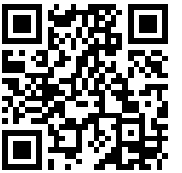

GENERAL MOTORS CONTRIBUTIONS TO AUTOMOTIVE SAFETY

Statements by

Frederic G. Donner

Chairman of General Motors

and

James M. Roche

President of General Motors

before

SENATE SUBCOMMITTEE ON EXECUTIVE REORGANIZATION

WASHINGTON, D. C.

JULY 13, 1965

STATEMENT BY

Frederic G. Donner, Chairman

My name is Frederic G. Donner. I am Chairman of General Motors. With me today are James M. Roche, our president, and Harry F. Barr, vice president in charge of our Engineering Staff.

The invitation to appear before your Committee, which was addressed to Mr. Roche and me, indicated that this series of hearings was on the subject of traffic safety and that your interest was not limited to any specific bill or proposal. We welcome this opportunity to report to you our policies and programs as they relate to today's pressing problems of safety on our highways. I believe you will find that our own objectives in this area are identical with yours. It certainly must be entirely clear that an enterprise like ours can hope to succeed only if we do everything we can properly do to promote highway safety.

May I also say, Mr. Chairman, that my associates and I wish to compliment you on your vigorous efforts on behalf of traffic safety, extending back over many years. Your efforts have had a great impact in creating public awareness of and promoting positive attitudes toward this problem.

In the engineering, development and testing of our automobiles no consideration is more important to us than safety. We are moving ahead in this area with

the help of all the scientific, engineering and manufacturing talent we can muster. These efforts go back to the very beginnings of General Motors. The safety improvement of our products has always had the full backing and support of management in our Corporation. Thus in General Motors the Engineering and Research policy groups are responsible for formulation of Corporation-wide policies that guide the development of our products. While vehicle safety is the direct responsibility of the individual divisions, these policy groups stress the need for constant attention to the safety of our products. Both Mr. Roche and I, together with our four executive vice presidents and other top executives, are members of the Engineering and Research policy groups. These policy groups work under our Executive Committee.

Today we should like to tell you what General Motors has done, is doing and proposes to do to assure that our customers will be driving safer cars from year to year when they buy General Motors cars.

Safety on the highways involves three factors—the car, the road and the driver. General Motors is concerned with all three factors and we are proud of our contributions to the improvement of all three.

Spurred on by the accelerating pace of technological advance and the growing experience and competitive pressures that come over the years, numerous safety improvements have been incorporated in our products. These improvements have ranged to every part of the vehicle and every aspect of its functions. I might mention safety glass, turret

steel tops, turn signals, windshield wipers and defrosters and better head lamps as examples of items that today are accepted as commonplace.

All of the constantly improving standards of safety have been the result of a wide variety of continuing research, engineering and testing activities. Our safety-related technical activities are conducted at the corporate staff level, by the car and truck divisions, by other divisions which supply parts and components for our vehicles, as well as by many outside suppliers, other organizations and consultants.

The focal point for the Corporation's staff activities in this field is the General Motors Technical Center at Warren, Michigan. The Engineering and Styling staffs and the Research Laboratories which are housed at the Center, all engage in extensive vehicle-safety oriented programs.

Extremely important to this many-faceted safety effort is the work done at the General Motors Proving Grounds at Milford, Michigan, Mesa, Arizona, and Pikes Peak, Colorado. Basically, our extensive and varied car testing facilities have car safety, reliability and durability as their first concern.

The Milford Proving Ground was established in 1924, the first in the industry by many years. It was our strong belief then, as it is now, that controlled testing can best produce the information needed for the continued improvement in the safety and quality of our products. Only the controlled conditions of a laboratory or a proving ground permit such testing. The experience of the past 41 years has completely

proven the need for and value of this type of test facility.

In addition to testing, important work has been done at our Proving Grounds to improve the safety aspects of highways. This work includes studies of roadside hazards and the development of more effective guard rails. We are also trying to learn what happens when we put the car and driver into given traffic situations at varying rates of speed.

As you are aware, the motor car and its equipment make up only one element in the safety equation. We need safer drivers, and the public has demonstrated its willingness to accept law enforcement measures to curb unsafe driving beyond those now in force in many of our states. In this area, your Chairman was a pioneer when he was Governor of Connecticut. Improvement in safe driving habits and law enforcement in turn go hand in hand with improvement in our roads and highways as we push ahead with measures that reduce driving hazards and increase road safety. Accident prevention and safety on our highways is a continuing and demanding problem, requiring dedicated effort all along the line. We intend to continue to work at it, and do everything we can, even in areas that go beyond designing and building the car itself.

Speed is one of the factors in the search for safety. Consequently, much attention has been directed to our relation to auto racing and the resulting promotion of speed and racing. In response to general interest in this subject, the Automobile Manufac-

turers Association adopted a resolution on June 6, 1957, recommending to its members that they refrain from participation in auto racing and from featuring references to racing and speed in advertising and sales promotion. General Motors incorporated these provisions in its own policy on participating in racing and in the resulting promotion of speed and racing. While there is much disagreement about the value of such a policy, and about the value of racing as a means of "improving the breed," General Motors as recently as February 15, 1965 reaffirmed its position in support of the AMA resolution. We continue to abide by the spirit of that resolution and of our own policy.

Beyond what we can accomplish with our own resources, there is other know-how and knowledge available. We have consistently worked with outside organizations to help reduce both the number of auto accidents and their severity. The Automotive Safety Foundation, for example, has long served as an effective channel for the constructive expression of our interest. General Motors has been one of the major contributors to this Foundation since its creation in 1937 through the Automobile Manufacturers Association.

General Motors has long supported the activities of the National Highway Users Conference. In 1932, Mr. Alfred P. Sloan, Jr., then president and later chairman of General Motors, was a co-founder, guiding spirit and the first chairman of this organization. In 1948 he was succeeded by Mr. Albert Bradley, formerly chairman of General Motors, who remained

NHUC chairman until 1956. We have also participated, since 1947, in the program of the Auto Industries Highway Safety Committee. These organizations conduct and support highway safety-related research and public information programs. Other leading organizations with which we work closely include The President's Committee for Traffic Safety, the National Safety Council and the Highway Research Board.

On technical aspects of safety we work with organizations such as the Automobile Manufacturers Association, the Society of Automotive Engineers and the State Motor Vehicle Administrators. As examples of such cooperative efforts I might cite important developmental work over the years on such items as seat belts, headlighting and turn signals. Another instance is the development of vehicle inspection standards.

We have taken, and will continue to take, further steps to bring all available knowledge to bear on the highway safety problem. The medical profession, certainly, is in a position to make a major contribution. Our industry, through the Automobile Manufacturers Association, is in close contact with the Automotive Safety Committee of the American Medical Association. General Motors has retained Dr. Donald F. Huelke, an eminent crash injury specialist at the University of Michigan Medical School, to work with us on interior body design features to reduce the frequency and severity of injuries. General Motors has also been supporting and utilizing the results of

the research carried on by Cornell and Wayne State universities, directed to improvement of passenger protection and minimizing injury in the event of accident.

In a major new program, General Motors is making a grant of $1,000,000 over the next four years to the Massachusetts Institute of Technology as a contribution toward a long-range research effort aimed at safer and more efficient highway transportation. Due to the complexity of the problem, it is expected that the effort will extend over a period of years. Plans for specific areas of study are now being defined. The need for such a broad research approach has been demonstrated by the fact that there is considerable difficulty in interpreting the available statistical data in a meaningful way. Accident reports are not made in a uniform manner, and accident records are combined into gross averages in such a way as to make an analysis of causes of accidents most difficult. It has long been recognized that a systems engineering approach to this overall highway safety problem has been needed, but experts trained in this field are nonexistent. M.I.T., one of the recognized world leaders in systems engineering, will undertake an engineering study in this area and train the kind of people who will be needed for work in this field.

This study will be a long-range, in-depth, quantitative analysis of all facets of the safety problem—the car, the road, the driver and their various interactions.

I am sure that you understand the complications and complexities of the safety problem as well as we

do. It involves a great many variables, some not susceptible to ready measurement or analysis. The problem embraces moving machines containing thousands of parts, driven at widely varying rates of speed on all kinds of highways under many conditions by all sorts of people.

Our job is to build a product that performs the job the customer expects it to do, under all sorts of conditions, under wide ranges of care and maintenance and often in the hands of a driver with little skill. And we must have a product that the customer will buy. The task of balancing these elements in the final design of the car is not an easy or a simple one.

Some things must be built into the motor car because they are essential to its operation. Examples are brakes, steering and lights. Other items must be sold to the customer on their merits. That is, the customer must be convinced of their usefulness and of the contribution they can make to his own safety and that of others. In this latter category, for example, were turn signals, first introduced by GM in 1939. Since they were part of an inter-car communications system these signals have impact on the safety not only of the occupant but of a great many other drivers he meets on the road. This should have been self-evident and one might assume that the potential safety contribution of turn signals would have been readily and universally recognized. This, however, was not the case and only a small minority of our customers ordered turn signals when they were first available as optional equipment.

Similarly, seat belts were ordered by only a very small percentage of our customers when they were first introduced as options on the 1956 models. As late as 1962, only about 10 percent of our cars were sold with seat belts. However, when seat belts were made standard equipment, subject to deletion only on specific request of the buyer in 19 states not requiring them by law, seat belt installation rose to 95 percent.

In this connection you will be interested in a disclosure of a Gallup poll released to the press on July 4, 1965. The researchers reported that of car owners with seat belts installed in their cars, only 36 percent said they used the belts "always"; 49 percent used them "some of the time", 14 percent "never" used them and 1 percent could not say. This disclosure is the more astounding in view of the substantial public education job that has been done by a variety of safety-oriented organizations—including General Motors—in attempting to convince the public of the wisdom of using seat belts at all times.

As manufacturers we need the support of the public —public acceptance of the new safety devices that become available. These items must also be thoroughly tested, under the controlled conditions of the proving ground and laboratory of which I spoke earlier. We do not propose to sell our customers untried equipment items.

This brings up the question of optional vs. standard equipment. The decision to offer an item as optional equipment recognizes what I believe is the basic

freedom of the customer to pay the cost of tailoring a car to his own specifications or rejecting whatever he may not want. From a commercial standpoint, in a competitive market place, this must be the approach until a very high proportion of customers select the item or unless there are other compelling reasons for standard installation. When this point is reached, the items can be included as standard equipment and required selling price adjustments made to cover the additional costs involved.

I come back again to the climate of public acceptance. If we were to force on people things they are not prepared to buy, we would face a customer revolt.

For these reasons the improvement of our automobiles—in the safety as well as in other areas—has been evolutionary. This process is continuing. Specifically, as we announced on July 7, our 1966 models will include as standard equipment on all cars a number of items previously available as optional or standard equipment on nearly all GM cars—outside left-hand rear view mirror, dual speed windshield wiper and washer, padded instrument panel, back-up lamps, padded visor and rear seat belts. Other items, which Mr. Roche will discuss in more detail, are also part of our cars today.

We believe that our approach to the goal of maximum vehicle safety has been a practical one. We have incorporated those features which have been proven by thorough testing under controlled conditions. This will continue to be our approach as new safety ideas emerge. When such ideas have been tested they will

be translated into hardware and made available to our customers.

I should also like to remind you that there is no iron-clad yardstick for engineers to use in determining what represents the optimum in vehicle safety conditions. Very often this is a matter of opinion. For example, views as to what constitutes a "safe" car interior vary.

We know very well that government at various levels has a role to play in regard to the safety problem. We view traffic safety promotion as primarily the responsibility of state and local governments, because these echelons of government are most familiar with local conditions that must be taken into account if successful programs are to be developed. At the same time, we recognize that there is an important role for the Federal government as well, primarily one of encouraging and assisting the states. We will continue to cooperate fully with any agency of government, at whatever level, concerned with the safety problem.

In conclusion, may I say that we have a real sense of pride in what we as manufacturers have done over the years to make driving safer on our highways. It is a problem we will continue to attack, and we will use our own extensive facilities and talents in this never-ending job. We will continue to study both on our own and in conjunction with interested industry groups, medical associations and institutional groups, all aspects of the safety situation. We will continue to cooperate with and seek the assistance of outside

experts, to the degree that such cooperative programs promise to make a real contribution to our objectives. These objectives include improvement in the highways and the driver as well as in the car. We have every reason for building cars that perform safely and reliably.

With your permission, Mr. Chairman, I would now like to present my associate, Mr. Roche, who will cover in more detail what we have done, are doing and propose to do.

STATEMENT BY

James M. Roche, President

Mr. Donner has stated the position and policies of General Motors with respect to highway safety.

My comments, therefore, will concentrate on what the Corporation has done and its significant contributions to the overall improvement of traffic safety in this country.

General Motors shares with all responsible citizens the desire to help reduce the toll of deaths, injuries and property damage caused by traffic accidents. The current high standards of safety engineered, tested and built into General Motors products are the result of continuing improvements which have been incorporated in our products year after year.

From the early days of our industry, General Motors vehicles have been improved by this continual and cumulative addition of safety features. Today we take these improvements for granted, but in their day they were revolutionary. It was not until after 1910 that all driver compartments were equipped with doors to keep the occupants from falling out. The same era saw the advent of demountable split tire rims, eliminating the hazard of the rim popping off while tires were being inflated.

Mechanical shock absorbers became standard equipment between 1915 and 1920, providing better

steering control on rough roads. Rear view mirrors and stop lamps—among other safety features—date from the same era.

The 1920's saw many additional advances. Four-wheel brakes replaced two-wheel brakes, substantially reducing stopping distances. Headlighting systems were improved and automatic windshield wipers came into use. Safety glass replaced ordinary glass in windshields. Dual tail and stop lamps were introduced, as was the footswitch for headlight beam control. The synchromesh transmission (a General Motors innovation) made positive gear shifting easier and thus improved the driver's ability to control the car, particularly in hilly or mountainous country. Hydraulic shock absorbers replaced mechanical ones and further improved vehicle stability. Adjustable front seats made it safer and easier for the driver to operate foot pedals and steering wheel.

The decade of 1930-1940 saw the advent of numerous significant safety improvements. Welded all-steel bodies increased structural strength for greater protection of the occupants in the event of an accident. Hydraulic brakes replaced mechanical brakes, resulting in better brake equalization and distribution of the braking effort between front and rear wheels. General Motors developed independent front suspension, replacing the solid axle, which gave better steering and ride control. Sealed beam headlights, a hermetically sealed unit, provided increased road illumination and service life. Steering wheels with cast spokes and wood rims were replaced with safety-

type spring steel spokes and a plastic rim. This eliminated the hazard of wood splinter injuries from the rim on impact. Also, the new spring steel spokes would give or bend on an impact, an energy-absorbing characteristic not possessed by the cast iron spokes.

Also in the 1930's, no-draft ventilation (another GM first) improved air movement inside the car and reduced fogging on the windshield and other glass areas. Passenger visibility was improved by new, slanted windshield design and a significant increase in overall glass area of cars. Windshield defrosters also contributed to better visibility in adverse weather.

Factory-installed directional signals gave positive indication of direction of turn, day and night. General Motors' Hydra-Matic transmission was the first automatic transmission in the industry. It improved safety by simplifying driving and eliminating the fatigue of manual gear shifting. The driver was free to concentrate on the road and to keep both hands on the wheel at all times.

In the post World War II period, a number of innovations were added in the safety area.

Of particular importance was the further increase in glass area of our cars during this period, providing an even larger field of vision for the driver. The cumulative improvement in this area is best demonstrated by the fact that a 1965 Chevrolet contains 4,000 square inches of glass area, almost twice the 2,134 square inches in the comparable 1935 model.

"E-Z-Eye" heat-absorbing glass, introduced in the first GM cars in 1950, reduced heat and glare from

sun and snow. Power assists for steering and braking became available, reducing driving effort which enhanced the driver's ability to control the vehicle, particularly under severe driving conditions. Spherical or ball joint front suspension improved stability and steering control.

Further advances were made in headlamps. Seeing distance provided by the lower beam along the right side of the road was increased, allowing the driver to see at greater distance both pedestrians and obstacles. The light intensity of the upper beam was increased, extending distance vision on the whole road area.

Seat belts were introduced and the steering wheel configuration was improved to reduce injury hazard in the event of a collision. The center of gravity of vehicles has been lowered substantially over the years, improving vehicle stability.

Since 1935, on a regular Chevrolet the center of gravity—the point at which the car's weight will balance—has been lowered from 24.8 inches to 19.6 inches. This is a reduction of over five inches—or more than 26 percent—in center of gravity during the past 30 years. Similar lowering of the center of gravity has been achieved on the other General Motors car lines. These changes have made our cars less top heavy and more sure-footed, decreasing the possibility of roll-overs.

We have film footage and data concerning earlier destructive tests run with cars on what we now call the "J" turn. A 1935 car traveling at about 50 miles

per hour on a grass field would roll over when put into a severe "J" turn. Today's automobile, even at higher speeds, is almost impossible to turn over in the same type of sharp turn unless the outside wheels strike an obstacle. This "J" turn test is included in the GSA specifications for testing the ability of tires to remain inflated during such a turn at 50 miles per hour on a concrete surface.

Our modern frames, which are much sturdier, have also contributed to this increased stability. New design concepts have allowed us to lower the side rails for a lower car and these rails are integrated more closely with the body than those of earlier years. This provides greater rigidity and strength for the overall body structure.

In the area of brakes we have added self-adjusting brakes which automatically insures that the brakes are properly adjusted. A new hermetically sealed brake master cylinder prevents corrosion and subsequent leakage. In addition, improvements were made in brake linings and drums to provide longer life and more positive action.

A higher capacity alternator has replaced the generator, providing better and more reliable performance of lights and other electrical equipment.

In the body itself, a number of improvements have reduced the potential for occupant injury. These have included such items as stronger front seat mountings, improved retention of rear seat cushions, front seat belts and smoother sunshade supports which are more flush to the headliner.

Because of their importance to occupant safety, door locks have been a matter of constant concern and study by General Motors. Locks have undergone constant improvement over the years, with a major new concept being introduced in 1955 cars as a result of an extensive development and testing program. Since that time additional improvements have been made in General Motors door locks, including a further refinement for 1966 models.

This recital of typical safety improvements incorporated in General Motors U.S. cars over the past decades is by no means complete. However, the examples I have listed will serve to illustrate that this process of building greater safety into our automobiles has been a continuing one for a long time.

These improved standards of General Motors products have resulted from a wide variety of research, engineering and testing activities throughout the Corporation, as well as by many outside suppliers, other organizations and consultants. We are certain that this continuing progress will allow us to build still safer cars in the future.

Extremely important to vehicle safety, as indicated by Mr. Donner, are the activities conducted at the General Motors Proving Grounds located at Milford, Michigan, Mesa, Arizona and Pikes Peak, Colorado. Because of the vital role they play in our vehicle safety efforts, I would like to outline some of these activities in more detail.

Our proving ground facilities allow us to give GM vehicles punishing and controlled testing on types of

roads and under conditions far exceeding those of normal driving. Since 1924 more than 323 million test miles have been run on GM cars at the three proving grounds, with a substantial portion of this testing bearing importantly on safety. During 1964 alone, nearly 22 million test miles were run on GM cars at the Proving Ground.

In this connection, our own Proving Ground accident statistics are most revealing. Since 1935 the national death rate per hundred million miles traveled has been 7.7, averaged over the entire period. This compares to the Proving Ground rate of .74 during the 1935 to 1964 period.

With respect to injury rates—based on National Safety Council statistics which classify an injury as one which results in loss of work time beyond the day of the accident—the data shows an even more striking relationship. Between 1950 and 1963, the average national injury rate on public highways was 213 per hundred million miles, compared to 7.3 injuries per hundred million miles at the GM Proving Grounds. This means that the death rate at the Proving Grounds has been less than one-tenth of the national average and the injury rate has been about one-thirtieth of the national average.

Obviously, the controlled driving conditions of our proving grounds are not the same as those experienced on the nation's public roads. However, except for intentional accident testing, our drivers are provided with the same safety equipment provided to our customers. As a result, proving ground driving does

demonstrate that General Motors cars—assuming proper maintenance and driven by safe drivers even under very strenuous and severe conditions far beyond those of the typical car—have high standards of inherent safety and durability.

One of the most unusual test roads at the Milford Proving Ground is made of worn granite blocks embedded in concrete. Years of data have verified that the bumps, irregularities and contours of this Belgian Block Road are ten times tougher on vehicle bodies, frames and suspensions than most secondary roads. We also have a special "Ride and Handling Loop" which is a winding road, largely concrete and blacktop—full of cracks and potholes—on which we run additional tests for handling and steering. A high-speed track allows us to test cars at sustained cruising speeds of 70 miles an hour to simulate conditions of long-distance travel on modern turnpikes. In addition, our cars are tested at much higher speeds to determine tire and handling performance.

In both laboratory and road programs, GM Proving Ground engineers use a wide variety of advanced equipment which makes possible a breadth and acceleration of test programs undreamed of even a decade or two ago.

Electronic computers have revolutionized the automotive testing process. Highly sensitive instruments for measuring virtually any characteristic of the automobile have infinitely improved the accuracy and reliability of our studies.

The use of high-speed photographic equipment is

an everyday occurrence at the Proving Ground to record vehicle safety tests, such as steering, braking and cornering. This equipment has a capability of taking up to 26,000 pictures per second to show in minute detail exactly what happens to the vehicle, components and occupants at every split second of an emergency or crash sequence.

Highly sensitive magnetic tape recorders are used in test vehicles at the Proving Grounds to record as many as 14 different test signals at one time. Information on temperatures, pressures, acceleration, displacements, stresses and strains are recorded immediately for later detailed analysis.

To meet the need for specialized equipment which does not exist commercially, proving ground engineers have developed such devices as a "Time-Distance Oscillograph" to measure acceleration, electronic stethoscopes to detect body and engine noises, special vibration detectors, an electronic "ride and roll" machine to measure the car's "feel" in terms of steering, chassis and front and rear end suspension and numerous other special gauges and recording instruments.

A good example is a brake testing instrument which permits operation of brake pedals by a controlled and repeatable means. This eliminates the variables introduced by even the most skilled test driver. The brake test instrument presents a complete graph of such variables as brake line pressure, pedal travel, vehicle deceleration or brake pedal force as soon as the vehicle has completed its test brake stop.

Specialized lower-power telemetry transmitters have been developed to permit the compilation of data from almost inaccessible locations.

The proving grounds testing, it should be pointed out, supplements equally long and gruelling laboratory and other road testing conducted both by the car and truck divisions.

Of great importance to our objective of building ever safer cars is the program of crash testing conducted at the General Motors Proving Grounds.

Since the program was established in the early 1930's, hundreds of vehicles have been crashed in tests. In 1964 alone, 79 vehicles containing instrumented life-size dummies were smashed in various types of crash situations.

Important correlated tests were conducted with two types of special equipment which simulate crash conditions without destruction of the vehicles. One is a so-called "snubber" device on which a trailing cable jerks the car to a sudden stop. The other is an impact sled, developed by General Motors in 1962.

Test equipment can be mounted on the impact sled at any angle or position to duplicate virtually any crash situation. It has the latest instrumentation for precise recording of tests, and photo floodlamps make possible high speed movies of complete sequences. This equipment is used in evaluating every vehicle interior part that affects occupant safety.

Actually, the sled duplicates deceleration conditions of an auto crash—but in reverse. From a standing start, the vehicle and components are generally

subjected to about 20 G's—twenty times the force of gravity. The basic effects on the car and occupants are the same as in an abrupt stop by a vehicle.

Information from this extensive crash test program —both real and simulated—provides General Motors engineers and designers with valuable insights which have led to improvements in structural design of motor vehicle components such as frames, suspensions, steering, roofs, doors, door locks, windshields, steering columns, and seat belts, to name only a few. This information also aids our designers in evaluating the injury potential of interior panels, hardware, controls and many other items so that improvements can be made.

While our own data were supplemented in some cases by other limited crash statistics, it is important to point out that much of this information is simply not available to us except through our own test programs. It also should be remembered that many of the improvements we have made were based on technological advances which made their earlier development impossible.

Here are some specific examples of how these crash tests—both real and simulated—have given us valuable information which have led to continuing improvement in the safety characteristics of our cars.

I have already mentioned our work with door locks. Much of the improvement made has resulted from the data provided by these crash testing programs.

Cornell Automotive Injury Research data indicated that many severe injuries were caused by the

fracture of the windshield by occupants in collisions. In 1962 General Motors launched an intensive research and development program in this area. Working in close cooperation with the glass companies, the chemical companies and with other auto companies participating, it was proved that a thicker layer of laminate between the glass would reduce the severity of head lacerations. More than 300 crash tests were conducted at the GM Proving Grounds and at Wayne State University as a part of this program. The result of this work is a new windshield glass which nearly doubles occupant penetration protection. It will be used on all General Motors cars in 1966.

Seat belts are another good example. GM first offered seat belts as optional equipment on its 1956 models. Since that time, our seat belts have always exceeded the minimum standards established for the industry by the Society of Automotive Engineers.

On the basis of more accurate data regarding the contributions made by seat belts reducing the severity of injuries, the SAE has increased its loop load specification from 3,000 pounds in 1955, to 4,000 pounds in 1958 and to its present standard of 5,000 pounds in 1963. During this period, General Motors has conducted extensive research and testing—particularly with crash activities—to be sure that our seat belts always exceeded the SAE standards.

These programs of research and testing—past and present—demonstrate the extensive efforts which GM is devoting to the continual improvement of safety standards in our automotive vehicles. Our market

success depends on how well we design and build automotive vehicles to satisfy the needs and desires of the public each year. We must be, and are, sensitive and responsive to changing conditions, attitudes and requirements that characterize the role of automotive transportation in the United States.

Over the years, extensive networks of highways have been built. The new interstate and defense highway system program has already added more than 19,000 miles of modern safer highways and another 17,000 miles are underway, and another 5,000 miles will be started in the next few years. These highways connect to other improved roads and modern freeways within the states and in and around our major cities.

The contribution of the interstate system to traffic safety was demonstrated by accident statistics over the fourth of July weekend which indicated that driving on the interstate freeways was twice as safe as driving on other roads.

The expeditious movement of all kinds of goods and materials to every part of the country has become a reality. Americans have the opportunity—which they are making the most of—to travel anywhere in the nation within a few days in their own personal transportation vehicle, the automobile.

Evidence of this rapid increase in motor vehicle travel can be seen in the dramatic rise in recent years of total miles driven by automotive vehicles in this country. From 1954 to 1964, total miles driven in the U.S. jumped from 561 billion to 838 billion—an

increase of almost 50 percent. The number of motor vehicles registered in the U.S. rose from 58.5 million to 86 million—an increase of 45 percent.

The automobile manufacturers have responded to the desires and demands of the motoring public by providing better all-around vehicles capable of sustained high-speed travel on modern freeways. The average car of the 1920's did not have the capability of sustained high speed and few highways could be traveled safely even at 60 miles an hour. Today's rural freeways are being built with design speeds of 70 miles per hour or more. And statistics prove that the modern automobile travels on these highways with greater safety than did earlier models on the roads of their day.

In the period between 1935 and 1961, when U.S. car manufacturers were building improved steering, braking, structural strength and durability into their cars to meet the modern needs of the motoring public, the national highway death rate dropped dramatically. It decreased from 15.9 deaths per hundred million vehicle miles traveled in 1935 to 5.2 deaths per hundred million miles traveled in 1961—less than one-third the rate of 26 years before. Between 1958 and 1963, the rate remained in the 5.2 to 5.6 range, although slight increases were recorded in the past three years to reach a level of 5.7 in 1964.

While the reasons for this reversal are not clear, it represents a very serious problem. Obviously, the many activities which have been conducted in this country over the years to reduce traffic accidents

must be intensified. In addition to research and development efforts by the automobile manufacturers to design and build ever higher standards of safety into our vehicles, it is important that greater emphasis be placed on improving the quality of roads, drivers and vehicle maintenance.

The importance of proper vehicle maintenance to overall highway safety is given special emphasis by the fact that the average car on our roads today is six years old and the average truck is eight years old. Twenty states have compulsory vehicle safety inspection. In three states recognized as having among the better managed programs, the rejection rate on safety checks during the latest year in which figures were available ranged from 35.9 to 54 percent, with most of these defects being caused by lack of proper maintenance.

Recognizing the vital role of adequate service facilities and proper vehicle maintenance in traffic safety, every General Motors dealer accepts important service responsibility before he receives his franchise. We have worked closely with our dealers over the years to build good service organizations. In recent years, we have intensified our efforts to improve the quality of dealer personnel and their mechanical skills in servicing auto vehicles.

Of particular importance to our objective of providing quality servicing at our dealerships is a system of 30 General Motors training centers strategically located around the United States to train dealer personnel, with the emphasis on mechanic training.

In the ten years that our training centers have been in operation, auto mechanics from GM dealerships have received more than 22 million hours of instruction in proper vehicle maintenance procedures.

Since 1959, we have conducted a strong advertising and promotional campaign called "Guardian Maintenance" to impress car owners with the need for regular and competent preventative maintenance as a guard against possible mechanical troubles which could cause accidents.

Cars and trucks have become a vital necessity to our way of life and to the performance of our work. At the same time, we recognize that the increasing movement of people and goods by motor vehicles contributes naturally to a higher possibility of accidents. This imposes new responsibilities on all of us. Automobile manufacturers must continue to seek all possible ways in which the built-in protection for car occupants can be improved. And public officials at every level of government must provide the means by which safer driving is facilitated through proper laws, regulations and their enforcement.

In recognition of our responsibility, General Motors cars for 1966 will continue the evolutionary improvement in safety carried out over the years by incorporating as standard equipment a number of items previously available as optional or standard equipment. As Mr. Donner has said, these will include outside left-hand rear view mirror, dual windshield wiper and washer, padded instrument panel, backup lamps, padded visor and rear seat belts. I have also

discussed other safety improvements which will be incorporated in our 1966 models.

As you know, many of these items are included in the specifications of the General Services Administration for all government cars purchased beginning with the 1967 model year.

With respect to other GSA specifications, I would like to point out that General Motors cars already have a standard gear quadrant, safety glass, standard height bumpers, as well as door latches, hinges and anchorages for seats and seat belts—all of which meet or exceed the standards established.

Our 1965 tires, with proper inflation pressures, meet the current Tire and Rim Association specifications. These specifications are in the process of being modified for next year and our 1966 tires will meet these new standards. In both years, our tires —with proper inflation pressures—meet both the T & RA and GSA requirements.

With regard to air pollution control, we have developed a system which we expect California authorities to certify tomorrow (July 14). While this is one of the GSA requirements for 1967 model vehicles, the economic advisability of such an expensive program on a national basis is questionable since there is not yet a clear indication on the basis of available technological data that it is needed in most areas of the country. However, if the need for the system nationally is proven, it could be made available as soon as the necessary field testing in other parts of the country can be completed and tooling

accomplished.

General Motors is currently producing dual braking systems. However, engineering opinion in the industry differs as to the need for such systems. If agreement on the need for dual brakes is reached, they could be installed on our cars beginning with the 1967 models.

With respect to glare reduction for instrument panels and windshield wipers, our 1966 cars will meet the GSA standards.

Progress has been made in the recessing of instrument panel controls and further improvements will be evident in our 1966 and 1967 models. It is important, however, to point out that easy accessibility of controls is in itself an important safety requirement.

Front seat head rests will be available as optional equipment on all General Motors cars beginning in 1966.

GSA steering column specifications for 1967 model vehicles require that the force developed during the collapse of the wheel shall not exceed 2,500 pounds and that the steering column shall not be displaced rearward more than five inches in a 20 mile per hour barrier crash test. Our current steering columns on our 1965 models more than satisfy these requirements. And further development on steering columns is continuing.

At this time, our plans do not include the installation of anchorages for shoulder harnesses. We have conducted extensive tests and studies of this device. Some of these tests have indicated that in a severe

impact situation, shoulder harnesses can do more harm than good. While the harness does restrain the car occupant's forward motion, it also can deflect the impact force into a downward motion, forcing the occupant farther down under the seat belt. This downward force can result in highly injurious pressures on the abdominal area.

A shoulder harness also can exert dangerous pressure on the occupant's neck, particularly in the case of a relatively high speed side impact.

For these reasons, we are convinced that further development and testing of shoulder harnesses is needed before they can be considered as standard equipment.

At the present time, there is no clear-cut expression of need for the four-way flasher system on all automobiles. This system was originally designed for emergency vehicles which perform a service on the highways, was later used on school buses and since 1960 has been required for all vehicles subject to Interstate Commerce Commission jurisdiction. The desirability of the flasher light system for stalled cars has been emphasized by the increasing danger of collisions due to the difficulty of observing stalled cars along today's higher speed and more heavily traveled roads. However, we believe that today's cars already have an effective flashing system in the form of turn signals. In addition, the four-way flasher system is actually prohibited by regulation in several states. For these reasons General Motors does not plan to make this system standard on its 1966 cars, but it

will continue to be available as optional equipment.

All 1966 models of General Motors cars will have as standard equipment 13 of the 17 safety items which will be required on all government-purchased cars in 1967. I have discussed the four-way flasher, shoulder harness anchorages and air pollution control system. As I have indicated, engineering study continues on the dual braking system.

These and other improvements which I have mentioned will increase still further the safety of General Motors cars.

With respect to the future, many projects are being diligently pursued throughout the Corporation in hopes of further improvements in automotive design. In addition to basic work involving major components such as engines, transmissions, brakes, suspensions and steering, we also are investigating many other areas offering potential improvements in safety standards.

One important project seeks to establish scientifically the degree of protection necessary in various areas of the car interior to decrease the extent of injury. This project is being conducted in cooperation with Wayne State University.

Many other safety-oriented projects are being given priority attention by Corporation staffs, car and truck divisions and their supplier divisions. While some are concerned with further improvement of existing equipment, many represent wholly new concepts and devices.

We would like to invite this Subcommittee to come

to Detroit as a part of its hearings so that we could show you firsthand the scope and variety of safety research and testing which General Motors is doing. We believe such a visit would be highly informative. It also would be helpful in obtaining a clear and comprehensive understanding of the part that car design plays in the total highway safety field.

Outside of the area of automotive design, our Corporation over the years has devoted extensive efforts to the improvement of highway safety on all fronts. Mr. Donner has commented on industry and General Motors' activities in cooperation with a variety of safety organizations, government agencies and universities on the broad problem of highway safety.

General Motors also carries on a variety of activities of its own. Included is a program of sharing with dealers the cost of cars loaned for high school driver training purposes. Since 1955 more than 40,000 cars have been made available through this program making it possible for more than three million young people to be properly trained in safe driving habits.

For more than 30 years, General Motors has carried on an extensive public information program to promote safe driving. This program embraces mass distribution of safety booklets, films and a special magazine for newly licensed drivers. These activities, along with our extensive efforts to continually improve product safety, demonstrate that General Motors has supported its strong interest in highway safety with constructive, vigorous action.

In conclusion, let me say again that General Motors has a vital interest in highway safety and we share the concern of Senator Ribicoff, this Subcommittee and the many others who are working to reduce highway accidents.

We believe that automotive design for safety is most important and General Motors has always considered this a number one priority in its forward product design.

Today's General Motors cars reflect the steadily advancing technological competence of our people and facilities, as well as extensive programs of research, development and testing in all areas of the vehicle which contribute directly and indirectly to safety. We must be guided in our work by the total information available to us as a result of our own research and testing, and equally important, from the data compiled by many other organizations in this complex field.

At the same time, safer automobiles cannot be viewed as a panacea for this highway safety problem. It is vital that extensive efforts be concentrated on correction of road, driver and vehicle maintenance deficiencies. The state and local governments have the major responsibility in this area, particularly with respect to sound traffic laws and their enforcement, mandatory motor vehicle safety inspection, improved standards of driver licensing, expanded driver education programs, and the provision of good roads and streets.

The safe operation of automobiles must take into

account widely varying conditions in all parts of the country. Speed conditions on a straight prairie road in the far West are quite different from those encountered on limited access highways in the East or the mountains of West Virginia. Vehicle performance and durability in a New England winter varies substantially from that in the heat of Arizona. These and countless other local conditions affect vehicle operation differently and thus require latitude in inspection procedures.

Local communities and states are obviously most familiar with their own conditions with respect to the safe operation of automobiles. The traditionally strong responsibility of local communities in traffic safety is emphasized by the fact that—even with the developing systems of interstate freeways—almost 80 per cent of all automobile trips are less than 10 miles in length.

We believe the Federal government also has an important role in highway safety—in encouraging and assisting the states and local communities in carrying out these important objectives, as well as providing funds for research in this complex field and in the continued improvement of our highways. General Motors stands ready to give full cooperation to any government agency—at the local, state or federal level—in the interest of improved highway safety.

GM also plans to intensify its already broad participation in, and support of civic agencies or other organizations seeking to advance traffic safety prog-

ress on all fronts. In addition, GM will devote even greater efforts to its own programs in this important field.

We want to thank you, Mr. Chairman, for giving us the opportunity of appearing before this Subcommittee and to discuss with you the broad scope of our contributions over the years to highway safety. With respect to the future, we welcome advice and support which can help us to contribute still further to this objective—which is a matter of vital concern to our country and to our industry.