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STATUS REPORT

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Motorcycles, Tractor-Trailers Most Lethal

A comprehensive study of vehicles in fatal crashes has found that motorcycles and tractor-trailer trucks have dramatically higher fatal crash involvement rates than other vehicles, based on the numbers registered.

The study, sponsored by the Insurance Institute for Highway Safety, examined the relationships between vehicle size and other factors in the 1,440 fatal crashes that occurred in Maryland during 1970 and 1971. The study dealt with motorcycles, cars categorized by size according to wheelbase, non-trailer trucks, and tractor-trailer trucks.

The researchers found strikingly different patterns of fatal crash involvement among vehicles of different sizes (see table, page 2). Among their findings:

- "Motorcycles had markedly higher rider death rates than other vehicles – three-and-a-third times those of the smallest cars."

- "Trucks had a particularly high involvement rate in multiple vehicle crashes where no one was killed in the truck – almost twice as high as the largest cars in the case of such crashes involving non-trailer trucks; and more than 10 times as high when tractor-trailers were involved."

- "Deaths in trucks in single vehicle crashes were also high – twice as high as the largest cars for non-trailer trucks and six times as high for tractor-trailers."

- "For pedestrian deaths, tractor-trailers were involved at three times the rate of the largest cars, and motorcycles at the same rate as the smallest cars."

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- "The smaller the cars, the greater the involvement rate in fatal crashes of cars in which their occupants (including drivers) died."

- "The smallest cars were involved at a rate almost three times the rate of the largest cars in fatal single vehicle crashes – 12.0 compared to 4.1 per 100,000 years registered."

- "The smallest cars were the death cars in multiple vehicle crashes at a rate almost twice as high as that of largest – 12.6 compared to 7.2 per 100,000 years registered."

- "The smallest cars were involved in pedestrian deaths at less than half the rate of the largest cars – 3.7 compared to 8.8 per 100,000 years registered."

- Where deaths occurred only in other vehicles, the smallest cars were involved "at about a third the rate of the largest cars – 2.7 compared to 8.0 per 100,000 years registered."

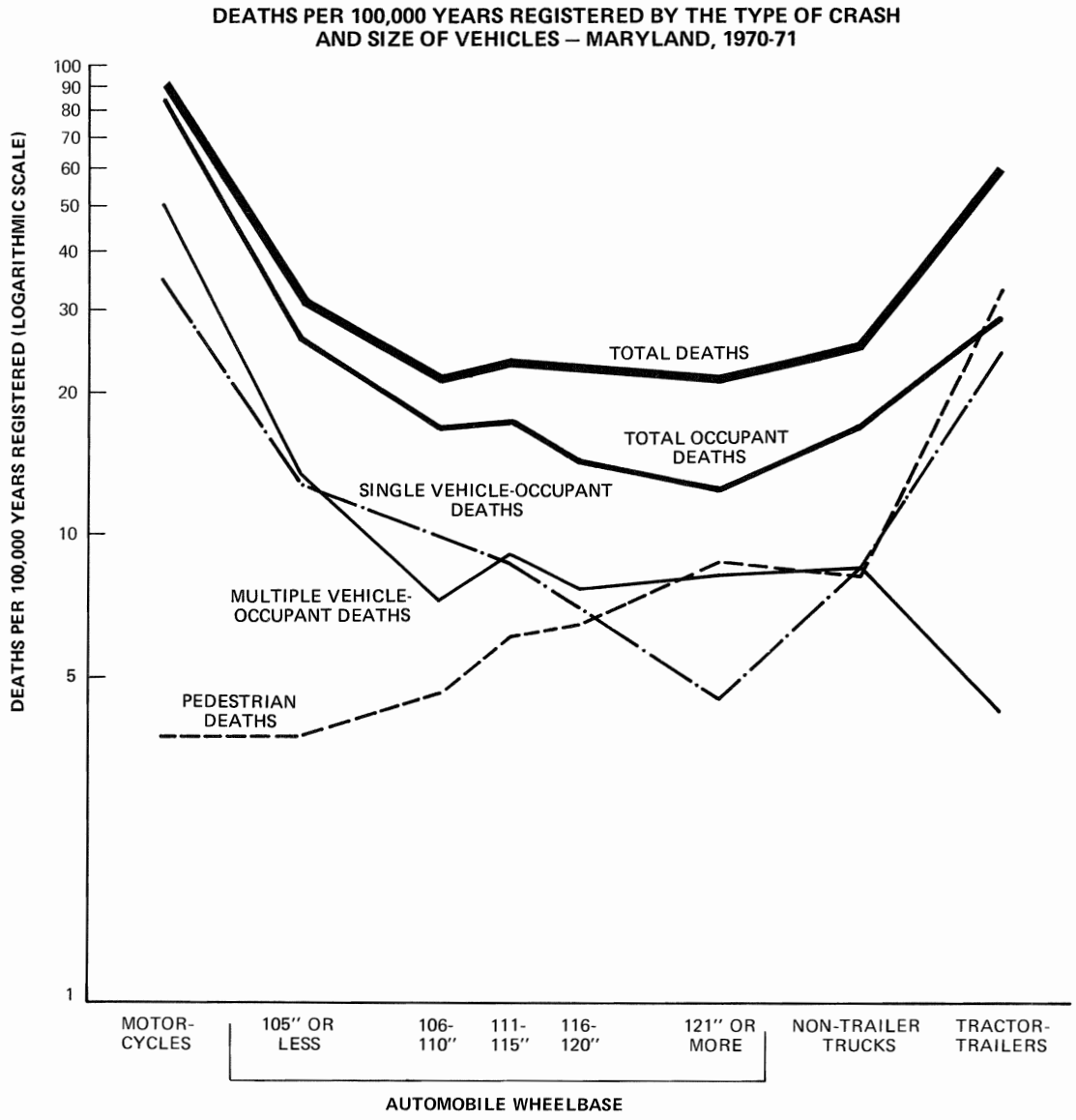
FATAL CRASH INVOLVEMENT RATE PER 100,000 YEARS REGISTERED BY SIZE OF VEHICLES – MARYLAND, 1970-71*

		Automobile Wheelbase in Inches						
Type of Involvement	Motor-cycles	105- or less	106-110	111-115	116-120	121 or more	Non-Trailer Trucks	Tractor-Trailers
Single Vehicle - Occupant Death**	35.1	12.0	9.2	8.2	6.5	4.1	8.4	25.2
Multiple Vehicle - Occupant Death**	49.9	12.6	6.9	8.0	6.9	7.2	7.3	4.2
Total in Which Occupant Died	85.0	24.6	16.1	16.2	13.4	11.3	15.7	29.4
Multiple Vehicle - No Occupant Death***	1.8	2.7	3.4	5.5	6.3	8.0	14.6	87.9
Pedestrian Death (Classified by size of striking vehicle)	3.7	3.7	4.6	6.1	7.5	8.8	8.0	29.3
Total Fatal Crash Involvement Per 100,000 Years Registered	90.5	31.0	24.1	27.8	27.2	28.1	38.3	146.6
Number of Fatal Crash Involved Vehicles	49	116	126	156	314	173	173	35
Years Registered	54,120	374,371	522,717	560,035	1,155,270	614,821	451,126	23,882

*Includes only those vehicles registered in Maryland.

**Death occurred to occupant (including driver, or any rider in the case of a motorcycle) of the vehicle described at the head of the columns.

***No death to occupants of this vehicle but death occurred in another vehicle involved in a crash with this vehicle.



The researchers found that factors other than vehicle size were not significant in the pattern of fatal crash involvement. "Regardless of age, sex, race, prior violation records of drivers, urban-rural sites, night or day, fatal crashes involve occupant deaths more often in smaller vehicles (in single as well as multiple vehicle crashes) and involve larger vehicles more often when pedestrians are killed or where death occurs in the other vehicle," they said.

MOTORCYCLES

"The very high rate of involvement of motorcycles in fatal crashes per years registered is especially worthy of note because their average exposure, in terms of miles traveled, is substantially less than that of cars and trucks . . . if it had been possible to calculate precisely fatal crashes per miles driven, the motorcycle death involvement would have been even worse relative to larger vehicles than that found in the analysis employed," the researchers said.

TRUCKS

"The much higher mileage of tractor-trailers at least partially accounts for their higher total involvement in fatal crashes. However, mileage differences do not account for their pattern of involvement,

including low occupant deaths in the tractor-trailers in multiple vehicle crashes relative to the high number of deaths in vehicles with which they crash," the researchers said. They pointed out that in multiple vehicle crashes the mass of a tractor-trailer results in forces that are usually more violent in the other vehicle.

The researchers also speculated that the absence of adequate energy attenuating crush space in front of the passenger compartment of many trucks, and the vehicle and cargo mass behind the occupant compartment, contribute to the relatively high incidence of tractor-trailer occupant deaths in single vehicle crashes, especially when the crash is into a fixed object such as a bridge abutment.

They also noted that many present federal standards, such as those that apply to head restraints, rearward displacements and energy absorbing properties of steering assemblies and occupant impacts with vehicle interiors, do not apply to trucks.

SMALL CARS

"For cars 105 inches or less [sub compacts, small compacts and small imports], the occupant deaths are so frequent as to result in their total deaths per years registered being the highest among cars, despite their low involvement in pedestrian deaths." They pointed out that the "greater vulnerability of occupants of small cars in collisions with larger cars has been found repeatedly." They noted that other researchers have found that, "for crashes between cars of the same size, severe injuries increase as car size decreases." They also pointed out that, in single vehicle crashes, "the relatively smaller deformation distance available for deceleration if any rigid roadside object is struck guarantees a higher rate of death of occupants of small vehicles."

"The vehicles found in this study to be especially dangerous – motorcycles, trucks and small cars – deserve special attention. Failure to take corrective steps to ameliorate the damage resulting from their disparate sizes relative to their masses, disparate stopping capabilities among various of the vehicles in the same traffic streams, and other inadequate energy management properties, will continue to endanger present and future generations," the researchers concluded.

The study, entitled *Motor Vehicle Sizes In 1,440 Fatal Crashes,* was conducted by Dr. Leon S. Robertson, IIHS senior behavioral scientist, and Susan P. Baker, MPH, associate professor, Johns Hopkins University School of Hygiene and Public Health. Copies of the study may be obtained by writing to "Motor Vehicle Sizes," Insurance Institute for Highway Safety, Watergate Six Hundred, Washington, D.C. 20037.

N.C. Data Dramatize Dangers In Car-Truck Crashes

When a car and truck crash, the driver of the car is "seven times more likely to be killed than the driver of the truck," according to preliminary analysis of data collected by the University of North Carolina's Highway Safety Research Center.

HSRC has analyzed crashes in North Carolina during 1973 that involved 5,653 three-axle and tractor-trailer trucks, all weighing more than 24,000 pounds. Of those trucks, 2,776 were involved in crashes with cars.

According to HSRC, preliminary analysis of the data shows:

- "About one to two per cent of all North Carolina motor vehicle accidents in 1973 involved a car and a heavy truck. A majority of these occurred on straight, level roads where the posted speed was above 35 mph. In such accidents the driver of the car was seven times more likely to be killed than the driver of the truck.

- "A total of 2.8 per cent of all accidents involving a car and a heavy truck resulted in a fatality. This is 14 times higher than the rate for car-car accidents.

- "In car-truck accidents, the driver of the car was less likely to be charged with a violation. Only 36 per cent of all car drivers were charged with a violation compared to 51.5 per cent of all truck drivers.

- "For single vehicle accidents, the fatality [per crash] rate for drivers of cars and heavy trucks was about the same: 1.2 and 1.3 per cent, respectively."

Police crash reports "indicate that truck operators report defective braking in 4.4 per cent of the cases while car operators cite brake problems in only 1.1 per cent of the cases. However, these proportions may increase when cases where brakes might not be actually defective but were unable to stop the large truck in the distance required are added. This does point up that braking problems are several times greater with trucks than with cars," HSRC said.

HSRC reported the preliminary findings in its *Better Driving* and *Highway Safety Highlights* newsletters. The study, funded by the State of North Carolina and the U.S. Department of Transportation, was conducted by Dr. Lorraine Lohman. She expects the study to be published in final version within several months. Information on the availability of the study may be obtained from Highway Safety Research Center, University of North Carolina, Craige Trailer Park, Chapel Hill, North Carolina 27514.

More Delay Proposed For Air Brake Rule

Shorter stopping distances for large trucks and buses may still be a long way off. In response to manufacturers' pleas, the National Highway Traffic Safety Administration has proposed delaying its rule to further upgrade the braking capability of newly manufactured air brake equipped vehicles. The agency's plan would also permanently exempt some vehicles, and weaken present requirements for some loaded large trucks.

Earlier this year, NHTSA had resisted efforts by truck and trailer manufacturers, the Council on Wage and Price Stability and others to indefinitely delay the first stage of the braking standard for air brake equipped vehicles. That stage of the standard (FMVSS 121) went into effect for trucks and buses on March 1, 1975. Its second stage sets more stringent stopping requirements for those vehicles starting Sept. 1, 1975. (See *Status Report*, Vol. 10, No. 2, Jan. 21, 1975.)

STOPPING DISTANCES

At the request of four vehicle manufacturers, a brake equipment supplier, a trucking firm and the American Trucking Associations, NHTSA now has proposed to delay until Jan. 1, 1978, the more stringent second stage requirements.

Under the proposal, vehicles would have to meet the following stopping requirements in the interim until Jan. 1, 1978:

- buses (both loaded and unloaded) would have to stop within distances currently required;

- trucks (unloaded), would also only have to meet the current requirements;

- trucks (loaded), would be allowed even longer stopping distances than at present.

The following chart shows the various current and proposed stopping distances in feet:

Miles Per Hour	Current Requirements For All Vehicles	Proposed Requirements For Loaded Trucks (Until Jan. 1, 1978)	Proposed Jan. 1, 1978 Requirements For All Vehicles
20	35	35	33
30	72	73	68
40	121	127	115
50	183	194	174
60	258	277	245

NHTSA said it proposed the longer distances because manufacturers claimed that "production and test procedure factors introduce sufficient variability into the performance of their products that large 'compliance margins' of overdesign must be built into each unit to assure 100 per cent compliance with the standard's requirements." As a result, manufacturers allege that "vehicle designs have reached the maximum limits of brake technology and the brake systems can produce significant lateral instability and related poor handling characteristics," NHTSA reported.

EXEMPTIONS

NHTSA also proposed that permanent exemptions be given to:

- trailers that "consist of equipment which is mounted on an axle system for convenience of infrequent shift from job site to job site," such as portable auto crushers;

- large, slow moving, non-passenger vehicles such as cranes and excavators, that "do not have a highway transportation function;"

- trailers that in a loaded condition weigh 10,000 pounds or less. An NHTSA official told *Status Report* this exemption would cover small speciality trailers, such as a horse trailer or tool trailer that can be pulled by a light truck, and that many of these trailers currently do not use air brakes.

Comments on the proposal should be sent by July 11, 1975, to: Docket 75-16, Notice 1, Docket Section, National Highway Traffic Safety Administration, 400 Seventh St., S.W., Washington, D.C. 20590.

Few Children Found 'Out Of Position'

According to an Insurance Institute for Highway Safety study – a visual survey of 4,602 child passengers traveling in more than 3,000 automobiles – only 11 children were found standing, sitting, or kneeling on the front seat floor – positions in which some researchers had questioned whether a child might be injured by air bag deployment. (See *Status Report*, Vol. 10, No. 10, May 12, 1975.)

Only 123 children – less than 3 per cent of the sample – "were observed in types of front seat positions of special interest in which the child would be contacted by the air bag early in its deployment . . . .

"Not a single one of these children was restrained by present systems requiring prior human action. Consequently, none were appropriately protected against crash injuries in the absence of air bags or other automatic restraints," the survey said.

Therefore, "children traveling in vehicles need 'passive' protection," the study concluded.

The child's position in a moving vehicle had previously been of concern to some researchers who, in widely publicized experiments with pigs and baboons, found that some of the animals, positioned on the front seat floor or suspended immediately before the dashboard, were injured in simulated air bag deployment tests.

However, the IIHS study pointed out that recent air bag technological developments suggest that the few children who "would be contacted during the early stages of air bag deployment" can be "protected by air bags." Experiments cited included:

- Nissan Co., Ltd. has refined its system to protect the child standing on the front seat floor by only partially inflating the air bag if a seat is unoccupied.

- Olin Corp. has developed an air bag system that it says "stalls when contact is made" with an out of position child and channels its pressure to envelop the child.

- General Motors has reported "favorable results" with a system based on variable inflation in its initial deployment phase and with a lower air cushion which it says " . . . produces a less direct impact on the head and upper torso of a standing child."

- Talley Industries has also successfully performed standing child tests using what it terms a "single level inflator," the IIHS study said.

Air Bags and Out of Position Children – A Survey, by Allan Williams, Ph.D., is available from the Insurance Institute for Highway Safety, Watergate Six Hundred, Washington, D.C. 20037.

Corrections

The April 28, 1975, issue of *Status Report* (Vol. 10, No. 9), reported that states had been slow to obligate almost $1.3 billion available to them for highway hazard removal. Wisconsin was shown as obligating none of its $9.1 million. Wisconsin should have been reported as obligating $816,000. B. E. Gehrmann, administrative officer for Wisconsin's Department of Transportation, said in a letter to *Status Report,* that the state expects "to use all available funds before they expire."

* * *

Status Report (Vol. 10, No. 10, May 12, 1975), in a story on a study entitled *Are 1974-1975 Automotive Belt Systems Hazardous To Children*, reported that "tests which employ 'child' anthropomorphic dummies cannot be validly interpreted in relation to injury, as has been attempted in one recent publication [*Consumer Reports*, March, 1975]."

Carl F. Thelin, Consumers Union's automotive safety engineer, has pointed out that the reference in the study applied to a February, 1974, Consumers Union child restraint evaluation, not the subsequent March, 1975, evaluation cited by *Status Report.* "The 1974 CR report did attempt to relate dynamic impact performance in terms of injury levels: uninjured, possibly injured, seriously injured or probably killed. This was not done in the 1975 report." The 1975 report listed child restraint systems as either "acceptable" or "not acceptable" and refrained from inferences of injury.

Current Standard Rapped

Better Flammability Standard Urged

Both the National Bureau of Standards and the National Transportation Safety Board have recently cited shortcomings in federal requirements that are supposed to protect people from flammable vehicle interiors.

The National Highway Traffic Safety Administration's current flammability standard (FMVSS 302) requires that the interior materials used in cars, multipurpose passenger vehicles, trucks and buses burn no more than four inches per minute when the material is tested in a horizontal position.

The current standard does not prohibit burning interior materials from giving off lethal gases. While neither the current NBS nor NTSB reports address this hazard, NBS and others have previously warned about the dangers of toxic gases released by burning materials.

NBS STUDY

The National Bureau of Standards study is the result of the agency's investigation of a series of Washington, D.C. transit bus fires. In its study, *Report of Fire Tests on an AM General Metro Bus,* NBS reported that the "interior furnishings of the bus all have [horizontal] burn rates below four inches per minute, in conformance with the Department of Transportation's Motor Vehicle Safety Standard 302." Yet, in testing the flammability of the vehicle seats, NBS found that once "the urethane seat padding catches fire a serious smoke hazard develops quickly. Within one to two minutes after the foam padding catches fire, visibility is nil within the bus. Evacuation of the bus would be imperative but would be made difficult because of the reduction in visibility."

NBS recommended that the urethane seat padding be removed from the buses or protected from ignition.

NTSB REPORT

The National Transportation Safety Board, which monitors the safety activities of the Department of Transportation, also investigated the D.C. bus fires. The board said it was "concerned not only with whether the interior materials comply with FMVSS 302, but whether the standard is adequate to provide protection for passengers." The board noted that although bus crashes involving fire are few in number, they "are not only much more severe and costly than the average bus accident, but the number of fatalities is 30 times the number per accident for all bus accidents."

As with the NBS report, the board focused on the need to provide adequate time for evacuation of a burning bus. "It is one thing for vehicle occupants to evacuate a burning automobile and yet another for a bus full of panic-stricken passengers to escape from a burning bus, especially if it is lying on its side," the board noted.

The board also pointed out that the current federal flammability standard for vehicle materials "requires that material be held in a horizontal position for flame propagation test purposes, yet at least half of the interior materials in a vehicle present a vertical surface. In an accident environment those surfaces that normally would be horizontal could become vertical surfaces. Therefore, the Safety Board believes that interior material should be tested in positions which produce the most adverse results."

The board recommended to the National Highway Traffic Safety Administration that it develop a flammability standard that would allow sufficient evacuation time from a vehicle under various post-crash positions before a "lethal environment" is created by the fire.

The board also recommended that the standard's test procedures include a vertical burn test, such as the test that commercial aircraft interior materials must meet under Federal Aviation Administration regulations.

Copies of the NBS study, *Report of Fire Tests on an AM General Metro Bus,* Report NBSIR 75-718, can be obtained for $3.25 from the National Technical Information Service, Springfield, Virginia 22151. Single copies of the NTSB study, *Safety Recommendations H-75-2 and 13,* can be obtained at no charge from the National Transportation Safety Board, Publications Section, Washington, D.C. 20594.

NHTSA Belt And Crash Test Data Rules Urged

The Center for Auto Safety has renewed its call for the National Highway Traffic Safety Administration to "establish injury criteria performance standards for active belt restraint systems" and to require regular disclosure by manufacturers of their crash test data.

NHTSA's public meeting on passive restraints "highlighted the importance and urgency of [the] two issues," the center said.

The agency denied earlier center petitions for these actions. In denying the earlier petition on crash test data, Robert Carter, NHTSA's Associate Administrator for Motor Vehicle Programs said, "This agency has adequate access to manufacturers' test data in connection with its rulemaking functions . . . ."

The center's new petition said, "While we doubt that belts can manage energy as effectively as air bags, we believe that belts should be held to at least the same injury criteria proposed for passive restraints." There are no present injury criteria or requirements for the strength of active lap and shoulder belts *in crashes.* Passive restraints must meet rather stringent crash performance requirements.

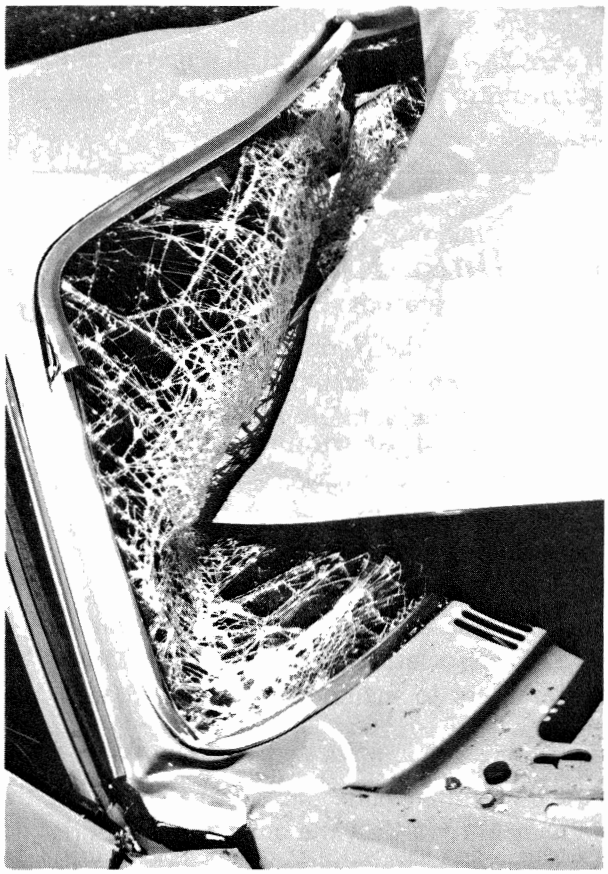
As for requiring that manufacturers submit their crash test data to the agency, statements made at the public meeting made it "apparent" that NHTSA officials were unaware of occupant restraint crash tests that had been conducted by Ford Motor Co., the center said. "Even in situations where NHTSA knows or assumes that relevant crash test data which could legally be requested from the manufacturers exists, NHTSA's goals would better be served by a required, periodic report from manufacturers concerning their crash test results," the center said in renewing its demand that the agency move to require such data.

NHTSA Prohibits 'Meat-Axe' Hoods

The National Highway Traffic Safety Administration has issued its long-awaited standard to prohibit hoods from slicing through car windshields in crashes.

The new standard (FMVSS 219) will take effect with 1977 model year cars, multipurpose passenger vehicles, trucks, and buses weighing 10,000 pounds or less. However, forward control vehicles, such as the Chevrolet Sportvan, and open-body-type vehicles with fold-down or removable windshields, such as some jeep-type vehicles, are exempt from the standard.

NHTSA's rulemaking on windshield intrusion began in 1969 with an advance notice of proposed rulemaking. In November, 1971, the Insurance Institute for Highway Safety reported to the agency that in the Institute's initial series of medium speed head-on crash tests, the hood of a 1971 Chevrolet Vega sliced through the car's windshield in a 43 mile per hour crash with a 1971 Chevrolet Impala. (See *Status Report*, Vol. 6, No. 21, Nov. 16, 1971.) Subsequently, NHTSA issued further notices of proposed rulemaking in 1972 and 1974.



1971 Chevrolet Impala windshield penetrated by "meat-axe" hood

The new standard establishes a protected zone in front of the windshield that may not be penetrated in a 30 mile per hour frontal barrier crash. Portions of the windshield beneath the protected zone may be contacted in the crash, but the windshield may not be penetrated. However, the standard exempts components designed to be routinely in contact with the windshield, such as the wipers. Those components are still allowed to penetrate the windshield in a crash.

NHTSA's 1972 notice of proposed rulemaking would have prohibited all vehicle components, including items such as wipers, from penetrating the windshield. An agency official told *Status Report* that the agency believes it unlikely that wipers and windshields molding would penetrate the windshield in crashes.

NHTSA Tests Confirm Fuel System Hazards

Rear-end crash tests conducted for the National Highway Traffic Safety Administration have confirmed earlier findings of fuel system inadequacies.

In six of the 11 NHTSA-sponsored tests, fuel leakages were reported from breaks or punctures in the fuel tank or filler pipe.

(Each of the six Insurance Institute for Highway Safety car-to-car rear end crash tests, of 1973 models, resulted in fuel system ruptures and leakages. Recent IIHS sponsored research has found that fuel system ruptures are a major source of post-crash passenger car fires. Motor vehicle fires, according to this study, are increasing at a rate of more than 10 per cent annually. See *Status Report*, Vol. 8, No. 11, May 29, 1973; Vol. 10, No. 3, Feb. 5, 1975.)

Eleven rear end crash tests were conducted for NHTSA with a moving barrier on 1968-71 model cars, at speeds ranging from 13 through 31 miles per hour. In a 19.9 mile per hour crash, a 1968 Plymouth Fury developed a leak at the joint of the filler pipe and tank and failures also occurred with this model in three higher-speed tests.

Other failures were in a 1969 Plymouth station wagon and a 1971 Ford Pinto, in 30.9 and 31.4 miles per hour crashes respectively.

The tests were conducted for NHTSA by the Federal Aviation Administration to verify the NHTSA rear end moving barrier crash test procedure for future rulemaking action and to assure the adequacy of repeatable test results.

The present federal fuel system integrity standard (FMVSS 301) sets requirements only for 30 mile per hour *frontal* collisions into a fixed barrier. A new standard, requiring car fuel systems to withstand *rear* (though not rear corner) impacts of up to 30 miles per hour with a moving barrier, will go into effect Sept. 1, 1976, by Congressional mandate.

Copies of the report, *Automotive Rear End Collision Tests,* DOT HS-801 163, may be obtained for $8.50 from National Technical Information Service, Springfield, Virginia 22151.

NHTSA Issues Tire Quality Rule

The National Highway Traffic Safety Administration has issued a rule establishing uniform tire quality standards.

The rule requires tire manufacturers to provide grading information for new passenger car tires in the areas of expected mileage, traction and high temperature resistance. The grading codes are to be molded into the tire sidewall and must also be listed on a label affixed to each tire sold as replacement equipment.

The new rule applies to all new tires manufactured for sale in the U.S. It becomes effective for radial tires Jan. 1, 1976; bias-belted tires July 1, 1976, and bias ply tires Jan. 1, 1977.

Eight major tire producers have brought suit to prevent this standard from taking effect. The suit challenges the validity of the quality grading standards alleging that they do not comply with criteria set forth in the National Traffic and Motor Vehicle Safety Act of 1966. The manufacturers asked NHTSA for a stay of the effective dates pending the outcome of their lawsuit. NHTSA denied the request.

The tire quality grading standards were ordered by the Congress in 1966. In 1974, the Congress asked the General Accounting Office to investigate why no tire standard had yet been implemented. The GAO report, issued this year, states that, the "extended delay in meeting the act's requirements can be attributed to technical difficulties in developing acceptable tire testing procedures and the safety administration's inability to provide effective leadership and resolve internal disagreements."

Small-State Bias Shown In DOT Grants

The Department of Transportation has awarded $13 million in incentive grants to 23 states and the District of Columbia for showing highway fatality rate reductions during the 1973 calendar year.

Although almost half of all the states received incentive grants, the 24 jurisdictions that benefited accounted for only about one third of the country's total population and one third of the nationwide total of highway fatalities in 1973.

This occurred because states with small populations are statistically likely to have a greater fluctuation in their highway fatality rates over a given number of years than states with larger populations during the same time span. Consequently, states are, in effect, being rewarded for their relatively small populations rather than for any significant highway loss reduction.

The Insurance Institute for Highway Safety noted this bias over one year ago, when DOT proposed its plan "to encourage effective ways of reducing fatality rates." At that time IIHS warned that the award scheme "would reward states with erratic shifts in their fatality experience and disfavor those with gradual but steady fatality decreases." (See *Status Report*, Vol. 9, No. 14, July 26, 1974.)

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