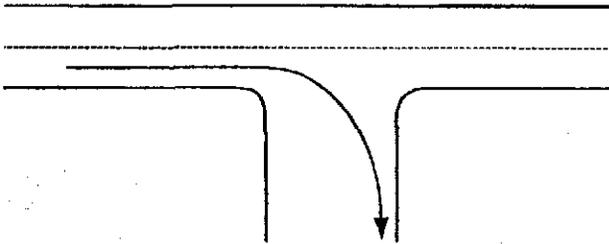
How The Jeep CJ-5's Were Tested

The Institute's handling tests to investigate the rollover tendency of Jeep CJ-5's under certain on-road driving conditions were run by Dynamic Science, Inc., an independent testing company, at its Phoenix, Ariz., test facility, under tightly controlled conditions. These included the following:

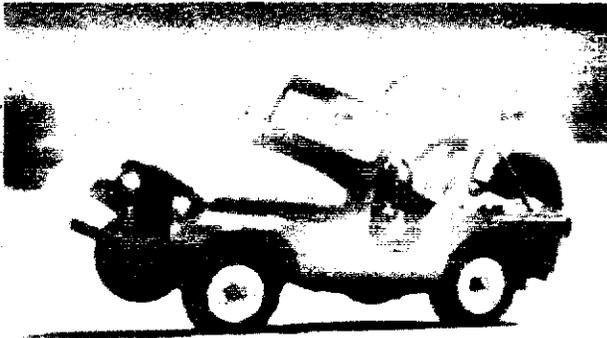
1. All Jeep CJ-5's were operated by Automated Vehicle Control (AVC) systems which steered, accelerated, and braked the vehicles to insure that no risk of human injury was associated with the tests. The control systems were also programmable, which insured that the steering and braking could be precisely repeated from test to test, thus eliminating any human involvement in the actual performance of the maneuvers themselves, and precluding the possibility that results would vary from test to test because of variations in human handling.
2. All tests were performed under dry, daytime conditions on a large, flat (runout less than 0.25 inches in 10 feet) asphaltic concrete surface covering 10 acres and having a maximum width and length of 600 feet each.
3. Four new, stock, open-top 1980 model Jeep CJ-5's were used in the tests. Each was equipped, as original equipment, with a four-cylinder engine, a four-speed manual transmission, a part-time transfer case with locking front wheel hubs, roll bar, and Goodyear H78 x 15 four-ply, regular tread, bias-ply tires. Two of the vehicles were equipped with front stabilizer bars.
4. During the tests, the front seats of the Jeep CJ-5's were occupied by two VIP 50th-percentile male test dummies. The driver dummy was restrained by the standard CJ-5 lap belt (no shoulder belt is provided in the CJ-5); the passenger dummy, typifying the great majority of motor vehicle occupants on American roads, was unrestrained in all but two rollovers.

A full technical description of the test procedures has been prepared by Dynamic Science. Copies are available from the Insurance Institute for Highway Safety, Watergate 600, Washington, D.C. 20037.

The J-Turn



No. 1 - At 22 mph, a 1980 model Jeep CJ-5 begins a 90-degree turn to the right, as shown in the diagram.



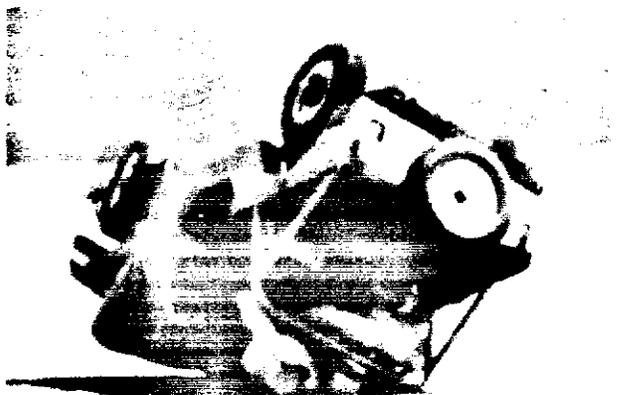
No. 2 - The vehicle is past the midpoint of the turn and its right wheels have lifted off the ground.



No. 3 - As the vehicle completes the arc of the turn, it is teetering on two wheels and rollover is imminent.



No. 4 - As the vehicle rolls on its side, the unbelted dummy passenger is thrown across the driver.



No. 5 - The restrained driver and the unrestrained passenger are smashed head-first onto the pavement.

Jeep CJ-5 Rollover Tendencies Demonstrated (Cont'd from page 2)

The CJ-5 is manufactured by the Jeep Corp., a division of AMC. In the 1979 model year 21,000 CJ-5's were sold; this year AMC is attempting to substantially increase the CJ-5's sales figures through an aggressive marketing campaign centered on the advertising slogan, "The Legend Lives On." According to national motor vehicle registration figures, about 250,000 Jeep CJ-5's are currently registered for use on the American highways. How many are being driven abroad is unknown, although AMC has been reported seeking to expand export markets for the CJ-5 in recent years.

Two Maneuvers Tested

The IIHS-sponsored handling tests involved two maneuvers. (See Pages 3 and 5 for diagrams of the maneuvers.) In one, a "J-turn," vehicles traveling on straight, dry, flat asphalt pavement were steered into 90-degree turns - simulating sharp right or, if continued, U-turns. In the other, an "obstacle avoidance" maneuver, vehicles traveling on such pavement were steered to the left in order to avoid an obstacle in their right-of-way, and then sharply to the right in order to return to the right-of-way once the obstacle was passed.

Three 1980 Jeep CJ-5's rolled over in the J-turn maneuvers, all at speeds of 22 mph. Three 1980 Jeep CJ-5's rolled over in the avoidance maneuvers, all at speeds no greater than 32 mph.

In contrast, a 1980 Chevrolet Chevette put through the same maneuvers at these and higher speeds showed no tendency whatsoever toward rolling over. The Chevette was chosen for comparison purposes because subcompact cars, such as the Chevette, have the highest rollover rates among passenger cars. Rollovers for all types of passenger cars are much less frequent than for utility vehicles such as the Jeep CJ-5, and a research study performed by Calspan for the Department of Transportation concluded in 1978 that it appears to be extremely difficult to roll over a modern passenger car by steering and braking maneuvers alone, even at speeds near 50 mph. (See story below.)

NHTSA's '73 Rollover Rulemaking Was Dropped

The National Highway Traffic Safety Administration (NHTSA) has been aware for years of the tendency of some vehicles - particularly those with a high center of gravity and narrow wheelbase - to turn over.

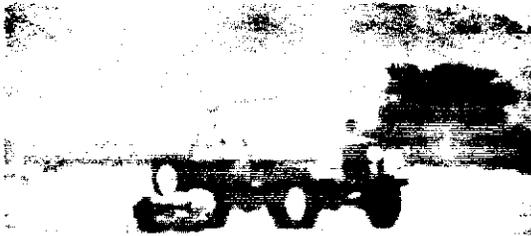
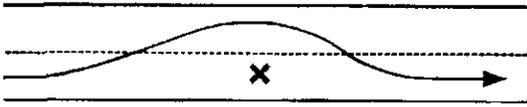
Despite its 1973 notice that the agency intended to regulate rollover tendencies in all vehicles, NHTSA dropped the matter without officially stating its reasons. A chronology of events follows:

1971 - Then-NHTSA administrator Douglas Toms notified the Army that the safety agency would not sanction the sale of surplus military jeeps to the public because of the vehicles' handling and stability problems. At that time, M-151 quarter-ton utility vehicles (jeep-type vehicles) were built by Ford under specifications set by the military. Toms noted that Army records indicated that rollover crashes accounted for 30 percent of all the vehicles' crash involvement. (See *Status Report*, Vol. 7, No. 10, May 22, 1972.) Subsequent studies raised the rollover rate to 66 percent. (See *Status Report*, Vol. 15, No. 7, May 6, 1980.) Some of today's utility vehicles evolved from the World War II military jeep.

1973 - The agency issued two advance notices proposing rulemaking to limit rollover tendencies in most vehicles. One was to be a standard on rollover resistance and the other was to cover steering control while braking and turning. (See *Status Report*, Vol. 8, No. 7, March 26, 1973.) Subsequent to the notices, the agency commissioned three vehicle handling studies to analyze the rollover characteristics of a wide variety of vehicles and to try to develop a set of repeatable test procedures.

(Cont'd on page 10)

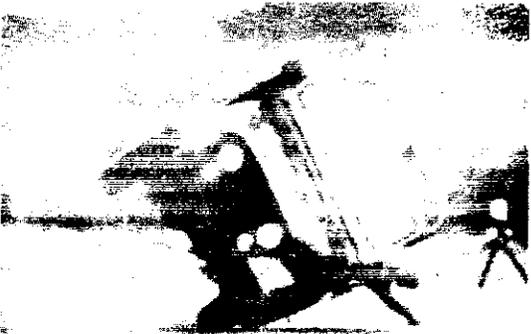
Avoiding An Obstacle



No. 1 - The CJ-5 swerves to the left at 32 mph to avoid an obstacle in the right-hand lane.



No. 2 - As the vehicle is steered back toward the righthand lane, it tilts up on its left wheels.



No. 3 - The righthand wheels lift off further, and the rollover is seen as inevitable.

CJ-5's Have Higher Fatality Rate Than Motorcycles

The Jeep CJ-5 has a rate of fatality per registered vehicle that is higher even than the motorcycle - one of the most hazardous types of vehicles on the American highways.

In fact, according to the preliminary results of a new study being sponsored by the Insurance Institute for Highway Safety, just the single-vehicle fatal crash experience of Jeep CJ-5's is worse per registered vehicle than all types of fatal crash experience - including single- and multiple-vehicle impacts - of motorcycles. It is particularly significant that nearly 90 percent of the Jeep CJ-5 single-vehicle fatal crashes involve rollovers, according to the study.

These data are some of the preliminary findings of a study being carried out jointly by the Institute and the Highway Safety Research Center of the University of North Carolina. The study is examining the crash experience of popular utility vehicles and pickup trucks in Maryland and North Carolina, together with the national fatal crash experience of such vehicles as described in the Fatal Accident Reporting System maintained by the National Highway Traffic Safety Administration.

Preliminary results from the study indicated that in 1978 and 1979 the Jeep CJ-5 had 11.0

(Cont'd on page 8)



No. 4 - The vehicle crashes on its side on the pavement. The belted driver dummy is visible pinned at bottom.

Jeep Crash Kills One Ontarian, 17, injured as jeep rolls

One man died and two others are in critical condition after being thrown from a jeep that overturned in Rancho Palos Verdes.

A 17-year-old Ontarian, injured as jeep rolls

Jeep crash kills girl, 19

A young Fort Wayne-area woman died early this morning at Methodist Hospital in Indiana when injuries received lacerations. Sheriff's department reports indicate that the 1974 AMC Jeep driven by...

Jeep accident leaves one critical

An area teenager is in critical condition today following a Jeep accident and all minor injuries.

Man Killed When Jeep Overturns

A San Benancio Canyon man was killed and three other persons injured when a Jeep rolled over on a dirt road.

Jeep rolls over, man listed serious

A Kalamazoo man was seriously injured Wednesday when the Jeep in which he was a passenger left M-96 and rolled over Kalamazoo.

Man dies as jeep wrecks

A local man died Friday around 11:35 p.m. after the Jeep he was driving...

bound vehicle crossed the oncoming lane in the vicinity of The West...

Woman dies in jeep n

A 27-year-old Purcellville, Va. woman was killed ye

Taylorville yc

when Jeep o

TAYLORVILLE — A 14-year-old Taylorville boy was killed and another teenager was injured Friday afternoon when a Jeep overturned on East Lake Shore.

Jeep rolls, kills

An Oconee County resident was killed Friday night in a one-vehicle accident on an access road west of Walhalla.

M
WOO
a je

These headlines represent a small reporting crashes of utility vehicles. They suggest the costly toll, in deaths that tests and real-world data indicate highway or off-road maneuvers.

Jeep Rolls, Two Injured

DUTCH HILL—Two people sustained injuries in a one-vehicle accident that occurred...

Jeep rider di

Indianapolis — There was a fatality yesterday at the Speedway, in an area called Snake Pit, just inside the first turn where young and the restless rule.

Jeep plunges over hill; one killed, one injured

One Billings man was killed and another injured in a Jeep accident on Bureau of Land Management up a ridge and lost control. Jeep plummeted down a steep hill rolling end over end.

Marlboro General Hospital. He was later...

Plumas jeep accident victims identified

Three persons who burned to death in a Plumas County jeep accident July 4 were identified Tuesday as residents of Reno, Lerrmon Valley and Calif.

forest service fire fighters arrived within a few minutes, they could not identify the victims, a sheriff's spokesman said.

dies
turns

Shawnee man dies in Jeep accident

Special to The Times
LOWRY CITY, Mo. — A 19-year-old Shawnee man was killed here early Friday when his jeep overturned on a

Flanagan man killed in jeep accident

By Inez Haase
A 29-year-old Flanagan man killed early this morning in a accident at Legion Lake, located west side of Flanagan. Prot head on arrival times

Jeep Flips Over, Kills Driver

CITY — A 17-year-old Ellicot City youth this morning here when a jeep he was driving landed on top of him, police report

nee man

Driver Critical After Jeep Flips

The Tribune
A 16-year-old Cottonwood driver was crushed beneath

Another Injured

Jeep Flips, Kills Two Teen-Agers

Jeep flips, driver hurt

MURRAY — A teenager was injured Monday afternoon when her jeep overturned while turning

ACETON — An unusual traffic accident in Graceton at 7 p.m. Sunday claimed the life of two young girls and injured a third occupant of a Jeep Renegade. All were thrown from

Rolled jeep pins 2 in Morro Bay

A jeep overturned in Morro Bay this morning, pinning two passengers.

she was the driver, Beth Ann, who died beneath it

Jeep Overturns, Killing 13-Year-Old Driver

MAINA, Maui

Woman killed in Jeep crash

A 32-year-old Rockford woman died early Sunday morning when the Jeep in which she was riding rolled over on an off-ramp of U.S. Bypass 20 at U.S. 51, police said.

Speedway 2 hurt when Jeep overturns

Two Hattiesburg men were injured around 6 a.m. Sunday when the jeep in which they were riding overturned near

Jeep Flips

in Delta;

Driver Dies

Two men hurt as Jeep rolls, burns

Jeep accident seriously injures Evans man

Colorado man was seriously injured Wednesday when the 1973 jeep he was driving rolled several times

County Memorial Hospital in "Bur" with injuries of the spine and fractured spine

Man dies as Jeep flips

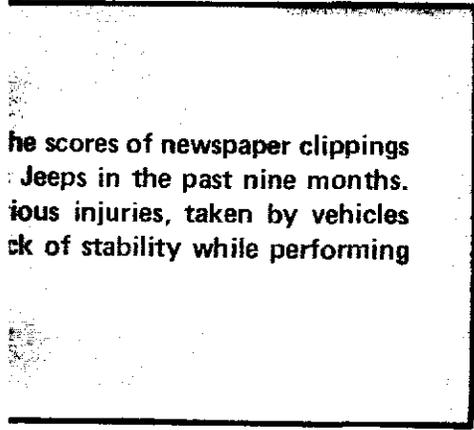
SCARBOROUGH — "Inattention" contributed to an accident in which a 23-year-old Litchfield man died after his jeep carrying five people overturned on the Maine Turnpike here Sunday, state police.

Man dies after Jeep overturns

ASSOCIATED PRESS

Jeep roll-over injures two

Two Indian River teenagers were injured when the vehicle they were in rolled over when he swerved to



he scores of newspaper clippings of Jeep accidents in the past nine months. Serious injuries, taken by vehicles lack of stability while performing

CJ-5's Have Higher Fatality Rate Than Motorcycles (Cont'd from page 5)

crashes with at least one occupant fatality for each 10,000 registered - 8.6 single-vehicle crashes and 2.4 multiple-vehicle crashes. This contrasts with 8.2 motorcycle rider fatalities per 10,000 registered motorcycles.

Results from the study indicate that rollover crashes account for the bulk of the CJ-5 crashes with occupant fatalities. Figure 1 shows the numbers of vehicles that rolled over with occupant fatalities per 10,000 registered vehicles for the three leading utility vehicles - the Jeep CJ-5, the pre-1978 Ford Bronco and the Chevrolet Blazer - and two leading pickup trucks - the Ford F-100, F-150 and the Chevrolet C-10/K-10. For the single-vehicle fatal crashes the Jeep CJ-5 rollover rate was 7.4, compared with the overall single-vehicle fatal crash rate of 8.6, indicating that almost 90 percent of the single-vehicle fatal crashes of CJ-5 Jeeps were rollovers.

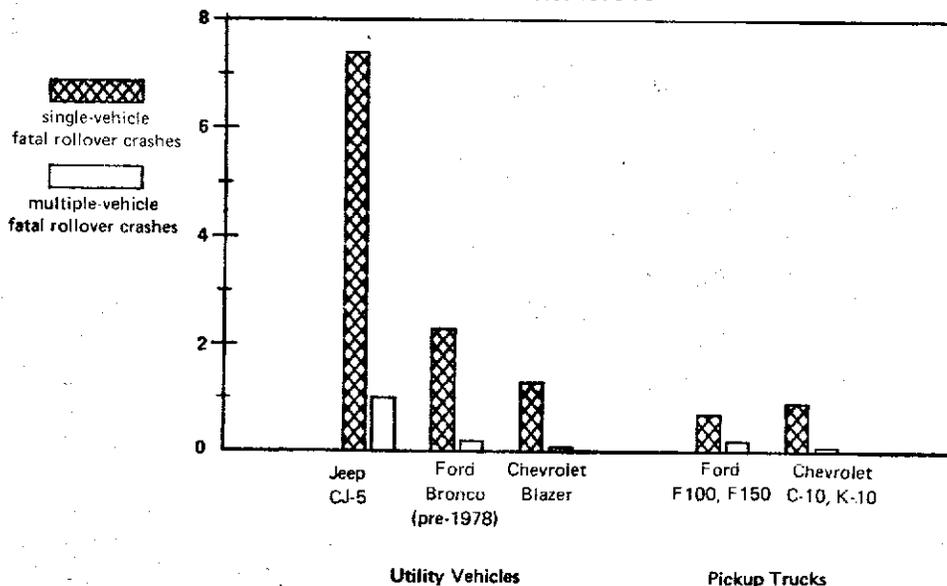
For single-vehicle fatal rollover crashes, the result for the Jeep CJ-5 was almost six times greater than the result for the Chevrolet Blazer, more than 2½ times greater than the pre-1978 Ford Bronco result, and more than eight times greater than the pickup truck results.

Figure 2 shows the percentage of vehicles that rolled over in all single-vehicle crashes in Maryland and North Carolina. In Maryland for both the Jeep CJ-5 and the pre-1978 Ford Bronco over 60 percent of the single-vehicle crashes were rollovers, contrasted with just over 22 percent for the Chevrolet Blazer and 15 percent for the pickup truck models. In North Carolina, the rollover percentages were somewhat lower for the Jeep CJ-5 (40 percent) and pre-1978 Ford Bronco (37 percent) and similar to the Maryland results for the other vehicles.

Figure 3 shows the numbers of vehicles that rolled over in all single-vehicle crashes, both fatal and nonfatal, per 10,000 registered vehicles in Maryland and North Carolina. In both states the Jeep CJ-5 had an extraordinarily high rate of involvement in single-vehicle rollover crashes compared to the other vehicles.

Figure 1

Numbers of Vehicles that Rolled Over With Occupant Fatalities
Per 10,000 Registered Vehicles
U.S. 1978-79



The new data reinforce the results of an earlier study by the University of Michigan's Highway Safety Research Institute. Noting particular rollover and driver ejection problems associated with Jeep vehicles, that study said that utility vehicles as a group are involved in fatal crashes almost 40 percent more often than passenger cars, that such vehicles experience rollover at a rate five times that for passenger cars, and that rollover protection for utility vehicles is inadequate. (See Status Report, Vol. 15, No. 7, May 6, 1980.)

Figure 2

Percentages of Vehicles that Rolled Over in Single-Vehicle Crashes
Maryland 1974-78 and North Carolina 1973-78

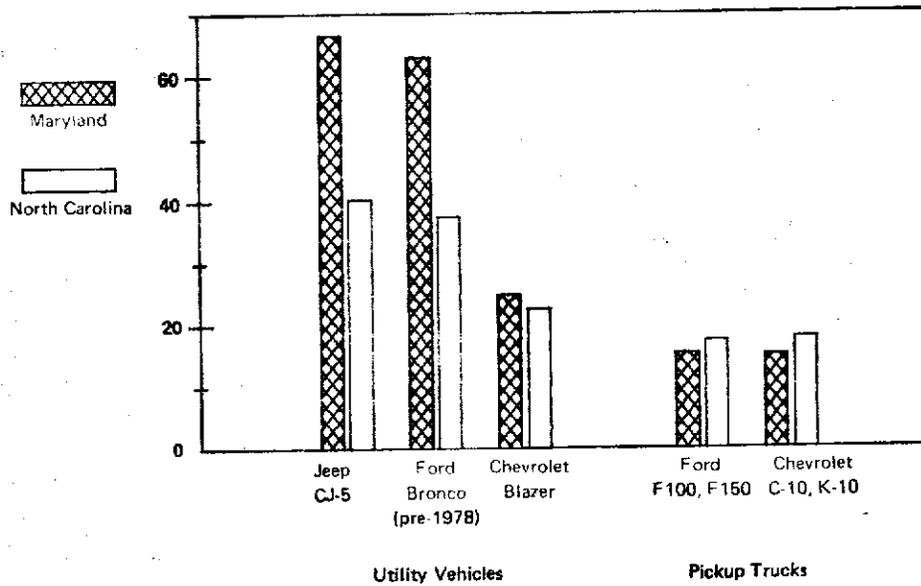
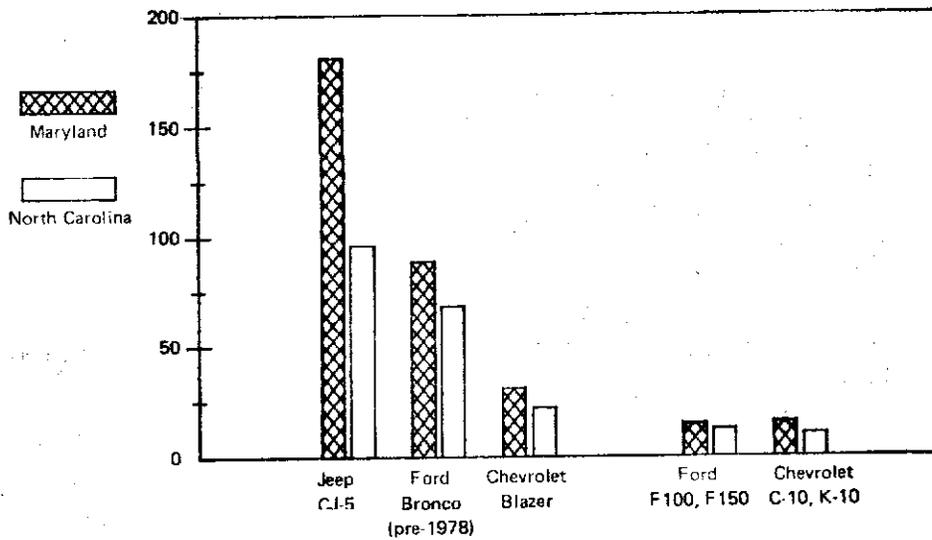


Figure 3

Numbers of Vehicles that Rolled Over in Single-Vehicle Crashes
Per 10,000 Registered Vehicles
Maryland 1975-78 and North Carolina 1975-78



NHTSA's '73 Rollover Rulemaking Was Dropped (Cont'd from page 4)

Industry responses to the rollover resistance notice in 1973 were generally negative. In comments to the docket, the Motor Vehicle Manufacturers Assn., American Motors Corp., and others argued that a standard was not needed. The Jeep Corp. also responded, saying, "An investigation of vehicle crash data indicates that, in general, vehicles do not roll over due to any inherent tendency toward rollover in the vehicle itself, but rather the rollover is a result of leaving the highway."

The company then went on to say this:

"The most significant difference between on-road and off-road vehicles (in terms of rollover resistance) is the ratio of center of gravity height to track width. Considerations for ground clearance and mobility require that this ratio for an off-road vehicle must be significantly greater than that for an on-road vehicle. This means that, on an absolute grading scale, it is likely that the inherent tendency for rollover would be greater than that of a typical passenger car. This is not to say, however, that these vehicles present any greater risk of rollover than a passenger car. . . ."

1978 - A study commissioned by NHTSA on the subject of handling and stability was completed by Calspan. The researchers came to the conclusion that it is nearly impossible to turn over contemporary passenger cars on a dry flat surface, although other types of vehicles, notably recreational vehicles and some pickup trucks, could be induced to roll over. However, the researchers said they were unable to develop repeatable test procedures that corresponded to real-world driving and the agency dropped the matter without official comment. During the course of the research program, no Jeep CJ-5 or CJ-7 was tested.

Oct. 8, 1979 - Edward W. Barrows, a California resident, petitioned NHTSA for an investigation "into the safety and stability of the soft top Jeep (CJ-5) manufactured by American Motors for the purpose for which they are widely advertised in the media, mainly off road use."

Barrows reported that his 15-year-old son, David, was killed in an off-road rollover crash on a steep hill frequently used by four-wheel-drive vehicles. The Jeep had turned over when it hit a rut. Young Barrows reportedly was using his seat belt, and was killed when his head struck the roll bar. His father's petition pointed out two other fatalities said to involve AMC Jeeps and said:

"It is my opinion that this vehicle with its high center of gravity and short and narrow wheelbase is totally unsafe on or off the road. I further believe that the presence of a totally inadequate roll bar gives the driver and passengers a false sense of security. It is particularly galling to me to see how widely this vehicle is advertised bouncing up and down rough off highway terrain when it is apparent that the slightest rut or bump is apparently enough to tip it over with disastrous results."

Oct. 29, 1979 - Lynn Bradford, acting director of the Office of Defects Investigation, began the agency's evaluation of the alleged problem by issuing a formal request for information from AMC concerning the stability of Jeep CJ-5 and CJ-7 vehicles.

Dec. 7, 1979 - The Jeep Corporation's safety director responded to the request for information, listing a total of six lawsuits in which the corporation had replied to allegations of instability of the Jeep CJ series. The company maintained the vehicles are safe "when driven properly."

Feb. 13, 1980 - Bradford, by this time associate administrator for enforcement, formally responded to the Barrows petition with a letter asserting that his office had "considered all 1973-79 CJ-type Jeep vehicles with a Jeep-approved roll bar in the analysis." Noting that the vehicles are designed with a short wheel base and high center of gravity in order to accommodate off road driving, Bradford said, ". . . our analysis indicates that most instances of instability resulting in rollovers occur under circumstances in which the limits of the vehicles are exceeded."

(Cont'd on next page)

Bradford stressed the hazards of off-road driving and concluded, "In summary, our findings do not indicate the presence of a potential safety defect in the design or manufacture of the CJ-type vehicle stability or Jeep-approved roll bar integrity," currently not required to meet any DOT safety standard. "Off-road driving is extremely hazardous and requires the driver to be experienced with the capabilities of the vehicle, the driving technique required in off-road driving, and the terrain on which the driving is to be done." (There is currently a two-year-old NHTSA investigation of another case in which the Jeep-approved roll bar is alleged to be defective. That case is still pending.)

HLDI Reports Heavy Insurance Claims For CJ-5

Human and property damage losses associated with the Jeep CJ-5 are very heavy, two recent studies of insurance claims indicate. Both were conducted by the Highway Loss Data Institute (HLDI).

In one of the studies, HLDI assessed the frequency with which insurance claims were made for injuries to the occupants of various models of 1977, 1978, and 1979 vans, pickups, and utility vehicles. Data were supplied by nine insurers on claims made under personal injury protection plans. (See *Status Report*, Vol. 15, No. 16, Nov. 5, 1980.)

HLDI researchers said that of the 10 models of utility vehicles reported, the CJ-5 "had by far the worst results; its overall frequency was 130 percent above average and its frequency of claims above \$250 was 179 percent above average." This latter figure "is the highest injury frequency result in this claim size category ever reported by HLDI," the researchers noted. They said the overall frequency for the CJ-5 topped that of "all but two of the passenger cars for the same model years" the Datsun 200 SX and the Plymouth Arrow.

In a second study of vans, pickups, and utility vehicles, the average size of collision coverage claims paid per insured vehicle year for the Jeep CJ-5 was found to be larger than that for any other utility vehicle in each of the three model years considered - 1978, 1979, and 1980. It also was larger than that for any of the other vehicles, except the Subaru Brat, a pickup truck.

Using data from 10 insurers on claims paid under non-commercial collision coverage, HLDI reported the relative size of average claim payments per insured vehicle year for fifteen 1978 models of utility vehicles, thirteen 1979 models, and four 1980 models.

For all of the 1978 models studied, including pickups and vans, the figure for the Jeep CJ-5 was 67 percent higher than the average, and 97 percent higher than that of the utility vehicle with the lowest figure - the ¾-ton Chevrolet C 20/ K 20 Suburban. For all 1979 models, the CJ-5 figure was 70 percent higher than the average, and 120 percent higher than the ½-ton GMC C 1500/ K 1500 Suburban, the utility vehicle with the best record. And for all 1980 models, the CJ-5 figure was 60 percent higher than the average, and 59 percent higher than the lowest figure for the utility vehicles studied, recorded for the Ford Bronco.

NHTSA Gets Test Results, Court Case List

The Insurance Institute for Highway Safety has filed with the National Highway Traffic Safety Administration the films and test reports of its Jeep CJ-5 handling tests, together with a list summarizing 37 court cases involving rollovers of CJ Jeep models.

The list, involving crashes dating from 1967 but predominantly occurring during or after 1975, is "by no means meant to represent a complete list of all possible litigation involving CJ Jeeps," the Institute stressed in a letter to the federal agency.

Noting that the cases reportedly involved at least 15 fatalities and 31 injuries, the Institute letter added that in "many of the listed cases, there may well have been occupants in the vehicles other than the plaintiffs, and those unnamed occupants may also have been injured or killed, but such information would not have appeared routinely in filings with the courts."