

*Studies Urge Upgrading*

## **Steering Assembly Standard Rapped**

The federal safety standard requiring energy absorbing steering assemblies (FMVSS 203) encourages the use of designs that perform poorly in real-world crashes, a British study of such devices has found.

The study, done at the University of Birmingham, England, is one of several that have recently reported on performance failures in energy absorbing steering assemblies in real-world and test crashes. The other studies were done by Calspan, Inc. and Minicars, Inc. Both the British and the Calspan studies recommended that the federal safety standard on energy absorbing steering assemblies be upgraded in light of the reported real-world performance failures.

Energy absorbing steering assemblies are designed to absorb, in a controlled compression, the force of a driver's impact with the steering assembly, so as to prevent or reduce injuries by limiting the forces exerted on the driver's chest. Energy absorbing steering assemblies were first introduced on many 1967-model U.S. cars. The federal safety standard requiring such devices went into effect on Jan. 1, 1968. It has been estimated that some 300,000 U.S. drivers died needlessly on spear-like steering assemblies before energy absorbing devices were used.

### **BIRMINGHAM STUDY**

The extensive U.K. analysis of the performance of energy absorbing steering assemblies in British cars was written by P. F. Gloyns, a researcher at the University of Birmingham, England. It reported on 103 frontal vehicle crashes involving unrestrained drivers, as well as laboratory tests of energy absorbing steering assemblies.

The study examined the performance of two basic types of energy absorbing steering assemblies. One was the so-called axial collapse system, which incorporates the energy absorbing device into the steering column so that the column compresses in a controlled manner under impact. The other system was the so-called energy absorbing wheel — a solid steering column with an energy absorber, which also

### **Inside**

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|---|--|
| ● House Would Forbid<br>Mandatory Air Bags . . . Page 2         | ● NHTSA Chided For Control Arm<br>Case Delay . . . Page 7        |
| ● NHTSA's 'Cost-Benefit' Role<br>Questioned By GAO . . . Page 4 | ● Reflectorized License Plates<br>Found Ineffective . . . Page 8 |

compresses in a controlled manner under impact, mounted directly behind the steering wheel. (With the exception of two Chrysler models, all 1974 model AMC, Chrysler, Ford and GM cars use axial collapse systems. The Dodge Challenger and the Plymouth Barracuda, both of which were discontinued during the current model year, use energy absorbing wheel systems.)

The study reported that when severe real-world collisions were examined, there "appear to be considerable differences" in the extent to which injuries were reduced by the two different energy absorbing steering assembly systems. With one exception, no "serious chest or abdominal injuries" were found in drivers of cars using the energy absorbing wheel system. However, such injuries were "common experience for drivers striking axial collapse assemblies in accidents at the upper end of the accident spectrum," the study reported. In addition, there was also a "considerable difference" in driver head and neck injuries, with the energy absorbing wheel system again providing more protection.

The University of Birmingham study also involved laboratory tests to determine how the two different types of energy absorbing systems performed in FMVSS 203 compliance tests. The study reported that in those tests, the energy absorbing wheel system, although "highly effective in preventing injuries" in real-world crashes, produced a "marginal pass" and "marginal failure." But, it reported, the axial collapse system, while "essentially ineffective in terms of limiting the loads on drivers' chests to below injury level"

(Cont'd on page 3)

## ***House Would Forbid Mandatory Air Bags***

A bill passed by the House of Representatives, H.R. 5529, would prohibit the National Highway Traffic Safety Administration from requiring passive restraint systems (such as air bags), ignition interlock belt systems, or "any warning device other than a warning light designed to indicate that safety belts are not fastened" on future new cars.

The bill would require instead that NHTSA issue a standard forcing manufacturers to offer their customers, starting with all 1977-model cars, the option of purchasing vehicles equipped either with passive restraint systems or with "integrated lap and shoulder belts for front outboard occupants and lap belts for other occupants."

The prohibition was attached to the House bill as an amendment during floor debate this week. The remainder of the bill, including provisions to require that DOT make its new fuel system crashworthiness standards effective for 1976-model cars rather than 1977-model cars, was passed by the House virtually intact. (See *Status Report*, Vol. 9, No. 12, June 18, 1974.)

If approved by the entire Congress, the House-passed bill would stop NHTSA from moving forward with its pending proposal (FMVSS 208) to require that manufacturers provide front-seat passive protection in new cars starting with the 1977 model year. (See *Status Report*, Vol. 9, No. 6, March 26, 1974.) However, the chairman of the Senate Commerce Committee, Sen. Warren Magnuson (D-Wash.), recently said that Congress should enact a law requiring passive restraints in new cars if NHTSA fails to push FMVSS 208, thus putting himself on the opposite side of the issue from the House vote. (See *Status Report*, Vol. 9, No. 14, July 26, 1974.)

in real-world crashes, produced a "good pass" in the compliance test. Thus, "it must be concluded that the present test method is inappropriate for differentiating between 'safe' and 'unsafe' steering systems," the study said.

## CALSPAN

In a paper presented at the recent Fifth International Technical Conference on Experimental Safety Vehicles in London, England, John W. Garret and Donald L. Hendricks of the Calspan Corp. also reported on performance failures in energy absorbing steering assemblies.

The researchers examined reports on 549 real-world frontal crashes involving 1970-1974 U.S. cars using axial collapse systems. They found that energy absorbing steering assemblies performed best when the driver squarely contacted the steering wheel in a crash. As the driver's contact with the wheel became angular rather than head-on, because of crash induced movement of the column and driver, the energy absorbing device compressed less, thus absorbing less energy and requiring the driver to withstand more injurious forces.

The Calspan study reported that there was greater energy absorbing device compression in the GM cars it examined than in the Ford cars. "Thus it appears that the Ford EAD [energy absorbing device] was stiffer or less yielding than that of General Motors," it said. "The Chrysler EAD data tended to resemble that of General Motors more than that of Ford. However, the volume of data available for both Chrysler and American Motors was limited," the study reported.

All of the GM cars in the Calspan study had ball and tube energy absorbing steering assemblies. The University of Birmingham study reported that the GM ball and tube system was not used on any of the British cars it examined.

## MINICARS

Minicars, Inc., which is conducting a NHTSA-funded contract (DOT-HS-113-3-746) to develop a crashworthy sub compact size vehicle, reported that in a 30 mile per hour frontal barrier crash test of a 1974 Pinto, a lap and shoulder belt restrained test dummy "hit the steering wheel with enough force to bend it down and toward the left door, preventing the column from achieving any significant" compression. The Pinto uses an axial collapse energy absorbing system. Minicars also reported similar steering column performance in a 40 mile per hour frontal barrier crash test of another 1974 Pinto. The Minicar reports have been filed in NHTSA's passive restraint docket (69-7).

## UPGRADE STANDARD

Based on its examination of energy absorbing steering assembly performance in real-world crashes, the Calspan study recommended a "review of [NHTSA's] compliance test procedures." Calspan cautioned that while its report "should not be interpreted as arguments against the EAD concept," its analyses "do indicate the need for improved implementation."

The University of Birmingham study, as well as the Calspan study, reported that crash induced movement of steering columns "means that they are not impacted by the driver either at their original installation angles or in their original mounting positions." Under NHTSA's current standard, the performance of energy absorbing steering assemblies is tested only under conditions representing a driver squarely hitting the steering assembly. The Birmingham study recommended, among other things, that energy absorbing steering assemblies be required to have acceptable, uniform performance when impacted by a driver over a range of angles.

## GAO Questions 'Cost-Benefit' At NHTSA

The General Accounting Office has questioned the National Highway Traffic Safety Administration's use of "cost-benefit" considerations in developing motor vehicle safety standards.

GAO's views were contained in a report prepared at the request of the Senate Commerce Committee. The report concluded that NHTSA's attempts to apply "cost-benefit" criteria in vehicle standards making have been hampered by lack of data, disagreement over crash loss cost estimates, and auto manufacturer resistance to giving NHTSA needed production cost and lead time information.

Legislation may be required, GAO told the Senate committee, to force manufacturers to cooperate with NHTSA by providing reliable cost and lead time information. (A pending House bill, H.R. 5529, contains such a requirement.)

As the GAO report suggested, when Congress enacted the National Traffic and Motor Vehicle Safety Act of 1966, it rejected suggestions by the Automobile Manufacturers Association (now called the Motor Vehicle Manufacturers Association) during House Commerce Committee hearings that "the balancing of costs versus benefits" be required in federal motor vehicle safety standards development. Instead, GAO recalled, both the House and Senate commerce committees made clear that in setting vehicle standards under the 1966 law, "safety was to be the overriding consideration . . . ."

As described in the GAO report, a benefit-cost analysis of a safety standard "involves estimating, in dollars, the benefits from establishing the standard and the consumer costs to comply with the standard. Comparing these totals, usually by dividing dollar benefits by dollar costs, gives a benefit-cost ratio. A ratio greater than one indicates that the estimated dollar benefits from establishing a safety standard exceed the estimated cost to comply with the standard."

Pointing out that "benefits" are measured by estimating the cost of crash losses and comparing them with the cost of standards to reduce the losses, GAO found substantial disagreement over methods for estimating crash losses.

It gave as an example the wide discrepancy between NHTSA and National Safety Council estimates of the value of life and the cost of crash losses — a discrepancy in which NSC, because of a self-described "basic difference in philosophy," consistently places much lower values on life, limb and economic loss than NHTSA.

For instance, the report said NHTSA estimated the average cost of a motor vehicle crash as \$46,000, while the National Safety Council estimated the average cost at only \$15,800. For a fatality, it said, NHTSA estimated a loss of \$132,000 in "average lifetime earnings," while NSC estimated a loss of only \$44,000 in average lifetime earnings.

### COST OF INJURIES

As for injury costs, GAO said, NHTSA estimated that "about 3.8 million people suffering [motor vehicle crash] injuries of varying severity would lose earnings of about \$10.8 billion" per year, based on data from the 1969 National Health Survey. NSC estimated that "persons suffering injuries of varying severity would lose about \$1.3 billion" per year, but it "could not provide us with the exact procedures and sources for its estimates," GAO added.

The GAO report said that NHTSA also included in its crash loss cost estimates elements not considered by NSC, such as disruption of home and family duties, pain and suffering, legal and court costs, and loss of service to the community.

## **COST, LEAD TIME INFORMATION**

NHTSA is "not in a good position to defend its cost and lead time estimates in standards cases," GAO indicated, because it lacks "the assistance of the (motor vehicle) industry to establish a viable cost and lead time estimating capability."

The GAO report said that NHTSA has attempted to get manufacturers to cooperate in providing cost and lead time information in a number of standards cases, but without success. It specifically cited lack of manufacturer cooperation in standards cases involving crashworthiness of bumpers (FMVSS 215) and mandating of passive restraints (FMVSS 208).

"Estimates of costs and lead time to manufacture safety equipment are essential to make realistic benefit-cost analyses," GAO concluded. "The Safety Administration needs the assistance of the industry to establish a viable cost and lead time estimating capability."

If NHTSA cannot get that assistance voluntarily, GAO said, the Senate Commerce Committee should "favorably consider legislation requiring the industry to furnish such data," such as has been reported favorably by the House Commerce Committee.

## **'EFFECTIVENESS' DATA**

GAO found that although NHTSA is spending "about \$6 million a year to collect accident data and make analyses to evaluate the effectiveness of proposed and existing safety standards," the resulting data "is of limited value" for that purpose. It called on NHTSA to initiate on an expedited basis a "nationally representative sampling plan . . . in identifying the cause of accidents."

Single copies of GAO Report No. B-164497(3), "Need To Improve Benefit-Cost Analyses In Setting Motor Vehicle Safety Standards," are available for \$1.00 from GAO, P.O. Box 1020, Washington, D.C. 20013.

## **Bumper Cylinder Test Report Available**

The Insurance Institute for Highway Safety has published the results of a test series, conducted for it by General Environments Corp., involving exposure of two makes of energy absorbing bumper cylinder to impact and high-temperature conditions such as might be present during post-crash fire, salvage or repair operations.

Tested in the series were Delco and Taylor bumper energy absorbers. The Delco cylinders are used on some General Motors and American Motors cars and the Taylor cylinders on certain other AMC models. The tests were conducted because of unverified reports of exploding cylinders.

None of the four types of tests conducted by GEC produced an explosion; under impact conditions, "no personnel hazard" was found.

However, high temperature oven tests and gasoline fire exposure tests "produced failures on both cylinders which present hazards if a person were to contact the hot cylinder and hot fluid droplets leaking from the cylinder."

Oxy-acetylene torch tests "produced failures in both types of cylinders which present hazards to personnel due to the hot cylinder, the burning fluid and hot fluid droplets," GEC reported. When a cutting torch was applied to the pressurized chamber of a partially compressed cylinder, as might be done in

disassembly after a crash, there was "an additional hazard to persons in the vicinity of such activity," it said. At the point of rupture of the cylinder wall, hot material spurted out several feet and the cylinder contents caught fire.

Copies of the full test report are available by writing to: "Bumper Cylinder Tests," Insurance Institute for Highway Safety, Watergate Six Hundred, Washington, D.C. 20037.

**Since 1966**

## **Gregory, Cole Agree: Losses Down**

The outgoing president of General Motors and the current head of the National Highway Traffic Safety Administration agree that highway crash losses have dropped impressively since 1966, when the federal government's vehicle and highway safety laws were enacted.

NHTSA Administrator James Gregory told the recent Third International Congress on Automotive Safety:

"... if we step back and view the national traffic safety effort of the last few years we must conclude that all of us have been doing something right. Highway fatality rates have come down. And it is hard to believe that the 5.7 fatalities per hundred million miles experienced in 1966 dropped over 20 per cent to the 4.3 of 1973, solely on the basis of chance alone or any significant change in human nature."

Edward N. Cole, who will retire next month as GM's president, told the Society of Automotive Engineers' Third International Conference on Occupant Protection:

"As to the vehicle, I think we can point to solid evidence that cars have become more reliable, more controllable and more crashworthy. . . . The structural integrity of the vehicle and its improved occupant protection features provide a higher level of safety. The fatality rate of car occupants dropped about 24 per cent during the six-year period from 1966 to 1973. During this same period — before the energy crunch and the 55-mile-per-hour speed limitation last fall — there were more people driving and they covered more miles than ever before."

It was late in 1966 that the National Traffic and Motor Vehicle Safety Act and the Highway Safety Act became law.

## ***U.K. Belt Use Law Defeated***

At least for the time being, Britain will not join the ranks of nations with mandatory safety belt laws. (See *Status Report*, Vol. 8, No. 19, Oct. 17, 1973.)

On July 23 the British government's Road Traffic Bill was defeated in the House of Lords. The government then decided to remove from the bill, before its reintroduction, a provision covering compulsory safety belt use. The notion of obligatory safety belt use had met with opposition in the House of Lords at least partly on the argument that it would infringe on individual liberties.

## New Zealand Reports High Belt Use

New Zealand, one of the first nations to adopt a mandatory safety belt law, has reported substantial increases in belt use and a "levelling off" in crash deaths since its law took effect.

These results were reported in a study, "Interim Evaluation of the Compulsory Seat Belt Law," by the New Zealand Ministry of Transport. The law requires that safety belts be worn by front seat occupants of post-January 1965 cars and light vehicles. This requirement went into effect in June, 1972. The study found that in vehicles covered by the law, front seat safety belt usage that month increased to 87 per cent, compared to 38.9 per cent in May, 1972.

The study warned, however, that its belt use observation methods made no check on whether belts were correctly adjusted: "In some cases . . . it is suspected that the belt is very loose or may be over the driver's shoulder but not actually buckled up, to make a show of complying with the law."

For fatalities, the New Zealand study reported a "levelling off" in the number of deaths to front seat occupants in vehicles subject to the new legislation. In the ten month period beginning June 1, 1971, it said, there were 355 front seat fatalities, compared to 354 for the ten month period beginning June 1, 1972, during which the new law was in effect.

"Fatalities to passengers other than those known to be occupying front seats (who were not required to wear safety belts) increased," the study noted, adding that fatalities for all other road users, including pedestrians and motorcyclists, also increased during the same period.

## NHTSA Chided For Control Arm Case Lag

The National Highway Traffic Safety Administration's five-month silence in the Ford lower control arm investigation case has drawn a letter of rebuke from the Center for Auto Safety.

The letter also criticized Ford Motor Co. for failing to keep its promise, made at the conclusion of the hearing, to "respond to each of the specific things and assertions of purported fact" presented at a NHTSA hearing in the defect investigation case on March 20. (See *Status Report*, Vol. 9, No. 6, March 26, 1974.)

At the hearing, NHTSA heard presentations by the Insurance Institute for Highway Safety, the Center, and John A. Bennett, a consulting metallurgist who had participated in a National Bureau of Standards analysis of possible defects in the Ford lower control arms. The presentations provided NHTSA with evidence and analysis showing that the agency lacked a basis for its conclusion, announced in December, 1973, that the involved lower control arms are not defective. (See *Status Report*, Vol. 8, No. 23, Dec. 20, 1973.)

The suspected defect involves a critical front-end suspension component on some 5.5 million 1965-1970 Ford-manufactured cars. The failure associated with the suspected defect causes the wheel to displace, resulting in loss of driver control.

In its letter to NHTSA Administrator James Gregory, the Center said that a presiding NHTSA counsel left the impression at the March hearing "that a decision would be reached as soon as possible, probably within one or two months . . . . In light of the persuasive showing of a safety-related defect, and Ford's utter failure in rebuttal, NHTSA's mandate to protect motorists calls now for action without further delay . . . . Please give us a definite indication of when we can expect a decision on this matter."

## Reflectorized Plates Found Ineffective

Reflectorized license plates, currently in use in all but eleven states, are ineffective in reducing the incidence of nighttime rear-end collisions. This was the conclusion of highway research analyst Charles B. Stokes in a report prepared by the Virginia Highway Research Council.

Stokes based his findings on his 1971 experiment in which 100,000 reflectorized plates were randomly distributed throughout Virginia. An equal number of plates without the reflective quality were similarly distributed as a control.

A comparison of road traffic records of the two sets of vehicles for a full year showed "no statistically significant difference between the number of nighttime rear-end collisions of vehicles equipped with reflectorized license plates and that of vehicles equipped with control nonreflective license plates," Stokes said. Nor were there differences in fatalities, injuries, or rates of property damage, he found.

Complete information on the report (VHRC 73-R32) can be obtained by writing the Virginia Highway Research Council, Box 3817, University Station, Charlottesville, VA 22203.

### 1973 Status Report Index Available

The Institute has published an index for 1973 issues (Volume Eight) of its *Status Report*. Single copies of the index are available by writing to "1973 Index," Insurance Institute for Highway Safety, Watergate Six Hundred, Washington, D.C. 20037.

Also available are copies of indices, published earlier, for the 1971 and 1972 issues of *Status Report*. They can be obtained by writing to the above address.

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the highway  
loss reduction

## STATUS REPORT

Editor: Ralph Hoar  
Writers: Ben Kelley, Stephen Oesch, Lloyd Slater,  
Christine Whittaker

INSURANCE INSTITUTE for HIGHWAY SAFETY  
WATERGATE SIX HUNDRED • WASHINGTON, D.C. 20037  
(AREA CODE 202-333-0770)

NON-PROFIT ORG.  
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PAID  
PERMIT NO. 42534  
WASHINGTON, D.C.