STYLING vs. SAFETY

The American Automobile Industry and the Development of Automotive Safety, 1900-1966

Joel W. Eastman

STYLING vs. SAFETY

The American Automobile Industry and the Development of Automotive Safety, 1900-1966

Joel W. Eastman

Dean Rules
Bexner
Wagner
Smith

UNIVERSITY PRESS OF AMERICA

LANHAM • NEW YORK • LONDON

University Press of America,™ Inc.

4720 Boston Way
Lanham, MD 20706

3 Henrietta Street
London WC2E 8LU England

Printed in the United States of America

Library of Congress Cataloging in Publication Data

Eastman, Joel W., 1939–
Styling vs. safety.

Originally presented as author's thesis (doctoral–University of Florida)
Bibliography: p.
Includes index.
1. Automobiles–Safety measures–History. I. Title. II. Title: Styling versus safety.
TL242.E24 1984 363.1'25'0973 83–21859
ISBN 0–8191–3685–9 (alk. paper)
ISBN 0–8191–3686–7 (pbk. : alk. paper)

All University Press of America books are produced on acid-free paper which exceeds the minimum standards set by the National Historical Publications and Records Commission.

Dedicated to

Claire L. Straith, Hugh DeHaven
and all of the other pioneers
of automotive safety

ACKNOWLEDGEMENTS

No research project is entirely the work of one person, and such is the case with this study which would not have been possible without the cooperation and assistance of scores of people. I would like to express my appreciation to those who agreed to be interviewed in person or on the telephone, allowed me to examine their personal papers, and answered questions and forwarded materials through the mail. I utilized the resources of numerous libraries and archives, but a few deserve special mention. The bulk of my research was carried on at Baker, Houghton and Weidner libraries of Harvard University, but the specialized collections of the Detroit Public Library, Henry Ford Museum, University of Michigan, and Syracuse University were vital to my work.

The original version of this study was written as a doctoral dissertation in history at the University of Florida but the major portion of the research was undertaken at Harvard University while I was serving as Assistant Editor of the Business History Review and Coordinator of the Business History and Economic Life Program, Inc. I must thank Arthur M. Johnson for engineering this arrangement and James P. Baughman for continuing it and for offering insightful suggestions about the direction of my research. David L. Lewis of the University of Michigan was extremely supportive in the early stages of my work and provided personal insights on the nature of the contemporary automobile industry. John K. Mahon, chairman of my supervisory committee, guided me through the long process of writing the dissertation with patience and good humor. John B. Rae of Harvey Mudd College, James J. Flink of the University of California at Irvine, and Leon S. Robertson of Yale University all gave generously of their time to read and comment on the manuscript and have been extremely supportive of my work. My wife, Linda J. Eastman, typed the first two drafts of the manuscript and aided me in solving many problems of composition and documentation. The revised draft was typed by Laura Graham and the final one by Patricia Peck.

TABLE OF CONTENTS

INTRODUCTION

When Charles E. and J. Frank Duryea placed a small, internal-combustion engine in a modified horse-drawn buggy in Springfield, Massachusetts, in 1893, the first step had been taken toward a revolutionary change in the highway transportation system of the United States and in American life. Within a generation road transportation had been almost completely "motorized" -- mechanical power substituted for animal power in highway vehicles -- and the motor vehicle had become the most important means of transportation in the country.

The motorization of the highway system was begun without any formal consideration of either how the motor vehicle might serve the transportation needs of the nation or what effect a change from animal to mechanical power might have on the economy, efficiency and safety of the road system. Motor car enthusiasts uncritically touted the many expected benefits of the transition. Some predicted a great revolution in transportation, but a positive one which would bring more freedom and a fuller life to Americans by solving many of the problems created by an urban industrial society.[1] Gouverneur Morris, in an article in Collier's in 1912, expressed this point of view very eloquently when he wrote, "God gave us the automobile: that in the short life which is ours we may see a few more hills and valleys, a few more fields of flowers. . . ."[2]

The American public accepted the motor car as enthusiastically as its early proponents, and the reason for the response is not difficult to discover. The motorized passenger vehicle fitted perfectly into American culture because it appeared to offer inexpensive, individualized transportation to an individualistic, highly mobile people. With the introduction of dependable, low cost motorcars like the Model T Ford in 1908, Americans rapidly abandoned their horse-powered vehicles for mechanically-powered ones, and the motorized highway system appeared full blown, almost overnight. Once it had arrived, its mere existence became its raison d'etre, and it developed a momentum all its own, fired by a growing number of interest groups with a direct economic stake in continuing and expanding the motorized highway transportation system.

The responsibility for the construction and maintenance of highways and the regulation, if any, of road vehicles had traditionally lain with the states, but

with the arrival of the motorcar there were calls for the duty to be accepted by the federal government. Ironically, the proposals came from the very interests which would so vigorously oppose federal regulation of motorcars sixty years later -- the automobile industry and its supporters, who wished to override conflicting state and local motor vehicle laws which they felt were inhibiting the sale and use of motor cars.

National automobile laws appeared in Europe in the first decade of the twentieth century setting uniform standards of competence for motorists and of safety for motor vehicles. In 1902, Horseless Age, a leading American automotive trade journal, endorsed the idea of government standards for motor vehicles as a way to keep unsafely-constructed automobiles off the market.[3] More significant, in the same year, the National Association of Automobile Manufacturers petitioned both the United States Senate and House of Representatives, requesting the framing and enactment of legislation providing for a uniform national automobile license, and in 1905, the NAAM joined with the American Automobile Association in a campaign to secure a national motor vehicle law. Several bills were introduced during the Fifty-Ninth Congress, but all died in committee.[4]

The campaign continued, supported by national magazines like the Nation and Harper's, and in 1907 another bill was introduced by the NAAM and the AAA calling for federal regulation of speed, identification and registration of vehicles, licensing of drivers, and establishment of a Federal Motor Vehicle Bureau to keep records, but the bill died before reaching the floor of the House.[5] The high point of the attempt by the NAAM and the AAA to secure national regulation of automobiles came with the calling of a national legislative convention on the matter in Washington, D.C., in February, 1910, but even this grand effort proved fruitless. Congressmen could not see the need for such legislation and doubted the constitutionality of the proposals which were based on the commerce clause. By 1910, general adoption of interstate reciprocity agreements and a trend toward uniformity in state motor vehicle laws ended most of the major problems involved with conflicting state requirements, and the campaign to secure national regulation was abandoned.[6]

In 1919, E. H. Beldon, Chief Engineer of the Willys-Overland Company, a well-known American automobile manufacturer, stated: "I believe the time is coming when

all cars will have to pass a government inspection for roadability for a given weight, and cars will only be permitted to travel below a definite speed depending on their roadability."[7] The time was coming, but it was nearly fifty years off. The federal government left the control of road vehicles in the hands of state and local authorities where it had historically lain. However, there were precedents for federal involvement in highway construction, and Congress did act in this area in response to pressure from the same groups which had called for national regulation of motor vehicles.

A "Good Roads" movement had been formed in the 1880's by bicycle enthusiasts and manufacturers, and early in the next century it came to be dominated by automobile interests.[8] In 1902, the NAAM resolved to support the Brownlow-Latimer Federal Good Roads Bill which would have appropriated $20,000,000 in government funds to construct a transcontinental highway. But despite strong support from the automobile industry and auto clubs, this bill and others introduced in 1905 died in committee like the proposals for national regulation of motor vehicles.[9] The Good Roads movement held national conventions beginning in 1908, and by 1909, the NAAM had been joined by the AAA, the American Motor Car Manufacturer's Association, the American Road Maker's Association, and the National Grange. The movement's lobbying on the state and local level resulted in an increase in improved and surfaced roads as well as in total road mileage.[10] While Congress still refused to approve a transcontinental highway, it did vote in 1912 to supply up to 33 percent of the cost of constructing post roads.[11]

In 1913, Carl G. Fisher, a successful manufacturer of compressed carbide gas for motor vehicle headlights, proposed to a group of automobile manufacturers that they set up their own transcontinental highway. The industry representatives agreed and on July 1, the Lincoln Highway Association was formed to work for the establishment of a highway from New York to San Francisco.[12] Henry B. Joy, President of the Packard Motor Car Company, and Roy D. Chapin, who was later to found the Hudson Motor Car Company, were among the leaders of the association, and Joy, especially, was very active in promoting the project, writing letters to, among others, presidents and senators on behalf of the highway.[13] Other industries within the highway movement offered financial support and aid in the lobbying effort for the project which pioneered national highway routing.[14]

In 1916, the highway movement gained a significant victory when Congress reluctantly passed and President Woodrow Wilson signed a Federal Aid Road Act into law which offered to pay 50 percent of the cost of construction of rural public roads.[15] With the passage of this act, the extent of major national involvement in the motorized highway transportation system was set for the next fifty years. The federal government had declined to regulate motor vehicles but it had agreed to pay 50 percent of the cost of the most important component of the system -- the roads upon which the motor vehicles would operate. Constantly increasing local, state, and federal expenditures for the construction of highways soon reshaped the total national transportation system. Inter-urban, streetcar, and passenger railroads, and boat lines found themselves unable to compete with the subsidized road system, and as more and more lines ceased operations, the motor vehicle emerged as the principle means of transportation in the United States.

At the same time that the growth of the highway system was destroying old industries, it was creating giant new ones to manufacture the components of the system -- roads, bridges, and vehicles. The increasing demand for motorcars and trucks stimulated the growth of automobile manufacturing into the largest industry in the United States by 1925.[16] It was to this new industry that the main responsibility was given for the economy, efficiency, and safety of the motor vehicles which operated within the highway system -- by the refusal of Congress to accept the responsibility and the inability of state and local governments to handle it adequately.

The safety of the automobile as a means of transportation soon became a significant question because the accident rate for motor vehicles quickly exceeded those of the transit systems it replaced. However, the increasing magnitude of the problem was masked by the decentralized nature of automobile accidents which, unlike mishaps in mass transit systems, rarely received more than local attention. Furthermore, it was natural for the public to assign the responsibility for accidents to the driver rather than to the inanimate motor vehicle or highway. This conclusion was quickly institutionalized in a number of safety organizations which used public relations methods in an effort to educate motorists to "drive safely." The automobile manufacturers did not initially see accidents as a threat to sales, but as public concern over the rising accident rate in-

creased in the 1920's and 1930's, the industry came to strongly support and financially subsidize the highway safety organizations.

Automobile manufacturers, echoing the reasoning of the highway safety professionals, took the position that it was not normal for a motor vehicle to be involved in an accident, and that, therefore, they were under no obligation to design for that circumstance. Manufacturers asserted that not only were automobiles "safe" when properly utilized, but that they were also becoming "safer" as a result of improvements introduced with each new annual model. In reality, the industry had found it difficult to use engineering improvements to a technically complex product as a means of selling automobiles to relatively uninformed consumers. Instead, the industry had come to emphasize fashion or "styling," altered on an annual basis in order to make previous models appear old-fashioned, particularly after automobile manufacturing became dominated by a few large firms competing for shares of a replacement market for motor vehicles. Rather than producing safer automobiles, the oftentimes exaggerated annual changes dictated by competition in styling resulted in motor vehicles that were sometimes more hazardous than previous models.

As automobile accidents increased in the 1930's, manufacturers expanded their support of and influence in the highway safety movement with its emphasis on driver responsibility. However, beginning in mid-decade, a small but increasing number of critics -- particularly physicians -- began to stress the necessity of automobile design to minimize injuries in what they argued were a large number of inevitable accidents produced by reliance on motor vehicles as a principle means of transportation. A number of design changes for crash protection were adopted and promoted as minor sales themes by some manufacturers in the late 1930's, but they were abandoned in the restyled models produced after the war. Increasing criticism of design by physicians coupled with formal crash injury research conducted by private and governmental agencies prompted one manufacturer to attempt to use safe design as a major sales theme in the 1956 model year. However, industry concern that raising the subject of safety might deter sales prevented any major progress on design for crash protection. This lack of responsible action by the largest and most profitable industry in the world in the face of the most serious public health problem facing the country was strikingly revealed in a series

of Congressional Hearings held in the mid-1960's.

Ironically, sixty-five years after the automobile industry had proposed federal standards for automobile construction, Congress passed the Highway Safety Act over the opposition of the industry. After a half century of the laissez-faire, a federal agency was given the responsibility for the safe design of American automobiles, and a new era in the history of the automobile industry was begun.

NOTES

[1]Flink, America Adopts the Automobile, 1895-1910 (Cambridge, Mass.: MIT Press, 1970), pp. 104, 108-9.

[2]Gouverneur Morris, "On Going from Here to There," Collier's, Jan. 6, 1912, p. 511.

[3]Horseless Age, Nov. 5, 1902, p. 492, quoted in Flink, America Adopts the Automobile, p. 115.

[4]James R. Doolittle, ed., The Romance of the Automobile Industry (New York: Klebold Press, 1916), p. 168; Flink, America Adopts the Automobile, pp. 172, 173; Automobile Manufacturers Association, Inc., Automobiles of America (Detroit: Wayne State University Press, 1968), p. 38.

[5]Harper's Weekly, April 13, 1907, p. 532; Nation, Oct. 10, 1907, p. 319 and Dec. 12, 1907, p. 530; AMA, Automobiles of America, p. 42.

[6]Flink, America Adopts the Automobile, p. 173.

[7]Automotive Industries, July 3, 1919, pp. 12-14.

[8]Flink, America Adopts the Automobile, pp. 204, 205; John B. Rae, American Automobile Manufacturers: The First Forty Years (Philadelphia: Chilton Co., 1959), p. 62.

[9]Doolittle, Romance of the Automobile Industry, p. 168; AMA, Automobiles of America, p. 33; R. T. Sloss, The Book of the Automobile: A Practical Volume Devoted to the History, Construction, Use and Care of Motor Cars and to the Subject of Motoring in America (New York: D. Appleton & Co., 1905), p. xii.

[10]Flink, America Adopts the Automobile, pp. 208,210.

[11]American Association of State Highway Officials, The First Fifty Years, 1914-1964 (Washington, D.C.: American Association of State Highway Officials, 1965), p. 151.

[12]Allan Nevins, Ford: The Times, The Man, The Company (New York: Charles Scribners Sons, 1954), pp. 485-486. See also, Lincoln Highway Association, Lincoln Highway: The Story of a Crusade That Made Transportation History (New York: Dodd, Meade, & Co., 1935).

[13]Henry B. Joy to Roy D. Chapin, April 30, 1914; Woodrow Wilson to Joy, June 19, 1914; Joy to Wilson, July 27, 1914; Theodore Roosevelt to Joy, March 2, 1917; Warren G. Harding to Joy, June 7, 1918, all in Henry Bourne Joy Papers, Michigan Historical Collections, University of Michigan, Ann Arbor.

[14]Harvey S. Firestone to Roy D. Chapin, Oct. 9, 1915, Roy D. Chapin Papers, Michigan Historical Collections.

[15]Frederick L. Paxson, "The Highway Movement, 1916-1935," in Essays in American Economic History, ed. by A. W. Coates and Ross M. Robertson (London: Edward Arnold, 1969), p. 295; AMA, Automobiles of America, p. 63.

[16]Alfred D. Chandler, Jr., ed., Giant Enterprise: Ford, General Motors, and the Automobile Industry; Sources and Readings (New York: Harcourt, Brace & World, 1964), p. 5; Rae, American Automobile Manufacturers, p. 153.

CHAPTER I

THE SAFETY OF THE FIRST AMERICAN AUTOMOBILE

The great and growing demand for motorcars, combined with initial difficulties of producing them in large quantities, did not encourage a careful, scientific approach in planning a basic motorcar design in the United States. After a brief period of producing the motor carriages developed by American inventors, manufacturers turned to the more stylish and fashionable French design first introduced by the Panhard Company in 1894 which was referred to in the United States as an "automobile".[1] Unlike the motor carriage, which was a horse-drawn style buggy steered by a tiller and propelled by a small motor mounted horizontally beneath a single seat, the French automobile was distinctly a motorized vehicle. A relatively large engine was mounted vertically beneath a hood at the front of a body--which was often enclosed--containing front and rear seats, and the driver sat behind a windshield facing a steering wheel, clutch, brake, and transmission selector. It was this design which manufacturers uncritically adopted as the basic configuration of the American motorcar. In effect, the modern automobile industry was created to produce this design in the first decade of the twentieth century, and it continues to produce that design with little fundamental change today.[2] Fortunately, the French automobile had its positive characteristics, but its weaknesses were to make it much more dangerous than the horse-drawn vehicles it replaced on America's streets and highways.

A scientific approach to the design of a motorcar would have required the establishment of definite criteria for the construction and operation of road vehicles, the evaluation of various alternative designs in light of these criteria, and then the selection of a single, standardized design. The general goal of such an approach would be to develop a vehicle which would operate as efficiently as possible within the highway system, and thus, a balance would have to be struck between speed, economy, and safety. Because of the laws of physics, the point of diminishing returns to an increase in the motive power and potential top speed of a vehicle is soon reached. Each increase in the power of the engine brings a decline in economy and a rise in exhaust emissions and requires an increase in the strength of the chassis and body and a modification of the weight distribution and suspension. Each in-

crease in the maximum speed, likewise, necessitates a stronger construction to handle higher stress and to protect occupants in the event of a collision and larger brakes to bring the vehicle to a halt. Increments in power and speed also bring an increase in the demands on the human operator and a decrease in his margin of error. When these observations are considered along with the fact that the highways, themselves, have to be designed for specific operating speeds, it is obvious that maximum speeds should not be especially high.

Once maximum power and speed are determined, the total vehicle system can be designed within these parameters. A fundamental criterion would be a proper relationship between the power and speed of the engine, the total weight of the vehicle and its distribution, and the braking capacity. While it is obvious that a vehicle should be able to decelerate as rapidly as it can accelerate, it is just as important that the power of the motor be in sensible ratio to the total weight of the vehicle and that the weight be distributed so as to enhance the stability and manuverability of the vehicle under all operating conditions. Equally of concern would be the relationship between the operator and the vehicle. The tasks that the driver is required to perform are complex and precise, and it is obvious that the information he receives on the vehicle and its relation to the road and environment should be as complete and useable as possible. The driver's position ought to be viewed as the center of a cybernetic complex, and the vehicle designed to ensure proper tactile input through the seat, foot rests, and hand controls as well as the more apparent audio and visual information.[3]

On the basis of this input, the driver would be required to take action--reflex action in an emergency situation--to keep his vehicle under control and properly coordinated with the other vehicles on the roadway. Thus, the controls must be designed not only to conform to the human physique but also the human physiology and psychology. The actions required to control the vehicle should closely approximate natural human movements and, especially for braking manuvering, reflex actions. Finally, it would be necessary to assume that failures of the motorized transportation system were inevitable given the ever-present possibility of human error and mechanical breakdown and, thus, to design vehicles--as well as other parts of the system--which would minimize, if not prevent, injury to occupants and pedestrians when such a failure occurred.

In the absence of effective governmental regulation of motor vehicles, however, there was no requirement that they be designed in a systematic way and no set of criteria against which alternative designs could be weighed. In this laissez-faire situation there was no real demand for vehicles which were scientifically designed since consumers lacked the technical knowledge of what was wanted in a functional motorized road machine. Thus, there was no incentive for manufacturers to design and produce a rational vehicle, to say nothing of a single, standardized design. From the beginning motor vehicles were marketed and consumer decisions were made, to a large extent, on the less than scientific but more easily comprehensible basis of such criteria as appearance, appointments, prestige, power, speed, and size. The early motor carriage designs offered excellent visibility, good weight distribution, and economy of operation. Steam and electrically-powered designs offered almost noise and emission-free operation. Yet, the automobile with its long hood, stylish body, and noisy but powerful internal combustion engine came to be the basic configuration of American road vehicles.

Regardless of whether the French style of motor vehicle would have been chosen as the result of a systematic evaluation of competing design types, the early automobile was not without its positive characteristics. The relationship between the machine's power, weight, and braking ability was acceptable, if only because its slow acceleration and low top speed matched its two-wheeled brakes. Weight distribution was good and visibility was very good except in inclement weather or at night when meeting another car. Tactile and audio input on the road and environment were not lacking in the largely open cars with their stiff springs, firm seating, and manual steering and braking. There were also deficiencies in the basic design of the automobile which raised serious questions about its utility. Vehicle controls, for example, left a great deal to be desired.

The form and location of the primary controls of the automobile evolved early and then were accepted uncritically as given. The accelerator, clutch, brake, and steering wheel have been basically the same since at least 1905.[4] The hand brake and gearshift lever both early moved from one side of the driver to the other; the former continues to do so while the latter moves up and down on the right from the steering column to the floor. Yet, even the acceptance and use of a design for seventy years does not necessarily guarantee that

it is a sound one. The steering wheel, for example, appears to have been an improvement over the tiller, and yet rotating a wheel in the direction of travel, especially when some effort and several rotations are required, is surely not the most natural operation for a human to perform; situations which require the rapid and precise manuvering of an automobile around obstacles especially when gearshifting, or braking are also required, could be expected to cause some difficulty for the operator.

However, human hands and arms are surely better suited to quick, precise actions than legs and feet with their great weight and large muscles and their usual trappings of heavy clothing and footwear. And yet the traditional controls required that the right foot be held on the accelerator, in an often unnatural and tiring position, to precisely control the speed and the acceleration of the automobile while the left foot manipulated the clutch.[5] More important, in order to halt the vehicle, the design of the controls required the right foot to be withdrawn from the accelerator, moved a precise distance to the left, and then applied with a specific amount of pressure to the brake, surely not the most simple action for these parts of the human anatomy. Thus, with the automobile controls designed so that a forward thrust of the right foot made the vehicle accelerate as well as decelerate, there was obviously some room for human error.[6]

Man is a very intelligent animal, capable of adapting to a wide variety of conditions, and he was thus able to conform to the complex controls of the automobile. Sufficient practice enables a person to condition himself to respond to stimuli from the vehicle, road, and environment with appropriate movements of the controls. However, in situations requiring quick and complex manipulation of the controls, it seems apparent that the driver would have some difficulty moving his limbs, especially his legs and feet, rapidly and precisely enough to successfully carry out the learned behavior. Moreover, in emergency situations when emotional stress rises beyond a certain level, conditioned responses can be completely blotted out and instinctive reflexes substituted.[7] Given the lack of precise standardization of location and design of the hand brake and gearshift lever, there would be even more reason to expect a confused response in an emergency situation.[8]

The implications of these deficiencies in the design of the controls of the automobile for the safe op-

eration of the highway transportation system were not missed by all observers of the motor vehicle. In 1914, a writer in the Scientific American pointed out:

> One of the prime requisites in the safe operation of an automobile is a thorough and instinctive knowledge on the part of the driver, of the uses of the various levers and pedals that control the movements of the car. The seasoned driver does not stop to think what motions must be made to bring the car to a sudden stop in case of an emergency.[9]

In 1911, the same magazine described a foot pedal design which could be adjusted to better accomodate both tall and short drivers; in 1922, an article in Automotive Industries stated, "The motor car engineer should know the facts of the human body, the skeleton system, the muscular system and the psychological system in order to produce the best results"; and in 1924, the journal called for better design of foot controls to keep the driver's foot from slipping off the brake pedal and hitting the accelerator by mistake, pointing out that this was a hazard which could be reduced or controlled by design engineers.[10] Two years later the Committee on Causes of Accidents of the National Conference on Street and Highway Safety reported that the lack of uniformity in the controls of automobiles was a "prolific" cause of accidents when a driver shifted from one car to another.[11]

In November, 1935, Professor Yandell Henderson of Yale University, an eminent physiologist, presented a paper before the National Academy of Scientists entitled "How Cars Go Out of Control: Analysis of the Driver's Reflexes." The thesis of his study was that it is a natural reflex in all animals to forcibly extend their limbs when unexpectedly jolted--the "extensor thrust" of the legs, "a righting reaction to recover equilibrium." Applying his thesis to automobile drivers, Henderson argued that many accidents in which automobiles went out of control could have been caused by man's natural reflexes pushing the accelerator to the floor in an emergency situation.[12] A highway safety expert, writing in 1942, admitted: "Very little systematic psychological research has been done on the efficiency of present-day controls. The traditional vehicle controls, having impressed automobile designers as being satisfactory, have become standardized."[13]

If primary controls, despite their serious limitations, did become largely standardized, secondary controls have yet to evolve any real consistency as to location and design, even among makes produced by the same manufacturer. Ignition, choke, throttle, headlight, windshield wiper, heater, defroster, and other controls are varied to distinguish one make from another and changed yearly to differentiate one annual model from another. However, no attempt has been made to differentiate one control from another so that the driver would be able to locate the proper switch without removing his eyes from the road.[14]

It was not until 1956 that General Motors decided to standardize the location of controls in well-defined areas in the automobiles produced by all its divisions. Charles A. Chayne, Vice President in Charge of Engineering, pointed out that hereafter drivers of General Motors cars would "not have to learn all over again where to reach for things."[15] At the same time that General Motors was taking this step toward standardization, it was producing automatic transmissions with at least two types of shift patterns; one transmission went into low when the selector was moved all the way to the right, the other transmission into reverse. The corporation also offered an ignition switch on at least one of its brands from which the key could be removed at any time. The possibility of a driver inadvertently leaving a car in gear with the engine running after withdrawing the ignition key was reviewed by General Motors engineers at the time the automatic transmission was put into use, but "this hazard was considered too remote to require a redesign of the switch."[16] After a court case resulting from an accident, the switch was changed.

Consumer Reports stated in 1958 that the lack of standardization of controls among automobiles was becoming a real threat as two car families increased and more people were renting cars.[17] A Department of Commerce report in 1959 pointed out in regard to automobile controls:

> Adequacy, simplicity, and standardization of dials and controls seem to have been sacrificed, to a degree at least, for attractiveness of layout and presentation and to provide individuality for the brand and year model.[18]

If human factors were largely ignored in the design

of vehicle controls, they were also given little consideration in other important areas of automobile construction. The first adjustable driver's seats did not appear until 1914 and were only slowly adopted throughout the next decade.[19] When engineers designing the Model T asked Henry Ford how much room should be left between the front and rear seats, he quickly told them to leave enough room for a farmer's milk cans.[20] At another manufacturer's plant the president's wife was used to test the seating in new models: "She was driven to the factory, seated in the car, and if she found it comfortable the design was approved; conversely, if the seat failed to fit her particular (and peculiar) dimensions, alterations were made."[21] As early as 1931, Scientific American declared that the driver's posture influenced fatigue and, thus, his ability to drive safely.[22] Another critic ten years later stated that the driver's seat "appears to be designed for complete comfort rather than the seat for a person performing a delicate action which required a great deal of skill," and he recommended a firm, straight-backed seat for the driver.[23] In 1955, similar comments were being made: "The seats, which serve as the only real contact between passenger and automobile, have been designed purely for comfort."[24] An article in Consumer Reports three years later complained that soft automobile seats absorbed rather than supported body weight, encouraging a tense, awkward slouch which produced a tired, squirming driver[25] and in 1962, another observer explained why seat were built the way they were:

> The tendency is to get a nice showroom feeling cushion so that when the prospective customer sits in the car he feels luxurious. But when you take that car out on the road you get the bouncing which is very fatiguing.[26]

Consumer Reports charged that automobile seats were not only absurd in design but also directly dangerous. The magazine explained that the high, hard forward edge of many car seats exerted pressure under the driver's thighs, restricting circulation and causing numbness and slower responses in the legs which were used to operate the accelerator and brake. In its advanced stages this ailment, called "auto legs" was said to bring blood clots and serious circulation problems.[27]

A highway safety expert writing in 1942 charged automobile manufacturers with creating a safety hazard

through their failure to consider drivers "who vary considerably from the norm in stature," and he pointed out that women and short people in particular had difficulty in reaching the controls and seeing out of automobiles. He further suggested that the driver, at least, be given a bucket-type seat to keep him from sliding sideways on curves.[28] Automobile manufacturers continued to use unscientific data as a basis for human dimensions, and apparently designers checked interior legroom and headroom, the relation of the seats to the windows and windshields, and the angle of the steering wheel and its relation to the seat only after the exterior body styling had been determined.[29] It was not until after World War II that some manufacturers began using anthropometric data; Ford Motor Company constructed a dummy to the dimensions of an eightieth percentile man based on data gained from a study of United States Army inductees during the war, and designers used the mannikin to "double check" on the visibility and comfort of Ford automobiles.[30]

Many people, however, continued to complain that American cars were not built around people, but built and the people put in afterwards, and one critic pointed out that dummies could reveal little about the muscular activity involved in operating an automobile and nothing of the psychology of the driver.[31] Scientists complained that the automobile industry was not collecting or using data scientifically and charged that manufacturers had refused to even consider available anthropological data. Others argued that despite a lack of standard body sizes for determining the proper locations of vehicle components, there were steps which could be taken immediately to improve the driver's workspace.[32] Some engineers raised familiar complaints, stating that "the continuous efforts of automobile manufacturers to insulate the driver from the discomforts of rough pavements by various kinds of shock absorbers and noise insulation serve also to insulate him from a kind of sensory input necessary for safe driving."[33] A well-known automobile stylist, Raymond Lowey, called current automobiles "dangerous" because attempts to achieve "comfort" had reached critical limits--the steering, seats, and springs were all too soft, lulling drivers to sleep.[34] Critics called for a separate seat for the driver, one that would provide forward, lateral, and lumbar support for the thighs, hips, and trunk increasing his ability to perform and helping to prevent fatigue. Furthermore, they stated that a well-designed seat should accomodate individual differences by adjust-

ing forward and back, up and down, and in the lumbar area, and transmit a "feel" of what the automobile was doing.[35]

Human factors were given less than adequate attention in other areas of automobile design, also. The first low-sided, often doorless styles were barely adequate for keeping occupants in position under normal operating conditions, and early forms of seat belts were installed in a few automobiles just to keep passengers from falling out.[36] The introduction of models with higher sides and closed bodies helped retain passengers more effectively, but door latches were designed for static conditions and often allowed doors to open when subjected to the stresses of highway travel.[37] As late as the 1950's, inside door handles were designed in such a way that they were easily confused with window cranks, often caught the driver's coat sleeve, and would unlatch the door if leaned on.[38] It was not until after World War II that General Motors "incorporated inside door handles that did not open the door if the passenger's weight was thrown against them." Vice President Chayne reported in 1956 that: "We found that with the old push-type handles, this situation frequently caused doors to be opened accidentally."[39] When a rear-hinged door of a moving automobile was unlatched accidentally, the possibility of a passenger falling out was increased since the action of the air would force the door completely open. Yet despite court cases involving injury from just such occurrences, rear-hinged doors were being manufactured as late as 1969.[40]

Another problem of automobile design which was early evident was headlight glare which became a point of criticism as soon as more than one driver ventured out after dark.[41] A highway safety group reported in 1915 that "The protest against the headlight nuisance has become very vigorous and widespread," and the following year the organization stated that the blame for the problem was partly "that of automobile manufacturers, who should have worked up long ago to the necessity of providing some way of obviating the headlight glare."[42] Strong criticism continued for the next ten years, and in 1926, a state motor vehicle official blamed automobile manufacturers for the problem.[43] In 1933, Safety Engineering magazine charged that "horse and buggy lights" were causing automobile accidents, and in 1941 another critic stated that all the drivers in the United States agreed on one thing--that automobile headlights were poor.[44]

A highway safety expert blamed the lack of progress on lack of cooperation among automobile manufacturers and conflicting state laws, but in 1937 the American Association of Motor Vehicle Administrators called on the industry to undertake a program to develop improved headlighting equipment which would be uniform regardless of manufacturer. This effort resulted in the general adoption of sealed beam headlights on the 1940 models but criticism continued.[45] The Massachusetts Registrar of Motor Vehicles declared that the new units were more powerful than necessary and still produced too much glare, and a highway safety expert claimed that many drivers did not dim their lights or keep them properly adjusted.[46] Another critic argued that headlights should be mounted above the windshield so that they would hit the road at a sharper angle producing less glare and more effective lighting with less distortion, but such an arrangement called for a radical change in styling.[47] In 1933, a paper had been presented before the Illuminating Engineers Society pointing out that four headlights rather than two would provide the best optical arrangement for automobile lighting but there were drawbacks to the plan, one of which was, again, styling. As Vice President Chayne of General Motors, explained in 1956, "car appearance design had not reached a stage which would permit satisfactory mounting of four headlamps."[48] With the development of sealed beam units in 1937 this proposal was again raised, but it was not until 1957 that the first dual headlights were finally installed.[49]

The most ambitious proposal put forward for improving headlighting was the use of polarized lighting equipment. Automotive Industries reported in 1936 that automobiles could be economically equipped with polarized lights and windshields, and Safety Engineering suggested that this was the way to solve the problem of glare.[50] Mr. E. H. Land of the Polaroid-Land Company discussed the prospects of using Polaroid headlamps and windshields for the prevention of glare in automobile headlights in the SAE Journal early in 1937.[51] Science reported early in 1940 that the automobile industry was contemplating the use of polarized light, and shortly after the war Fortune suggested that the time was ripe for the switch.[52] However, the automobile industry had decided well before 1940 not to adopt the system, primarily because of the cost of increasing the capacity of the automobile electrical system to meet the larger demands of the Polaroid system.[53] The Committee on Highways and Motor Vehicles of the Massachusetts House of

Representatives investigated the system in 1952, a study by the United States Department of Commerce in 1959 concluded that most of the automobile industry's objections to the system were no longer valid, and the Bureau of Public Roads began a study in 1965 of polarized lighting as a way of eliminating the still present headlight glare.[54]

Deficiencies in other areas of the automobile lighting system were also recognized at an early date. Observers of the automobile suggested that if effective signalling devices were mounted on motorcars which would indicate the intentions and actions of the driver for other operators and pedestrians to see, the result could be a more efficient flow of traffic and a reduction of accidents. In 1915, Scientific American reported that the New York Safety First Society was testing various rear signalling devices which used electric lights to indicate braking and right and left turns. The following year the same magazine described an illuminated celluloid hand which was mounted over a flashlight for improved night-time signalling, and in 1920, Popular Mechanics detailed another variation of automobile direction indicator.[55] In 1928, a friend of Pierre S. du Pont, former President of General Motors, wrote to him describing a signalling device widely used in Europe to which an acquaintance had acquired the American patent rights and suggested that the corporation might be interested in the system.[56] However, although directional signals continued to be advocated as safety devices and various types of accessory systems were put on the market, the first automobile manufacturer, General Motors, did not offer them until 1939, and they did not appear on other models and makes until the late 1940's.[57]

In 1962, amber lights for front turn signals--long used on trucks and European automobiles--were adopted by the entire industry after the AMA reported that extensive visibility tests had revealed that amber lights could be seen more readily than white lights.[58] In 1960, Chrysler Corporation began installing a four-light emergency flashing system on all its models, but as late as 1965 General Motors insisted that such devices were not necessary and stated that it had no plans to place them on its products.[59] A 1959 Commerce Department study had criticized the lack of emergency flashers and clearance lights and pointed out that rear lights had been moved lower making them less visible, that lights with different functions were not separated, and that none of the lights were designed to stay clean

and visible in use. The report went on to state that "it is evident that vehicle lighting, a highly functional aspect of design which needs greater standardization and improvement for safety reasons, is instead being manipulated to a considerable extent for appearance purposes."[60] A General Motors report published six years later admitted in regard to automobile lights that "Their outside shape may be influenced by styling considerations, but the lens has been designed by illuminating engineers to direct the light in the most effective manner."[61]

If automobile design was less than satisfactory under normal operating conditions, it was completely inadequate when a failure of the highway transportation system resulted in a vehicle going out of control. The few seat belts in use were designed merely to retain passengers on rough roads. Thus, when an automobile decelerated rapidly as the result of a collision, the laws of physics dictated that the unrestrained occupants of the vehicle would continue to travel at the previous speed until they also collided with something. Occupants were often ejected from open cars and through the easily-unlatched doors of closed cars to be halted by objects within the road environment. At other times they were slowed or brought to a halt by parts of the vehicle itself. Depending on the nature of the object he decelerated against, the individual passenger could receive any degree of injury from a minor scratch to a fatal wound.

The possibility of failure of the highway transportation system and the consequences of this were considered by some individuals,and inventions appeared intended both to prevent accidents from happening and to minimize human injury when accidents did occur. In 1916, Scientific American described a system which allowed a rear-seat passenger to cut the ignition and apply the brakes in an emergency by merely pushing a button while a similar device detailed in 1922 did the same thing automatically; fifteen pounds of pressure on a specially designed bumper threw out the clutch, applied the brakes, cut the ignition, and blew the horn. The Oakland, California, manufacturer also claimed that the energy-absorbing qualities of the bumper minimized the effects of a collision on the car and on pedestrians.[62] Earlier, in 1911, Scientific American had pointed out that the steering wheel and the column, especially in the long, low style of automobiles then in fashion, was both inconvenient and dangerous. "If the car is sudden-

ly stopped by a collision, the driver is projected violently forward and is seriously injured by the steering wheel." The magazine went on to describe a French design for a modified steering column equipped with a universal joint at the floor level which allowed the column and wheel to be pushed forward to permit ease of entrance and exit and, more important, which would bend forward in a sudden stop, allowing the driver to be "thrown clear" of the automobile.[63]

Other devices appeared with the purpose of minimizing pedestrian injuries, a major accident problem in the early decades of the century. In 1908, John O'Leary of Cohoes, New York, was granted the first of several patents on an "auto fender":

> A slight touch on a bar of the Fender which would first come in contact with a person in front of the car, releases levers holding the cradle or net basket of the Fender in place, and this cradle scoops the person up out of harm's way.[64]

This and several other types of safety fenders were successfully developed, but were objected to because of their "unsightly" appearance. Then in 1921, another New Yorker, E. Finelli, designed one that was effective but which did not "detract from the lines of the car," and he tested in on himself successfully at twenty-five miles per hour.[65]

While a few individuals pointed out some of the deficiencies of automobile design and a few inventors wrestled with the problems of preventing accidents and minimizing the results of those that did occur, the automobile industry continued to manufacture and market its product, little changed. There was no significant demand for improved vehicle controls and seating or safety steering columns and pedestrian-protecting bumpers, and thus no incentive for the industry to give its attention to such devices. Demand for improved headlighting was present but alternative designs either involved costs which manufacturers felt could not be passed along to consumers or were incompatible with current styling or both, and there was no single national agency with the authority to force a change.

There were exceptions to this general lack of consideration of improved automobile design, however. The unpredictable Henry Ford developed a semi-automatic

transmission for the Model T which he felt was simpler to operate than a conventional transmission and which enabled the car to be halted in an emergency by pushing on almost any or all of the three foot controls. In addition, the door latch on the Model T featured a grip that prevented the door from being opened accidentally unlike some other cars. As a former Ford employee recalled:

> Mr. Ford wouldn't let go of that lock. That was outmoded so far, but he wouldn't let go of it. He had a good point there too. As long as that open car wasn't tied up, it was more safe than anything else.[66]

Around 1910, Henry M. Leland of Cadillac Motor Car Company was moved to attempt to devise a safer method of starting automobiles as the result of the death of his friend and fellow automobile manufacturer, Byron Carter. Carter of gangrene after suffering a broken jaw when a crank handle kicked back while he was attempting to start a stalled automobile for a woman motorist. Leland was determined to prevent such future tragedies, and he put his company's engineering department to work on the problem. He also discussed the situation with Charles F. Kettering of the Dayton Engineering Laboratories Company, later taken over by General Motors, and it was Kettering who applied the principle he had used in developing the electric cash register to the starting problem and came up with what became the modern electric automobile starter.[67]

Despite these exceptions, the American automobile industry generally accepted the French-style of motor vehicle uncritically and concentrated primarily on improving production techniques in order to increase output to meet the great and growing demand for automobiles which existed during the first twenty years of the century. The fact that this design had its positive as well as negative characteristics may have partially ameliorated the potentially disastrous consequences of this unscientific approach to the planning of a complex motor vehicle, but the automobile was killing and injuring more people than horse-drawn vehicles by 1909. The motorcar accident rate surpassed that of horse-drawn vehicles in that year, and automobile accidents were claiming an average of 6,800 lives per year in 1913-19 compared to horse and buggy deaths which peaked at 3,860 in 1909.[68] In the 1920's the automobile industry, under the competitive pressure of a stabilizing market for

motor vehicles, began a manipulation of the basic automobile design which resulted in a vehicle that was in many ways less functional and safe than the original one, and the accident rate skyrocketed.

NOTES

[1]AMA, Automobiles of America, p. 17; Rudolph E. Anderson, The Story of the Automobile: Highlights and Sidelights (Washington: Public Affairs Press, 1950), p. 91; Stephen Black, Man and Motor Cars: An Ergonomic Study (New York: W. W. Norton & Co., Inc., 1966), pp. 12, 19; Arthur Pound, The Turning Wheel: The Story of General Motors through Twenty-Five Years, 1908-1933 (New York: Doubleday, 1934), p. 441; Rae, American Automobile Manufacturers, p. 45. The 1894 Panhard had a steering tiller and solid tires, but the steering wheel and pneumatic tires were added soon thereafter to French automobiles (Black, Man and Motor Cars, p. 20). The 1900 French Darracq, for example, included these features plus a steering column-mounted gear shift lever (Automotive Industries, May 15, 1946, p. 18).

[2]Thomas J. Pendergast, "Automobile Design," in Factors Affecting Determination of Market Shares in the American Automobile Industry, ed. by Frederick Stuart, Hofstra University Yearbook of Business, Series 2, Vol. III (Hofstra, N. Y.; Hofstra University, 1965), p. 88; Black, Man and Motor Cars, pp. 19-20; George R. Leighton and Joseph L. Nicholson, "Has the Automobile a Future?" Harper's Monthly, June 1942, pp. 64, 68. John B. Rae selects the year 1903 as a good point to mark the emergence of automobile manufacturing as a distinctive enterprise (American Automobile Manufacturers, pp. 26, 48).

[3]Black, Man and Motor Cars, p. 240.

[4]Ibid., p. 193.

[5]Ibid., p. 212.

[6]Henry Dreyfuss, "The Car Detroit Should Be Building," Consumer Reports, July, 1958, p. 353; Stevens, Highway Safety, p. 66.

[7]Black, Man and Motor Cars, pp. 191-3.

[8]Dreyfuss, "Car Detroit Should Be Building," p.353.

[9]Scientific American, supp., July 18, 1914, p. 43.

[10]Ibid., Jan. 6, 1912, p. 10; Automotive Industries, June 8, 1922, p. 1200, Dec. 11, 1924, p. 1018.

[11]Outlook, Mar. 24, 1926, p. 444.

[12]Stevens, Highway Safety, pp. 68-69; Yandell Henderson, "How Cars Go Out of Control: An Analysis of the Driver's Reflexes," Science, Dec. 27, 1935, pp. 603-6.

[13]Harry R. DeSilva, Why We Have Automobile Accidents (New York: John Wiley & Sons, Inc., 1942), p. 249.

[14]Black, Man and Motor Cars, p. 193; U. S. Congress House, The Federal Role in Highway Safety, Letter from the Secretary of Commerce transmitting the Report on the Investigation and Study Made to Determine What Action Should Be Taken by the Federal Government to Promote the Public Welfare by Increasing Highway Safety in the United States, Pursuant to Section 117 of the Federal Aid Highway Act of 1956, H. Doc. 93, 86th Cong., 1st sess., 1959, p. 40; U. S. Congress, House, Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings before a subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, on H. R. 5389, 86th Cong., 1st sess., 1959, p. 227.

[15]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 367.

[16]Ralph Nader, "Patent Laws: Prime Source to Secure Safer Auto Design to Reduce Highway Deaths," Trial (Dec./Jan., 1964-65), p. 28 as quoted in Jeffrey O'Connel and Arthur Meyers, Safety Last: An Indictment of the Auto Industry (New York: Random House, 1966), p. 171.

[17]Dreyfuss, "Car Detroit Should Be Building," p. 353.

[18]Commerce Dept., Federal Role in Highway Safety, 1959, p. 40.

[19]U. S. Congress, Senate, Committee on the Judiciary, Economic Concentration, Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U. S. Senate, 89th Cong., 1st sess., 1965, pt. 3, p. 1123; AMA, Automobiles of America, p.58.

[20]Ford Motor Company, Ford at Fifty (Dearborn, Mich.: Ford Motor Co., 1953), p. 78.

[21]Smith, Wheels Within Wheels, p. 160.

[22]Scientific American, Oct., 1931, p. 272.

[23]Stevens, Highway Safety, p. 50.

[24]C. Hunter Sheldon, "Prevention, The Only Cure for Head Injuries Resulting from Automobile Accidents," Journal of the American Medical Association, CLIX (Nov. 5, 1955), pp. 981-86, reprinted in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 11.

[25]Dreyfuss, "Car Detroit Should Be Building," pp. 352, 353.

[26]Association for the Aid of Crippled Children and Consumers Union of the United States, Inc., Passenger Car Design and Highway Safety: Proceedings of a Conference on Research (New York: Association for the Aid of Crippled Children and Consumers Union of the United States, Inc., 1962), p. 83.

[27]Dreyfuss, "Car Detroit Should Be Building," p. 352.

[28]DeSilva, Automobile Accidents, pp. 247, 249.

[29]Automotive Industries, Dec. 15, 1947, p. 72.

[30]Ford Motor Co., Ford at Fifty, p. 71; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 507.

[31]Dreyfuss, "Car Detroit Should Be Building," p. 351; Black, Man and Motor Cars, p. 260.

[32]Association for Aid of Crippled Children, Passenger Car Design, pp. 82, 88, 89, 93, 100.

[33]David Klein and William Haddon, Jr., "The Prospect for Safer Autos: The Proposed Specifications for Government-Bought Cars Raise Hopes and Questions Alike," Consumer Reports, April, 1965, p. 179.

[34]Raymond Lowey, "Twenty Years from Now," Atlantic, July, 1965, p. 95.

[35]Black, Man and Motor Cars, pp. 68, 69, 264; Association for Aid of Crippled Children, Passenger Car Design, pp. 76, 78.

[36]American Seat Belt Council, Inc., Chronological History of Automotive Seat Belts (New Rochelle, N. Y.: American Seat Belt Council, Inc., 1964). When King Edward VII took his first automobile ride in 1902, he reportedly wore a seat belt (Louis W. Steinwedil, "The Eternal Ghost," Motor Trend, June, 1970, p. 94).

[37]"What Makes a Car Safe?" Consumer Reports, Oct. 1950, p. 453.

[38]"The Reminiscences of Mr. Richard Kroll" (Ford Motor Company Archives, Oral History Section, Oct., 1953), p. 55, typewritten transcript in Ford Motor Company Archives, Henry Ford Museum, Dearborn; General Motors Corporation, Automobile Buyer's Guide (New York: General Motors Corp., 1934), p. 27; Cornelius W. Gillam, Products Liability in the Automobile Industry: A Study in Strict Liability and Social Control (Minneapolis: University of Minnesota Press, 1960), p. 170n.

[39]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 336.

[40]Gillam, Products Liability, pp. 106, 107n. Ford Motor Company's Lincoln Continental four-door models featured rear-hinged rear doors until 1969.

[41]Horseless Age, Sept. 9, 1914, p. 400, Jan. 27, 1915, p. 144.

[42]Safety First League, Safety First and the Auto (Boston: Safety First League, 1915), p. 11; and ibid., Highway Safety (Boston: Safety First League, 1916), p. 10.

[43]See, for example, Scientific American, Sept. 8, 1917, p. 178, Nov. 1923, p. 320; Motor Age, Sept. 26, 1918, p. 28; Automotive Industries, Jan. 23, 1919, p. 223, June 9, 1921, p. 1199, Nov. 12, 1925, p. 828, Feb. 4, 1926, p. 169.

[44]Safety Engineering, Sept. 1933, p. 92, April, 1937, p. 31; Automotive Industries, Feb. 1, 1940, p. 114; Stevens, Highway Safety, pp. 38-40.

[45]DeSilva, Automobile Accidents, pp. 243-44; House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 92; AMA, Automobiles of America, p. 104.

[46]Stevens, Highway Safety, p. 43; DeSilva, Automobile Accidents, p. 244.

[47]Stevens, Highway Safety, p. 41.

[48]House Committee on Interstate and Foreign Commerce, Traffic Safety Hearings, 1956, p. 334.

[49]Ibid., p. 324; AMA, Automobiles of America, p. 140.

[50]Automotive Industries, Sept. 12, 1936, p. 344; Safety Engineering, Feb., 1936, p. 73.

[51]SAE Journal, Jan., 1937, pp. 19-20.

[52]Science, Jan. 26, 1940, supp., p. 6; Fortune, Aug., 1945, p. 236.

[53]House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 63; Business Week, Nov. 22, 1947, p. 46.

[54]House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 64; Commerce Dept., Federal Role in Highway Safety, 1959, p. 43; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965, pt. 1, p. 582.

[55]Scientific American, Sept. 25, 1915, p. 274, July 8, 1916, p. 46; Popular Mechanics, Oct., 1920, p. 638.

[56]G. d'A. Belin to P. S. du Pont, Oct. 10, 1928, General Motors 624-6, Pierre S. du Pont Papers, Eleutherian Mills Historical Library, Wilmington, Delaware. My thanks to Professor Alfred D. Chandler, Jr., for bringing this letter to my attention. At the time of my research the du Pont papers were closed.

[57]Popular Mechanics, Aug., 1934, p. 209; Joseph C. Furnas and Ernest M. Smith, Sudden Death and How to Avoid It (New York: Simon and Schuster, 1935), p. 37; AMA, Automobiles of America, p. 102.

[58]AMA, Automobiles of America, p. 160.

[59]Ibid., p. 151; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965, pt. 2, p. 669.

[60]Commerce Dept., Federal Role in Highway Safety, 1959, pp. 41-43.

[61]General Motors Corporation, Design for Safety, (Detroit: General Motors Corp., 1965), p. 40.

[62]Scientific American, April 22, 1916, p. 430; Oct. 1922, p. 243. See also, Motor West, June 15, 1922, p. 22 and Popular Mechanics, Dec., 1922, p. 899.

[63]Scientific American, July 29, 1911, p. 101.

[64]"O'Leary's Auto Fender" in D. Cameron Peck Collection, Automotive History Collection, Detroit Public Library, Detroit, Michigan.

[65]Popular Mechanics, Oct., 1922, p. 576, Dec., 1922, p. 899, and Aug., 1923, p. 166; Scientific American, June 11, 192], p. 475, and Dec., 1923, p. 4]6.

[66]"Kroll Reminiscences," p. 55. The Model T also featured a convex steering wheel which would protrude into the chest of a driver thrown forward into it.

[67]Rae, American Automobile Manufacturers, pp. 47-48; Christopher G. Sinsabaugh, Who Me? Forty Years of Automobile History (Detroit: Arnold-Powers, Inc., 1940), p. 243. Kettering, himself, was injured in 1911 when his automobile went off the road. He somehow got his foot caught between the pedals and his ankle was broken (Thomas A. Boyd, Professional Amateur: The Biography of Charles Franklin Kettering [New York: E. P. Dutton & Co., Inc., 1957], p. 74).

[68]One source lists 3,700 deaths in horse and buggy accidents in 1907, 3,650 in 1908, and 3,860 in 1909, the peak year (Paul G. Hoffman in collaboration with Neil M. Clark, Seven Roads to Safety: A Program to Reduce Automobile Accidents [New York: Harper & Row, Publishers, 1939], p. 5), while during the period 1913-17, automobile accidents were killing an average of 6,800 people per year (National Safety Council, Accident Facts [Chicago: National Safety Council, 1968], p. 59). Accident statistics revealed by 1909 that the accident rate for automobiles was much higher than what was considered normal for horse-drawn vehicles (James J. Flink, America Adopts the Automobile, 1895-1910 [Cambridge, Mass.: MIT Press, 1970], pp. 100, 104, 108-9).

CHAPTER II

THE IMPACT OF THE ANNUAL MODEL CHANGE ON THE DESIGN OF THE AMERICAN AUTOMOBILE

It was natural for motor vehicle sales and production to be geared to an annual cycle for manufacturers had been faced with a seasonal market from the beginning of the industry--few people wanted to purchase motorcars in the late fall or dead of winter when their operation was inhibited, if not prevented, by inclement weather. In adjusting to this fact, manufacturers came to schedule whatever modifications were to be made to their products on an annual basis in order to be able to use these changes as selling points during the next buying season. Annual national automobile shows, held continually from 1900, added to this tendency. Each year every manufacturer attempted to appear at the show with a vehicle which had been improved in some way over the previous year's design.

The introduction of the inexpensive, mass-produced Model T Ford eclipsed the importance of the annual model change for over a decade by meeting the demand of most Americans for their first automobiles. However, when this initial demand was satisfied and replacement sales came to dominate a market of relatively fixed size in the 1920's, the annual model change loomed up again as the logical strategy for convincing customers to replace their current cars with new ones. It was General Motors, under the leadership of Alfred P. Sloan, Jr., which led the industry in adapting to the mature market for motorcars by formulating a definite strategy of using the annual model change as a method of obsoleting its previous models--and those of the competition--in order to speed the replacement cycle, increase the corporation's market share, and allow an increase in the price and profit on each unit. The use of technological innovation as a basis for yearly new models was rarely considered by General Motors or any other manufacturer--research was expensive, risky, unpredictable and not in the tradition of the industry; furthermore, technical developments were often difficult for the consumer to appreciate. The use of restyling, on the other hand, could easily be made to conform to a yearly cycle and a precise budget, and the modifications to be made in the product could be selected on a basis of their adaptibility to advertising.

The structure and priorities of General Motors soon came to reflect the new emphasis on sales and styling. Sales and styling departments gained in prominence over engineering and production, and sales and styling considerations took precedence over those of engineering and production. Although the basic vehicle configuration continued to be accepted as given, modifications were made to the chassis if necessary to accomodate a new body designed by the styling department; keeping production costs low continued to be an accepted policy, but costly assembly line machinery and procedures were adopted to produce new models if it was felt the increased expense would be covered by increased sales.

As the use of the annual model change became institutionalized, body designs and other vehicle components and subsystems which would aid sales were added, modified, or deleted without any serious consideration of the functional value of each, to say nothing of any attempt to determine how the changes would affect the operation of the vehicle as a whole or its functioning within the highway system. Components and subsystems which could not aid sales were not only neglected, but sometimes sacrificed to achieve savings which could be used elsewhere. Because there was a limit to the number of practical sales themes, some changes were made primarily to serve as the basis for an annual advertising campaign and were dropped at the end of a model cycle, only to reappear some years later. More important, the bulk of the changes came to be made merely to make previous models obsolete and to differentiate one brand from another, and thus had little intrinsic value; while each might be advertised as a significant "improvement" at the time it was introduced, it would not be included on the next model.

Restyling of the body was the principal means used to outmode previous models. Fashion can have artistic value, and the most enduring styles are usually based on function. However, because the annual model change required such frequent alterations of body design, it was rarely possible to achieve or maintain functional styling. Furthermore, certain aspects of design came to be accentuated for sales purposes to serve as symbols of qualities of the vehicle such as power, speed, status, and ultimately, even psychological factors. In addition, the public's fancy was frequently caught by flamboyant body designs and frivolous features which further encouraged the lack of function in body design.

Competition in the automobile industry tended to

further exaggerate all the irrational design tendencies produced by the annual model change strategy. Competing firms were forced to copy the successful styles and features of rivals--or those which seemed to have that potential--or risk losing sales, whether they felt these items to be worthwhile or not. Furthermore, some aspects of design such as long bodies and hoods or powerful engines were relative qualities, measured in comparison to those of other cars; thus, competition required an increase in the size of the item which necessitated a similar response from other firms which often produced an exaggeration of a certain aspect of the vehicle all out of proportion to what would be desired in a balanced design. If the original approach to the design of automobiles had been uncritical and uninnovative, it had been based on relatively sound engineering. The introduction of the annual model change downgraded even this modest effort and created a highly unscientific approach to design based on a philosophy which gave top priority to almost any change, no matter how frivolous, which promised to increase the sales of the product, with much less consideration to the function or service life of the vehicle.

The policy of the annual model change was not readily accepted by the entire automobile industry. Automotive Industries reported in 1924 that annual changes had been "questioned many times in the past" and were being questioned again because of poor sales and high inventories. The trade journal stated that dealers and distributors opposed the annual model change because it made the past year's model obsolete, causing dissatisfaction among people who had just purchased one and making sales difficult late in the year since customers refrained from buying a car until the new model came out; furthermore, it required changes in parts inventories and tools. Manufacturers were divided on the issue, but those who opposed the annual model change were forced to adopt it by the competition within the industry.[1] C. E. Eldridge of the Reo Motor Car Company opposed making frequent model changes, stating that it was not necessary for the improvement of the automobiles; "However, it was a sales stimulant and it served to transform a durable good into a consumable, thus permitting greater production."[2]

Proponents of the annual model change, led by General Motors, argued that yearly models were not only needed to deliver new technical innovations to the public, but also that they stimulated the inventive process

within the industry. Harry H. Bassett, head of Buick division of General Motors, proclaimed in 1926, "A design that was successful this year is not one to be retained next year if the most diligent effort can produce something better,"[3] while the corporation's president, Alfred P. Sloan, Jr., argued that, although the bringing out of a new model every year was a very costly process, it was a worthwhile undertaking "for the annual model change is part of the very nature of the development of the industry. Since its earliest days, long before the expression 'annual model change' was used, the process of creating new models has generated the progress of the automobile," and Sloan added that it had become " a natural and accepted part of American life."[4] Sloan stated that yearly models made it possible ". . . to make available, . . . as rapidly as possible, the most advanced knowledge and practice in the building of motorcars."[5] The General Motors president in 1955, Harlow H. Curtice, stated that the annual model change had "speeded technological progress,"[6] while the corporation's annual report for 1959 stated: "The requirements presented by the yearly model change spur engineers and designers to greater accomplishment. . . . By bringing out new and improved models each year, General Motors gives the public the benefit of research, engineering and styling advances as soon as they have been developed and tested."[7] This argument was echoed later by other large firms; in 1966 John S. Bugas, a Ford Motor Company vice president, stated, "The new models include not just styling changes but also a large number of mechanical advances, . . ." and he further argued: "This industry thrives on the annual vehicle improvement. That is the rhythm that the industry has developed over the years, by which to improve its vehicle."[8]

When General Motors began to implement a program of planned obsolescence through the use of the annual model change in the 1920's, its management attempted to formulate specific requirements for automobile design which were summarized in a company publication in 1940:

> Since the automobile is an intimate personal possession--comparable in a sense to one's clothes or one's home--it is essential that it express <u>individuality, style and good taste</u>. Because it is a swiftly moving vehicle, its exterior must suggest <u>fleetness and movement</u>; because it carries passengers, its interior must express <u>comfort and repose</u>.[9]

The use of changes in styling to obsolete previous models was an item of particular concern at the corporation. As Alfred Sloan observed: "Automobile design is not . . . pure fashion, but it is not too much to say that the 'laws' of the Paris dressmakers have come to be a factor in the automobile industry--and woe to the company which ignores them."[10] Buick division's chief engineer, Oliver K. Kelly, expanded on this point in 1959 when he stated: "We live in a highly civilized country where the appearance of our cars is almost as important as the appearance of our clothing. When clothes become old fashioned we discard them--this is true of our cars too."[11] President George Romney of American Motors eight years later likened the automobile business to the "millinery industry,"[12] while in 1966, Chrysler's safety director, Roy C. Haeusler, echoed this when he observed: "To a great degree our cars are 'women's hats.' They have to have special attractiveness, and sometimes they even compromise with function."[13]

In an effort to abide by the laws of fashion, General Motors' styling department kept "in close touch with the style trends in other fields such as architecture, furniture, interior decorating, women's gowns, etc., to the end that the styling of General Motors cars shall be kept in step with the style tempo of the times."[14] However, public reaction was hard to predict and could change quickly. As Alfred Sloan observed, after spending millions of dollars over a two or three year period, "the consumers' taste, income, and spending habits may have all changed radically. For that matter, we cannot even be certain that the new model is 'right' at the time it is first conceived. . . ."[15] Another automobile company executive stated, "Consumer's styling preferences shift unpredictably from round to blunt to sharp, or gaudy to austere."[16] Sloan also discovered that "The degree to which styling changes should be made in any one model run presents a particularly delicate problem." The 1929 Buick failed to sell because of its "radical styling" featuring a roll below the belt line which earned it the nickname of the "pregnant Buick."[17] This lack of certainty about what the public reaction to a new design would be led to an attempt to gauge likes and dislikes by building experimental models based on "advanced styling ideas." The first of these automobiles, which were soon being called "dream cars," was begun in 1937, and when the public reaction appeared to be favorable, General Motors went ahead with plans to implement new styles and to speed up model changes.[18]

Despite all the efforts of General Motors and other

firms in the automobile industry to predict consumer reaction, there was still an element of uncertainty in the use of styling, and this was reflected in the way decisions on design were made and in the sources of inspiration for the styles, themselves. Business Week pointed out in 1968 that "the seat of the pants still plays a major role in decisions" on styling and that "the biggest styling influence comes from the gut reaction of executives who have spent a lifetime building and selling cars." The magazine stated the strong executives often overrode earlier decisions to make changes in styling.[19] A Ford biographer echoed this point that a "telepathic gut"--"a gut feel"--was vital to success in the automobile industry, and a 1953 Ford Motor Company publication pointed out that through the long period during which a new model was being prepared, ". . . stylists and engineers pray that the public will like the new design."[20]

This intuitive approach was also evident in the activities of styling departments. During World War I, stylists drew inspiration from armored cars and other military vehicles, designing automobiles with straight lines, high hoods, and steel wheels. Designs for radiator caps were copied from the figureheads of old ships, while in the 1930's, stylists began to imitate the lines of aircraft; this popular styling influence was labeled "streamlining," although it had no basis in aerodynamic design.[21] One of the most prominent design features in the history of the industry was inspired by a World War II fighter plane. During the war General Motor's director of styling, Harley Earl, obtained special security clearance so that his stylists could see the new P-38 which featured twin engines, twin fuselages, and twin tail fins. The tail fins were copied and appeared after the war on the 1948 Cadillac. The fins were widely imitated, and General Motors stylists spent the next twenty years making minor and major alterations to those on the Cadillac.[22]

Ford Motor Company revealed in 1953 that the styists in the advanced styling studio were completely free of restrictions:

> Nobody tells them what to do. Their job is simply to draw sketches of any kind of idea for a new car that happens to come into their heads. A magazine picture of a tropical fish may inspire a sketch for a fender, or the nose of a jet fighter may lead to a contour for a hood.[23]

Yet for all the freedom of advanced stylists, those who were preparing the designs for planned production models were restricted to styles that would sell; as Ford vice president and director of styling, Eugene Bordinat put it in 1965, "It's the [sales] curve that counts." Another observer argued, "like the slave in the southern plantation economy, he [the stylist] is so valuable that he must be kept in his place."[24] Once a design feature--such as a rear fender design inspired by an airplane tail fin or a tropical fish--caught the fancy of enough consumers, a demand would be created, and other manufacturers would be forced to copy it. An automotive writer pointed out in 1938 that imitations of successful styles, or just parts of one, were found in the styling departments of all manufacturers, where they were blended with other ideas in an effort to produce a similar model.[25] Consumer Reports stated in 1958 that each manufacturer operated a well organized espionage system so that everyone knew what everyone else was doing and could come out with similar styles and other design features.[26]

Thus, industry competition, in practice, not only put limits on the type of designs which the stylists could create, but also sometimes forced them to produce or copy styles which they did not feel were artistically pleasing. In the years before World War II, some stylists opposed the growing use of "bright work" decoration on automobiles, and management was concerned about the rising labor costs involved since it had to be installed by hand. Finally, the industry agreed to limit the amount of chrome decoration to a specific number of square inches and then to reduce that amount each year. However, the pact was dropped in the face of opposition from dealers who argued that it helped to sell automobiles.[27] Not only did this attempt to limit the use of chrome fail, but competition in the postwar period led to annual increases in decoration until by late in the decade of the 1950's some models appeared to be entirely covered with bright work. General Motors' head of styling, William L. Mitchell, later admitted: "Sales dictated the wide use of chrome in the 1950's. No designer wanted it." Finally, in an effort to reverse the trend, General Motors' central styling studio produced a "clean" model design in 1963 which it offered to any division that wanted it.[28] Ford's chief stylist, Eugene Bordinat, stated that the automobiles produced in the 1950's were revolting, but he pointed out that they sold well. He and other stylists argued: "The American public is to blame. If they want it, who are we not to let them have it?"[29]

Styling and decoration were not the only aspects of automobile design which were affected by the annual model change and the oligopolistic competition of the automobile industry. Fundamental was the process of making models longer, lower, wider, and heavier (making an automobile lower may, at first, appear to be directly opposite the other changes, but a lower design makes the vehicle appear to be even wider and longer than it really is). Sales executives and advertising men began pushing for larger automobiles in the 1920's for some very particular reasons.[30] As one automobile observer explained in 1938: "A car that looks like a lot for the money is easy to sell. This appearance of a 'big package' may boil down to a general massiveness of outline. It may mean overall length, or wheel base, or even only a longer hood."[31] Large cars were also felt by the public to offer a better ride and to be more stable and safer in a collision, although these assumptions were not always valid.[32] New models grew in size almost every year and each was advertised annually as longer, lower, and wider. Plymouth advertisements boasted that the 1938 model was "nearly seven inches longer than one low-priced car, ten inches longer than another."[33] In advertising new models automobile manufacturers took steps to make cars look even longer, lower, and wider. This was relatively easy when drawings of automobiles were used for artists could easily manipulate the cars, people, and other objects in the scene. However, when advertising switched to the wide use of photographs because they carried more of a "conviction of truth," things became more complicated. Elaborate photo sessions were held where automobiles were weighted down and large people photographed beside them to make them appear lower; small people were placed inside the cars to make them appear wide and roomy.[34] W. S. Knudsen of General Motors effectively stated the industry's attitude toward the physical dimensions of its product when he proudly proclaimed in 1940: ". . . if you go out and weigh a motor car and see how much you pay per pound you will find out that you are paying a very low pound price for your car."[35]

The intense competition of the 1950's exaggerated the emphasis on size even more, and even low-priced cars reached what, at the time, seemed like monumental dimensions. The 1958 model Ford, for example, was five inches longer, five inches wider, six inches lower, and 240 pounds heavier than it had been in 1949.[36] The 1957 recession helped to produce a reaction against big American automobiles which resulted in an influx of small,

imported cars. As Barron's magazine put it, "economy has become the latest style in cars," and another observer felt that the foreign competition would force the American automobile industry to abandon its large, luxurious models and begin manufacturing sensible vehicles again.[37] By 1959 this segment of the market was large enough so that the major American manufacturers all offered "compact" models for the 1960 sales year. However, size is, of course, relative, and the automobile industry applied the same policy of upgrading to the compacts as it had to the small, standard-size cars of the 1920's.[38] As one observer wrote, "The giants cajoled and led the public back to the type of car they wanted to produce."[39] The compact cars were annually made longer, wider, heavier and more powerful until they were comparable to the low-priced cars of the mid-1950's, which led to another invasion of small foreign cars in the late 1960's and another generation of small American models.[40]

Overall size was not the only thing that was annually increased; individual aspects of automobile design were also exaggerated. A stylist pointed out in 1937 that hoods were being made artificially long for styling purposes, and another observer stated the next year:

> Most beholders assume that a powerful engine ("It must cost him a lot to run, but doubtless he can afford it") resides under a long or high hood. This helps to explain why manufacturers make even the cheapest cars as large, as long, as powerful-looking, and as high of hood as they can. . . .[41]

Another writer in 1948 added that a long, massive hood was used by stylists as a symbol of power, an image left over from the time of massive engines, when today the hood "could be done away with entirely." He also argued that what had come to be called "streamlining" was not functional but had been used as a symbol of speed and power by designers. Boxy, rectangular styles were done away with in favor of rakish lines which suggested speed, and windshields were slanted at sharper angles each year.[42] A zinc manufacturer pointed out in 1937 that the radiator grill could serve as a symbol of a well built automobile:

> One of the chief reasons for the increased use of this type grill[zinc] on next

> year's models has been dealer demand. The radiator grill, by creating the greatest single note of distinction on the car, naturally means much to the dealer in his sales talks to the prospect. With the new grills, die-cast in zinc alloy, the dealer can point out their sturdy, solid construction as being typical of the construction to be found throughout the entire car. This factor gives him an important edge for competitive selling against those cars still equipped with the previously favored type of grill.[43]

The emphasis on radiator grills was also an example of what one observer called the tendency of automobile manufacturers ". . . to include equipment that can be seen, like white side-wall tires, rather than items which will add to the value of the car for transportation purposes."[44] Novel pieces of equipment like fancy radiator caps, fender skirts, or trunk racks would usually be introduced on luxury cars and then would be copied by medium and low-priced automobiles until almost all cars had them and their sales appeal diminished. Then some of these features would be dropped, only to appear years later advertised as a new innovation. Steel wheels replaced wire ones and the spare tire was relocated inside the trunk in the 1930's, but in the 1950's both wire wheels and externally-mounted spares reappeared as optional, luxury equipment.[45] Business Week echoed the point that manufacturers tended to emphasize appearance items in 1968 when it quoted a former automobile product planner as saying, "The general practice is to put the cost where the customer can see it or feel it. . . ." The article continued by crediting General Motors with being most successful in this approach, pointing out that the corporation usually invested heavily in dashboards since they were an obvious center of attention for the occupants of an automobile.[46] Sound also played an important role along with sight and feel. Chevrolet's general manager boasted in the mid-1950's, "We've got the finest door slam in the low-price field, a real big car sound."[47]

Just as automobile manufacturers used symbolism to represent solid construction, power, and speed and attempted to appeal to the consumer's physical senses, the industry soon came to use symbolism and sophisticated advertising to appeal to the social and psychological desires of the public. As one observer of the automobile has written: "The motor car was invented in an era

when status and privilege were still respected by all. And since motor cars were expensive and wealth went with status, the motor car was easily established as the status symbol discovered later by commercial analysts."[48] The automobile soon became the most important symbol of status in the United States; in 1909 so many people were making financial sacrificies in order to purchase motorcars that the practice became a matter of public concern in some areas. Paradoxically, the automobile became an item of mass consumption at almost this same time so that status soon came to be determined not by the mere ownership of an automobile, but by the particular type of car owned.[49] As an important historian of the automobile industry observed in 1928, "as the use of automobiles became more and more common, motives of emulation and display reinforced the immediate services of the vehicle as important elements in the demand."[50] Another automotive writer stated ten years later that "large, high-powered expensive cars are . . . an obvious sign of social superiority," and he pointed out, "As something to be judged by, a car's chief virtue is to appear expensive."[51] Automobile manufacturers were quick to respond to the potential of the motorcar as a mobile status symbol, in their designing and in their advertising. An ad for the Owen Magnetic which was published in Country Life magazine in March, 1919, illustrates this approach well: Entitled "Banishing the Commonplace," the essay stated that Magnetic owners were

> strict individualists, though not bizarre. Their town and country houses, their gardens, all their possessions are far from commonplace. And so when it comes to a car, they insist on getting away from the monotonous. Up and down the Avenue, or at the opera, or at the Country Club--wherever the world of fashion congregates--certain cars distinguish the vivid personalities from the drab. Each Owen Magnetic expresses this idea of unobtrusive elegance. Exterior and interior colors and upholstery are decided upon by the owner. . . . The most casual observer knows instantly that the owner is a person of faultless taste.[52]

The use of psychology in automobile promotions was more complex than the appeal to status, but Edward Jordan, who founded the Jordan Motor Car Company in 1916, began the use of the "wildly explicit" automobile adver-

tisement in the early 1920's "composed in an eccentric free-verse manner, rich in easy imagery and commercially desirable associations"--like sex, romance, youth, "vicarious escape from the grubby details of everyday life."[53] One of his ads for the Playboy model created a sensation when it was first published in 1926:

> Somewhere west of Laramie there's a bronco-busting, steer-roping girl who knows what I'm talking about. She can tell what a sassy pony, that's a cross between greased lightning and the place where it hits, can do with eleven hundred pounds of steel and action when he's going high, wide and handsome.
>
> The truth is--the Playboy was built for her.
>
> Built for the lass whose face is brown with the sun when the day is done of revel and romp and race.
>
> She loves the cross of the wild and the tame.
>
> There's a savor of links about that car--of laughter and lilt and light--a hint of old loves--and saddle and quirt. It's a brawny thing--yet a graceful thing for the sweep o' the Avenue.
>
> Step into the Playboy when the hour grows dull with things gone dead and stale.
>
> Then start for the land of real living with the spirit of the lass who rides, lean and rangy, into the red horizon of a Wyoming twilight.[54]

In the 1930's, the J. Sterling Getchell agency which had won the Plymouth advertising account employed psychiatrist Ernest Dichter to study the symbolism of the automobile and he reported that a convertible was like a mistress and a sedan like a wife.[55] During the postwar period a formal theory was put forward arguing that the consumer "does not judge on an objective, rational, or even conscious grounds," for he "consumes not things, but expected benefits, . . ." such as "the car's capacity to enhance its user's status and his access to female prey," and thus advertisements should be psycholog-

ically oriented.[56] A 1954 Chicago Tribune study urged automobile manufacturers to make better use of their car's personalities in advertising: "By personality of the car is meant its character or reputation, which is the composite of all the attitudes that people have about it. It isn't a question whether these are factual or not. These are what people believe is true."[57] The automobile industry also took the lead in designing consumer motives into their models, and in 1958 Ernest Dichter and Albert Shepard of the Institute for Motivational Research were urging manufacturers to put even greater emotional satisfaction into their products. Observers noted the symbolism of Cadillac's "bosom" bumper design, Buick's ring-shaped hood ornament pierced by a "flying phallus," and Edsel's "vaginal" center grill design. At first attempts were made to give all possible motives to the same car and sell it to everyone, but this too often resulted in cars that lost their distinctiveness. As a result, more of an effort was made to differentiate the personality of each model, ". . . based on exhaustive psychological research" for different segments of the market.[58] An advertising expert wrote in 1957 that the auto ". . .tells us who we are and what we think we want to be, it is a portable symbol of our personality and our exact position."[59]

The effect of the annual model change on the automobile is evident in the changes in the Ford during a nine year period. As compared to the 1949 model, the 1958 was not only five inches longer, five inches wider, six inches lower, and 240 pounds heavier, but also featured smaller wheels, 20 percent more glass area, 100 percent more horsepower, an oil filter, an air cleaner, foam rubber seat cushions, four headlights, four tail lights (two were dropped the next year), turn indicators, increased chrome decoration, radically different "sculptured" styling, and a markedly increased price. As Ford vice president Theodore O. Yntema pointed out, "The current model is clearly a more costly car to build--more glass, more and larger lights, larger bumpers, more complex sheet metal surfaces, . . . and increased ornamentation have all added to the cost and value of the car." Yntema asked, "where else can you buy as much for your money as in the mechanical marvels that make up an automobile? Where can you get as much per dollar in performance, comfort, convenience and style?"[60]

Not everyone agreed that the annual model change was producing mechanical marvels. An article in Auto-

motive Industries in 1925 charged that the annual innovations were trivial while engines were wasteful, transmissions poor, and the weight of the automobile was twice what it should be. Most manufacturers just ". . . alter a few body lines or change the kind of paint employed"; the last real improvement had been the adoption of four-wheel brakes. "Gadgets and doodads appeal more, or are supposed to so appeal, than things which would make cars safer and more economical to operate."[61] In 1933 L. H. Pomeroy wrote in the Society of Automotive Engineers' journal that the design of American cars was based on ". . . a hodge podge of ideas taken from competitors, absolutely sincere but misinformed opinions of ignorant golf-club critics [and] . . . salesmen, . . . plus what little the engineering department can wedge in on the side."[62] Three years later, a feature in the Aubomobilist, a publication of the Automobile Legal Association of Boston, stated:

> We grow angry when we stop to consider the game automobile manufacturers are playing with our pocket books. Every year they out-mode our last year's model by bringing out a car which is really no different from the old "bus," except for perhaps the horizontal radiator louvres as against the vertical louvres. They call it progress and waste a lot of reading space in newspapers and magazines with advertisements designed to shame us into buying new cars.[63]

Another critic, writing in 1938, observed: "The manufacturers of automobiles . . . are not in the transportation business, except indirectly. Their aim is to make cars that can be sold at a profit." The author went on to argue that although obviously the car had to run, features which improved its service life were ". . . not the chief features which make it sell readily. . . ." Thus, the manufacturer invested in styling, elaborate grillwork, ornate dashboards, chrome moldings, period hardware, and gadgets, and the author stated, ". . . every chromium strip drains a few cents from the value of a hidden bearing. . ." or other unseen part.[64] A more eloquent writer in the New Yorker two years later argued:

> The public is just the whipping boy for the industry's style experts, who are trying to out-streamline each other and

> who are so snarled up in their little chromium do-funnies and nutty refinements to take the eye of half-anesthetized people in the sluggish air of a sales-room that they are not doing their job as engineers.[65]

Other critics charged that the automotive engineers had been "pushed aside by the high command who give their first attention to those who talk glibly of color, chromium and 'class'" and that they were finding it difficult to make new cars run as well as earlier models because the wrenching of the basic machinery to fit the new shapes created by the stylists had almost reached its limit.[66]

Immediately after the war, Lewis Mumford attacked as a perversion the practice of "fashioning a motor car to go out of style in five years in order merely to increase the demand for production and profit,"[67] while the well-known styling engineer of Studebaker Corporation, Virgil M. Exner, stated in a paper delivered at the 1948 meeting of the American Society of Body Engineers in Detroit: "If the present trend toward building elephantine automobiles persists, we shall find our automobiles literally choked under their own weight."[68] Even the usually uncritical American Automobile Association attacked postwar automobile design in a series of resolutions passed at local, regional, and national conventions during 1948 and 1949, suggesting that cars were now being designed in Hollywood. The new models were criticized for: being too long and wide to maneuver, park, or fit into garages; being too low to the ground to drive on rural roads or in sand, mud or snow; having roofs and seats too low for comfort or visibility; being too expensive to operate, maintain, and repair; and having brakes too small for the larger size of the cars.[69] An article in Harper's magazine in 1949 entitled "Those Big Fat Cars: Detroit's Big Package and How It Grew" charged that the argument the industry had been using for the previous twenty years in response to criticism of automobile design--"We are building the kind of cars our customers tell us they want"--was absurd because the public had no alternatives to pick from other than what the industry produced: "And the successive models which Detroit has poured out in their tens of millions during the past twenty years--together with the sales talk that sold them--have pointed steadily to the form which postwar cars have now assumed."[70]

Complaints about new car styling continued into the

1950's. Consumers' Research Bulletin printed letters from readers complaining about various aspects of design,[71] and in 1954 an article in the New Republic criticized automobile manufacturers for decreasing space on the highways by making cars larger and for encouraging accidents by increasing horsepower, and it charged: "In our opinion the absurdity of the 1955 models is exceeded only by the idiocy of the advertising through which they are being foisted on the American public."[72]

The year 1957 which saw the launching of the Soviet space satellite, Sputnik, and the beginning of a recession in the United States also produced a great deal of comment and criticism, some of it very bitter, of American automobiles.[73] In particular, attacks were centered on a new, medium priced model introduced that year by the Ford Motor Company, the Edsel, which seemed to symbolize the direction in which automobile design was headed. The new Edsel was longer, lower, wider, heavier and more powerful than other medium priced cars, and featured a variety of new features and accessories including a push button transmission selector in the center of the steering wheel, dual headlights, a horse-collar shaped center piece in the grill and dual tail lights sculptured into a gull-wing rear deck design.[74] Dr. S. I. Hayakawa of San Francisco State College offered some particularly biting comments on the Edsel in the spring of 1958 and charged that automobile company executives "in their efforts to turn out a car that would satisfy customer's sexual fantasies and the like, had failed to supply reasonable and practical transportation, . . ." and he claimed the motivation researchers had neglected to tell the automobile manufacturers "that only the psychotic and the gravely neurotic act out their irrationalities and their compensating fantasies."[75] The Edsel did not sell in volume, and when it was withdrawn from the market two years later, David Wallace, the director of planning for the Edsel, blamed its failure on the launching of Sputnik:

> I don't think we yet know the depths of the psychological effect that that first orbiting had on us all. Somebody had beaten us to an important gain in technology, and immediately people started writing articles about how crummy Detroit products were, particularly the heavily ornamented and status-symbolic medium priced cars . . . . The American people . . . put themselves on a self-imposed austerity program. Not buying Edsels was their hair shirt.[76]

A poll taken by Elmo Roper and Associates in 1958 revealed that 50 percent of the public opposed the annual model change with only 38 percent approving it, and a proposal was put forward to continue the 1958 models unchanged through another year and pass on the $250 saving on each car to the public in the form of a reduced price in order to stimulate new car sales and help boost the economy out of the recession.[77] Attacks on the styling of the new models continued in numerous articles and editorials. Consumer Reports charged that the industry's definition of "improving" automobiles was merely a change in style,[78] and E. B. White, writing in the New Yorker complained:

> For 25 years car makers have been foolishly pursuing two false and seductive ideas: first, that the stature of man is decreasing; second, that the way to create beauty is to turn the matter over to the style department after consulting a few motivational research monkeys and a covey of social psychologists.[79]

Dr. Earl L. Koos, a sociologist at Florida State University, commented: "The auto is not necessarily the most useful instrument of transportation, and it is used because of its status value and its use to the individual as an instrument of power, etc."[80] Speakers at the annual meeting of the American Society of Body Engineers again criticized automobile manufacturers, charging that the horrible, chrome-covered models merely delineated the fantasies of the sales managers, and the members of the Senate subcommittee on antitrust and monopoly blamed the excessive emphasis on styling and other non-price features on the oligopolistic nature of the industry.[81] J. B. Lippincott published a full length, comprehensive criticism of the automobile industry and its products by John Keats entitled the Insolent Chariots which criticized the automobile industry for, among other things, operating on the theory "that Americans don't buy automobiles, but instead buy dreams of sex, speed, power, and wealth."[82]

Criticism continued through the next few years, if at a lower level of volume. Some charged that the industry was "engaged in forcing extravaganzas on an unwilling public, and that their business is the creation of fantasies and the rolling palaces in which to indulge them."[83] A study by the Commerce Department was much less colorful in its language, reporting: "Vehicle de-

signs are necessarily a continuous series of compromises, balancing engineering against considerations of styling, weight, cost, and available space. The problem is complicated by the competition for sales and the relative appeal of body styling as compared with sound engineering and safety in design."[84] Edward A. Tenny in a book published in 1962 entitled the Highway Jungle stated that "the average citizen is compelled to buy a dangerous car, one built on the principle of planned obsolescence--a car designed to convert itself within one decade or so into rust and oily rubble, as the ample auto cemeteries testify."[85] Consumer Reports continued to periodically criticize the emphasis on styling as opposed to sound engineering, and charged that the main goal of "the manufacturers has been and remains predominately salability favored by newness and change, and obsolescence that makes a 3-year old car look passe. . . ."[86] Senator Estes Kefauver devoted a chapter in his book, In a Few Hands: Monopoly Power in America, published in 1965, to the automobile industry and was critical of planned obsolescence, stating: "To convert a durable type of consumer product into an ephemeral perishable of fashion is a difficult art."[87] A British observer of the American automobile industry charged that the annual model change not only increased the cost of cars by 25 percent, but also produced poor automobiles, "bulging with useless chromium and littered internally with ill conceived and dangerous gadgets." Furthermore, he conceded that "The motor car has . . . been ideally designed as a status symbol and has performed this function in society with great effect--if we can accept this as anything but a design failure."[88] An American historian of the industry wrote in 1968:

> spokesmen for the industry are forever proclaiming, "We struggle unceasingly to give the public what it demands." It is a noble thought, but it is a myth, repeated so persistently as to assume the stature of a fact. It is a phrase used to explain or justify upward price movements, annual models, increases in engine horse-power, absence of small cars; in fact, any sales policy or engineering design a company believes will be most profitable.[89]

In spite of criticism, the annual model change was a highly profitable approach to the market for General Motors. The replacement cycle was speeded up so that annual sales remained at a level well above what could

be expected on the basis of replacement sales alone, profits per unit sold increased, and the corporation's market share grew. The rest of the automobile industry was forced to adopt the General Motors' strategy, and the great resources required for annual model change quickened the demise of the remaining small competitors. There were occasions when General Motors officials and other commentators spoke candidly about the annual model change. General Motors president Sloan stressed in 1928 that the key to industry's current economic position and future growth lay in keeping the customer "dissatisfied" through the use of yearly model changes,[90] and he later pointed out: "The automobile industry is able to expand its own payroll and those of others through the production incident to the glamour of the new model."[91] The author of one of a collection of papers on The Dynamics of Automobile Demand published by General Motors in 1939 pointed out that if the customer could not be made dissatisfied with his old model, ". . . the life of the product will be prolonged and the current demand will fall."[92] Business Week echoed this point in 1947: "Any change in favor of less frequent car buying can have a drastic effect on production schedules, used car turnover, prices and profits, replacement parts production--even advertising and promotion."[93] To keep this from happening, the magazine argued for more radical styling changes to make present models obsolete along with more advertising and promotion to create buying desires.[94] An article in Advertising & Selling in the same year by industrial designer J. Gordon Lippincott agreed with the industry's use of the annual model change "as a merchandising feature leading to style obsolescence," claimed that it was "soundly based on our economy of abundance," and argued: "It must be further nurtured even though it is contrary to one of the oldest inbred laws of humanity --the law of thrift--of providing for the unknown and often feared day of scarcity."[95]

In 1955, General Motor's president Harlow H. Curtice said, "It is my considered opinion that the annual model change has been the most important single factor responsible for the growth and vitality of our industry," and he argued that it brought employment and increased purchasing power.[96] The corporation's 1959 annual report echoed this later point: "Without the annual model change, industry sales would not have reached the current volume with the employment, purchases and services this produces."[97] General Motor's president James R. Roche repeated these arguments in 1965,[98] and five years later, when Henry Ford II, chairman of the

board of the Ford Motor Company, stated that the annual model change and planned obsolescence were now passe, Roach in rebuttal claimed that they were the very cornerstone of the automobile industry: "Planned obsolescence in my opinion is another word for progress. Nobody in the industry coined the phrase. But if we had not had the annual model change, I don't think the auto industry would be in the position it's in today."[99]

In 1964 Time magazine called the annual model change "the most unbeatable sales gimmick of them all," and a year later, an automobile company executive was quoted as saying, "If the public ever catches on to the fact that a new car every two years is not a necessity, we are sunk."[100] The public, lacking the information necessary to evaluate the complex motor vehicle rationally, and overwhelmed by the millions of dollars spent by the automobile manufacturers in advertising, did not catch on to the annual model change gimmick. And tragically, although the strategy produced enormous profits for the industry, the new models on which the money was made were less economical, less efficient, and in many ways less safe than the vehicles they replaced.

NOTES

[1]Norman G. Shidle, "Are Yearly Models on the Way Out?" Automotive Industries, Sept. 4, 1924, pp. 429-31.

[2]Smith, Wheels within Wheels, p. 113.

[3]Forbes and Foster, Automotive Giants, p. 10.

[4]Sloan, My Years with General Motors, pp. 238, 247.

[5]Ibid., Adventures of a White Collar Man, p. 177.

[6]Harlow H. Curtice, Meeting the Challenge Ahead (New York: General Motors Corp.,1954), p. 7.

[7]General Motors Corporation, Annual Report, 1959, (New York: General Motors Corp., 1959), pp. 10, 21.

[8]Senate Committee on Commerce, Traffic Safety, Hearings, 1966, pp. 371, 411.

[9]General Motors Corporation, Motorists' Handbook (New York: General Motors Corp., 1940), p. 46.

[10]Sloan, My Years with General Motors, p. 245.

[11]"Are Car Buyers Coming of Age?" Iron Age, May 14, 1959, p. 121, quoted in Stuart, Factors Affecting Market Shares, p. 349.

[12]Nick Thimmesch, "The Metaphysics of Automotive Design," Esquire, Dec., 1967, p. 188.

[13]Time, Apr. 1, 1966, p. 27.

[14]General Motors, Motorists' Handbook, p. 47.

[15]Sloan, My Years with General Motors, p. 239.

[16]U. S. Congress, Senate, Committee on the Judiciary, Administered Prices, Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U. S. Senate, 85th Cong., 2nd sess., 1958, pt. 6, p. 53.

[17]Sloan, My Years with General Motors, pp. 265, 272. The bulge on the 1929 Buick was only one and one-quarter inches. Sloan pointed out: "In modern cars we tolerate a bulge of three to five and a half inches. The 'preg-

nant Buick' of 1929 is a classic example of how the public generally prefers gradual rather than drastic changes of design" (Ibid., p. 273).

[18]Sloan, My Years with General Motors, p. 277; Harlow H. Curtice, "The Development and Growth of General Motors," statement before U. S. Congress, Senate, Committee on the Judiciary, A Study of the Antitrust Laws, Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U. S. Senate, 84th Cong., 1st sess., 1955, pt. 7, General Motors, pp. 22-23.

[19]Business Week, Sept. 14, 1968, p. 118.

[20]Booton Herndon, Ford: An Unconventional Biography of the Men and Their Times (New York: Weybright and Talley, 1969), p. 251; Ford Motor Co., Ford at Fifty, p. 67.

[21]AMA, Automobiles of America, pp. 66-67; "Lucky Figureheads for Autos Copied from Old Ships," Popular Science, Mar., 1932, p. 65; W. E. Berchtold, "Automobiles Turn to Airplanes for Design," Literary Digest, Jan. 13, 1934, p. 25.

[22]Sloan, My Years with General Motors, p. 278.

[23]Ford Motor Co., Ford at Fifty, p. 72.

[24]Caplan, "It's the Curve that Counts," p. 183. The author points out that only in Detroit are stylists called "stylists"; most others prefer the more professional-sounding title of "designer". (Ibid.).

[25]Dewey H. Palmer and Lawrence E. Crooks, Millions on Wheels: How to Buy, Drive, and Save Money on Your Automobile (New York: Vanguard Press, 1938), p. 9; Smith, Wheels within Wheels, p. 143.

[26]Dreyfuss, "Car Detroit Should Be Building," p. 351. See also, "Ford Problem Cars to Get GM Look," Iron Age, June 17, 1965, p. 13.

[27]Alfred H. Sinks, "Those Big Fat Cars: Detroit's Big Package and How It Grew," Harper's, Apr.,1949, p.60.

[28]Business Week, Sept. 14, 1968, p. 122.

[29]Thimmesch, "Metaphysics of Automotive Design,"

p. 122; David Cort, "You, Too, Can Drive a Juke Box," Nation, Dec. 22, 1956, p. 536.

[30]Sinks, "Those Big Fat Cars," p. 59.

[31]Palmer and Crooks, Millions on Wheels, p. 14.

[32]Sinks, "Those Big Fat Cars," p. 60; Eugene Jaderquist, "The Horsepower Race," Atlantic, June, 1954, p. 58; Automotive Industries, July 3, 1919, p. 14.

[33]Quoted in Palmer and Crooks, Millions on Wheels, p. 7.

[34]Frank Rowsome, Jr., They Laughed When I Sat Down: An Informal History of Advertising in Words and Pictures (New York: Bonanza Books, 1959), p. 124.

[35]K. T. Keller, The Automobile Industry (Washington: The United States Industrial College of the Armed Forces, 1940), p. 6; See also, H. F. James, "How a Typical Small Car Has Grown Up: Chevrolet through the Years," Business Week, June, 7, 1947, p. 20.

[36]Theodore O. Yntema statement in Senate Judiciary Committee, Administered Prices, Hearings, 1958, pt. 6, pp. 25-26.

[37]"Challenge to Detroit," Barron's, Aug. 11, 1958, p. 1; Robert P. Weeks, "Detroit Discovers the Consumer," Nation, Sept. 19, 1959, p. 153, quoted in Stuart, Factors Affecting Market Shares, p. 343.

[38]AMA, Automobiles of America, p. 150.

[39]Smith, Wheels within Wheels, p. 158.

[40]"1963 Cars: Back to Bigness, Power," Printer's Ink, Aug. 17, 1962, p. 21; "Selling Them Big and Bigger," Time, Apr. 19, 1963, p. 103; Time, Oct. 1, 1965, p. 101.

[41]Palmer and Crooks, Millions on Wheels, p. 7.

[42]"Public Calls for Body Design That Suggests Speed," Automotive Industries, May 8, 1937, p. 698; Sinks, "Those Big Fat Cars," p. 61.

[43]Palmer and Crooks, Millions on Wheels, pp. 5-6.

[44]Ibid., pp. 7-8.

[45]Ibid., p. 7; H. C. Tuttle, "On 1953 Models, Builders Will Offer Wire Wheels, Continental Spare Tire Kits," Steel, Nov. 3, 1953, p. 77.

[46]Business Week, Sept. 14, 1968, p. 119.

[47]John Keats, The Insolent Chariots (Philadelphia: J. B. Lippincott Company, 1958), p. 75.

[48]Black, Man and Motor Cars, p. 60.

[49]Flink, America Adopts the Automobile, pp. 102-103.

[50]Seltzer, Financial History, p. 47.

[51]Palmer and Crooks, Millions on Wheels, pp. 6,7.

[52]Clymer, Motor Scrapbook, p. 119.

[53]Rowsome, They Laughed, p. 117; Kenneth Ford, "Safety and Auto Ads," Printer's Ink, July 8, 1966, p.9.

[54]AMA, Automobiles of America, p. 83.

[55]Rowsome, They Laughed, p. 125.

[56]Stuart, Factors Affecting Market Shares, pp. 1, 3; Theodore Leavitt, "The Morality of Advertising," Harvard Business Review, July-Aug., 1970, p. 91.

[57]"Chicago Tribune Study Shows Influence of Product Personality on Auto Sales," Printer's Ink, Jan. 8, 1954, p. 31, quoted in Stuart, Factors Affecting Market Shares, p. 341.

[58]"Auto Industry Research: Can It Help Detroit Bounce Back," Printer's Ink, Aug. 8, 1958, p. 52, quoted in Stuart, Factors Affecting Market Shares, p. 368; "Psychological Engineering: Detroit's Future Approach to Automobile Design?" Printer's Ink, Nov. 21, 1958, pp. 65-66; Keats, Insolent Chariots, p. 155; "New Cars Called Symbols of Male Sex," Science Digest, Sept., 1957, p. 38; S. I. Hayakawa, "Why the Edsel Laid an Egg," ETC: A Review of General Semantics (Spring, 1958), p. 221, in Stuart, Factors Affecting Market Shares, p. 290; "Dodge Will Differentiate Its Cars' Personalities in 1961," Advertising Age, Sept. 19, 1960.

[59]Pierre Martineau, Motivations in Advertising (New York: McGraw-Hill Book Co., Inc.), p. 67, quoted in Stuart, Factors Affecting Market Shares, p. 2.

[60]Senate Judiciary Committee, Administered Prices, Hearings, 1958, pp. 18-19, 25-27, 29, 65.

[61]A. Ludlow Clayden, "Automobile Engineer: Is He Falling Down on Job?" Automotive Industries, Nov. 19, 1925, p. 871. As early as 1905, one critic had stated, "Builders are far too prone to turn out machines with unnecessary ornamentation. These look very smart in the showroom, . . ." but they are not very practical (Sloss, Book of the Automobile, p. 219).

[62]"What Is Wrong with American Cars?" Automotive Industries, Aug. 26, 1933, p. 230.

[63]Automobilist, Apr., 1936, quoted in Stevens, Highway Safety, p. 134.

[64]Palmer and Crooks, Millions on Wheels, pp. 4-7.

[65]New Yorker, Mar. 6, 1940, quoted in Stevens, Highway Safety, p. 79.

[66]Stevens, Highway Safety, p. 83; Leighton and Nicholson, "Has the Automobile a Future?" p. 63.

[67]Advertising and Selling, Oct., 1947, p. 43.

[68]"Are Dangerous Curves Ahead?" Automotive Industries, Dec. 1, 1948, p. 45.

[69]Sinks, "Those Big Fat Cars," pp. 56-58.

[70]Ibid., p. 57.

[71]"Faults of New Car Styling," Consumers Research Bulletin, Apr., 1953, p. 22.

[72]"How Strato Is Your Streak?" New Republic, Dec. 13, 1954, p. 22.

[73]"Solid Chrome Monster," Reporter, Jan. 10, 1957, p. 4; "Spearing the Whales," Time, Jan. 28, 1957.

[74]John B. Columbo, "Long Term Failures," in Stuart, Factors Affecting Market Shares, p. 289.

[75]Hayakawa, "Why the Edsel Laid an Egg," p. 290.

[76]"Annals of Business--The Edsel," New Yorker, Nov. 26, 1960, p. 218, quoted in Stuart, Factors Affecting Market Shares, p. 288.

[77]Harper's, Aug., 1958, p. 81; Smith, Wheels within Wheels, p. 156.

[78]"Still Open Season on Detroit," Printer's Ink, Nov. 7, 1958, p. 12; Dreyfuss, "Car Detroit Should Be Building," p. 351.

[79]E. B. White, "Letter from the North," New Yorker, Apr. 5, 1958, p. 34.

[80]President's Committee on Highway Safety, "Special Report on Williamsburg Conference, February 23-28, 1958," reprinted in U. S. Congress, House, Committee on Interstate and Foreign Commerce, Research Needs in Traffic Safety, Hearings before a subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 85th Cong., 2nd sess., 1958, p. 23.

[81]"Open Season on Detroit," p. 13; "Senators Hit GM: Say Car Ads Shrink Market," Advertising Age, Nov. 1, 1958, p. 1.

[82]Keats, Insolent Chariots, p. 115.

[83]Russell Lynes, "How Customers Shape Birth of New Car," New York Times, Oct. 4, 1959, sect. 11, p. 2.

[84]Commerce Department, Federal Role in Highway Safety, 1959, p. 39.

[85]Edward A. Tenny, The Highway Jungle: The Story of the Public Safety Movement and of the Failure of "Driver Education" in the Public Schools (New York: Exposition Press, 1962), p. 157.

[86]Consumer Reports, Sept., 1963, p. 21; Caplan, "It's the Curve that Counts," p. 183.

[87]Estes Kefauver, In a Few Hands: Monopoly Power in America (New York: Pantheon Books, 1965), pp. 90, 93-94.

[88]Black, Man and Motor Cars, pp. 98-99.

[89]Smith, Wheels within Wheels, p. 143.

[90]"Alfred Sloan on the Future of the Automobile," Printer's Ink, May 3, 1928, pp. 57-58.

[91]Sloan, Adventures of a White-Collar Man, p. 178.

[92]American Statistical Association, The Dynamics of Automobile Demand, Based upon Papers Presented at a Joint Meeting of the American Statistical Association and the Economic Society in Detroit, Michigan, December 27, 1938 (New York: General Motors Corp., 1939), p. 122.

[93]"Car Buying Pattern May Change," Business Week, Apr. 5, 1947, p. 39, quoted in Stuart, Factors Affecting Market Shares, pp. 340-341.

[94]Ibid.

[95]J. Gordon Lippincott, "Forced Style Changes Spur Our Economy," Advertising and Selling, Oct., 1947, pp. 42-43.

[96]Curtice, Meeting the Challenge Ahead, p. 7.

[97]General Motors, Annual Report, 1959, p. 10.

[98]"General Motors Defends Model Changeover," Steel, Dec. 13, 1965, p. 96.

[99]Newsweek, April 6, 1970, p. 75.

[100]Time, Jan. 24, 1964, p. 62; Paul B. Sears, "Man or Motor?" Atlantic, July, 1965, p. 75.

CHAPTER III

THE SAFETY DEFICIENCIES CREATED BY THE ANNUAL MODEL CHANGE

The annual model change strategy pioneered by General Motors was a highly effective technique for increasing the replacement sales of the industry's products, but at the same time it was a highly irrational method of designing motor vehicles. Although the basic configuration of the automobile was accepted as given by the manufacturers, the annual model change gave rise to a product philosophy which gave priority to almost any nonfundamental change in design which promised to increase sales, while downgrading research and development on significant aspects of motor vehicle design. Functional improvement of the automobile was not a prerequisite for change, and the effect an alteration in design might have on the operation of the vehicle was given little or no attention. It was inevitable that this approach to automobile design would have an adverse effect on the motor vehicles produced by the industry, and numerous safety deficiencies were observed and criticized over the years by engineers, mechanics, insurance men, state highway administrators, traffic safety officials, federal government investigators, and members of the general public. The specific defects included deficiencies in visibility, brakes, weight distribution, steering, tires and wheels, springs, ventilation, maintenance and repair, and basic body structure. Although the consequences of these specific defects as well as of the total irrationality of the approach to automobile design are almost impossible to calculate in terms of resultant accidents and injuries and deaths, contemporary critics realized that the inadequacies resulted in automobiles which were in many ways less safe than previous models.

In 1920, a writer in Automotive Industries stated: "To the automobile the windshield, the glass in the rear of the car, and the mirror are its eyes upon which depend to a large extent the safety of traffic. The slightest blemish by which vision is distorted may bring about a grievous accident."[1] Good visibility for the driver is one of the main requirements of functional motor vehicle design, and yet the "eyes" of the automobile were modified yearly like other aspects of the motorcar in order to meet the demands of the annual model change. These changes, along with other alterations, combined to

diminish the driver's field of vision, to eliminate important vehicle reference points which he used in maneuvering on the highway, and even to distort his view. The deficiencies in visibility were obvious even to the untrained observer, and many people criticized them and pointed out the dangers involved.

Styling changes affected all the windows in the automobile, but the windshield, the most important part of the vehicle in regard to driver vision, was, perhaps, altered the most. Fashions in body design emphasizing the illusion of speed required the slanting of windshields at more and more rakish angles during the 1920's and in the next decade the round shapes of the "streamlining" style led to the wide adoption of slanted, two-piece, v-type windshields. Chrysler pioneered a return to a one-piece windshield by bending a single sheet of glass in the middle, but as a company vice president later reported, "The location of that curvature was at such a point that it gave quite noticeable and, in some cases, severe eyestrain."[2]

Yet, v-type windshields were not compatible with design trends, and stylists demanded curved windshields to give them more freedom in designing future models. There was some resistance to this proposal; curved glass cost four times as much to manufacture as flat glass, was more difficult to fit, seal, and replace, and presented problems of visibility, reflection, and cleaning. Furthermore, since most glass was less than perfect, the industry practice was to place the clearest portion of the windshield in front of the driver; since curved glass could not be reversed, this technique would not be possible.[3] However, General Motors' re-styled postwar Cadillac, Buick and Oldsmobile models featured two-piece, double-curved windshields in 1947 and 1948; in 1950 one-piece curved windshields appeared and competition forced other manufacturers to follow General Motors' lead.[4]

The most radical change in windshield styling came in 1954. President Harlow Curtice of General Motors announced that the corporation had topped its previous "major developments" in windows--the divided windshield, the sloping windshield, the curved rear window, and the one-piece, curved windshield--with a major technological advance, the "panoramic," or, as it was more commonly called, "wraparound" windshield.[5] A year later Curtice reported: "It is no exaggeration to say that the improved styling inspired by the panoramic windshield together with higher compression engines, automatic trans-

missions [etc.] . . . have been responsible for the greatest forward surge by all manufacturers in the entire history of any industry."[6] Curtice argued that "This outstanding achievement of the stylists and engineers combines beauty of design with increased vision for greater driving safety," but the wraparound windshield was soon being attacked as a hazard.[7] At the annual meeting of the American Medical Association in 1956, Dr. Dupont Guerry, chairman of the Department of Ophthalmology at the Medical College of Virginia, complained:

> In it all basic optical principles have been completely ignored, and the stylists' dream or nightmare has been allowed to run rampant. The driver who must use such [a windshield] suffers from terrific visual distortion due to prismatic effect, increased glare because of the focusing of extraneous light in the axial area of the windshield, and insuperable diplopia [double vision] from ghost images resulting from the surface reflections exaggerated by the acute curvature.[8]

Another critic charged that as far as the vision geometry of the driver was concerned, "scientific data regarding the population could not have been used in the design of the windshield," and insurance men criticized the great expense involved in replacing the complex piece of glass.[9]

Roy Haeusler, director of automotive safety at Chrysler Corporation, admitted that the automobile industry had not consulted any authority in the field of optics while designing the wraparound windshield and concurred that there was distortion in it: "This is one of the many instances in which we have to evaluate the balance between a new problem introduced, such as the addition of distortion and benefits to be gained from the greater wraparound windshields."[10] Larry Nagler, safety engineer at American Motors Corporation, pointed out that the greatest distortion in the windshield was in the area that the driver did not have to look through constantly, while in the section immediately in front of the operator "distortion . . . is not great," and he argued that the distortion was compensated for by an increase in the driver's angle of vision.[11] Virgil Exner, a leading automobile stylist, stated, on the other hand, that wraparound windshields not only gave less visibil-

ity and more distracting reflections day and night, but also provided a much weaker installation than flat windshields. He also claimed that it had not been in the power of anyone to oppose the adoption of the new windshield despite its faults for "this was the style and this is what all the companies were doing at the time."[12] Before the windshield competition had run its course, Chrysler Corporation introduced a double compound windshield which extended into the roof line.[13]

At the same time that General Motors was introducing the one-piece curved windshield, it was making another innovation in automobile visibility--the tinted windshield, introduced first on the 1951 Buick. General Motors announced that this new feature (which was actually developed by Libbey-Owens-Ford Glass Company), eliminated about one-third of the sun's glare-producing rays and one-half of its heat-producing rays while still preserving the optical qualities of clear glass, thus making the new "E-Z-Eye" glass a safety feature.[14] However, Consumer Reports soon asked whether tinted windshields were not a safety hazard, and others also questioned the merits of the new design.[15] Finally, in 1955 a study published in the Journal of the Optical Society reported that tinted windshields were a hazard to safe night driving, reducing driver vision from 9 to 15 percent at distances of 200 to 1,000 feet and from 30 to 45 percent where there was poor contrast between an object and the background. Furthermore, the study claimed that the tinting had only negligible effectiveness against daylight glare.[16] A similar examination ten years later came to the same conclusion and recommended that the front and rear windows of automobiles not be tinted.[17] Charles Chayne, General Motors vice president in charge of engineering, admitted in 1956 that tinted glass did reduce vision, but only by 3 percent at night at distances of 200 feet which did not constitute a hazard. Furthermore, he argued that it did absorb heat rays and reduce glare, thus making it a safety feature.[18] Chrysler's safety engineer, Roy Haeusler, concurred but set the loss of visibility at 4 percent or more, while the director of engineering at American Motors Corporation reported a 10 percent loss of visual distance in night driving.[19] The president of General Motors again called his corporation's innovation a safety feature in 1965, and, perhaps more to the point, a company booklet entitled Design for Safety, published in the same year, stated: "This comfort and safety feature has been well accepted by car buyers."[20]

There were aspects of automobile design other than

the windshield itself which also caused visibility problems. The widespread adoption of closed cars in the 1920's with their glass side and rear windows offered improved vision over the composition windows of the side curtains used in inclement weather on open cars, which "cracked and scratched easily, became opaque and made for poor visibility."[21] However, as an article in the Literary Digest in 1925 pointed out, the wide windshield and door pillars and broad rear quarter panels of the closed cars caused blind spots which restricted the range of vision of the driver, a situation which sometimes caused accidents.[22]

The yearly alterations brought by the annual model change resulted in further impediments to vision. A writer in Automotive Industries in 1933 reported: "While seats have been going down, belt lines, windshield bars and hoods have all been going up in an effort to make cars look lower by reducing the vertical dimensions of the windows. The result has been that driving vision has been impaired. . . ." The author went on to point out that the right front fender was no longer within the view of the driver, and in response to this situation automotive accessory companies had begun manufacturing and selling fender markers to help indicate to the driver what the actual dimensions of his vehicle were.[23] An article in Safety Engineering in 1934 stated that automobiles had "twentieth century speed" but only "nineteenth century visibility," and the following year National Safety News asked, "How well can the driver see?"[24] An article in the New Yorker magazine charged in 1937 that the new cars were "brilliantly powered, wonderfully smooth and foully designed by persons of criminal negligence. They are so badly designed that thousands of people are committing suicide in them, because of an inability to see where they are going." The author offered detailed criticism: "Cowls are built to eye level. Top of steering wheel at eye level. Rear windows nothing but slits. Side windows divided so you can't stick your head out when necessary. Sills built up to neck level; seats tilted back at lounging angle." And he pointed out that this design made it impossible to see the right front fender or the area for several yards in front of the radiator and created a huge blind spot in the right rear, all of which made the new car a "death trap."[25] Automobile manufacturer Eddie Rickenbacker in a Collier's article entitled "Your Car is Safe," published in the same year, admitted that the driver was forced to move in his seat in order to see when parking or entering a stream of traffic.

However, he pointed out that improved visibility was hard to obtain in the current style of cars because of their rounded tops, heavy windshield posts, and low floors, but he reported that engineers were trying to improve the visibility in the new models.[26]

In 1938, a Consumers Union publication by Dewey H. Palmer and Lawrence E. Crooks entitled Millions on Wheels: How to Buy, Drive, and Save Money on Your Automobile pointed out that although driving was accomplished largely through the sense of sight, in current automobiles "the driver is actually placed under the unique handicap of trying to maneuver an object--his car--without being able to see a single point lying on the outer . . . rim of that object." The authors charged that "most obstructions are due to or at least made worse by styling . . . to impress the beholder as he looks at [the car] from outside, not to afford maximum visibility. It is, in short, styled for sales rather than safety." They reported that when the vision problems were pointed out to automobile manufacturers, the response was that "there are no statistics showing that blind spots cause accidents," and the authors charged the industry with hypocrisy for allowing obstructions to vision to remain because of styling, while at the same time proclaiming an interest in accident prevention.[27] Dean A. Fales, a professor of automotive engineering at M.I.T., supported the Consumers Union criticism in a paper entitled "Design Suggestions for Safety" delivered at the summer, 1940, meeting of the Society of Automotive Engineers. Fales pointed out that the long hoods and low seating position required by current styling greatly limited driver vision, while the wide, rounded front corner posts created blind spots and the small rear windows offered almost no vision at all. Furthermore, he argued that steeply slanted windshields picked up more dirt and reflections from the dashboard than vertical ones and that the slanted rear windows then in style became useless during any kind of precipitation.[28] General Motors admitted that rear window wipers were necessary and offered them as optional equipment, but the corporation reported later that very few people were willing to pay extra for them.[29]

Some automotive engineers advocated rear-engined cars as a way of improving visibility. Arthur W. Stevens, in an article in the Safety Engineering journal in 1936, pointed out that such a design could provide a greatly increased field of vision for drivers, which he argued was the key to highway safety. Stevens later quoted the managing director of the National Safety

Council, W. H. Cameron, in support of this claim. Cameron argued that it would be "a major step in eliminating the FALSE SECURITY the driver feels when he sits, as now, behind five or six feet of hood. At the front of the car, where he could see the road flash beneath him, there would be a greater awareness of speed. . ."[30] However, the reaction to this proposal from the automobile industry was negative, due primarily to the change in styling it would require. A former motor vehicle administrator who had investigated the possibility of rear-engine cars as a solution to the lack of vision reported: "The principle difficulty we have encountered in dealing with this problem has been, in the consensus of opinion of those concerned, the more than doubtful effect on the sales and production of automobiles by such a radical change in design."[31]

Engineer Stevens went on to publish a book in 1941 entitled Highway Safety and Automobile Styling in which he estimated that the blind spot in forward vision found in American automobiles as then being designed was between 1,041 and 1,231 square feet, and he argued that this was a large loss in a critical accident area. All in all, he calculated that people were being required to drive without nine-tenths of their accustomed view of the surroundings, and he argued that if similarly handicapped as a pedestrian, a person would not be allowed on the street without an attendant. The driver "sits at the rear center of the car, where he is forced to peer. . . across an exaggerated engine hood. And in this handicapped position, he attempts to guide a powerful machine capable of traveling 90 miles an hour over roads he shares with some 40,000,000 other operators and a much larger number of pedestrians." Stevens reported that drivers were trying to compensate for the deficiencies in their automobiles by using cushions to raise them so that they could see more and fender guides to indicate where the edges of the vehicle were, and, he observed: "In a sense these fender guides which drivers buy and attach to new cars are overwhelming evidence that the manufacturers have not permitted safe traffic vision in their product--a product which they tell their customers is 'perfect.'"[32] A highway safety expert writing the following year echoed these complaints and pointed out that in the coupe body style there was more blind area than area visible to the driver, and an article in Harper's magazine charged that windshields were almost impossible to see out of.[33]

Criticism of poor visibility continued in the postwar period. A letter to the editor of the New Republic

in 1945 called for a Congressional investigation of the accident situation and charged automobile manufacturers with contributory negligence in producing cars with unnecessary speed potential and with poor visibility because of styling, and Consumers Research Bulletin claimed that most current models were "unsafe to drive" because of their poor visibility.[34] In 1956, GM vice president Charles Chayne claimed that his company was constantly striving to maximize vision and pointed to the one-piece curved windshield and the wraparound windshield as evidence of progress.[35] Consumer Reports, on the other hand, charged that although wraparound windshields gave wider vision, they were distorted and a lower rear view mirror made necessary by a lower roof caused a large blind spot right in the middle of the windshield. Furthermore, the magazine indicated that hoods had been heightened in the body style used by General Motors in 1953 and 1954 so that the minimum distance at which the driver could see the road had been increased over what it had been on older models.[36] Chrysler Corporation executive engineer Allan G. Loofbourrow concurred that "Driver visibility is an all-important factor in traffic safety," and he pointed out: "The styling trend toward lighter superstructure is in the right direction, since the driver sees more of the road and his traffic environment."[37] However, a Department of Commerce study released in 1959 reported that, despite larger glass area in newly styled automobiles, rear windows were blocked by tail fins and by rain and snow, while windshields were distorted and precipitation caused blind spots larger than on older models because wipers cleaned such a small area.[38] In 1963, optical specialist Merrill J. Allen charged that no American car provided an adequate visual environment for driving, and he observed: "It almost appears that automobile manufacturers believe that vision has nothing to do with driving."[39]

If the annual model change tended to decrease driver visibility, it also had other, more complicated, effects on other aspects of vehicle design. Early automobiles had offered an adequate balance between power and speed, total weight and its distribution, and handling and braking ability. However, annual models were made longer, lower, wider and heavier with more powerful engines, softer springs, smaller wheels, and less even distribution of weight, and these changes soon resulted in an unbalanced design which was in many ways less functional than earlier designs. One deficiency which evolved that many observers noted was brakes.

All early automobiles were equipped with brakes just on the rear wheels, but in 1909 and 1910, European manufacturers began adopting four-wheel brake systems.[40] American manufacturers, however, continued to rely on the less effective two-wheel design, while, at the same time, their models grew larger, heavier, and more powerful, making the brakes less and less effective and causing a great deal of criticism. In 1922, Harold F. Blanchard, an investigator for Motor magazine, estimated that 90 percent of automobile accidents could be prevented by equipping cars with better brakes, but he pointed out that "the size and effectiveness of the brakes used is sometimes determined by their cost. Saving money on this important point at the expense of effectiveness is something that should be prevented by law."[41] Automotive Industries called for better brakes in 1923 and 1924, and charged:

> The condemnation of all American cars for their insufficient brakes is fully justified and these and the steering system parts are two things on which safety is dependent and no excuse is too great to justify their improvement, but when both can be improved at less cost than the present construction, not to do so is criminal.[42]

The journal later reported that one reason four-wheel brakes were not adopted earlier in the United States was that they "added considerably to the cost of production."[43]

Four-wheel brakes had appeared first in the United States on high priced automobiles in 1920, and from 1924 on they were added to medium and low priced cars until, with the introduction of the new Ford Model A late in 1927, the feature became standard equipment on most automobiles.[44] Although the new Ford had four-wheel brakes, when it was revealed that the company had not seen fit to include a separate hand brake system, motor vehicle authorities in fifteen or sixteen states, the District of Columbia, Great Britain, France, and Germany all raised objections. The governor of the state of Washington publicly protested the deficiency. German officials withheld a license to import the new model, and British officials pointed out that the company could be held liable there for damages if an accident occurred to a car which lacked a separate emergency braking system, which was required by law. As a result, Ford Motor Company gave in and modified its braking system in 1928,

although Henry Ford argued that it was not necessary.[45]

Hydraulic four-wheel braking systems, which were more effective than the mechanical type, came to be widely adopted in the 1930's. However, as Ford and other observers pointed out, unlike mechanical brakes, a failure in a hydraulic system meant the loss of all four brakes, which, despite the presence of a hand brake, was a hazardous situation which could cause accidents. Some European automobile manufacturers offered dual hydraulic braking systems, and Great Britain required a back-up mechanical system operated by the brake pedal to activate the rear brakes in the event the hydraulic brakes failed. Yet Hudson, beginning in the 1930's was the only American manufacturer to ever offer such a system.[46] Finally, in 1961, American Motors Corporation began offering dual hydraulic braking systems on all of its models, but as late as 1965 General Motors chairman of the board James C. Roche stated: "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."[47]

An article in Atlantic Monthly in 1932 argued that while the introduction of four-wheel brakes had been hailed as a boon to safety, accidents had increased since their adoption because they could not compensate for the increased speeds of automobiles.[48] An engineer speaking before the Indiana section of the Society of Automotive Engineers in November, 1935, claimed that if single car accidents were investigated, it would be found that a large number of them were caused by the inability of American cars to be steered and braked severely at the same time. He argued that the reason for this condition was that no motor vehicle with more than 50 percent or more of its weight on the front wheels "can be expected to respond to directional control under emergency braking," and he concluded by pointing out that this was obviously a dangerous situation.[49] Another automotive engineer, writing in 1941, concurred in the criticism of poor weight distribution: "One of the outstanding dangers in the automobile itself is the skidding danger. Speed contributes to this, but the danger is inherent in any unit of today's pleasure cars because the heavy end of the car carrying the engine is in front." He argued that this excess of weight in the nose of the vehicle caused it to dive on braking and to skid on any but a straight line stop.[50] A critic writing after the war pointed out that the continual increases in the length of the American automobile had caused

problems of weight distribution, as well as other difficulties. Increasing the length of the wheelbase put a strain on the engine driveshaft, as well as the frame of the vehicle, and moved the center of gravity to the rear, which often resulted in serious oversteering problems and dynamic instability above certain speeds. He further argued that the development of the cantilevered frame, which allowed the frame and body to be extended beyond the rear wheels, further exaggerated the poor weight distribution of automobiles.[51]

Criticism of brakes continued in the postwar period. Consumer Reports complained in 1954 that brakes were inadequate, and a Bureau of Public Roads study of automobiles during the years 1942 to 1955 revealed: "During the period in which passenger-car size, weight, horsepower, and speed have all been increasing, and thereby imposing greater demands on braking systems, the general levels of braking performance have improved only slightly." The report also pointed out that there was a wide range of stopping abilities among different makes and models and that most braking systems were subject to swerving, locking, and fading.[52] Brake dive continued to be a problem until it was solved through a modification of front suspension geometry in 1955, but a more serious difficulty in postwar cars with rear leaf springs was "spring wind-up." Under severe braking rear springs were distorted by braking torque and when the tires broke traction, the springs were released, setting up an oscillation which made the car almost uncontrollable.[53] The introduction of power-assisted brakes on a wide scale was pointed to as a safety development by automobile manufacturers, but Consumer Reports pointed out in 1954 that, because of the low pedal pressure required with power brakes, it was difficult for the driver to apply the appropriate pressure, and, thus, he tended to lock the brakes in an emergency, reducing their effectiveness. Furthermore, if the power-assist were to fail, the effort required to bring the car to a halt increased to a level many times what was required on an automobile with a conventional braking system.[54] Three years later, the magazine charged: "Considering the weight increases and the big increase in power of the 1957 cars, the auto industry doesn't even appear to be holding its own in matching braking ability or resistance to fade with the acceleration and speed of the new cars."[55]

Another important aspect of vehicle control in which deficiencies developed was the steering system. Early steering wheels, for example, usually consisted of

an aluminum center and spokes fitted with a wooden rim, and as a 1911 advertisement pointed out: "Cases have been known where the steering wheel has broken in the hands of the operator at a critical moment. . . ."[56] Other parts of the steering system also failed on occasion, and in 1923 Automobile Industries called the manufacturers' lack of response to the need for safer steering systems "criminal." Another article in the journal the following year echoed the call for better steering and called in particular for the adoption of an irreversible design to prevent the steering wheel from being whipped from the driver's hands so that he lost control of the automobile when the wheels hit a hole in the road.[57]

Steering problems became more critical in the early 1930's as a result of the wide adoption of smaller diameter low pressure balloon tires and of a change in the weight distribution of most automobiles. Stylists and sales executives promoted the adoption of the new, wider tires--which were nicknamed "doughnuts" because of their appearance in comparison with older, narrow styles--because their size complemented new, lower styling designs and their lower pressure resulted in a softer ride. Many automotive engineers opposed the new tires since the chassis, suspension, and steering system had to be modified to accomodate them.[58] The new tires caused the most problems in regard to the steering system for the wider, low pressure design created much more friction with the road requiring much more steering effort. The situation was made worse by a shift in vehicle weight to the front wheels. Again, sales and styling departments urged that engines be moved forward over the front wheels in order to provide more room in the passenger compartment, reduce engine vibrations, and remove weight from the rear wheels so that rear springs could be softened to produce a more comfortable ride. Engineers opposed the change, reporting that it would have an adverse effect on steering control and steering effort, on front tire wear, on rear wheel traction, on drive shaft whipping, and on engine accessibility.[59] The change was made, however, and critics were soon attacking the poor roadability, steering, and braking which resulted. They agreed that the ride had been improved, but argued that it had been at the expense of maximum possible braking with steering control and rapid steering in an emergency.[60]

The obvious method of reducing the increased effort required to steer an automobile--especially in parking--caused by the adoption of low pressure balloon tires and

the addition of weight to the front wheels was to increase the steering ratio and reduce friction in the steering gear. This was the solution chosen but this improvement to the steering system--which had been made necessary by "improvements" in tires and body design--had some negative effects. The increased steering ratio reduced effort but so many turns of the wheel were required to steer the car that rapid maneuvering in an emergency became almost impossible. Furthermore, although friction in the steering system required extra driver effort, it also served to dampen road shocks. When friction was removed, road shocks were transmitted directly to the steering wheel, but multiplied by whatever the steering ratio was to create enough force to often whip the wheel from the driver's hands. As a General Motors engineer explained in 1934:

> When balloon tires first appeared in 1923, we had "in the bank" certain possible changes in steering-gear. From the available balance we have already expended in many cases more in the way of reduced friction in the steering system than is really desirable, and in the case of our larger cars we seem to have used everything in the way of increased ratio between wheel and steering that is consistant with safety.[61]

Other engineers also pointed to the safety problem of high steering ratios. B. J. Lemon of United States Rubber Company reported in 1932: "Steering ratios of manually operated equipment are reliably stated to have reached the limit of a driver's ability to spin the steering-wheel quickly for a sharp turn at high speed."[62] Another engineer, quoted in Automotive Industries in 1932, asked: "Is it not time to deplore the modern tendency of making steering gear ratios so high numerically as to constitute a nuisance in traffic and a positive hazard in an emergency?"[63] A highway safety expert warned the following year that "at present speeds, blow-outs of front tires are apt to throw a car clear out of control and cause a wreck and injury and death." He pointed out: "It takes a firm grip on the wheel and the exercise of considerable strength to stop a car at high speed with a blow-out."[64]

Some critics argued that in a properly designed automobile, with good weight distribution, there would be no steering problems. However, there were also engineers with improvements for steering systems that

would solve the difficulties of cars with heavy front ends and low pressure balloon tires. Francis W. Davis, who had worked for the Pierce-Arrow Motor Car Company for twelve years before becoming a consulting engineer in 1922, saw the problem and designed a hydraulic power steering gear in 1924 as a solution to it. Davis built a prototype and installed it on his Pierce-Arrow which he drove to Detroit in 1926 in order to demonstrate it for the automobile industry. General Motors representatives tested his device, even conducting a high-speed blow-out to see how the system handled in such an emergency, and they were impressed enough with it that an agreement was reached with the inventor after long negotiations, looking toward its installation on 1932 Cadillac models as optional equipment. However, because of the Depression, projected sales of the unit were low compared to the costs of going into production.[65] Introduction of the power steering system was delayed, and, in 1934, Davis was informed by General Motors vice president O. E. Hunt that the corporation had decided to terminate the agreement.[66] Davis wrote back to Hunt pointing to some of the problems which his power steering system would solve:

> You are now using a 24-1 ratio steering gear in your Cadillac car and it takes from 45 to 60 pounds pull on the wheel rim to park the car. The large Buick with a 23.5 to 1 ratio is little better off. Recent tests at the Cadillac Company indicate a required pull of 10,000 lb. in. necessary to swing the front wheels of the Cadillac 16 on dry pavement.[67]

Davis went on to point out that the limit of efficiency in hand-operated gears had been about reached, and he argued that "the reversibility in the high efficiency steering gears introduces a dangerous factor with tire blowouts and other heavy reactions on the front wheels." He reported that in the truck and bus field there was discussion of legislation to require power steering in the interest of public safety.[68] In his reply vice president Hunt stated:

> All the points you raise were given consideration at the time we made out decision to discontinue our agreement with you.
>
> We came to the conclusion that the cost of the protection to us under the then existing arrangement was greater than its value

to us either now or in the future.[69]

Criticism of automobile steering continued throughout the 1930's. One automotive writer complained about the increased weight on the front wheels brought about by moving the engine forward, and he pointed out:

> Easy steering is needed for parking and is a sales feature; . . . rapid steering is needed for maneuvering and is a safety factor. This compromise is rarely resolved in favor of safety, because under normal conditions the driver can get along with a slow-steering car. . . . Under abnormal conditions, however, like skidding or being forced off the road, inability to steer fast enough leads to fear and panic . . . and can be disastrous.[70]

Francis Davis signed a contract with Bendix corporation after his agreement with General Motors was cancelled, and Bendix went back to the corporation and was on the verge of signing a contract with Buick division when World War II broke out. Bendix sold power steering units for heavy military vehicles during the war, but in the postwar years automobile manufacturers were not interested in adding expensive new options when they could sell every vehicle they could produce. However, in 1951, when competition began to stiffen, Chrysler Corporation introduced power steering based on Davis' early patents which had expired in 1948.[71]

By this time new, compact, high-compression engines were being widely adopted which could be moved farther forward, allowing more interior room and softer rear springs, but placing more weight on the front wheels. This development, along with the addition of another generation of smaller diameter, wider, lower pressure tires, caused a further strain on conventional steering systems. In 1953 and 1954, Consumer Reports criticized the slow steering, the loss of "road feel," and the tiring, difficult parking of high ratio steering systems, and it called the maneuverability of larger cars "generally inadequate" in recent years.[72] The magazine pointed to power steering as an "improvement" made necessary by other improvements--increased room and a softer ride--and it argued that if cars were properly designed, it would be possible to steer them without power assistance.[73] Furthermore, Consumer Reports criticized power steering for having a ratio almost as high as conventional systems and for reducing the important quality of

"road sense" or "road feel," which the driver unconsciously depended on for information, thus forcing him to rely on vision alone.[74]

Once Chrysler Corporation began offering power steering, General Motors moved to meet the competition in 1952, but using Davis' improved design which differed from others by having enough resistance built into the system to provide a "road feel." There was some discussion as to whether or not the corporation should take out a license under the Davis patent, but a retired executive who had dealt with the inventor--called in for consultation--argued that the corporation had a moral obligation to Davis, and a decision was made to pay the royalty.[75] General Motors did not mention Davis in its advertisements for power steering, but it did use many of his arguments as reasons why the public should purchase the option piece of equipment. One corporation publication, entitled The Facts about Power Steering, admitted that:

> Engineers have had to compromise to keep steering effort down. Steering ratios had to be increased, . . . and less favorable caster, camber and king pin angle had to be adopted. Since manual steering had reached its ultimate [form], . . . the only practical way to improve steering efficiency was to add power assistance. . . . [76]

The booklet went on to point out how power steering absorbed road shocks--ending "wheel flight" and eliminating the danger of the wheel being jerked out of the driver's hands--and allowed the driver to keep a car under control if he hit a rut or the shoulder of a road or had a blowout.[77] In 1956, GM vice president Charles Chayne called power steering "a most important safety contribution," and the next year the corporation was calling the system "safety" power steering, which "assures more rapid and precise steering response in emergencies. It helps you outmaneuver trouble which you otherwise might be unable to avoid." Furthermore, a company publication proudly pointed out: "By eliminating all heavy physical exertion in steering, it enables many persons with heart conditions, arthritis and similar disabilities to drive. . . ."[78]

One of the annual changes which had contributed to the need for modifications to the steering system--the adoption of wider, smaller-diameter, low pressure tires--

caused problems with other automobile components as well. Wheel diameter was down to sixteen inches in the late 1930's, and when it was reduced again to fifteen inches after World War II, most observers felt the point of diminishing returns had been reached. However, as part of the long term effort to lower automobiles, the industry moved in 1956 to reduce wheel diameter another inch, and car height another half inch, for the 1957 models.[79] A Commerce Department study published in 1959 criticized the manufacturers for using smaller wheels to reduce the height of automobiles "without undertaking major structural changes" and charged that this had "compounded troublesome problems with brakes."[80] Consumers Research Bulletin concurred, pointing out that the smaller wheels limited the size of the brake drum and of the cooling area around it which resulted in less effective brakes.[81] Stylist Virgil Exner reported that he had argued against the adoption of what he considered to be unsafe smaller wheels and urged Chrysler Corporation to go to larger wheels instead, but he pointed out that smaller wheels were a styling trend which could not be halted.[82]

Other critics argued that automobile manufacturers mounted tires which were too small on cars in order to make the automobile look lower and bigger, as well as to save money over the cost of tires of proper capacity. Manufacturers had been charged with fitting their products with tires that were too small for the weight and power of the automobile before World War I, and there were calls that cars be equipped with tires heavy enough to carry its weight safely instead of straining inadequate tires by overloading them.[83] Most criticism came in the 1960's, however. Tire manufacturers complained privately that automobile industry equipped cars with tires which were too small and, therefore, less expensive than adequate tires. James C. McCreary, Jr., chairman of the board of McCreary Tire and Rubber Company, charged that many standard equipment automobile tires were overloaded before any passengers were aboard and that station wagon tires were almost always overloaded. Federal Trade Commission hearings in 1965 revealed that six passenger automobiles were being fitted with tires that were only adequate for carrying three passengers, and a court case against Goodyear Tire and Rubber Company in the same year brought out the fact that not only were the original equipment tires on station wagons inadequate, but also the wheel wells on these models were not large enough to accept adequate sized tires.[84]

Automobile company officials, on the other hand, argued that their standard equipment tires were the safest that money could buy. General Motors vice president in charge of engineering, Harry F. Barr, told a Senate Committee investigating tire safety in 1965 that "we can and do offer our motor vehicles equipped with tires manufactured to specifications which make us confident that these tires will operate safely and withstand vigorous driving conditions."[85] However, at the same time they were defending the tires as safe, automobile manufacturers began installing larger sizes as standard equipment.[86]

While the continual increase in the width and decrease in the pressure of automobile tires served to increase their ability to absorb road shocks, the principal means adopted to make each new year's model ride more smoothly and comfortably was to decrease spring rates or "soften" the springs. However, softer springs combined with higher speeds produced some unexpected effects, one of which was front wheel shimmy which produced a great deal of concern in the automotive engineering profession in the late 1920's. Engineers remained baffled by the cause of the problem, but they did discover that independent front suspensions would cure shimmy and at the same time allow the use of even softer springs.[87] Independent front suspensions were widely adopted in the 1930's, and the process of reducing the size and the rates of springs continued. A letter to the editor of Automotive Industries claimed that one manufacturer had softened the springs on its 1933 models so much that, when one was parked on a side slope, it looked like it would tip over. The writer went on to charge that all American automobiles had inadequate springs, a condition which resulted in diving on braking and rearing up during acceleration or when loaded, throwing off headlight aim.[88] This criticism of soft springs was echoed by other observers who pointed out that it was impossible to have a soft ride and at the same time stability at high speeds.[89] As Lawrence Crooks, head of Consumers Union's automobile testing program, put it: "The industry has promoted the idea of the cradle ride--the marshmallow ride and this does not help the controllability of the car. They've gone too far, just as the industry always goes too far in a successful direction."[90]

While automobile manufacturers concentrated on making their new models longer and lower with a softer ride, they paid little or no attention to aspects of vehicle design with little potential sales appeal, such as ventilation and maintenance and repair. The danger of car-

bon monoxide from automobile exhausts was recognized early--in 1916 Horseless Age warned, "beware of petromortis"--but it did not become a serious problem until the wide adoption of closed body types in the 1920's.[91] Around 1929 a prominent Yale physician recommended that automobile exhaust pipes be carried to the roof of the vehicles in order to safely dispose of the gas, and other critics pointed out that leakage of engine fumes and exhaust into the passenger compartment could have an adverse effect on the performance of the driver.[92] National Safety News called the gas "murderous monoxide" in 1936, and Safety Engineering called poorly ventilated cars a hazard the following year.[93] M.I.T. professor of automotive engineering, Dean A. Fales, speaking before a meeting of the Society of Automotive Engineers in 1939, called for design changes to keep carbon monoxide from seeping into the interior of automobiles.[94] Cities Service Oil Company tested several hundred automobiles selected at random and discovered traces of carbon monoxide in 50 percent of them, with dangerous levels in 1 percent, and an automotive engineer pointed out that while the gas seeped into the interiors of older cars through apertures in the floor, recent styling was such "that a vacuum was created behind many of the new cars which acted as a suction to pull gas fumes from the exhaust through door drains."[95] He and other critics pointed out that the problem was especially acute in station wagons, but he saw the manufacturers taking no steps at remedying the situation until engineering was given more emphasis than styling in automobile design.[96]

In 1937, Nash Motors introduced a pressurized, fresh air heating system with a cowl intake and a filter in response to the ventilation problem. Most other manufacturers did not adopt similar systems until the late 1940's, and they utilized designs with intakes located at the front of the vehicle which were connected with the passenger compartment via rubber ductwork that passed through the engine compartment.[97] Consumers Research Bulletin charged in 1951 that these ventilation systems were hazardous and reported the case of a driver killed by carbon monoxide when the front intake heating system in his Buick drew in the exhaust from a car in front.[98] Major manufacturers switched from front to cowl intakes for heating systems in the mid-1950's, but a 1959 Commerce Department study reported, "gases and fumes, such as carbon monoxide, smokes, and smogs, may possibly play a role in accident occurence. Anoxia (oxygen deficiency), no matter how produced, will have a deleterious effect on certain processes of the central nervous system."[99]

Ease of maintenance and repair was another area which ranked low in priority compared to other aspects of design with more sales appeal. New body styles, in particular, often made regular service difficult and repairs costly. In 1922, Automotive Industries reported that the lack of mechanical accessibility on new models was causing criticism among servicemen, and the next year, American Machinist questioned whether automotive engineers were giving full consideration to maintenance problems.[100] In 1926, Automotive Industries urged manufacturers to think of repair costs when designing new body styles, but ten years later National Petroleum News reported that new body designs were still complicating maintenance, and an insurance industry spokesman pointed out that the cost of repairs to automobiles involved in collisions had gone up 15 to 25 percent in just three years: "Grills as now constructed are sometimes damaged in parking, and they cannot be easily repaired, so the insurance company must replace the entire grill."[101] Another critic reported:

> The manufacturer reduces the car's cost . . . by designing it with extreme care for assembling it at the factory with minimum effort and time . . . but the cost of having the car repaired or adjusted is increased because little attention is paid to the question of how the parts are to be got at after they have been assembled into the car.[102]

An automotive engineer put it more colorfully when he said, "It is my impression that the designer draws a picture he thinks will sell; then he pours in the mechanism and hopes for the best."[103] Servicemen continued to complain about the problems created by the new styles in the postwar period,[104] and a Commerce Department study reported in 1959:

> Much improvement is needed on a motor vehicle to make frequently serviced components easily accessible for maintenance. A vehicle that is difficult to maintain is often not adequately maintained because the cost is too high. To the extent that manufacturers share in the responsibility for the enduring safety of their product, this is a matter of their concern.[105]

Bumpers helped protect automobiles from damage in the 1920's and 1930's. Underwriter's Laboratories test-

ed bumpers, and those that met their energy-absorbing standards were granted an insurance rate reduction.[106] However, in the postwar period, the Laboratory abandoned its testing program as bumper designs grew less functional and were incorporated into the body as part of the overall styling of the automobile. In 1959, a government study pointed out that current bumpers were not only ineffective for protecting the automobile but that their styling projections presented needless hazards to pedestrians.[107] In 1966, National Underwriter called for a return to functional bumpers in order to help reduce the destruction on the highways, and an insurance representative estimated two years later that functional bumpers could reduce automobile accident losses by $1,000,000,000 per year.[108]

Perhaps the most damaging criticism of the annual model change policy was that it did not allow sufficient time for the testing and perfection of new designs, no matter how ill-conceived those designs might be. Alfred Sloan reported that the first prototypes of a new model--with many handbuilt components--were not ready for testing until seven to eight months before new models were scheduled to go on sale. The first models from the new production dies were not ready for testing until three months before the introduction date and many of these were built "to be used by Sales and Advertising sections for promotional purposes."[109] Critics argued that this was not enough time to adequately test a new design. One writer observed that often after a new model was unveiled, the engineers, after the last minute rush to get it into production, wondered if it would stay on the road. Another writer elaborated: "The theory underlying dynamic control is not well enough developed to make it possible to foretell the characteristics of the completed automobile. Much must therefore be done on a cut-and-try basis, and some bad tries have resulted."[110] Others pointed out that the annual model changes resulted in errors and mistakes in design and production which required a long time to work out.[111] One writer stated: "Small changes are sometimes made and mistakes corrected during the first few months of the production year. Also, cars put out during the first few weeks of a model 'run' are often less well assembled than those made after production has 'shaken down.'"[112]

Yet, even after the errors in the new model had been corrected and production line problems worked out, the automobile produced was an irrational design often featuring inadequate visibility and ventilation, defic-

ient brakes and unresponsive steering, and poor weight distribution and overloaded springs and tires. Perhaps the product philosophy which evolved out of the annual model change strategy and the irrational effect this had on the evolution of automobile design is best illustrated by the development of the hard-top convertible type body--a sedan without center pillars to support the roof or reinforcing structure on the upper half of the doors. Referring to General Motors' new technical center in 1954, corporation president Harlow Curtice said that the complex represented "a determination on our part to ensure a position of continuing leadership in technological progress in the years ahead." He continued by reporting that while General Motors' progress in design and engineering was usually evolutionary, occasionally "a major step forward" occurred. Curtice pointed to the development of the high-compression engine in 1948 and the hard-top convertible type body in 1949 as "just two examples of the many major advances that have come from General Motors. . . ."[113] In 1955, Curtice proudly told a Senate committee: "General Motors pioneered one of the most outstanding developments of recent years--the 2-door and 4-door hardtops . . . the impact of which will be felt in the industry for years to come."[114] The next year a surgeon, testifying before a House committee, charged: "The new four-door hardtop without a center post may prove to be the most lethal of all the body styles because of the noticeable lack of structural stability through the midsection of the body," and accident data introduced at the same hearing showed that the top of the automobile was the principal area of impact in 24 percent of urban crashes.[115] Ten years later, automobile stylist Virgil Exner told another Senate committee: "Everybody knows that the hardtop is not as safe as the sedan. It goes without saying. [The public] can't help but recognize that this car has less support."[116]

NOTES

[1]William C. Hirsch, "Glass and Its Unstudied Problems in Automotive Construction," Automotive Industries, Aug. 26, 1920, p. 427.

[2]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 535.

[3]W. G. Patton, "Windshields with New Curved Glass Introduce Many Problems for Car Producers," Iron Age, Dec. 18, 1947, p. 84; H. Malone, "Problem Related to Cleaning Curved and Flat Windshields," Automotive Industries, Dec. 1, 1946, p. 42.

[4]AMA, Automobiles of America, pp. 118, 124.

[5]Senate Committee on the Judiciary, Study of Antitrust Laws, Hearings, 1955, pt. 7, p. 3506.

[6]Harlow H. Curtice, Facing the Future with Confidence (New York: General Motors Corp., 1955), p. 8.

[7]Ibid., Meeting the Challenge Ahead, p. 9; "Wraparound Windshield is Hazardous, Doctor Says," Science Digest, Sept., 1956, p. 40; "Curved Windshield Defended by GM," ibid., Oct., 1956, p. 52.

[8]Quoted in Paul W. Kearny, "How Safe Are the New Cars?" Harper's, Feb., 1957, p. 42.

[9]Richard Domey, "Passenger Car Workspace Design," in Association for Aid of Crippled Children, Passenger Car Design, p. 88; "Wraparound Windshields as Insurance Problem Discussed by Replacement Expert," National Underwriter, Dec. 6, 1956, p. 15.

[10]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 535, 536.

[11]Ibid., p. 129.

[12]Senate Committee on Commerce, Traffic Safety, Hearings, 1966, pp. 556, 564.

[13]AMA, Automobiles of America, p. 144.

[14]AMA, Automobiles of America, p. 124; "Buick Offers Glass to Cut Glare and Heat," Business Week, p. 40; "New Shaded Car Windshield," Automotive Industries, Dec.

1, 1950, p. 60; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 338; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 2, p. 660.

[15]"Tinted Windshields: A Night Driving Hazard?" Consumer Reports, Aug., 1952, p. 360; "Vision Reduced by Some Tinted Windshields," Science News Letter, Jan. 23, 1954, p. 57.

[16]H. Haber, "Safety Hazards of Tinted Automobile Windshields at Night," Journal of Optical Society of America, XLV (June, 1955), p. 418, quoted in O'Connell and Myers, Safety Last, p. 123.

[17]Merrill J. Allen and John K. Crosley, "Automobile Liquid Glass Tint: A Research Report," American Journal of Optometry and Archives of American Academy of Optometry, June, 1965, quoted in Senate Committee on Commerce, Traffic Safety, Hearings, 1966, p. 611.

[18]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 338.

[19]Ibid., pp. 129, 130, 537.

[20]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 2, p. 660; General Motors Corporation, Design for Safety (Detroit: General Motors Corp., 1965), p. 32.

[21]Parlin and Bremier, Passenger Car Industry, p. 91.

[22]"Blind Spots and Accidents," Literary Digest, Apr. 25, 1925, pp. 71-73.

[23]Don Blanchard, "They Look Good But--Does the Public Think 1933 Bodies Skimp Comfort and Driving Vision for Style?" Automotive Industries, Apr. 1, 1933, p. 392.

[24]Safety Engineering, Nov., 1934, p. 193; National Safety News, Mar., 1935, p. 19.

[25]New Yorker, Mar. 6, 1937, pp. 46-50, quoted in Stevens, Highway Safety, p. 77.

[26]Colliers, Nov. 6, 1937, p. 48.

[27]Palmer and Crooks, Millions on Wheels, pp. 46-48.

[28]Automotive Industries, June 15, 1940, p. 563.

[29]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 358.

[30]A. W. Stevens, "Key to Highway Safety," Safety Engineering, Mar., 1938, p. 36; W. H. Cameron, quoted in Stevens, Highway Safety, p. 60.

[31]Quoted in Stevens, Highway Safety, p. 152.

[32]Ibid., pp. 62, 96, 103.

[33]DeSilva, Automobile Accidents, pp. 241-243; Leighton and Nicholson, "Has the Automobile a Future?" p. 72.

[34]New Republic, Jan. 1, 1945, p. 22; "Car Designs Criticized," Consumers Research Bulletin, Nov., 1952, p. 22.

[35]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 328-29.

[36]"What's Become of the Engineers?" Consumer Reports, May, 1953, p. 218; "Safety," ibid., May, 1954, p. 211; Dreyfuss, "Car Detroit Should Be Building," p. 354.

[37]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 561.

[38]Commerce Dept., Federal Role in Highway Safety, 1959, p. 40.

[39]Quoted in Ralph Nader, "Detroit Makes Your Choice--Fashion or Safety," Nation, Oct. 12, 1963, p. 214.

[40]Automotive Industries, May 15, 1946, p. 22.

[41]"Two Cures for Motor Accidents," Literary Digest, July 1, 1922, pp. 60-61.

[42]T. J. Little, Jr., "Better Brakes Needed," Automotive Industries, Sept. 27, 1923, p. 647; C. R. Allen, "How Insurance Hazards Can Be Reduced or Controlled by Design Engineers," ibid., Dec. 11, 1924, p. 1018.

[43]Automotive Industries, May 15, 1946, p. 22.

[44]AMA, Automobiles of America, pp. 70, 80, 85.

[45]Nevins and Hill, Ford: Expansion and Challenge, p. 461.

[46]"Kroll Reminiscences," p. 56; "The Reminiscences of Mr. F. G. Liebold" (Ford Motor Company Archives, Oral History Section, Jan., 1953), XIII, 1150, typewritten manuscript in Ford Motor Company Archives; Letter to the editor, Automotive Industries, Mar. 27, 1937, p. 486; Palmer and Crooks, Millions on Wheels, pp. 40, 52; Consumer Reports, May, 1955, p. 214; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 2, p. 875.

[47]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 2, p. 668.

[48]Curtis Billings, "The Nut That Holds the Wheel: A Primer for Motorists," Atlantic, Oct., 1932, p. 441.

[49]Automotive Industries, Jan. 23, 1937, p. 123.

[50]Stevens, Highway Safety, p. 56.

[51]Sinks, "Those Big Fat Cars," p. 59.

[52]Commerce Dept., Federal Role in Traffic Safety, 1959, pp. 40-41.

[53]Association for Aid of Crippled Children, Passenger Car Design, p. 73.

[54]"Safety," Consumer Reports, May, 1954, p. 213; Senate Committee on Commerce, Traffic Safety, Hearings, 1966, p. 192.

[55]Consumer Reports, Apr., 1957, p. 162.

[56]Locomobile Company, The Car of 1911, (Bridgeport, Conn.: Locomobile Co., 1910), p. 227.

[57]W. J. P. Moore, "Better and Safer Steering Systems Advocated," Automotive Industries, Mar. 15, 1923, p. 628; Allen, "How Insurance Hazards Can Be Reduced," p. 1018.

[58]AMA, Automobiles of America, pp. 75, 78, 80; J. Younger, "Making a Steering Gear for Low-Pressure Tired Wheels," American Machinist, Aug. 13, 1925, p. 264; N. G. Shidle, "Engineers Eschew Overtures of New Doughnut Tires," Automotive Industries, July 9, 1932, p. 33; J. W. Cottrell, "Sleepless Nights Ahead for Engineers as Sales Executives Demand 'Doughnuts,'" ibid., July 16, 1932, p. 68; J. E. Whitside, "Low Pressure Tires Point

to New Design," ibid., Aug. 27, 1932, p. 273.

[59]Palmer and Crooks, Millions on Wheels, pp. 10-11; "Decade of Automotive Development," Automotive Industries, Jan. 15, 1940, p. 53.

[60]Letter to the editor, Automotive Industries, Dec. 15, 1934, p. 745.

[61]J. H. Hunt of General Motors in S.A.E. Journal, Oct., 1932, quoted in Francis W. Davis Papers, in the Possession of Mr. Davis, Belmont, Mass.

[62]S.A.E. Journal, Oct., 1932, quoted in Davis Papers.

[63]Automotive Industries, Apr. 15, 1934, quoted in Davis Papers.

[64]Furnas and Smith, Sudden Death, p. 26.

[65]Interviews with Francis W. Davis, Oct. 21, 1968, Nov. 15, 1969.

[66]O. E. Hunt to Davis, Jan. 22, 1934, Davis Papers.

[67]Davis to O. E. Hunt, Fed. 6, 1934, ibid.

[68]Ibid.

[69]O. E. Hunt to Davis, Mar. 2, 1934, ibid.

[70]Palmer and Crooks, Millions on Wheels, p. 50.

[71]Davis interview, Oct. 21, 1968; AMA, Automobiles of America, p. 126.

[72]"What's Become of the Engineers?" Consumer Reports, May, 1953, p. 219; "Safety," ibid., May, 1954, p. 211.

[73]"What's Become of the Engineers?" p. 219.

[74]"Safety," p. 211; Consumer Reports, Apr., 1957, p. 160.

[75]Davis interview, Oct. 21, 1968.

[76]Saginaw Steering Gear Division, General Motors Corporation, The Facts about Power Steering (Saginaw, Mich.: General Motors Corp., 1953), p. 4.

[77]Ibid., pp. 9, 10.

[78]House Interstate and Foreign Commerce Committee, Traffic Safety, Hearings, 1956, p. 339; Saginaw Steering Gear Division, General Motors Corporation, The Why, How, What of Safety Power Steering (Saginaw, Mich.: General Motors Corp., 1957), pp. 15, 20.

[79]Business Week, Sept. 22, 1956, p. 189.

[80]Commerce Dept., Federal Role in Traffic Safety, 1959, p. 39.

[81]Consumers Research Bulletin, Nov., 1966, p. 22.

[82]Senate Committee on Commerce, Traffic Safety, Hearings, 1966, p. 565.

[83]Flink, America Adopts the Automobile, p. 285; "Car Makers Strain Tires by Overloading Them," Automobile, Oct. 1, 1914, p. 624; "Makers Should Base Tire Equipment on Car Weight," ibid., Jan. 7, 1915, p. 38.

[84]Dun's Review, May, 1966, p. 80; James Ridgeway, "That Super-Quiet, Squishy Ride," New Republic, Jan. 30, 1965, p. 15; Senate Committee on Commerce, Motor Vehicle Safety Standards, Hearings, 1967, p. 49.

[85]U. S. Congress, Senate, Committee on Commerce, Tire Safety, Hearings before the Committee on Commerce, U. S. Senate, on S. 1643, 89th Cong., 1st sess., 1965, p. 124; Elizabeth B. Drew, "Politics of Auto Safety," Atlantic, Oct., 1966, p. 97.

[86]Dun's Review, May, 1966, p. 79.

[87]Association for Aid of Crippled Children, Passenger Car Design, pp. 67-68; W. L. Carver, "Engineers Argue Cause of Wheel Shimmy," Automotive Industries, Jan. 29, 1925, p. 175; "Wheel Shimmey Is Blamed on Tires," ibid., Feb. 5, 1927, p. 162; "What Makes 'Em Shimmey?" ibid., Mar. 18, 1933, p. 334; A. F. Denham, "Is Independent Suspension a Cure for Front End Troubles?" ibid., Nov. 11, 1933, p. 571; D. Senseud de Lavaud, "Independently Sprung Front Wheels a Remedy for Shimmy," SAE Journal, June, 1928, p. 623; "End of Shimmy in Sight," ibid., Feb., 1929, p. 230.

[88]P. M. Heldt, "Engineers Seek To Improve Riding Qualities by Independent Springing," Automotive Indus-

tries, June 23, 1928, p. 942; ibid., "Frames Get Heavier, Springs Lighter in Last 12 Years," ibid., Mar. 30, 1929, p. 514; F. J. Clarke to the editor, Mar. 27, 1937, p. 486, and May 15, 1946, pp. 20-21, ibid.

[89]Palmer and Crooks, Millions on Wheels, p. 44.

[90]Quoted in O'Connell and Myers, Safety Last, p. 134.

[91]Horseless Age, Mar. 9, 1916, p. 466.

[92]Stevens, Highway Safety, p. 53; Furnas and Smith, Sudden Death, p. 35.

[93]National Safety News, Jan., 1936, p. 19; E. S. Evens, Jr., "Ill-Ventilated Vehicles Constitute Hazard," Safety Engineering, Apr. 1937, p. 36.

[94]Dean A. Fales, "Design Suggestions for Safety," Automotive Industries, Jan. 15, 1940, p. 563.

[95]Cities Service Oil Company, Carbon Monoxide: A Menace Everytime You Drive, quoted in Stevens, Highway Safety, p. 53; Stevens, Highway Safety, p. 52.

[96]Fales, "Design Suggestions for Safety," p. 563; Stevens, Highway Safety, p. 53.

[97]Senate Committee on the Judiciary, Economic Concentration, Hearings, 1965, pt. 3, p. 1123; AMA, Automobiles of America, p. 101.

[98]"Automobile Ventilation Systems Often Hazardous," Consumers Research Bulletin, Nov., 1951, p. 24.

[99]Commerce Dept., Federal Role in Traffic Safety, 1959, pp. 33, 45.

[100]B. M. Ikert, "Lack of Accessibility Causes Just Criticism among Service Men," Automotive Industries, Feb. 23, 1922, p. 464; J. W. Lord, "Does Factory Engineering Organization Give Full Consideration to Service and Service Station Problems?" American Machinist, Feb. 8, 1923, p. 228.

[101]D. Beecroft, "Factories Urged To Think of Repair Costs When Designing New Cars," Automotive Industries, Dec. 9, 1926, p. 957; "Car Design from the Insurance Angle," ibid., Jan. 16, 1937, p. 97; A. L. Clayden, "New Body Designs Make Service Men Cuss and Complicate Engine Lubrication," National Petroleum News, Dec. 11,

1935, p. 45.

[102]Palmer and Crooks, Millions on Wheels, p. 13.

[103]Quoted in Leighton and Nicholson, "Has the Automobile a Future?" p. 68.

[104]"Bumping the Bumper," Scientific American, Dec., 1923, p. 397; P. M. Heldt, "Low Weight and Great Shock Absorption Chief Aims of Bumper Design," Automotive Industries, Oct. 9, 1924, p. 642.

[105]H. Armond, "Make the Automobile Safer: Hazard of Rear Bumpers," Safety Engineering, Jan., 1938, p. 19; "Expert Sees Functional Bumpers Reducing Highway Destruction," National Underwriter, Nov. 25, 1966, p. 2; Commerce Dept., Federal Role in Traffic Safety, 1959, p. 39.

[106]Edward Daniels, claim manager, Detroit Automobile Interinsurance Exchange, speech before the American Society of Body Engineers, Oct. 2, 1968, quoted in Edward Ayres, What's Good for GM (Nashville: Aurora Publishers, Inc., 1970), p. 93.

[107]L. J. Hoar, et al., "Problems That Automobile Design Creates for the Service Station," American Petroleum Institute Proceedings, XXXVI (1956), p. 80.

[108]Commerce Dept., Federal Role in Traffic Safety, 1959, p. 47.

[109]Sloan, My Years with General Motors, p. 246.

[110]David M. Boodman, "Safety and Systems Analysis, With Application to Traffic Safety," Law and Contemporary Problems, XXXIII (Summer, 1968), p. 505.

[111]Leighton and Nicholson, "Has the Automobile a Future?" p. 68; O'Connell and Myers, Safety Last, p. 135; Kefauver, In a Few Hands, p. 94.

[112]Palmer and Crooks, Millions on Wheels, p. 81.

[113]Curtice, Meeting the Challenge Ahead, p. 8. Kaiser-Frazer introduced a two-door hardtop in 1949 along with General Motors' Buick, Oldsmobile, and Cadillac, but Chrysler, Dodge, and DeSoto's models did not appear until 1950. In 1955, all the major manufacturers introduced four-door hardtops at the same time. AMA, Automobiles of America, pp. 120, 122, 137.

[114]Senate Committee on the Judiciary, Study of Antitrust Laws, Hearings, 1955, pt. 7, p. 3500.

[115]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 11, 907.

[116]Senate Committee on Commerce, Traffic Safety, Hearings, 1966, p. 563.

CHAPTER IV

THE "HORSEPOWER RACE" AND ITS IMPACT ON AUTOMOTIVE SAFETY

There was an effective limit to the number of practical sales themes which could be used to annually promote new models, and so the more successful ones were used over and over again. One of the most enduring subjects for sales campaigns was speed. Speed was one of the main attractions of motorized road vehicles, and American automobile manufacturers were quick to adopt it as an important theme in their advertising. A related aspect of speed advertising was stress on what came to be called "performance"--the ability of an automobile to accelerate rapidly to high speed (soon to be emphasized as necessary for passing slower-moving vehicles) and to maintain that speed on hills as well as level highways. Both the speed and performance of an automobile are directly related to the effective power of its engine, and so horsepower soon became an important aspect of speed and performance promotions. In addition, an obvious method of demonstrating a motorcar's speed and performance was through automobile racing--which offered the additional advantage of a great deal of publicity for winners.

Speed, performance, horsepower, and racing were all used singly and in various combinations by automobile manufacturers as important themes throughout the first seven decades of the twentieth century. Because of the nature of competition in the oligopolistic automobile industry, as soon as one of these themes was used successfully by one firm, the other competitors were forced to adopt it in self-defense for fear of losing their shares of the market; once all the major firms had done so, the sales theme offered no advantage to anyone and it would be dropped, only to be reintroduced in some later year, starting the whole cycle again.

These reoccurring sales competitions emphasizing speed, performance, horsepower, and racing had a very adverse effect on the design and operation of automobiles and on the functioning of the highway system. Since speed, performance, and power are all relative, each sales battle using these themes was based on a series of increases in horsepower--usually coinciding with the annual model changes--while the competition lasted. These increases tended to throw the relationship between the power, weight, and braking capacity of the automo-

bile out of balance. Oftentimes, larger, heavier engines were installed which changed the weight distribution--putting more of the vehicle's weight on the front wheels--resulting in less satisfactory handling and braking characteristics and in harder steering. The increased power of the engine put a strain on all of the other vehicle components--especially the brakes--unless they were also redesigned, which was rarely the case. The increased top speed of the vehicle almost inevitably made it possible for an automobile to travel at speeds beyond the capacity of the rest of the vehicle--especially in regard to occupant protection in case of a collision--of the operator, and of the roadway. Also, faster, more powerful cars had an adverse effect on the highway system as a whole by adding to the heterogenity of vehicle types, producing a wide range of performance capabilities which did not mix together efficiently.

The use of speed, performance, horsepower, and racing as important sales themes had another significant, if difficult to quantify, impact on the highway transportation system. Advertisements emphasizing high speed driving, rapid acceleration, and racing undoubtedly played a part in conditioning many drivers to accept the idea that automobiles were meant to be driven at high speeds and in an individualistic, competitive manner--an image of the use of the motor vehicle which was directly opposite the standardized, cooperative actions needed for the highway system to operate safely and efficiently. As with other negative aspects of motor vehicle design and sales promotion, there were contemporary observers who noted and criticized the increases in automobile power and speed and its use in advertising. Furthermore, speeding was associated in the minds of most Americans with accidents, and so this component of automobile design and advertising was probably subject to more public comment and criticism than any other.

The use of the themes of speed, performance, horsepower, and racing by automobile manufacturers to promote their products was evident from the very beginning of the industry. The first American manufacturer, the Duryea Company, was entered in one of the first races of motorcars in the United States, and the first large-scale manufacturer, the Olds Motor Works, used racing and endurance runs as part of its promotional activities. In 1903, Ransom E. Olds constructed a special racing machine for the purpose of setting a speed record in the measured mile, which it was successful in achieving with much resultant publicity.[1]

Advertisements for the Pierce Motorette and the Winton motorcars in 1902 both emphasized speed and the winning of speed trials, and by 1905, a number of manufacturers were investing large amounts of money building special racing cars in the hopes of reaping publicity and advertising copy from a first place finish. The Buick Motorcar Company, then headed by William Durant, was spending $100,000 per year to support a factory racing team, and in 1905, the company purchased a sixteen-page section in a leading magazine to feature the results of a successful racing season.[2] Four years later, Buick ads were still emphasizing racing results: "During the season of 1909 Buick cars won 166 firsts--90 percent of the events entered--Tests Tell--Could you ask for more convincing evidence."[3] In 1910, Oldsmobile commissioned the painting of an automobile racing a train and used it widely in advertisements along with the slogan, "Power-Silence-Speed,--with Safety."[4] To provide substance for advertising claims, most manufacturers increased the horsepower of their products each model year. Engines grew rapidly in the first two decades of the century from one cylinder to four, six, and eight cylinders, and a twelve cylinder motor appeared in 1916.[5] The horsepower to weight ratio of American automobiles increased greatly, and they were soon overpowered in comparison to European motorcars.[6]

Just as speed was used very early in the history of the automobile industry to promote the sale of motor vehicles, automobile "speeding"--driving too fast for road conditions--was a problem in the highway transportation system almost from the first introduction of the motorcar. As one critic of the automobile wrote of early attempts to control the speed of automobiles: ". . . the lawmakers of that day were ignoring a fundamental twist in human nature: a contrivance built to run forty miles an hour was going to be run forty miles an hour, laws and ordinances not withstanding."[7] Speeding had rarely been a problem before the introduction of motorized road vehicles because of the physical limitation of the animals providing the motive power, and traffic laws merely restricted vehicles to speeds that were "reasonable and proper."[8] When automobiles immediately began operating faster than what the majority of people--accustomed to horse-drawn vehicles--considered to be reasonable and proper, the first maximum speed laws were passed. These limitations proved to be difficult to enforce, and a variety of approaches--including "speed traps" and vigilante organizations--were used in an attempt to deal with the speeding problem.[9]

It was accepted from the beginning that speeding and accidents were almost synonymous. As a Travelers Insurance Company publication entitled Motor Vehicles and Safety stated in 1915:

> Excessive speed is one of the chief causes of accidents, and many drivers have a mania for traveling at a high rate even when there is no definite object in doing so, and when conditions make the practice distinctly hazardous.
>
> It is safe to say that if legal speeds were never exceeded the number of accidents would be greatly reduced.[10]

The New York Times took a stand against speeding in 1905, Harper's Weekly attacked the "speed mania" in 1907, and the following year Horseless Age admitted that speeding was a cause of accidents, but it predicted that the problem would soon end--and automobile accidents would disappear along with it.[11] Outlook magazine condemned speeding in 1909 and stated: "If it should appear that it is impossible to reduce the rate of mortality, the automobile will be driven off our highways. Human life is much more important than speed in getting from place to place."[12] Mechanical delimitation of speed was suggested as a solution to the problem as early as 1907 when Scientific American described an automatic electric speed governor which would cut the ignition or throttle when an automobile reached any pre-set speed. An article in Atlantic the following year advocated the installation of a similar device on all motorcars which would activate colored signals at ten miles per hour--the display of which would be a misdemeanor in urban areas--and cut off the ignition at eighteen miles per hour; and an insurance executive publicly urged automobile manufacturers to consider mechanical delimitation of speed capacity in 1917.[13]

Just as the public became upset about automobile speeding, there was also a reaction against automobile racing in the first decade of the century. By 1905 automotive trade journals were questioning the advertising value of racing to individual manufacturers as more and more firms entered the competition. As Motor Age stated in that year: "The amount of direct benefit to all but a few concerns has proven so small that it is doubtful if even the winners can see any great profit in the outcome, whereas it is certain the losers . . . have lost more by failing to make the showing they expected to

make."[14] Other writers stated that while early automobile competition had served a useful purpose in educating the public about the motorcar, current activities not only served little purpose but might be alienating the public.[15] Automobile road races, especially the Vanderbilt Cup race sponsored by the American Automobile Association, were subjected to a great deal of public criticism due primarily to the accidents which occurred in them. Scientific American magazine called the Vanderbilt Cup race a "slaughter" in 1910, and the next year, Outlook carried an article on automobile racing entitled "Commercial Murder."[16] As a result of this criticism and of the diminishing returns as a form of advertising, major manufacturers stayed out of organized automobile racing until the 1950's. However, competition in the area of speed and horsepower continued unabated.

A 1920 advertisement for the Maibohm motorcar stressed, "Whizzing Speed! . . . unleashed it will roar nose to nose with an express train," and the next year Buick boasted that one of its cars had raced and beaten "the Southern Pacific's Fastest Limited."[17] An advertisement for the 1922 Roamer claimed that "In any brush of speed its radiator will forge its way irresistibly to the front, . . ." while a promotion for the 1926 Chrysler 70 Royal Sedan stated that "Chrysler Model Numbers Mean Miles Per Hour."[18] The announcement of the Franklin "Airman Series" for 1927 stressed "Acceleration--the swift-darting, quick maneuvering of the pursuit plane,"[19] and an automotive observer, commenting many years later, stated: "The old Franklin was a poky car. Then they got Cannonball Baker to do some hill climbs and such, and every old codger began to get belligerent and develop bad manners behind the wheel of his Franklin."[20]

There continued to be criticism of speed and speeding in the early 1920's. An article in Literary Digest in 1922 called for the use of speed governors as a cure for automobile accidents, and Mark Sullivan charged in World's Work the following year that automobile manufacturers were using "subtle propaganda" in a campaign to raise speed limits so as to make room for more cars.[21] The following year George M. Graham, chairman of the Traffic Planning and Safety Committee of the National Automobile Chamber of Commerce and vice president of the Chandler Motor Car Company, stated that it was not the automobile manufacturer "who created this state of menace. . . . It is the offspring of an impulse which traces back to the beginnings of known history: The demand for swifter and better transportation, subject to the control of the individual operator. No human aspira-

tion over the centuries has been stronger, no striving more intense."[22]

Competition among automobile manufacturers emphasizing speed and horsepower was particularly intense in the second half of the 1920's, leading to some very strong claims in advertisements about performance and to some startling increases in the power of automobile engines.[23] Higher horsepower was the chief trend by the 1928 model year, and this"horsepower race" continued into the 1930's, accentuated by Ford Motor Company's introduction of a low-priced, mass produced V-8 engine in 1932. In that year Automotive Industries pointed out that the average horsepower had jumped nearly 60 percent since 1925.[24]

Advertisements proclaiming the "fastest car over the road" and the "fastest stock car"--as well as specific speed claims and the practice of designing speedometers to read faster than the actual speed--produced a great reaction beginning in 1927.[25] Safety officials charged that speed advertising encouraged high speed driving, and W. H. Cameron, managing director of the National Safety Council, stated that since one-third of all automobile accidents were caused by speed, the automobile manufacturers were "handling a very dangerous weapon" when they emphasized speed in their advertising.[26] The state of South Carolina passed a regulation requiring all buses to be equipped with speed governors as a means of preventing accidents, and the Eastern Conference of Motor Vehicle Administrators meeting in Cleveland, Ohio, in 1928 voted a resolution "decrying the over-emphasis being placed on speed in the advertising by the manufacturers, and urge that other points of merit of the cars be stressed. . . ."[27] Dr. Knight Dunlap, professor of psychology at Johns Hopkins University, criticized speed advertising for giving the impression that speeding was a matter of law enforcement rather than law observation,[28] and the state of Washington took direct action on the matter by revising its motor vehicle code to make the publication of the results of automobile speed tests on the public highway prima facia evidence of reckless driving with all parties involved subject to prosecution.[29]

Advertising trade journals were quick to point out the dangers of speed as a promotional theme and to urge the automobile industry to change its advertising before more state governments intervened. On September 1, 1927, an article in Printer's Ink entitled, "Danger Ahead--

Slow Down Automobile Advertisers: An Open Letter to Motor Car and Truck Advertisers and to the Advertising Agencies and Copy Writers Serving Them," warned that state legislatures would pass legislation requiring governors on automobile engines if speed advertising was not toned down and urged manufacturers to act responsibly to help reduce accidents rather than encouraging reckless driving, and one month later the journal asked for "some speedy action on speed advertising."[30] The next year Advertising & Selling also published "An Open Letter to Our Automobile Manufacturers" criticizing advertisements which "with almost no exceptions . . . stress speed; and not only speed but power." The journal urged the manufacturers to accept greater responsibility for traffic accidents by changing their advertisements to stress "Safe Motoring": "If advertising can sell automobiles--as it can--surely it can sell the idea of using them so that they will be a blessing, not a curse, as they threaten to become."[31]

Even representatives of individual automobile manufacturers were frank to admit that they felt speed advertising was dangerous. F. B. Sears, president of the Elcar Motor Company, declared in 1927:

> Many buyers that would never think of speed ordinarily are today asking for it and demanding it, undoubtedly due to the cause that speed has been advertised so promiscuously during the last eighteen months or two years. There will be no question that this demand will continue as long as advertising is carried on along this line.[32]

Eddie V. Rickenbacker, the World War I flying ace who had entered the automobile industry in the early 1920's, stated that the continued emphasis on speed in advertising would produce a nation of speed conscious drivers and result in a rise in automobile accidents.[33] L. G. Reed, sales manager of Willys Overland, stated that "Excessive speeds entail added hazards, not only to the driver and occupants of the car, but also to other sane drivers and pedestrians who may be on the road or street."[34] William L. Lewis, director of advertising and assistant sales manager of the Cadillac Motor Car Company, agreed: "Speed is very dangerous. We do not like to promote speed and I think it would be beneficial if more attention was paid to stressing more thoroughly many of the other important factors equally interesting to the prospective buyer."[35] C. A. Triphagen, sales

manager of the Reo Motor Car Company, summed up the attitudes of this group of automobile spokesmen when he stated that while he did not like emphasizing speed, competition in the industry forced him to do so.[36]

On the other hand, Paul G. Hoffman, president of Studebaker Corporation, and F. E. Moskovics, president of Stutz Motor Car Company, both stressed that speed was an important indicator of a car's ability to give safe and reliable performance under normal operating conditions, and that it was almost impossible to get the idea across to the public without giving some indication of the potential speed of an automobile. Moskovics argued that a car capable of 90 or 100 miles per hour would be so well built that it would be exceptionally safe at ordinary speeds. Hoffman added that even though automobile manufacturers stressed speed in their advertisements, it did not mean that automobiles should be operated at high speeds: "The practice of a well-known watch manufacturer of showing in his advertisements a watch enclosed in a cake of ice is not interpreted by the public that all owners of such watches should store them in the icebox overnight."[37] However, public resentment of emphasis on speed in automobile advertising was serious enough so that in late 1936 the members of the AMA pledged to eliminate "all references to vehicle top speeds" in their promotions and publicity and added that "every safety factor proven by research and engineering will continue to be built in American automobiles."[38] If specific speeds were no longer mentioned in advertisements, the rest of the copy appeared to change little until the outbreak of World War II. Buick advertisements which in 1936 proclaimed, "Hot! It's a Ball of Fire!" and described the new model as the "most satisfying carrier of high-power energy that ever thrilled an appreciative traveler!" were much the same five years later:

> Out at the General Motors Proving Ground they judge an automobile by what's under the hood and not by the bright shining paint. So straight from that plain-talking--hard-testing bunch we bring the picture of this new Buick, as you'll get it once you take it out on the road. . . . What they <u>went</u> for was the <u>Fireball</u> Eight, . . . a sockdalagin' son-of-a-seacook for <u>wallop</u>. "It's as if you gotta string o' <u>comets</u> by the tail," they said. . . . You can get it <u>stepped up still</u> more in power . . . by the new fuel supply we call

Compound Carburetion.[39]

Criticism of the emphasis on speed and power as a cause of automobile accidents also continued unabated. A 1932 article in Atlantic Monthly stated that "The average motorist buys a car advertised and extolled for its speed," and that the automobile manufacturers "have not been content merely to provide speed; they seem to insist--if subtly--that the driver use it."[40] The author went on to charge that the argument that "speed, in itself, is not dangerous" was fallacious for traffic statistics indicated that the accident rate had risen along with the increase in speed and power of automobiles, and traffic research had shown "conclusively that where speed is reduced the number of accidents is correspondingly lowered."[41] Furthermore, the laws of physics dictated that "The faster a vehicle is going, the more damage it can do to itself and the more injury to the people riding in it, because its energy increases as the square of the speed."[42] A Travelers Insurance Company publication the following year concurred, stating: "No one can deny that there is a distinct relation between the rate of speed at which a person or object is struck and the severity of the resulting injuries and damage."[43]

Robbins B. Stoeckel, Connecticut Commissioner of Motor Vehicles, warned in 1932 that continued emphasis on speed in automobile advertising would bring a "flood of restrictive road laws," and Delmar G. Roos, a vice president of the Society of Automotive Engineers, called on the automobile industry to cooperate with state motor vehicle commissioners in regard to speed and safer automobile design in an effort to prevent the passage of restrictive legislation.[44] Scientific American reported that English automotive engineers felt that the size of the engines in American automobiles was "all out of proportion to the requirements of rational performance" and that they were critical of what they saw as an over-emphasis on speed and quick acceleration, speculating that this was "perhaps due to the ease with which publicity departments can impress the public with spectacular figures."[45] An American critic, writing five years later, agreed with this interpretation:

> A lot of horsepower for the money . . . is a sales asset for reasons which go back to the early days of motoring. A large figure looks nice in print, and impresses buyers. High maximum horsepower, however, has just one main value--it and it alone

> will ensure high top speed. It is not necessarily a measure of the other factors of good "performance"--acceleration and power on hills.[46]

The author also concurred with the criticism that American automobiles were overpowered, pointing out that most drivers overlooked the higher operating costs which this incurred. Furthermore, he charged that the argument stressed in automobile advertising that the added power was a safety feature which enabled drivers to get out of dangerous situations was fallacious for it tended to encourage poor driving habits which got more drivers into trouble than out of it. Another critic charged that "the speedometer, which is graduated to register 90 miles an hour or higher, is a standing invitation to the operator to test his skill as a speed driver." Speedometers were marked in this way, he argued, as a selling point to make the "customer feel he is acquiring a powerful machine, regardless of whether or not it is capable of reaching that velocity safely."[47]

Dean Fales, professor of automotive engineering at MIT, agreed that American automobiles were overpowered and that high speed driving was dangerous, and he pointed out that "Many of the new cars are so much faster and smoother than the older cars that the driver is deceived as to his speed, and when he meets an emergency, both he and the vehicle are unable to cope with it."[48] An article originally published in Readers Digest offered a more colorful description of this same phenomenon:

> The automobile is treacherous, just as a cat is. It is tragically difficult to realize that it can become the deadliest missle. . . . It makes 65 feel like nothing at all. But 65 miles an hour is 100 feet a second, a speed which puts a viciously unjustified responsibility on brakes and human reflexes, and can instantly turn this docile luxury into a mad bull elephant.[49]

Evidence continued to pile up supporting the idea that high speed driving was a cause of accidents. An examination of 2,571 highway deaths in Pennsylvania in 1934 indicated that 56 percent could be attributed to "exceeding the speed limit or driving too fast for conditions."[50] A study of two groups of drivers conducted by the Committee on Transportation of Yale University

substantiated the conclusion that high speed driving caused more accidents than driving at moderate speeds.[51]

Even a spokesman for the federal government was moved to react to the speed problem. Secretary of Commerce Daniel C. Roper asked: "Why is it necessary to manufacture cars with speeds from 80 to 100 miles an hour? What steps are being taken by dealers to insure the public against the selling of high-speed cars to reckless, disabled, or incompetent drivers?"[52] The New York Times was still speaking out against fast driving and arguing that it was the most important cause of automobile accidents, and in 1935, Charles A. Harnett, New York State Commissioner of Motor Vehicles, suggested the possible use of mechanical speed governors: "We urge that a maximum speed limit of 50 miles an hour be established by law in the State of New York, and if enforcement does not bring about the desired results, it may be necessary to resort to mechanical devices as a means of restriction."[53] New York Governor Herbert H. Lehman responded with a highway safety program in 1936 including forced installation of speed governors on the cars of operators convicted of reckless driving and the establishment of new limitations on speed. Other states and cities experimented with speed restrictions, and fifty miles per hour gained acceptance as a top limit on rural roads while cities cut legal speeds to twenty-five and thirty miles per hour, and an insurance company organized a "Not over 50 Club" complete with windshield decals.[54] It was reported that hundreds of motorists were installing speed governors voluntarily, a poll taken by the American Institute of Public Opinion revealed that 68 percent of those interviewed would agree to attach governors to their cars to keep them from going over fifty miles per hour, and a survey of state motor vehicle administrators in 1938 showed them also favoring the devices. The Federal Government began installing governors on all the cars it purchased, following the lead of many oil companies, the meat packing industry, and the Railway Express Agency who agreed that the devices not only reduced accidents but also cut operating and maintenance costs.[55]

The arguments on the other side of the issue were little changed. The author of a book on fast driving published in 1935 stated:

> It is logical to hurry in an automobile. The motor car was invented so that man could go faster from place to place, and ever since it was invented it has been made a

> faster and safer machine. . . . It is not logical to expect our evolution to be toward slowness when the major inherent quality of the automobile is speed. . .[56]

Other writers agreed, arguing that even though "higher automobile power and speed inevitably entail certain hazards, . . . to abandon such power and speed would be a step backwards, which the American public will not tolerate."[57] Automobile manufacturers echoed this argument, pointing out that they were merely responding to the demands of the marketplace by providing faster, more powerful automobiles, and it was not their fault that the cars were driven too fast.[58] General Motors stated in 1934 that "Under modern conditions of travel, SPEED and PICK-UP are essential factors of safety,"[59] but a statement by GM executive president William Knudsen two years later was more to the point:

> We spend a great deal of money every year finding out what our customers want. So it is with considerable confidence that we tell you that they want cars which will accelerate quickly, negotiate the majority of hills without gear shifting, and transport them at a fairly rapid rate of speed. We are confident that the public will not buy cars which do not have these performance characteristics, no matter what we as individuals may think about it.[60]

Paul Hoffman, president of Studebaker, argued in 1939 that speed did not appear to be the main cause of most accidents, although it might increase the severity of accidents which did occur. More important, "Speed in relation to safety is a complex subject, and we need to know more than we do before we make final pronouncements concerning its regulation."[61]

With the outbreak of World War II, the Federal Government halted all automobile production, rationed tires and gasoline, and moved to regulate the entire highway transportation system for the first time by establishing a national speed limit of forty miles per hour, which was later reduced to thirty-five. The speed regulation was not aimed primarily at the reduction of accidents but rather at conserving tires, gasoline, and the motor vehicles themselves for use during the war.[62] However, the accident rate did drop during this period as a result of the lower speeds and the decline in the use of automobiles, and there was discussion of retaining speed

control in the postwar period.[63] But with the end of hostilities the national speed limit was abandoned along with other wartime measures; under state control, limits not only returned to prewar levels but higher maximums were established on many of the new, state-constructed toll highways built in this period.[64] Furthermore, as soon as renewed automobile production satisfied the initial deferred demand after the war and significant nonprice competition returned to the automobile industry, the greatest speed, performance, horsepower, and racing contest in history broke out among the manufacturers.

The basis for what came to be called the "horsepower race" of the 1950's was the development of a high compression V-8 engine by General Motors under the direction of its legendary engineering research director, Charles F. Kettering. Designed to burn high octane fuel, the new motor produced a big increase in power in relation to its size and weight, and, thus, offered the potential of a large jump in the horsepower of automobiles which had been previously limited by the great weight and bulk of low compression, in-line eight cylinder and V-12 engines. The new, high compression V-8 appeared first in the 1949 Cadillac and Oldsmobile lines, and it was soon adopted by other General Motors divisions and copied by other manufacturers.[65]

The horsepower race officially began during the 1951 model year when the new Chrysler model was offered with 180 horsepower in order to top Cadillac and Packard which each featured 160. The next year, the Cadillac rating was increased to 190 horsepower, and Buick, which had traditionally featured power and speed, came out with a 170 horsepower engine; Oldsmobile, DeSoto, and Lincoln were all increased to 160 horsepower ratings. In 1953, Cadillac was raised to 210 horsepower and Buick to 188 while Lincoln was increased to 204. DeSoto came out on top the following year with 235 horsepower while Cadillac increased to 230, Packard to 212, and Buick to 200.[66]

"Power" soon became one of the major advertising themes of the 1950's as the horsepower race, which had begun in the high-priced class, was soon copied by medium-priced cars.[67] A 1951 Buick advertisement asked:

> How long since you lifted the hood of a car, and took a good look at what's beneath? We like to have the folks do that with a Buick. You'll find that broad bonnet isn't put there for show. It's

> packed with horsepower--high, wide and handsome--more horsepower than normal drivers will ever use in full.[68]

By 1953, the number of eight cylinder cars manufactured in the United States exceeded the number of six cylinder ones for the first time, and the next year the low-priced class was caught up in the horsepower race. Chevrolet and Plymouth introduced V-8 engines for the first time, and Ford adopted the new, high compression V-8 motor to replace its old, less powerful, low compression design.[69] The horsepower competition continued and by 1958 the ratings of the low-priced models had exceeded the horsepower of the high-priced 1950 models.[70] The luxury and medium-priced automobile power competition also continued unabated. The 1956 DeSoto featured 320 horsepower, and advertisements for it stated that "this beautiful package of golden dynamite" had been "electronically clocked at the scorching speed of 137 miles per hour." Shortly thereafter, Chrysler came out with a 340 horsepower model which the company claimed had been clocked at 147 miles per hour, making it the fastest production automobile in the world.[71]

Criticism of the dangers of speed and power reappeared in the postwar period along with the outbreak of the horsepower race. The automobile industry was criticized for building cars which were able to attain speeds which were beyond the capability of highways and the ability, skill, and judgement of drivers, and speed was charged with being the main reason for traffic accidents, causing half of all automobile deaths.[72] A 1953 article in Changing Times magazine stated, "We've gone horsepower crazy,"[73] and James K. Knudsen, a member of the Interstate Commerce Commission and administrator of defense transportation, charged in a speech before the Economic Club of Detroit that "The automobile public--in large part by your [the automobile manufacturers'] encouragement--has gone quite power mad. Power makes for speed. Speed is the killer." Knudsen urged the industry to shift its emphasis to safety and "to devise further and more ingenious devices for the automobile user, to limit the range of opportunity for human error and to minimize the consequences of that error."[74] Even the American Automobile Association publically criticized the high horsepower of the new cars at its fifty-first annual meeting in 1953. One of the speakers at the gathering, MIT Professor Dean Fales, charged that the "power far exceeds the maneuverability of the vehicles, with the result that there is a lack of control [and] the accident rate goes up." The 800 delegates

then passed a resolution asking the automobile manufacturers to "tone down the increasing emphasis on horsepower and higher and higher speed potentials and devote more thought and emphasis upon ways and means of protecting the driver against his own mistakes."[75] The AAA meeting two years later again criticized the horsepower race, stating that although "reasonable reserve power" was desirable, "power above that would seem to impose on the car user an unwarranted potential hazard."[76]

Consumer Reports charged that the horsepower race was producing more powerful engines at the expense of "docility, quick warming up, moderate speed economy, longer engine life, [and] greater moderate speed performance." More important, the magazine charged that manufacturers were "guilty of a dangerous practice--dropping all this power into vehicles that do not handle, steer, stop or hold the road as high-powered cars should do."[77] Other critics echoed this charge that increased horsepower had made other components inadequate and pointed out that manufacturers were being forced to correct major weaknesses caused by the increased power, especially in regard to transmissions and brakes, sometimes even during the model year.[78]

An article in Atlantic magazine the following year stated that there was no good reason for putting such high horsepower in passenger cars. The author argued that it was not needed for normal driving, that the brakes and suspensions of the vehicles were not designed to handle it, and there was danger in entrusting it to the majority of drivers: the argument that increased power meant increased safety was dismissed as false; rather, it was claimed that more powerful engines tended to get drivers into trouble.[79] Consumer Reports echoed this latter point, stating that "the much advertised safety factor of rapid acceleration" was "an unreliable instrument" with many variables which was "utterly unsafe for the average driver or even the self-styled 'expert,'" and that braking was the safest way to avoid an accident.[80]

In 1954, Consumers' Research Bulletin pointed out that automobiles were now capable of going much faster than was legal under most state laws and charged these cars with being "the number one killer on the road."[81] Two years later, Congressman Paul F. Schenk of Ohio concluded: "It seems rather foolish to discuss a recommended speed limit and enforcement and safety and at the same time build automobiles which will exceed those very things."[82] New York Traffic Commissioner T. T. Wiley

stated that any further increase in horsepower would be "sheer madness" and charged that the automobile manufacturers had "gone on a horsepower jag [which was] as insidious as dope." The traffic engineer of the city of Denver added: "We're running 300 h.p. cars on 50 h.p. streets."[83]

The National Safety Council and other organizations attempted to counter the horsepower race with elaborate "Slow Down and Live" campaigns, which they claimed produced definite results.[84] However, the Council admitted that some of the advertising of the automobile industry ran counter to the safety messages which it turned out.[85] Other observers were less reserved in their criticism of the industry's emphasis on speed and power. Phillip C. Johnson, chairman of the Indiana Legislature's study commission on traffic safety, pointed out that the automobile manufacturers were not only putting engines in passenger cars which were more powerful than were allowed on some motor speedways, but they were also spending more in advertising this than was being spent in promoting traffic safety: "All the work the [safety] professional can do is lost. . . and is being counteracted by this advertising campaign, in my opinion, of the automobile industry which is pushing speed and blazing horsepower."[86] Christian Century called for a Congressional investigation of the automobile manufacturers' emphasis on "power and speed in their frantic competition to sell cars" in hopes of achieving a voluntary limitation on horsepower and top speed, and the magazine suggested a tithe on advertising budgets to be used to condition motorists to drive safely: "Advertising is so powerful a medium for creating desires that it might be used to create the desire to live and let others live."[87] American Motorist magazine concurred, criticizing the stress on "hopped-up speed" and suggesting that automobile manufacturers spend more time engineering developments to protect drivers from their own mistakes.[88]

Even in the face of all this criticism, some spokesmen for the automobile industry argued that increased horsepower, far from being a hazard, was a safety feature. GM President Harlow Curtice stated in 1954 that "New engines with increased horsepower . . . provide better performance, more economy and greater highway safety."[89] A spokesman for Chrysler Corporation argued two years later that "Methodical study and analysis of the available facts shows that increases in horsepower have not resulted in appreciable increases in highway cruising speeds," while an official of the Ford Motor Company stated that his company advertised horsepower

because "our experience indicates that the public mind associates an increase in horsepower with an improvement in performance and efficiency," and "We have seen no proof that this type of advertising incites to reckless driving."[90]

It was perhaps inevitable that automobile manufacturers would return to racing as an additional weapon in their horsepower battle. Chevrolet adopted the sales theme of racing as a method of demonstrating the performance of its new, high compression V-8 engine in 1955. Chevrolet won two major races, advertised the results heavily, and sales rose 15.7 percent over the previous year. As a result of Chevrolet's success, Chrysler's Dodge and Plymouth divisions began active participation in racing; the corporation spent heavily to promote racing and saw its market share increase from 13 to 16.9 percent.[91] Ford division's general manager Robert S. McNamara called a "council of war" with his engineers as a result of the Chevrolet victories, and the meeting resulted in a decision to support racing financially and technically, but indirectly through an outside firm. The Ford effort was late, however, and its share of the market fell from 31 to 27.8 percent for 1955, but victories in 1956 and 1957 which were advertised widely put Ford back in the competition.[92]

The involvement of the major automobile manufacturers in racing and their active promotion of the results on top of the other aspects of the horsepower race produced a significant reaction. The AAA decided to end its sponsorship of automobile racing in 1955 after a half century, and during the next two years, two Congressional committees and the Governors' Conference on Traffic Safety, headed by Abraham Ribicoff of Connecticut, began separate investigations of the traffic safety problem.[93] Ribicoff took the initiative and worked out a voluntary agreement within the industry to end the horsepower race.[94] At the annual meeting of the Automobile Manufacturers Association in 1957, the board of directors, fearing government intervention, voted "to encourage owners and drivers to evaluate passenger cars in terms of useful power and ability to afford safe, reliable and comfortable transportation, rather than in terms of capacity for speed."[95] Furthermore, the AMA approved a resolution introduced by GM President Harlow Curtice banning participation by members of the association in racing or speed and acceleration tests and prohibiting the use of the results of such contests in advertising.[96] Sometime earlier, the three largest automobile manufacturers had agreed not to mark speedometers high-

er than 120 miles per hour, a practice engaged in to indicate--accurately or not--the top speed potential of a car, which had developed into a race of its own that critics charged was an enticement for drivers to drive fast.[97]

Ford Motor Company halted its support of racing activities, and Business Week magazine asked, "Can Detroit Sell without Speed?"[98] At General Motors, however, Chevrolet and Pontiac divisions continued to clandestinely support racing and to emphasize speed in advertisements aimed at specialized audiences despite the corporation's sponsorship of and continued official support of the AMA ban. Chevrolet won important racing victories during the next two years, and Ford's market share slipped noticeably behind that of its main competitor. When the construction of new speedways at Daytona, Florida, Charlotte, North Carolina, and Atlanta, Georgia, in 1959 and 1960 brought new popularity to automobile racing, Lee Iacocca, the new Ford general manager, also began giving support to racing through the company's Autolite division.[99] Plymouth returned to racing, also, and by 1962, the Wall Street Journal reported, "The spirit, if not the letter, of the [AMA] agreement has been shattered" by the automobile industry's "urge to woo customers by bragging about the number of horses under the hood."[100]

In June, 1962, Henry Ford II, president of Ford Motor Company, notified the AMA that his firm would no longer abide by the 1957 agreement since it had "neither purpose nor effect." The company began emphasizing speed and performance in its advertising aimed at the general public, and it was soon laying plans to attempt to win some of the biggest races in the world, including those at Indianapolis, Indiana, Daytona, and Le Mans, France. Chrysler Corporation announced that the Ford position had made the resolution "inoperative" and was soon officially racing again. General Motors announced that it continued to support "the soundness of the principle of the AMA resolution," but its Chevrolet and Pontiac divisions continued to race and also began to emphasize speed and performance in general advertising.[101] American Motors, on the other hand, which lacked the resources to support a racing program, continued to strongly support the AMA resolution. In 1963, when speed and horsepower appeared as a major theme in the advertisements of both Ford and Chrysler, AMC President Roy Abernathy condemned putting "an aura of glamour around speed" and argued that "The start of a new horsepower race . . . would create a public spectacle that

could rob the industry of its deserved and hard-won reputation for responsibility."[102] In 1964, American Motors ran full page advertisements stating that it did not feel that emphasis on speed and horsepower was a contribution to safety, and that the company would not become involved in such promotions.[103] Two years later, Abernathy stated:

> I think there may be some indication . . . that there are some people, particularly young people, who are romanced by it [horsepower] and might purchase cars on that account. . . . We are against the glamorizing of it. . . . We think it has something to do with the action of the driver on the highway.[104]

The return of the horsepower race also brought the return of public criticism. Congressman Paul Rogers of Florida, a member of one of the House Subcommittees which looked into the problem in 1957, lamented the end of the AMA resolution: "The need for such an agreement was reflected in the rising death toll on America's highways. At that time, each manufacturer based his claims on massive horsepower and high speed figures. Competition being what it is, the public was caught in a race of spiraling high performance figures and death statistics to match."[105] Two government investigations prompted by concern over the earlier horsepower race which had been completed in 1959 lent support to Rogers' concern. A Bureau of Public Roads study revealed that both excessively high horsepowered automobiles and low horsepowered ones had higher accident rates than cars of average power. A Commerce Department study concluded that despite industry claims, "it would seem to be of economic disadvantage to the consumer, both in engine cost and fuel consumed, to provide any vehicle with a power-plant capability far in excess of the needs for speed and acceleration, which surely have some practical and finite limits from the safety viewpoint." The report went on to state that additional development work might make mechanical speed control feasible.[106] A spokesman for the AMA argued, on the other hand, that "Prevention of excessive speed is essentially a matter of driver control through enforcement and education."[107] Advertising Age reported that an examination of automobile advertising revealed that the art work and copy was little different from that in advertisements forty years earlier; there was the same emphasis on speed on the open highway "as if people still bought cars to experience the thrill of powered travel on a wide, unclutter-

ed road."[108]

Consumers' Bulletin charged in 1963 that speed and power had been increased beyond all reason and that the automobile manufacturers' claims that the extra horsepower was a safety feature was "an insult to the consumer's intelligence."[109] A former automotive engineer turned safety consultant again pointed out the discrepancy between the type of vehicles the industry was producing and the rest of the highway system:

> Today dozens of automobiles being offered to ordinary consumers are capable of speeds exceeding 100 miles per hour and a substantial number of models can reach speeds of 140 to 160 miles per hour. Design of public road and driver licensing requirements of most states contemplate maximum speeds of around 60 miles per hour. . . . Thus users are consciously being provided with high speed ability that exceeds legal limits, . . . ability of all public roads, . . . driving skill of nearly all drivers, and the expectations of innocent bystanders. . . . [110]

General Motors, always fearful of Federal antitrust action because of its control of 55 percent of the automobile market, took the criticism of the use of speed and horsepower seriously enough so that it retained the official policy of support for the 1957 AMA resolution despite pressure from several division managers for open participation in automobile racing, but its products did not fall behind in horsepower ratings. Thus, the new emphasis on racing found Ford and Chrysler as the main contestants in a drive for victories which could be turned into "highly competitive, if not sensational advertising campaigns." Sam Petok, a public relations manager for Chrysler, pointed out the large amount of free publicity which winners of automobile races--one of the largest spectator sports--received from newspapers, magazines, and television, as well as at the races themselves. Plymouth, Dodge and Chrysler cars achieved a number of victories in 1963 and 1964 which the company touted widely, even in its annual reports to stockholders. Plymouth sales jumped 22 percent after a victory at the Daytona International Speedway in February, 1964. Robert Rogers, special car manager and chief engineer of Chrysler Corporation, argued that although "We lay no claim to racing specially-equipped vehicles as an experimental proving ground for standard

passenger car development," no automobile manufacturer could afford to ignore the public demand for performance, and the company spent $3,000,000 on racing activities in 1964.[111]

Ford initially claimed that racing was merely being used to stress the durability of its products. However, Ford general manager Lee Iacocca, long an outspoken advocate of racing, argued in a speech in 1964 that the total performance ability of an automobile was best judged in public contests; furthermore, if a manufacturer could project a "winning image," many consumers would purchase cars of that brand. Ford was soon spending $20,000,000 per year on racing, and by 1967 estimates ranged as high was $30,000,000 as the company invested heavily in an effort to win the Indianapolis 500 and the Le Mans Gran Prix. Leo C. Beebe, special vehicles manager of Ford division, estimated that the firm's race cars were performing before an audience of 10,000,000 people, and the news of victories were widely featured in advertising campaigns. The total effect of this effort, the Ford sales people were convinced, was increased sales.[112]

In 1965, Abraham Ribicoff, the man who was given credit for the 1957 AMA resolution, was again investigating the horsepower race, this time as chairman of a Senate committee. Ribicoff was convinced that there was a direct connection between the resumption of racing by the automobile companies and the steady rise in traffic accidents since 1962, and his committee called representatives to Washington in order to question them on the subject.[113] Arjay Miller, the president of the Ford Motor Company, argued that automobile racing was a popular sport and that no resolution would stop it or the use of industry products in it. Therefore, Ford felt it should become involved in racing to see that its products were used properly and safely. Furthermore, Miller claimed that racing was an important testing ground. As for increases in the horsepower of passenger cars, the Ford president stated: "Some drivers misuse the top speed potential of their cars. Nevertheless, it is clear that, on balance, the development of more efficient, more powerful engines has been an important factor in improving highway safety."[114] On the other hand, Frederick C. Donner, chairman of the board of General Motors, reaffirmed the corporation's continued support of the 1957 AMA resolution, and Roy Abernathy, president of American Motors, concurred, admitting that he felt emphasis on speed and horsepower had a detrimental effect on driver behavior.[115]

Despite the Ribicoff investigation and a study of automobile safety, speed, and racing advertising by the Federal Trade Commission, the Ford Motor Company continued its active participation in six major racing categories through 1969, winning impressive victories in all areas. However, by this time the speed and horsepower sales theme had lost much of its appeal, the demand for high performance models declined, and many customers were again rejecting American cars in favor of less powerful, less expensive and more economical imported brands. Just as important, after 1966 the Federal government began its first serious attempt to regulate the highway transportation system and the automobile industry. It was Federal requirements in regard to safety and air pollution, which began coming into effect in the late 1960's, that were responsible for reordering priorities within the automobile industry, making the large expenditures on racing financially impossible. Ford's 1970 racing budget was cut by 75 percent, and in November of that year, Vice President Matthew S. McLaughlin announced that the company was withdrawing from all major forms of automobile competition. Executive Vice President Lee A. Iacocca suggested that Ford's investment in racing had not given a good return on the dollar.[116] However, indications were that, until 1970, Ford Motor Company's emphasis on speed, performance, horsepower, and racing had, despite some criticism, given a good return in terms of sales and profits, especially given General Motors' reluctance to participate openly in the competition. But this successful sales campaign, like the many others before it, encouraged the production of unbalanced automobile designs capable of attaining speeds well beyond the capacity of the rest of the vehicle, the operator, and the highway, and it may have helped condition drivers to use the vehicle's speed potential--and in a highly aggressive manner.

NOTES

[1]AMA, Automobiles of America, p. 13; Niemeyer, Ransom E. Olds, p. 51.

[2]Automotive Industries, Aug. 4, 1928, p. 145; Sloss, Book of the Automobile, pp. 277, 284-85.

[3]General Motors Corporation, Buick Division, Buick's First Half-Century (Detroit: General Motors Corp., 1952), p. 46.

[4]Anderson, Story of the Automobile, pp. 271, 281, 284.

[5]AMA, Automobiles of America, pp. 38, 47, 59, 61.

[6]Flink, America Adopts the Automobile, p. 283.

[7]Seth K. Humphrey, "Our Delightful Man-Killer," Atlantic, Dec., 1931, p. 725.

[8]Flink, America Adopts the Automobile, p. 180.

[9]Ibid., pp. 188, 192.

[10]Travelers Insurance Company, Motor Vehicles and Safety (Hartford: Travelers Insurance Co., 1915), p.21.

[11]Flink, America Adopts the Automobile, p. 136; Harper's Weekly, Mar. 30, 1907, p. 470; Horseless Age, Oct. 28, 1908, p. 580, as cited in Flink, America Adopts the Automobile, p. 99.

[12]"Time to Stop," Outlook, Apr. 17, 1909, p. 852.

[13]"Automatic Speed Governor," Scientific American, Nov. 9, 1907, p. 332; Seth K. Humphrey, "Automobile Selfishness," Atlantic, Nov. 1908, p. 682; Lee K. Frankel, The Increasing Automobile Hazard: An Address Delivered before the Association of Life Insurance Presidents at New York, December 7, 1917 (New York: n. p., [1917]), p. 10.

[14]Motor Age, July 13, 1905, p. 6, quoted in Flink, America Adopts the Automobile, p. 45.

[15]Sloss, Book of the Automobile, pp. 281-83; Flink, America Adopts the Automobile, p. 45. Henry Ford supplied race driver Frank Kulick with Model T Fords

which Kulick raced at state fairs during the years 1908-1911. However, Ford decided after a racing accident that the practice was too dangerous and withdrew his support (Reynold M. Wik, Henry Ford and Grass-Roots America [Ann Arbor: University of Michigan Press, 1972], p. 39).

[16]Scientific American, Oct. 15, 1910, p. 293; Outlook, Sept. 30, 1911, p. 258.

[17]Clymer, Motor Scrapbook, p. 122; General Motors, Buick's First Half-Century, p. 58.

[18]Clymer, Motor Scrapbook, p. 126; Rowsome, They Laughed, p. 119.

[19]Clymer, Motor Scrapbook, p. 146.

[20]Lawrence Crooks, head of Consumers Union automobile testing program, quoted in O'Connell and Meyer, Safety Last, p. 134.

[21]"What Shall Be the Cure for the Automobile Speed Mania?" Illustrated World, Sept., 1920, p. 85; H. D. William, Jr., "Maryland's Road Accident Map Shows Great Danger of Speed," Public Roads, Sept., 1921, p. 15; F. W. Parsons, "Less Speed, More Safety," Saturday Evening Post, Aug. 27, 1921, p. 26; Mark Sullivan as quoted in Automotive Industries, Jan. 4, 1923, p. 16.

[22]George M. Graham, "Safeguarding Traffic: A Nation's Problem--A Nation's Duty," Annals of the American Academy of Political and Social Science, CXVI (Nov., 1924), p. 174-75.

[23]Norman G. Shidle, "All This Talk about Speed," Automotive Industries, June 18, 1927, p. 925.

[24]AMA, Automobiles of America, p. 86; Automotive Industries, Jan. 14, 1928, p. 45, July 5, 1930, p. 1, Feb. 13, 1932, p. 229; Business Week, Feb. 17, 1932, p. 5.

[25]Shidle, "All This Talk about Speed," pp. 925-27.

[26]"Wanted: Some Speedy Action on Speed Advertising," Printer's Ink, Oct. 6, 1927, pp. 94, 96.

[27]J. T. Breck, "Use of Speed Governors Defended as Highway Safety Measure," Automotive Industries, Nov. 11, 1926, p. 822; Robert L. Cusick, "State Authorities Make an Issue of Speed Advertising," Automotive Industries,

Aug. 4, 1928, p. 145.

[28]Clarence Wagener, "Danger Ahead--Slow Down Automobile Advertisers," Printer's Ink, Sept. 1, 1927, pp. 10, 12; "Wanted: Action on Speed Advertising," p. 96.

[29]"No Speed Test Advertising in State of Washington," Printer's Ink, July 21, 1927, p. 146.

[30]"Wanted: Action on Speed Advertising," p. 94.

[31]J. M. Campbell, "An Open Letter to Our Automobile Manufacturers," Advertising & Selling, Oct. 31, 1928, p. 67.

[32]"Wanted: Action on Speed Advertising," p. 94.

[33]Cusick, "Speed Advertising," p. 148.

[34]"Wanted: Action on Speed Advertising," pp. 93-94.

[35]Cusick, "Speed Advertising," p. 148.

[36]Ibid.

[37]Ibid., pp. 145, 147.

[38]John H. Crider, "Speed with Ease," Scientific American, Dec., 1936, p. 332.

[39]General Motors, Buick's First Half-Century, pp. 60, 61.

[40]Billings, "The Nut That Holds the Wheel," p. 439.

[41]Ibid., pp. 440-41.

[42]Ibid., p. 440.

[43]Travelers Insurance Company, Worse Than War (Hartford: Travelers Insurance Co., 1933), p. 20.

[44]"Speed as Car Advertising Will Bring Flood of Restrictive Road Laws," Automotive Industries, July 23, 1932, p. 106; "Less Speed and More Safety," Literary Digest, Aug. 20, 1932, p. 27.

[45]Scientific American, Nov. 1933, p. 330. A British magazine also reported that evidence taken by the Royal Commission on Transport in April, 1929, indicated that the prime cause of automobile accidents was the "compet-

itive spirit" (R. Appleyard, "Our Crimson Highways," Nineteenth Century and After, June, 1932, p. 716).

[46]Palmer and Crooks, Millions on Wheels, pp. 14-15.

[47]Ibid., p. 53; Stevens, Highway Safety, pp. 58-60.

[48]Crider, "Speed with Ease," p. 331.

[49]Furnas and Smith, Sudden Death, pp. 2-3.

[50]Crider, "Speed with Ease," p. 331. Basil R. Creighton, safety engineer in the Colorado Motor Vehicle Department from 1937-1940, reports that it was evident then that higher horsepower cars, particularly Ford V-8's, were involved in more accidents. Interview, Oct. 29, 1969.

[51]Palmer and Crooks, Millions on Wheels, pp. 248-49.

[52]Crider, "Speed with Ease," p. 331.

[53]Ibid., pp. 331-32.

[54]"Speed Curb: Reckless Drivers in New York Ordered To Use Governors on Their Cars," Literary Digest, Oct. 24, 1936, p. 12; C. A. Harnett, "Restricted Licenses Requiring Use of Speed Governors," Safety Engineering, Nov. 1936, p. 29; "Limiting Car Speed," Business Week, Jan. 11, 1936, p. 12; "Toward Safer Highways," Nation's Business, Jan., 1937, p. 70; C. G. Gonter, "30 Mile-an-Hour Experiment," Safety Engineering, Dec., 1936, p. 37; T. E. Murphy and E. J. Murphy, "Holiday from Death," Reader's Digest, Oct., 1938, p. 65; M. M. Stearns, "Warning, Slow Down!" Collier's, May 6, 1939, p. 19; O'Connell and Meyers, Safety Last, p. 60.

[55]Stevens, Highway Safety, p. 61; "Mechanical Speed Limitation Favored 3 to 1," Insurance Field, Apr. 25, 1935, p. 10; "Sudden Death: Poll by American Institute of Public Opinion," Scholastic, Feb. 15, 1936, p. 27; "Speed Mania Creates Big Market for Auto Governors," Sales Management, Jan. 15, 1936, p. 74; "Motor Vehicle Administrators Give Views on Car Design," Automotive Industries, Jan. 29, 1938, p. 132.

[56]Ray W. Sherman, If You're Going To Drive Fast (New York: Thomas Y. Crowell Co., 1935), p. 15.

[57]Alexander Klemin, "Are Modern Cars Safe?" Scientific American, Aug., 1936, p. 64.

[58]Palmer and Crooks, Millions on Wheels, p. 249.

[59]General Motors, Automobile Buyers' Guide, p. 34.

[60]Quoted in Crider, "Speed with Ease," p. 332.

[61]Hoffman, Seven Roads to Safety, p. 51.

[62]John B. Rae, The American Automobile: A Brief History (Chicago: University of Chicago Press, 1965), p. 154.

[63]H. F. Hammond, "Move to Control Post-War Speeds of Automobiles," National Underwriter, Mar. 2, 1944, p. 21; "Fourteen Organizations Join To Restrain Speed on Highways," National Underwriter, Aug. 30, 1945, p. 15.

[64]"70 MPH Speed Limit on Pennsylvania Turnpike Is Accident Cause," Roads & Engineering Construction, July, 1951, p. 58.

[65]AMA, Automobiles of America, pp. 118, 121.

[66]Jaderquist, "Horsepower Race," p. 56.

[67]Stuart, Factors Affecting Market Share, p. 68; Jaderquist, "Horsepower Race," p. 56.

[68]General Motors, Buick's First Half-Century, p. 64.

[69]AMA, Automobiles of America, pp. 132, 134.

[70]Advertising Age, Feb. 25, 1958, p. 103.

[71]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 730.

[72]T. N. Boate, "Cars Travel Too Fast for Drivers and Roads," Safety Maintenance & Production, Sept., 1953, p. 32; R. Moses, "To Turn Back the Killer, Speed," New York Times Magazine, Jan. 4, 1953, p. 11; "High Speeds Cause Half of Traffic Deaths," Science Digest, June, 1953, p. 85; "Speed, '52 Top Killer," Safety Maintenance & Production, June, 1953, p. 57.

[73]"We've Gone Horsepower Crazy," Changing Times, May, 1953, p. 19.

[74]James K. Knudsen, "Auto Makers Responsibility," Vital Speeches, Mar. 15, 1953, p. 350.

[75]"Too Much Horsepower," Time, Sept. 21, 1953, p. 96.

[76]"Horsepower Madness and a New Year," American Motorist, Jan., 1956, reprinted in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 47; Consumers Research Bulletin, Jan., 1956, p. 18.

[77]"Engineers," Consumer Reports, May, 1953, p. 219.

[78]Jaderquist, "Horsepower Race," p. 56; Pendergast, "Automobile Design," p. 118.

[79]Jaderquist, "Horsepower Race," p. 56.

[80]"Safety," Consumer Reports, May, 1954, p. 211.

[81]"Off the Editor's Chest," Consumers Research Bulletin, June, 1954, p. 2.

[82]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 502.

[83]Time, Jan. 17, 1955, p. 87.

[84]T. N. Boate, "Slow Down and Live Drive Hailed by Safety Experts," Weekly Underwriter, July 3, 1954, p. 34; ibid., "Slow Down and Live Drive Getting Good Results," ibid., July 24, 1954, p. 194, Aug. 7, 1954, p. 304; ibid., "Highway Accidents Can Be Reduced," ibid., Sept. 4, 1954, p. 525; "Slow Down and Live Drive Obtained Definite Results," ibid., Oct. 23, 1954, p. 998; P. H. Blaisdell, "Speed Root of All Evil," ibid., Apr. 27, 1957, p. 989.

[85]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 211.

[86]Ibid., pp. 846-47.

[87]"Death Takes No Holiday," Christian Century, Jan. 4, 1956, reprinted in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 47.

[88]"Horsepower Madness and a New Year," p. 47.

[89]Curtice, Meeting the Challenge Ahead, p. 9.

[90]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 491, 543.

[91]Jim Brokaw, "Ford Black Flags Racing," Motor Trend, Feb. 1971, p. 65; Robert L. Brown, "Derring-Do in Detroit," Sales Management, April 17, 1964, p. 26; Stuart, Factors Affecting Market Shares, pp. 52-53.

[92]Brokaw, "Ford Black Flags Racing," pp. 65-66; Stuart, Factors Affecting Market Shares, p. 53.

[93]AMA, Automobiles of America, p. 138; O'Connell and Myers, Safety Last, p. 150; "Legislation for Auto Safety," Consumers Research Bulletin, Oct., 1956, p. 26.

[94]Sales Management, Apr. 17, 1964, p. 26.

[95]Quoted in O'Connell and Myers, Safety Last, p. 150.

[96]O'Connell and Myers, Safety Last, p. 150; AMA, Automobiles of America, p. 143; Brokaw, "Ford Black Flags Racing," p. 66.

[97]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 499.

[98]Brokaw, "Ford Black Flags Racing," p. 66; Business Week, July 20, 1957, p. 51.

[99]Brokaw, "Ford Black Flags Racing," pp. 66-67; Brown, "Derring-Do in Detroit," p. 26; New York Times, Sept. 7, 1963, p. 1, quoted in O'Connell and Myers, Safety Last, p. 151; Hugh Quinn, "Abernathy's Plea To Eschew Speed Appeal Unlikely To Affect Auto Ads," Advertising Age, Jan. 28, 1963, p. 10; Herndon, Ford, p.87.

[100]Wall Street Journal, Mar. 5, 1962, p. 1, quoted in O'Connell and Myers, Safety Last, p. 150.

[101]Brokaw, "Ford Black Flags Racing," p. 67; Advertising Age, June 18, 1962, pp. 3, 108; Quinn, "Abernathy's Plea To Eschew Speed," p. 10.

[102]Advertising Age, June 18, 1962, p. 108; "Pros and Cons of Horsepower Controversy," Printer's Ink, Mar. 29, 1963, p. 8, quoted in Stuart, Factors Affecting Market Demand, p. 69; Quinn, "Abernathy's Plea To Eschew Speed," pp. 10, 92.

[103]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 2, p.875.

[104]Ibid., p. 874.

[105]U. S. Congress, House, 87th Cong., 2nd sess., Mar. 6, 1962, Congressional Record, CVIII, 3199, quoted in O'Connell and Myers, Safety Last, pp. 151-52.

[106]Commerce Dept., Federal Role in Traffic Safety, 1959, pp. 43-44, 83.

[107]U. S. Congress, House, Committee on Interstate and Foreign Commerce, Motor Vehicle Safety Standards, Hearings before the Subcommittee on Health and Safety of the Committee on Interstate and Foreign Commerce, House of Representatives, on H. R. 903, H. R. 1341, and H. R. 2446, 87th Cong., 1st sess., 1961, p. 85.

[108]"Forty Years Later, the Same Old Theme," Advertising Age, June 18, 1962, p. 97.

[109]"Traffic Deaths," Consumers Research Bulletin, Sept., 1963, p. 20.

[110]Henry H. Wakeland in a speech before the NACCA convention, Aug. 4, 1963, quoted in O'Connell and Myers, Safety Last, p. 107.

[111]Brown, "Derring-Do in Detroit," p. 25-29; F. B. Beaumier, "Auto Safety Picks Up Speed," Iron Age, Jan. 13, 1966, p. 29; "Horsepower Race Breaks Out Again," Business Week, Mar. 9, 1963, p. 30; Chrysler Corporation, Annual Report, 1963, (Detroit: Chrysler Corp., 1963), pp. 15-16; ibid., Annual Report, 1964 (Detroit: Chrysler Corp., 1964), p. 10; Hugh Quinn, "Ford, Chrysler Step on Promotional Accelerator as Race Season Appears," Advertising Age, May 17, 1965, p. 10.

[112]Hugh Quinn, "Racing? It's Just a Backdrop for Ads Stressing Durability, Ford Explains," Advertising Age, July 22, 1963, p. 3; John Lantier, "Industry Marketing Views," in Stuart, Factors Affecting Market Shares, p. 369; Quinn, "Ford, Chrysler Step on Accelerator," p. 10; "Ford Touts Results at Daytona Race in New Ad Drive," Advertising Age, Mar. 11, 1963, p. 12; Herndon, Ford, p. 88.

[113]Business Week, July 10, 1965, p. 26. A British observer writing the next year argued that given the aggressive image of the automobile created by American automobile manufacturers, the society's taboo on speed created repressions in the American people. Thus, he continued, stock car and drag races allowed a release of these repressions--similar to the ritualistic periods of

license in primitive societies--which helped to reduce the accident rate on the highways (Black, Man and Motor Cars, pp. 95-96).

[114]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 2, pp. 906, 908-909.

[115]Ibid., pp. 655, 874.

[116]U. S. Congress, Senate, Committee on Small Business, Planning, Regulation, and Competition: Automobile Industry, Hearings before subcommittees of the Select Committee on Small Business, U. S. Senate, 90th Cong., 1st sess., 1968, p. 453; Brokaw, "Ford Black Flags Racing," pp. 65, 84; Motor Trend, Jan., 1971, p. 80.

CHAPTER V

THE REACTION OF THE AUTOMOBILE INDUSTRY TO THE PROBLEM OF TRAFFIC ACCIDENTS

Early proponents of motorized road vehicles argued that they were much safer than horse-drawn vehicles. Horseless Age stated in 1896: "The motor vehicle will not shy or run away. . . . These frightful accidents can be prevented. The motor vehicle will do it."[1] J. Frank Duryea said the following year:

> The horse is a willful, unreliable brute. The ever recurring accidents due to horses which are daily set forth in the papers prove that the horse is a dangerous motor and not the docile pet of the poet. The mechanical motor is his superior in many respects, and when its superiority has become better known his inferiority will be more apparent.[2]

Harper's Weekly stated in 1899 that "a good many folks to whom every horse is a wild beast feel much safer on a machine than behind a quadruped, who has a mind of his own, and emotions which may not always be forestalled or controlled."[3]

The safety argument was not used for very long, however. In 1899, a New York City real estate dealer was run over and killed near Central Park to become the first known victim of the motor vehicle.[4] From that point on the toll climbed rapidly. An official of one automobile company admitted in 1902 that "there have been some accidents and these happenings in or near metropolitan districts have attracted more or less attention and possibly have been given undue publicity by publications of a sensational nature."[5] Agricultural journals editorially criticized speeding and reckless driving, and in 1905 the National Grange claimed that "Accidents of the most shocking nature have been a common occurance."[6]

Even supporters of the automobile admitted that "The problem of the automobile is a serious one,"[7] but rather than concede the need for stronger regulation, the first reaction of some automotive interests was to advocate a campaign to educate newspapers that were giving unfavorable coverage to the automobile through their

articles on accidents.[8] In 1909, a writer in Overland Monthly, in an article entitled the "Automobile as the Agent for Civilization," attacked "certain people who have not awakened to the benefits of the motor age. When they read a newspaper account of an automobile accident, the unlucky machine is subjected to all sorts of criticism."[9]

Yet the criticism continued. In 1908, Living Age complained that it was now impossible to walk or ride a bicycle along a highway because of the dust, noise, and danger caused by automobiles, and a writer in the Atlantic Monthly stated flatly that "unavoidable" automobile accidents would continue "so long as men and women were prone to forget, and children are possessed of immature judgement" and that the automobile, not the public, should be controlled.[10] In 1909, Outlook, in an article entitled "Slaughter on the Highways," asked "how long (will) this reign of death . . . continue?" and a prominent Boston citizen, in a letter to a daily newspaper, demanded; "Have we killed enough people or do the automobile drivers wish a few more victims?"[11] Magazine articles pointing out the "Menace of the Automobile" and calling for the "Curbing of the Automobile Danger" continued to appear as automobile accidents increased.[12] The electric railway industry was particularly upset by the numbers of its customers who were run over by automobiles after stepping from street cars.[13]

Automobile accident statistics released at the 1909 meeting of the International Association of Accident Underwriters revealed that the motor vehicle was not safer than the horse, for the record was much worse than what had been considered normal for horse-drawn vehicles.[14] In the same year, Horseless Age admitted that "the 'automobile hazard' is not likely to decline in frequency."[15] Not only did the accident rate seem very high given the number of automobiles in use, but automobile accidents usually involved more serious bodily injury and higher property damage claims than accidents involving only horse-drawn vehicles. Moreover, motorcars were more costly to repair or replace.[16] In 1915, the Travelers Insurance Company, in a booklet entitled Motor Vehicles and Safety, stated: "The evolution of the automobile, from the slow, uncomfortable, cumbersome, and mechanically-imperfect conveyance of the past, to the swift, dependable, luxurious car of to-day, has been attended by a correspondingly increasing amount of danger, not only to the operator of the car and his passengers, but also to the public at large."[17] The following year the Governor of Massachusetts spoke of "The alarm-

ing proportions reached by mortality upon the highways."[18]

In December, 1917, Lee K. Frankel, third vice president of the Metropolitan Life Insurance Company, delivered an address entitled "The Increasing Automobile Hazard" before a meeting in New York City of the Association of Life Insurance Presidents:

> The increasing importance of the automobile as an instrument of injury and death is daily being viewed with greater alarm by life insurance companies, police officials, civil authorities and public health administrators. Vital statisticians are observing that while the communicable diseases have responded more and more each year to the measures instituted by health authorities for their control, injuries and fatalities resulting from the growing use of automobiles are steadily climbing. . . . The data available show clearly that we have before us a problem of the first magnitude and that we must organize all communal groups interested in public safety to combat the growing evil. It will be necessary to interest legislatures and to educate the public generally if we are to control the results of the automobile industry which has grown so tremendously in recent years.[19]

Frankel also pointed out that "The increase in the number of accidents and fatalities bears a definite relation to the increase in the number of automobiles in use."[20] Another observer the same year reached the same conclusion:

> Other things being equal, accidents will increase with motor vehicle registration. One check which was expected to operate before now upon increased registration, and therefore upon accidents, was a limit to the proportion of persons supposedly able to buy automobiles. That limit was entirely misconceived. Automobiles can be procured so cheaply now and so many people to procure them are ready to sacrifice necessities as well as luxuries, that no one longer dares define any limit.[21]

Some automobile interests continued to attack the press for sensationalism in its coverage of automobile accidents, criticizing newspapers for publishing grouped accident reports and accusing them of giving space to accident statistics of doubtful accuracy. James R. Doolittle, the editor of a large volume published in 1916, entitled The Romance of the Automobile Industry, wrote: "In the view of some of the press, the automobile is today a juggernaut, a motoring speed-monster, intent on killing and maiming all who stand in its way. The motorist . . . is an intoxicated savage, in charge of a dangerous device."[22]

The automobile industry as a whole, however, became implicitly aware that the accident problem posed no real threat to its sales or autonomy. Motor vehicle crashes were, due to the national scope of the highway transportation system, a decentralized phenomenon, usually involving just a very few individuals in any area at any particular time. Residents of any specific locality were always aware of a few accidents, but the magnitude of the problem across the country was seldom impressed upon them. When the decentralized nature of automobile accidents was coupled with the natural tendency of an individual to view his chances of being involved in a crash as very remote, the result was a public acceptance of a very high accident rate. Just as important, because the automobile, unlike the horse, was an inanimate object, it was natural for the blame for accidents to be laid on the human operator. Vehicular contributions to crashes were complex, often concealed by the crash, and, thus, seldom considered. Since highway transportation was not viewed as a system--although a few observers noticed that there was a connection between the number of accidents and the number of vehicles on the road--the natural conclusion as to a solution for the accident problem was to improve driving through the education of operators and the enforcement of motor vehicle laws.

Given the nature of the public reaction to the accident problem, it was obvious that any costs incurred in the research, development, and adoption of design changes to improve the safety of the automobile, itself--which might be very expensive, indeed--could probably not be passed along to the consumer in the form of higher prices, even with heavy promotion--which might at the same time raise unhealthy doubts about automobile transportation in the minds of the consumers and the government and cries of unfair competition from the firms in the industry which did not have the improve-

ments. Thus, the logical strategy of the automobile industry in regard to accidents was merely to strongly support--in as many ways as seemed desirable at a particular time--the public's original conception of the highway safety problem. The industry used a variety of tactics in implementing this strategy. One of the most important--and successful--was to stress as unquestioned the proven safety and reliability of the automobile, the continual improvement of the vehicle with each model year, and the progressiveness of the industry in general. As Henry Ford II, chairman of the board of the Ford Motor Company, put it--in his very blunt language--in 1966: "We build safe cars and have always built safe cars, but that is not to say that we can't make them safer, and that is what we are doing every model year. . . ."[23]

The industry argued that automobiles almost never cause accidents and that it was not normal for one to be involved in a crash--thus, there was no obligation to design a car with this possibility in mind. It was vociferously maintained that even the "perfect vehicle" could not prevent driver error or poor road conditions, and that, thus, the solution to the safety problem lay in improving the driver and the highway. Walter P. Chrysler, president of the Chrysler Motor Car Company, said in 1927: "The more I study this problem [of automobile accidents] the more I am convinced that a major part of the problem is an educational one."[24] Eddie Rickenbacker, aviator turned automobile manufacturer, stated in 1935: "Even though the maker builds the best and safest car in the world, still its safety is determined by the person who handles it."[25] A General Motors publication echoed this thought five years later, saying, "But regardless of all the progress that has been made in building safe cars, the ultimate effectiveness rests with the DRIVER of the car,"[26] and an advertising campaign in 1966 stressed, "safety comes first at GM (but remember, you're still in the driver's seat)."[27] Dr. Laurence P. Hofstad, vice president of research staff at General Motors, stated in 1958: "I am convinced that more progress can be made in traffic safety by emphasizing the relations between the driver, the signalling system, and the road, than by undue emphasis on a crash proof car. . . ."[28] Harry F. Barr, vice president in charge of engineering staff, repeated this point of view seven years later when he said: "We feel our cars are quite safe and reliable. . . . The driver is the most important, we feel. If the drivers do everything they should, there wouldn't be any accidents, would there?"[29] Henry Ford II echoed this statement a

year later when he emphasized, "The driver is the most important part of this whole thing [automobile safety], because, if you drive safely, accidents won't happen,"[30] and Ford president Arjay Miller concurred: "The same effort and money will give greater progress if applied to the driver rather than to the car."[31] Speaking for the entire industry, AMA representative Karl Richards reiterated this view by testifying, "Driver improvement offers the greatest hope for traffic safety."[32]

This shift of emphasis from the automobile to the operator was augmented by stress upon changes in vehicle design which involved the driver, road, and environment --such as lights, tires, brakes, windshield wipers, and window area--and government--through inspection for proper vehicle maintenance. The success of this approach made it very easy to keep the burden of responsibility for automobile accidents elsewhere. The industry continually emphasized that the legal duty for dealing with the problem of highway safety lay with specific state and local officials, and it periodically offered aid and assistance to public and private agencies dealing with safety.

The automobile industry was aided in the implementation of its strategy by the fact that the initial public reaction to automobile accidents soon became institutionalized in a number of private and public agencies. The highway safety movement began around 1914 as a "public-spirited activity, activated by a little group who saw the necessity of 'doing something' and doing it effectively and quickly."[33] The largest and most important of the various organizations which sprang up around the country soon came to be the National Safety Council. The Council had grown out of a Cooperative Safety Congress held in 1912 in the aftermath of public concern over the Triangle Shirtwaist Factory fire in New York which claimed 145 lives. Out of this Congress came the National Council for Industrial Safety the following year, which began producing posters featuring safety slogans to be placed in factories. As one safety worker recalled: "The Council came up with slogans to put up in plants. Accidents decreased so they felt their material was effective."[34]

The organization soon broadened its scope to include public safety and in 1914 changed its name to the National Safety Council. The major public safety problem was automobile accidents, and the Council soon came to devote a great deal of its attention to highway safety. The rationale for the Council's approach to acci-

dents was based on the assumption that all accidents had causes; as one author put it: "Human misbehavior, human frailty, human ignorance, human laziness all cause accidents. Remove them and accidents cease. The problem is the technical one of getting them out. When all the causes of accidents have been discovered . . . and removed, the accident problem will have been solved."[35] Thus, the way to solve automobile accidents was to keep accident records and study them to determine the causes, and then to point these causes out to the public.[36]

However, the "cause" of automobile accidents had already been discovered. As early as 1902, a newspaper reporter had pointed out: "The accident which happens to the automobile is seldom due to the machine itself, but almost wholly to the loss of control or presence of mind of the operator."[37] Thus, the search for causes by safety organizations became almost a self-fulfilling prophecy. In reality, automobile accidents are the result of a complex, synergistic interaction of a multitude of factors involving the driver, the vehicle, the highway, and the environment. And yet the safety workers, usually untrained in statistics or statistical inference and using highly unreliable data, were searching for unicausal solutions, and, of course, they found one.

The analysis of the available statistics on automobile accidents by individuals and members of various groups concerned with the accident problem revealed that almost every accident involved a violation of a motor vehicle law or traffic ordinance or of a safety rule. Given this situation, the solution to the problem seemed obvious--educate the public to obey the law and the safety rules, and enforce the law vigorously in the case of those who violate it.[38] In 1914, the Safety First League of Boston stated that "the automobile would cease to be a public problem the moment a substantial number of owners and operators for one reason or another [become] personally and actively interested in safer conditions on the highway," and the next year the group concluded that it was going to be necessary "to educate the Public to demand proper standards of care in the operation of automobiles."[39] In 1916, a League publication announced:

> Those automobilists who wish to cooperate for the public welfare must be encouraged and educated by constant propaganda, public and private. Those who do not must be coerced with the aid of the Courts and the Highway Commission, upon who must be exerted

> constant pressure for strict law enforcement.[40]

This narrow, naive campaign was soon being presented to the public as a comprehensive, scientific program with the adoption of a "new approach" to the automobile accident problem, suggested around 1915 by Julian H. Harvey, a pioneer in the safety movement, in the form of a catchy phrase, "The Three E's"--Engineering, Enforcement, and Education. Harvey presented his program as an all-encompassing attack on highway accidents: engineering was to emphasize the improvement of highways and motor vehicles; enforcement was to push for the enactment of wise traffic laws and the establishment of just traffic courts; and education was to work for the training of safe drivers and pedestrians.[41] The comprehensiveness of the Three E's gave this approach a very convincing appeal. It was soon adopted as sort of a trinity of the highway safety movement--a status which it has retained to the present day--and its supporters were soon citing statistics proving the effectiveness of the program. However, the most scientific private program would have been doomed to failure, and the one that developed had many flaws. Fundamental, of course, was the failure to view highway transportation as a complex, interrelated system and accidents as failures of that system. Just as important was the acceptance of the automobile as a nearly perfect mechanism which caused few, if any, accidents. The safety professionals concluded that, since almost all accidents could be attributed to some human action--which was usually in violation of at least one traffic ordinance--the solution was to educate drivers and pedestrians to behave "safely" and legally and to enforce the laws against those who misbehaved.

The highway safety movement had no real power to influence highway and automobile engineering or local and state courts and police, and so its efforts were focused on only one of the Three E's, education. As the Boston Safety First League admitted in 1915:

> If all automobile operators worked for one employer and he insisted on obedience to Safety First rules an enormous decrease in accidents would follow. But where Taxi Cab companies are competing for trade and a majority of operators are their own masters, Safety First Principles must be voluntarily and hence slowly absorbed.[42]

The term education in reality meant publicity--attempt-

ing to impress simple messages upon the public mind through donated advertising and campaigns carried on by local civic organizations. The only expertise that most safety groups had lay in the area of publicity--the larger organizations tended to recruit their personnel from the advertising and public relations field--and success tended to be measured in the number of posters and pamphlets distributed, the number of safety campaigns conducted, and the amount of column inches of newspaper space or radio and, later, television time acquired. In 1915, the Safety First League convinced the Boston Chamber of Commerce to include automobile accidents in its regular Safety First campaign, and as a result, 150,000 circulars were distributed to public school children. Despite its admission that safety would be only slowly achieved, the League--like most other safety groups--was quick to claim results for its work: the safety circulars had produced a drop of 66 percent in traffic deaths during "the busiest period of the campaign."[43]

The response of the automobile industry to the institutionalized approach to traffic accidents was warm. Spokesmen repeated the arguments and conclusions of the safety groups. Motor Age called for the cooperation of the industry in the effort, and an automotive writer stated in 1916, "statistics prove that 90 percent of the accidents contain at least an element of contributory negligence . . ." and are thus preventable, "not through the enactment of more . . .statutes, but through the education of the whole public" in the "principles of Safety First."[44] A well known automobile manufacturer argued the same year:

> It rests entirely with motor car owners whether future accidents are to increase with each season's new crop of drivers. To prepare chauffeurs and owner drivers for their responsibilities, I believe a campaign of education should be started by various automobile clubs and motor trade papers along the lines of Safety First. I feel sure that the real remedy will be found in the loyal cooperation of every man at the wheel obeying traffic rules now in force and reporting violations to the authorities.[45]

Industry trade journals continually emphasized that the driver was the prime cause of accidents. An automotive writer in 1916 argued that the "reckless motorist"

was "the most serious of all the problems that the automobile industry has had to face. . . ."[46] In 1923, Automotive Industries called driver "carelessness and recklessness, the two great causes responsible for at least 75 percent of the motor vehicle accidents," and a writer in the same journal a year later laid the blame for automobile accidents on "lack of human intelligence."[47] A writer in the American Motorist in 1923 announced that "much unnecessary alarm and near-hysteria" had been aroused, for the number of fatalities in proportion to the number of cars on the road was going down.[48] Another automotive observer the next year seconded this point. While he admitted that total automobile deaths continued to increase, he argued that "there should be some encouragement in the fact that the increase in automobile deaths does not keep pace with automobile use. Twelve thousand, five hundred deaths in 1921 meant one for every 837 cars; 15,750 deaths in 1923 would mean one to every 921 cars, an appreciable reduction."[49]

The automotive campaign of support for a program of safety education to solve the problem of traffic accidents was hardly necessary because the public and even the most sophisticated public and private agencies accepted the approach almost without question. An editorial in Collier's in 1925 stated, "Automobiles are now nearly fool-proof. Streets are not and some drivers are fools," and the magazine repeated six years later, "Automobiles are built for safety but we throw caution to the wind and reap the harvest of recklessness."[50] Another journal summed it up less colorfully a year later when it reported: "Death and injury are to be attributed in the main to the predominance of inefficient but otherwise well meaning drivers. . . ."[51] Safety organizations repeated these conclusions and backed them up with statistics. James Sinke, director of public safety in Grand Rapids, Michigan, reported that "failure to take into consideration the rights of others" was responsible for 86 percent of the automobile accidents in that city during 1925.[52] Dr. Miller McClintock, director of the prestigious Albert Erskine Russell Bureau for Street Traffic Research at Harvard University, stated in 1931 that the defects in human nature were so much more numerous than those in the automobile "as to make it instantaneously obvious that we have only ourselves to blame. People cause 90 percent of accidents," and it was apparent that the solution to the problem was education.[53] The National Safety Council concurred with this conclusion, and by 1932 had moved from its emphasis on instilling safety principles in school children that

would last for life to a "Balanced Program for Reducing Traffic Accidents" which stressed driver training, driver's license laws, investigation of accidents, prosecution of violators, and uniform traffic laws--but which, in reality, remained merely a safety publicity program.[54]

Perhaps the most significant convert to the highway safety cause was Herbert Hoover, for he brought the federal government into the fold. As the number of automobile accidents increased in the early 1920's, Hoover concluded that action was needed, but that the role of the federal government should be merely to encourage state and local governments to work together voluntarily to solve the problem.[55] With this in mind, Hoover in 1924 invited public and private agencies and organizations from all over the country to participate in a National Conference for Street and Highway Safety in Washington, D. C. In his opening remarks to the delegates, the Secretary of Commerce stated:

> I have conceived this Conference and other conferences of this character as perhaps the first steps in a new concept of government. Not government from a central authority, but government by stimulation of the local community to its responsibilities and education of the local community. to intelligent action. That to me is a far wiser, a far greater solution than the constant drive to centralize the government of the United States.[56]

Obviously, Hoover did not have a radical, new approach to the problem of automobile accidents in mind, and the groups invited to send representatives to the Conference--which consisted primarily of state motor vehicle departments--were not prepared for innovation, either. Six months before the Conference began, committees were appointed to prepare a series of comprehensive reports for approval by the entire meeting. The main goal was to agree on uniform traffic laws, regulations, and guidelines, which then could be adopted by the states in lieu of national regulation. The first Conference produced a vast body of recommendations--a uniform vehicle code; model traffic ordinances and regulations; guidelines for the education of the child, the adult pedestrian, and the driver; law enforcement; accident records and statistics; traffic engineering--but a model uniform vehicle code was not approved until a second conference in 1926. Model municipal traffic ordinances and regulations were developed two years later,

but few of the suggestions had been greeted enthusiastically by the states by the time a third conference was held in 1934.[57]

Although the conference spent the bulk of its time dealing with non-vehicular matters, a "balanced approach" to the problem of traffic accidents required that at least some attention be given to motorcars, and so two pages in the final report of the first conference were devoted to the construction and maintenance of automobiles. The committee on motor vehicles concluded that standards were needed for brakes, steering gears, lighting, visibility, horns, and vehicle width.[58] The committee's report, as summarized two years later, stated:

> Continued effort on the part of manufacturers is urged with a view to improving further the design and construction of motor vehicles from a safety standpoint, with particular reference to proper road illumination without dangerous glare; construction and location of controls, accelerator and brake pedals to minimize possibility of confusion or uncertainty of application by the driver; greater certainty, durability and readiness of adjustment of brakes; improvement of driver vision, and other safety features.[59]

Any criticism implied in the report was negated in a 1930 Conference publication which concluded, after reprinting the 1924 comments: "In the years since this recommendation was made there has been a notable improvement in the design and construction of motor vehicles from a safety standpoint. . . ."[60] The impact of Secretary Hoover's efforts can, perhaps, be summarized in the words of a writer in the Washington Star in 1925, who concluded that the first conference had shown that the modern, high-powered automobile was not a "Juggernaut," but that "The real death-dealing monster is our national ignorance of traffic and highway safety."[61]

There were a few individuals in the years before 1935 who questioned these conclusions about the causes of accidents and the approaches to them. Some observers, especially in the pre-World War I years, found it difficult to determine exactly how many automobiles were being produced or registered due to lack of uniform reporting methods, a fact which raised some doubts about the statistics on which safety campaigns were based.[62]

The number of automobile accidents and injuries was even less certain, while the most accurate figure, the number of deaths in motor vehicle accidents, was criticized in 1923 by traffic engineering authority William P. Eno. He charged that "the official figures of death from highway traffic are far too small . . ." due to the fact that some people who died as a result of automobile accidents were not recorded as such.[63]

Other observers raised questions about emphasizing the driver as the cause of accidents. The authors of a study published in 1930, entitled the Psychology of Driving, revealed that they had been "more and more impressed with the complexity of the problem" of safe driving, and they concluded that a great deal more study was going to be needed before any definitive answers were reached.[64] A letter to the editor of the Scientific American in 1921 argued that the monotony of highway driving could lead to self-hypnosis, and to an accident if the driver did not come to in time.[65] A 1925 study in Connecticut indicated that there were more accidents on smooth, straight highways than on older roads, and other states also reported that new, wider roads resulted in more accidents, rather than reducing them as had been anticipated.[66] Other observers pointed to highway distractions, car radios, and fatigue as contributing accident causes, further emphasizing the complexity of the problem.[67] An article in Atlantic magazine summed up many of these doubts when it pointed out that, while the driver was usually blamed for accidents, there were two other equally important factors involved--the automobile and the highway--and there were circumstances which extenuated the role of driving, such as lack of proper training, problems of adequate vehicle maintenance, and the manufacturers' emphasis on speed. Of all these factors, the author argued that "the human factor" was the most "elusive" by far.[68]

Highway safety campaigns, themselves, came in for criticism. One writer in 1923 attacked "the very strong tendency toward superficial or half-hearted safety campaigns which not only fail to accomplish their purpose, but leave the community cynical, and make it difficult later to start a really effective campaign."[69] Two years later, W. H. Cameron, the managing director of the National Safety Council, admitted that such things as "safety weeks" were of little real value.[70] Despite these few reservations, the view that automobile accidents were caused by drivers and pedestrians and the way to curb accidents was through safety education and law enforcement was almost universally held by the public,

the private safety organizations, and government. The only thing the automobile industry was really required to do in order to carry out its strategy on the automobile accident problem, was to loudly applaud the conclusions and efforts of these groups.

NOTES

[1]Horseless Age, June, 1896, p. 10, quoted in Rae, American Automobile Manufacturers, p. 16.

[2]Horseless Age, July, 1897, p. 2, quoted in Flink, America Adopts the Automobile, p. 95.

[3]Harper's Weekly, Nov. 18, 1899, p. 1172, quoted in Flink, America Adopts the Automobile, p. 95.

[4]Newsweek, July 26, 1965, p. 67. Edward A. Tenny in his book, The Highway Jungle, p. 20, cites an instance in Ohio in 1895 when the only two motor vehicles in the state collided, killing one driver.

[5]Country Life in America, Aug., 1902, p. 139, quoted in Flink, America Adopts the Automobile, p. 34.

[6]"Farmer's Wise Words," Motor Age, Nov. 23, 1905, p. 33, quoted in Flink, America Adopts the Automobile, p. 68.

[7]Sloss, Book of the Automobile, p. x.

[8]"Unfavorable Newspaper Influence and How to Avoid It," Automobile, Nov. 9, 1905, p. 544, quoted in Flink, America Adopts the Automobile, p. 138.

[9]Overland Monthly, Mar., 1909, p. 248.

[10]Living Age, Sept. 26, 1908, p. 813; Harper's Monthly, Nov., 1908, p. 618.

[11]Outlook, Jan. 2, 1909, p. 16, May 29, 1909, p.275.

[12]Electric Railway Journal, July 18, 1914, p. 118; Hampton's Magazine, Mar., 1910, p. 426; House Beautiful, supp., July, 1912, p. 26; Municiple Journal, Jan. 13, 1916, p. 44.

[13]Electric Railway Journal, July 18, 1914, pp. 118-19; June 26, 1915, pp. 1203-4; Oct. 16, 1915, pp. 812-13; Jan. 1, 1916, p. 36; June 22, 1918, pp. 1194-5.

[14]J. E. Jennings, "Automobile Insurance," Horseless Age, Aug. 11, 1909, p. 153, quoted in Flink, America Adopts the Automobile, p. 100.

[15]Horseless Age, Aug. 11, 1909, p. 153, quoted in

Flink, America Adopts the Automobile, p. 100.

[16]Flink, America Adopts the Automobile, pp. 213-14. About 1947 a statistician in the National Safety Council estimated a death rate for horse travel of 30 per 100,000,000 miles. In 1972, the Council reluctantly decided to recalculate the estimate because of numerous inquiries and "try to get a reasonable ballpark estimate," realizing that "this entire procedure is shaky. . . ." The result was a figure of 25 fatalities per 100,000,000 miles traveled (R. J. Peszek to the author, April 12, 1972).

[17]Travelers Insurance Co., Motor Vehicles and Safety.

[18]Safety First League, Highway Safety, p. 4.

[19]Frankel, Increasing Automobile Hazard, pp. 1-2.

[20]Ibid., p. 2.

[21]Safety First League, Highway Safety, p. 4.

[22]Doolittle, Romance of the Automobile Industry, p. 440.

[23]U. S. News and World Report, May 2, 1966, p. 44.

[24]Walter P. Chrysler, "The Only Cure for Auto Accidents," Outlook, Apr. 27, 1927, p. 531.

[25]Sherman, If You're Going to Drive Fast, p. 8.

[26]General Motors, Motorists' Handbook, p. 33.

[27]"General Motors Ad Drive Will Promote Six Safety Features," Advertising Age, Dec. 13, 1965, p. 32.

[28]Quoted in Atlantic, Feb., 1958, pp. 20-21.

[29]New York Times, Jan. 28, 1965, p. 14, quoted in O'Connell and Myers, Safety Last, p. 6.

[30]U. S. News and World Report, May 2, 1966, p. 44.

[31]Business Week, June 11, 1966, pp. 184, 186.

[32]Quoted in Ralph Nader, "Safer Cars: Time for Decision," Consumer Reports, Apr., 1966, pp. 195-96.

[33]Stevens, Highway Safety, p. x.

[34]Tenny, Highway Jungle, pp. 20-24; O'Connell and Myers, Safety Last, p. 53.

[35]Tenny, Highway Jungle, pp. 20-24, 54. See also, P. H. Smith, "First Step in Accident Prevention Is a Study of Causes," Automotive Industries, May 10, 1923, p. 1020.

[36]Curtis Billings, "Accidents Don't Happen," Atlantic, June, 1932, p. 694.

[37]G. T. Baright, "Automobile Racing at Newport," Independent, June 5, 1902, p. 1368, quoted in Flink, America Adopts the Automobile, p. 96.

[38]W. Bruce Cobb, "Automobile Accidents, Their Cause and Prevention," American City (city ed.), Aug., 1919, p. 127.

[39]Safety First League, Safety First and the Auto, p. 3; ibid., Highway Safety, p. 15.

[40]Safety First League, Highway Safety, p. 16.

[41]Tenny, Highway Jungle, pp. 23-24.

[42]Safety First League, Safety First and the Auto, p. 16.

[43]Ibid., p. 4.

[44]Doolittle, Romance of the Automobile Industry, pp. 440, 441; Safety First League, Highway Safety, p. 16.

[45]Safety First League, Highway Safety, p. 16.

[46]Doolittle, Romance of the Automobile Industry, p. 441.

[47]C. W. Price, "Automotive Industry Should Lead in Safety Movement," Automotive Industries, Dec. 13, 1923, p. 1189; S. Shelton, "Lack of Human Intelligence is the Cause of Most Traffic Accidents," ibid., Oct. 9, 1924, p. 646.

[48]Literary Digest, Feb.3, 1923, p. 52.

[49]Graham, "Safeguarding Traffic," p. 175.

[50]"Can't We Stop the Slaughter?" Collier's, June 6,

1925, p. 24; "Hold Your Horsepower," ibid., Mar. 14, 1931, p. 74.

[51]Appleyard, "Our Crimson Highways," p. 706.

[52]"Cause of Motor Smashes," Literary Digest, May 29, 1926, p. 22.

[53]"Human Nature vs. the Motor Vehicle," American City, Sept., 1931, p. 117.

[54]A. R. Lauer, "Improvements in Highway Safety," Highway Research Board Proceedings (1932), pt. 1, p. 389; S. J. Williams, "What We May Expect as the Future of Traffic Accidents," Institute of Traffic Engineers Proceedings (1932), pp. 88-94.

[55]Herbert Hoover, "Urgent Problem of Street and Highway Traffic Accident," Economic World, Dec. 20, 1924, p. 885.

[56]First National Conference on Street and Highway Safety, Washington, D. C., December 15-16, 1924 (Washington: National Conference on Street and Highway Safety, 1924), p. 38.

[57]Graham, "Safeguarding Traffic," p. 177; Commerce Dept., Federal Role in Traffic Safety, 1959, pp. 12-13.

[58]First National Conference on Street and Highway Safety, pp. 27-28; National Conference on Street and Highway Safety, Report of the Committee on Motor Vehicles, pp. 7-18.

[59]Second National Conference on Street and Highway Safety, Washington, D. C., March 23, 24, 25, 1926 (Washington: National Conference on Street and Highway Safety, 1926), p. 20.

[60]National Conference on Street and Highway Safety, Ways and Means to Traffic Safety: A Summary of All Recommendations of the National Conference on Street and Highway Safety (Washington: National Conference on Street and Highway Safety, 1930), p. 26.

[61]"Making the Automobile Safe for Everybody," Literary Digest, Jan. 10, 1925, p. 56.

[62]Flink, America Adopts the Automobile, p. 55.

[63]Literary Digest, Feb. 3, 1923, p. 52.

[64]Albert P. Weiss and Alvhh P. Lauer, Psychological Principles in Automobile Driving (Columbus: Ohio State University, 1930), p. 147.

[65]D. O. Skinner, "Incursive Somnipathy," Scientific American, Feb. 26, 1921, p. 107.

[66]"How Safety Causes Accidents," Literary Digest, Oct. 17, 1925, p. 89; Hoffman, Seven Roads to Safety, pp. 46-47; Palmer and Crooks, Millions on Wheels, p.251.

[67]G. H. Bartholomew, "Distraction and Fatigue--The Killers," National Safety News, Oct., 1930, p. 89; Carl Dreher, "Homocide on Wheels," Nation, Aug. 27, 1930, pp. 221-22.

[68]Billings, "Nut That Holds the Wheel," p. 439.

[69]Price, "Auto Industry Should Lead in Safety," p. 1187.

[70]"Fight for Safer Motoring," Literary Digest, May 16, 1925, p. 68.

CHAPTER VI

THE AUTOMOBILE INDUSTRY AND THE HIGHWAY SAFETY MOVEMENT

The institutionalized highway safety movement from the beginning did an effective job of carrying out the automobile industry's strategy in regard to the accident problem, but there were times when heightened public concern over deaths on the highways convinced automobile manufacturers of the value of taking some formal action in support of the accepted safety program. A great deal of publicity about the accident problem before American entry into World War I prompted the National Automobile Chamber of Commerce to appoint a Safety First Committee in 1916 but it was short-lived, and when accidents again became a matter of national concern in the early 1920's, a Traffic Planning and Safety Committee was formed.[1] Both the Chrysler Motor Car Company and the Ford Motor Company joined the National Safety Council at this time, and a number of General Motors divisions became members, also, although the corporation as a whole did not join until 1938.[2]

The chairman of the NACC Traffic Planning and Safety Committee was Paul G. Hoffman of Studebaker Corporation. Hoffman had begun as a car salesman in Los Angeles and rose through the ranks to sales manager, district branch manager, vice president, and, finally, president of Studebaker. Experience in California, where the problem of automobile accidents and congestion became highly evident after World War I, made Hoffman aware of the safety issue. He became convinced that it was a deterent to sales and that something had to be done about it, and he became involved in the highway safety movement. There was no emphasis on the vehicle--Hoffman stated candidly many years later that since he and his associates were selling automobiles, they did not want to admit that they were not safe--but rather attention was focused on some of the other, easily identifiable problems, such as dangerous intersections, bad driving, glaring headlights, and inadequate driver training.[3] It was this concern about the accident problem which prompted Hoffman to accept the chairmanship of the Traffic Planning and Safety Committee in 1922 and again in 1932.[4]

During Hoffman's first term as chairman, the committee arranged for 256 newspapers in cities of more than 25,000 population to send reports on deaths in automobile

accidents which the NACC summarized in a monthly bulletin along with an analysis of causes and suggestions for remedial action.[5] In 1924, Hoffman was made president of the Los Angeles Traffic Commission, and he privately financed some of the earliest traffic engineering studies in the United States; he was instrumental in establishing the Erskine Bureau for Street Traffic Research in 1925--first located at Harvard University and later moved to Yale--and donated the Bureau's Traffic and Transport Library.[6] By 1932, however, during Hoffman's absence from the committee, the duties of chairman had dwindled to that of preparing one press release each year on what the automobile manufacturers were doing in regard to safety.[7]

Hoffman felt that the industry should become more involved in the highway safety movement, and there were a few others who agreed with him. In 1923, C. W. Price, former president of the National Safety Council, urged the automobile industry to step into what he saw as a vacuum in the safety movement and take control: "The whole problem of public safety is still in the formative stage, awaiting the leadership of some group of interests--such as the automotive industries--having more invested capital, wider contacts, greater influence, and more aggressiveness than have thus far been available for this movement."[8] Price argued that there were very sound economic reasons for the industry to take the leadership in the safety movement: A reaction had set in against the purchase, use, and tolerance of automobiles because of the accident problem; the high cost of insuring automobiles was going to hurt sales; inadequate safety campaigns made the public cynical, making later campaigns more difficult to undertake; and if something constructive was not done, legislation on the safety problem would be passed.[9]

The following year, Price again put forward his proposal, further arguing that the effects of safety campaigns had a positive effect on sales, and, thus, automobile industry involvement in the safety movement "would weaken sales resistance, build up good will, insure intelligent consideration of traffic problems as well as avert drastic regulation"--"such as often results in response to an unintelligent but insistent popular demand. . . ."[10] An article in Sales Management in 1927, repeated many of Price's points, suggesting that automobile sales were declining because of accidents, expensive and poor service, and congestion on the highways. It concluded that far-sighted automobile manufacturers should begin a program to make driving safer

and to improve the efficiency of automobile service rather than concentrating all their energy on crowding more and more cars onto the highways.[11] Sales Management announced a year later that several companies within the automotive industry had taken the journal's advice and were promoting safe driving through the use of bumper stickers.[12] Another writer, equally concerned about the accident problem, wrote, "There are infinite ways of reaching the great public in an effort to arouse it to the imperative need of care," and one of the methods recommended which had proven its effectiveness was to place "Posters on automobile windshields and in windows."[13] Other firms in the automotive industry, principally oil companies, joined in the safety campaign during the early 1930's.[14]

Despite the urging of Paul Hoffman, the automobile manufacturers, themselves, were not convinced that there was any need for them to become directly involved in the highway safety movement. Not long after Hoffman reassumed the chairmanship of the Safety Committee in 1932, he requested the board of directors of the AMA to allocate $10,000 for a study of the highway safety movement which would determine how the automobile industry might best become involved, but the board refused.[15] Three years later the AMA abruptly changed its mind as the result of a great rise in public concern about automobile accidents, the catalyst for which was a short article in Reader's Digest.

In the spring of 1935, DeWitt Wallace, editor of Reader's Digest, witnessed the results of an automobile accident, and he "immediately realized that if more people knew what an accident was really like it might bring some of the reckless drivers and speed maniacs to their senses."[16] Wallace commissioned free-lance writer J. C. Furnas to prepare an article on the subject. Furnas later described the reasoning behind the article:

> Publicizing the total of motoring injuries . . . never gets to first base in jarring the motorist into a realization of the appalling risks of motoring. He does not translate dry statistics into a reality of blood and agony. Figures exclude the pain and horror of savage mutilation--which means they leave out the point. A passing look at a bad smash or the news that a fellow you had lunch with last week is in the hospital with a broken back will make

> any driver but a born fool slow down at least temporarily. But what is needed is a vivid and sustained realization that every time you step on the throttle, death gets in beside you, waiting for his chance.[17]

Furnas described the "pain and horror" of a number of types of automobile accidents in agonizing detail in a short article which he entitled "--And Sudden Death." The piece made an instantaneous impact as soon as it was published in Reader's Digest, in August, 1935, and was soon being widely reprinted. Furnas quickly published the essay in book form, adding to it another piece entitled "Better Off Dead" in which he described those persons seriously injured in automobile accidents, some of whom were paralyzed for life, and concluded: "Since medicine does not recognize mercy killing, it might be a good idea to step up the efficiency of the automobile as a slaughtering machine, so it would do a cleaner job."[18]

In January, 1936, Reader's Digest reported that 3,500,000 reprints had been ordered by individuals, businesses, police departments, and traffic courts. Police officials and judges gave copies to traffic offenders. Some 2,000 newspapers and magazines reprinted the article, many of which editorialized about it and some of which based safety campaigns on the piece. The total printed circulation of "--And Sudden Death" in the last few months of 1935 was estimated at over 35,000,000 copies.[19] Paul G. Hoffman wrote four years later:

> The greatest single impetus to the [highway safety] program from the standpoint of the general public came in 1935 with the publication in Reader's Digest of a lurid and macabre article by J. C. Furnas entitled "And Sudden Death," . . . a spark that touched off a tremendous explosion of public interest and concern.[20]

The Furnas article and the resultant public anxiety about the automobile accident problem ignited a burst of concern within the industry, and Hoffman was quick to take advantage of the circumstances by reactivating the safety committee and returning to the AMA board of directors and again asking for a study of traffic accidents. This time the board approved the request.[21] As George Romney, president of the American Motors Corporation, put it twenty years later: "The automobile manufacturers concluded that they were in a position to make

more of a contribution than they were then making."[22] The AMA also immediately approved grants to some highway safety organizations, including the Hoffman-sponsored Erskine Bureau for Street Traffic Research at Harvard University, which received $54,000. American City magazine wrote that it was significant that "the organized automotive industry has decided to sanction such a study," for it was evidence of the "constructive attitude of the Association toward the solution of serious problems of safety and congestion. . . ." The magazine reported that the Bureau was studying limited access streets as a means of reducing accidents.[23]

The Hoffman-proposed safety study was undertaken by Norman Damon and Pike Johnson of the AMA, Sidney Williams of the National Safety Council, Frank Kremel of the Northwestern University Traffic Institute, and Miller McClintock of the Harvard Bureau for Street Traffic Research. The report, completed in 1935, was a considerable shock to the board of directors of the AMA, first, because it recommended an outlay of $450,000 rather than a $50,000 request which had been expected, and second, because it suggested that the industry become a grantmaker to existing highway safety agencies rather than becoming directly involved. The argument of the report was that the existing agencies had the expertise to solve the problem of automobile accidents but that they lacked proper funding--and, thus, had to devote a great deal of their time to raising money rather than preventing accidents--and that their efforts were not properly coordinated--resulting in duplication and inefficiencies. The authors of the AMA study argued that by a policy of giving specific grants, the automobile industry could provide not only increased efficiency to the highway safety movement, but also direction, both of which would bring progress in overcoming the automobile accident problem.[24]

The AMA was reluctant to approve the proposal, both because of the large size of the request and for fear that the industry might not receive proper credit for its contribution. The board of directors finally agreed to raise one-half of the total amount, requesting that the remainder come from associated industries--automotive parts and accessories manufacturers, automobile finance companies, and tire manufacturers. The money was raised by 1936, and grant making operations begun in January under Norman Damon.[25] Damon granted funds for the training of traffic police and traffic engineers and to assist several national highway safety organizations during 1936 through the AMA, but early in 1937 a separate organization--the Automotive Safety Foundation--was

established to handle the job. The "guiding spirit" behind the project, Paul Hoffman, was elected president and Damon was appointed director of the foundation, continuing, in effect, in his previous capacity.[26]

With the formation of the Automotive Safety Foundation, the automobile industry had formally institutionalized its strategy toward the automobile accident problem, and Foundation President Hoffman spelled out the components of that strategy clearly in his inaugural address at a final organizational meeting on June 2, 1937.[27] Hoffman first made clear where the duty lay for dealing with the accident problem when he stated: "Effective control of traffic accidents will not be achieved until government--Federal, state and local--fully recognizes its responsibility by exercising the authority it now has to deal with the problem."[28] He then went on to argue:

> Every state can have as much or as little safety as its citizens insist upon getting. Each state and municipality should have an official state safety organization, financed by state funds, to correlate the engineering, enforcement and educational activities of governmental departments, and to enlist public support. To the achievement of this objective the Automotive Safety Foundation pledges its utmost support.[29]

On other occasions Hoffman repeated and elaborated on many of these points, hammering away at the idea that automobile accidents were the responsibility of government, that the main cause of crashes was drivers, and the cure for the problem was principally education. In 1939, he wrote:

> If we could determine exact causes of all highway accidents, then, we should probably find a fairly even apportionment of blame between correctible driver failures and correctible highway failures, with a small percentage due to car failures, and a few more, perhaps, caused by what lawyers call "acts of God."[30]

Automobiles were not the problem: ". . . our cars are the safest we know how to build. We will continue to build into them every sound safety factor developed by

engineering genius."[31] The driver was where the focus of attention should be, with an effort aimed toward developing a proper attitude: "A safe driver is one who is expert and wants to avoid accidents. It is that desire, a feeling concerning the urgency, smartness, and sporting character of safety, that education must inculcate."[32] The solution to the automobile accident problem could be summarized in what Hoffman described as the "classic three"--education, engineering, and enforcement: "Train safe drivers. Make penalties for unsafe driving certain--but not punitive. Engineer hazards off the right-of-way, engineer safety into it. . . ."[33]

Hoffman described the Automotive Safety Foundation and its "Seven-Point Program" in a large volume entitled Seven Roads to Safety: A Program to Reduce Automobile Accidents, written in collaboration with Neil M. Clark, which appeared in condensed form in the Saturday Evening Post, March 26, 1938, and was published a year later. Hoffman reported that the first task of the Foundation had been to formulate a comprehensive, yet balanced approach to the problem. ASF officials soon concluded that "out of the years of experience of public officials and national organizations devoted to highway safety, the value of certain methods and procedures has been proven beyond question." Thus, the decision was made to merely promote and encourage existing programs, but with an effort to coordinate activities. With this goal in mind, the highway safety movement was broken down into what the Foundation considered its basic components which were identified as Legislation, Motor Vehicle Administration, Enforcement, Engineering, Education, Technical Personnel Training, and Research. These seven items became the ASF's Seven-Point Program, "a complete traffic safety program" which Hoffman enthusiastically called "A rallying point, a unifying wheel, to which all safety efforts can be geared. . . ."[34]

Under each of the Seven Points, the Foundation merely adopted the programs of major organizations operating in regard to highway safety. The Legislation section was the National Safety Council's program to get states to adopt a uniform vehicle code, model traffic ordinances, and uniform signs, signals, and markings, much of which had been prepared by the National Conference on Street and Highway Safety. The Motor Vehicle Administration program was a project of the American Association of Motor Vehicle Administrators to convince states to adopt a uniform accident reporting system, driver examinations and reexaminations, and suspension

and revocation of drivers' licenses. The Enforcement program was that of the International Association of Chiefs of Police which called for adequate patrol of highways, enforcement of laws, and cooperation with courts. The Engineering program merely endorsed the Bureau of Street Traffic Research (now at Yale) recommendation for a traffic engineer in each state and in each city with a population of over 50,000.[35]

The Education program combined the activities of nine groups which included the objectives of providing traffic safety instruction in grade and high schools and driver training in high school, and driver and pedestrian safety education through newspapers, posters, contests, and meetings. The groups involved were the National Education Association, National Grange, Highway Education Board, National Congress of Parents and Teachers, American Automobile Association, National Safety Council, American Legion, Automobile Manufacturers Association, and General Federation of Women's Clubs.[36] The Technical Personnel Training program combined the projects of the Yale Bureau for Street Traffic Research, Northwestern University Traffic Institute, National Safety Council, and the American Automobile Association which were designed to train traffic officers and engineers, and safety teachers and safety organization personnel. Finally, the Research program was based on activities of the National Safety Council, American Automobile Association, Yale Bureau of Street Traffic Research, National Conference of Judicial Councils, and International Chiefs of Police which included studies of traffic congestion, accident causes, and the effectiveness of safety measures.[37]

Thus, the automobile industry had, in effect, carefully selected organizations within the highway safety movement--groups which would later be called the "safety establishment" by critics--whose programs conformed to the strategy of the industry in regard to the accident problem. The exclusion of programs focusing on the automobile, itself, was made easy by the fact that there were no formal studies underway at this time, but the establishment of the automobile industry as the major source of funding for highway safety organizations was certainly not conducive to encouraging such studies. Paul Hoffman described the ASF approach in this way: "In light of this Seven-Point Program the automotive industry has dedicated effort and funds, through the Automotive Safety Foundation, to the expanded efforts of national organizations whose records over a long period of years have proven effective in supporting the work of

public officials."[38]

The formation of the Automotive Safety Foundation with its $450,000 a year annual budget for grants made a considerable impression, especially upon the groups which made up the highway safety movement. In 1937, Paul Hoffman was given the Grand Award of $5,000 by the C.I.T. (Commercial Investment Trust) Safety Foundation for his leadership in the field (he requested that the money be given to the staff of the ASF), and CITF director John W. Darr wrote an introduction to Seven Roads to Safety, calling the book the "best discussion and appraisal of the problem and what is being done about it yet presented."[39] General Motors head, Alfred P. Sloan, Jr., showed his approval of the ASF program in 1939 in the form of a $25,000 donation to provide nineteen scholarships to enable highway engineers and state police officers to spend a year at Northwestern University's Traffic Institute. Sloan's gift was made in the "belief that the traffic problem will yield to the broad application of proven techniques and that progress in traffic control will be measurably accelerated when the services of adequate numbers of trained men are made available."[40]

Aided by the moral and financial support of the automobile manufacturers, the National Safety Council--along with the other national organizations whose programs were to be included in the ASF's Seven-Point Program--launched the largest safety campaign in history in 1935 with the goal of reducing automobile fatalities 7 percent a year by utilizing every available agency in the country.[41] Some observers saw signs of immediate progress. An editorial in Scientific American in 1937 entitled, "It Can Be Done," argued that despite a rise of 4 percent in the fatality rate from 1935 to 1936, there was cause for optimism about automobile accidents because during the same period car registrations had climbed 8 percent and miles driven had also increased according to estimates by the American Petroleum Institute; furthermore, cities and states with coordinated safety programs had reduced their deaths.[42] An article in the insurance journal Weekly Underwriter announced that the automobile accident death rate was the "lowest in history."[43] A safety worker reported in 1938 that the march toward victory in the battle against traffic accidents was well underway showing the "effectiveness of the various activities which have been so well coordinated under a sound and scientific program." He argued that safety education carried on through newspapers, radio, and motion pictures and the activities of local civic organizations were helping to produce drivers with

"a greater sense of social responsibility."[44] John W. Darr, director of the C.I.T. Safety Foundation, wrote in 1939 that the problem of automobile accidents was being attacked "on a wider front and, perhaps, in a better organized way than almost any other single problem before our society."[45]

Paul Hoffman predicted in 1939 that the death rate per 100,000,000 vehicle miles would be reduced by safety work to eleven deaths annually, which would mean a saving of 13,000 lives per year and $400,000 in accident costs. He forecast that by 1967, the death rate would be down to five or less per 100,000 miles.[46] In his role as president of the Automotive Safety Foundation, Hoffman became, in effect, the chief spokesman for the industry on the automobile accident problem. In addition to addressing the annual luncheon of the ASF, he presented the industry's views in speeches to business and civic groups, in articles published in popular periodicals, and in interviews in magazines and on radio.[47] In 1941, Hoffman proudly announced that the industry-backed national highway safety program's war on automobile accidents had reduced the fatality rate from an average of 16.9 per year in the period 1925-1935 to 11.4 for 1940-1941, resulting in the saving of 15,000 lives per year since 1934.[48] Six years later, Hoffman was honored for his work by the Society of Automotive Engineers and asked to deliver the first David Beecroft Memorial Lecture. Hoffman spoke on highway safety and took the opportunity to reiterate one of the basic assumptions of the automobile industry about the accident problem:

> The basic issues lie in the public domain; the responsibility for meeting them is a public responsibility. As businessmen, we seek only to assist, in such ways as we properly can, those duly constituted authorities in the various jurisdictions who are charged with the responsibility for doing the job.[49]

The automobile industry was highly successful in establishing--through the ASF--a powerful position in the highway safety movement from which it could bring considerable influence to bear to insure the approach and programs conformed to industry strategy in regard to the accident problem. However, there was some doubt for a time in the late 1930's as to whether the Democratic government of Franklin D. Roosevelt would be willing to lend unquestioning support to the safety establishment the way the two previous Republican administrations had.

A fourth session of the Hoover-founded National Conference on Street and Highway Safety was held in 1934, but in 1936, at the height of national concern over automobile accidents, President Roosevelt called a new, Accident Prevention Conference.[50]

In its first report, the Accident Prevention Conference pointed out that it would take the entire Army and National Guard, in addition to local police, just to enforce the speed regulations in all parts of the country at all hours of the day and night. "Thus, engineering--a change in the power and design of cars to protect the reckless motorist against his own folly--appears to hold out the only possible hope of solution." The Conference recommended: "Slower speeds, better lights, and safer body construction, such as raising seats . . . and generally strengthening of bumpers and body parts to increase safety in cases of collision, . . ." and the group stressed it hoped the automobile manufacturers would make changes voluntarily rather than waiting for compulsory design requirements that "a growingly impatient public might demand."[51]

The Conference report had a radical ring to it, but no action was taken before American entry into World War II brought rationing of gasoline and tires and an end to the production of automobiles--a situation which brought, as a by-product, a temporary end to the accident crisis.[52] Once the war ended, controls were lifted, production of automobiles was resumed, and automobile accidents again skyrocketed. By this time Roosevelt was dead, and the new President, Harry S. Truman, not only uncritically embraced the safety establishment as Secretary of Commerce Hoover had done in 1924, but also lent the prestige of his office to the movement. In 1946, Truman called the first President's Highway Safety Conference to focus attention on the "alarming increases in traffic deaths since V-J day." The President also asked the automotive industry to organize an agency to encourage highway safety on the local level by automobile and tire dealers, and an Auto Industries Highway Safety Committee was soon formed with its funding coming from the ASF.[53] As with previous national safety meetings, committees of safety experts from various fields, one of which was headed by Paul G. Hoffman, met before the conference to prepare reports on law enforcement, engineering, accident records, motor vehicle administration, laws and ordinances, public information, and organized public support. The Conference took elements of each which were combined into a seven-point "Action Program," similar to the Seven-Point Program of the

ASF.[54]

The Conference concluded that statistics demonstrated the effectiveness of the Action program in reducing accidents and that all that local authorities had to do was implement it, and only if they did not would intervention by Federal government become necessary. The Conference stated, in regard to the automobile, that "Safe operation has always been a major objective of motor vehicle design," and it included one clause in its eighteen page report suggesting "Continued improvement in brakes, headlights, directional signals, tires, wheel rims, and bumpers and especially in driver vision."[55] At the second conference, held in May, 1949, President Truman had praise for the Action Program despite the fact that accidents continued to increase: "We have saved, through our safety programs, almost 11,000 lives and prevented injury to nearly 40,000 persons, and I think that has made this Conference worthwhile. Nevertheless, the frightful slaughter on our streets and highways continues. The program of highway safety must be expanded and intensified."[56]

In 1954, President Dwight D. Eisenhower called a "White House Conference on Highway Safety," and by executive order created a permanent group to oversee highway safety activities, called the President's Action Committee for Traffic Safety, in order "to lend the prestige and interest of the President to Traffic Safety."[57] Eisenhower's White House Conference retained Truman's Action Program with few changes, one of which was the recommendation of the "establishment of an effective and continuing liaison among motor-vehicle manufacturers, road builders, and traffic engineers to promote closer coordination of vehicle design, the geometric and structural plans for roadways, and plans for operation and traffic control."[58] In the foreword to a President's Committee publication, entitled Crusade for Traffic Safety, Eisenhower wrote that the loss of 38,000 lives each year made automobile accidents a "national problem of first importance." In pointing to a solution to the problem, the President expressed the theory under which the safety movement had been operating for over forty years in clear, if idealistic, terms:

> In a democracy, public opinion is everything. It is the force that brings about enforcement of the laws, it is the force that keeps the United States in being, and it runs in all its parts. So if we can mobilize public opinion, this problem . . .

can be solved. . . .[59]

The establishment of the President's Action Committee on Traffic Safety symbolized the high point of the status and significance of the safety establishment and of automobile industry influence on the highway safety movement. The first chairman of the President's Committee was Harlow H. Curtice, president of General Motors Corporation, while GM vice president William F. Hufstader and Ford Motor Company vice president Walker Williams sat on the Business Advisory Board.[60] The Committee was originally entirely privately financed and operated, but over time the federal government assumed more and more responsibility for financing and staff. By the time John F. Kennedy became President, the government was paying three-quarters of the budget--which was $200,000 in 1964--and civil servants were working on the staff. The executive director and his two assistants, however, were selected and paid by industry.[61]

GM president Harlow H. Curtice reported in 1956 that as Chairman of the President's Committee he was "in close touch and have worked with a great many groups interested in improving safety on the highways. As a result of this experience I have reached the firm conclusion that driver education offers the most fertile field by far for making substantial progress toward our objective."[62] Under Secretary of Commerce for Transportation, Louis J. Rothschild, said in 1957 that although the President's Committee was "a purely voluntary effort, dependent entirely on promotion and persuasion," the "results achieved have been excellent." Many states had adopted parts of the uniform safety codes, improved their motor vehicle administration, driver examinations and enforcement, and come up with better systems of accident reporting and analysis. He concluded that the accident situation would be much worse without the efforts of the group.[63]

In addition to the involvement of industry leaders on the President's Committee, the Automotive Safety Foundation continued to give guidance and support to the highway safety movement through its grants, with the largest amounts going to the National Safety Council and the Auto Industries Safety Committee.[64] The ASF funded a number of traffic engineering studies for cities and states, and a representative testified before the President's highway committee in 1954 in support of the need to expend $101,000,000,000 on new highways in the next decade.[65] Two years later, American Motors president,

George Romney, pointed out that in the twenty years since the Foundation had begun its work, the fatality rate in automobile accidents had dropped from 15.1 to 6.4 deaths per 100,000,000 miles of travel.[66] ASF President, J. O. Mattson, was more specific in 1964 when he reported that the various programs initiated and supported by the Foundation during the previous twenty-five years had saved 825,000 lives, prevented 30,000,000 injuries, and produced $100,000,000,000 in economic savings.[67]

Spokesmen for groups within the highway safety movement continued to assert that they knew how to solve accidents but that it would require full public support and funding to accomplish the task completely; yet without the programs then in operation, the accident problem would be much worse. One author wrote in 1952: "When nine out of ten people in America want safety enough to pay the price of safety--we'll be on the way to having safety overnight."[68] The director of the Indiana Safety Foundation stated in 1956: "Safety professionals know what is needed to bring a much greater degree of traffic safety than we now have. We can have just about as much traffic safety as we the people are willing to pay for. . . ."[69] Long time safety professional Frank M. Kreml, head of the Northwestern University Traffic Institute, testified in the same year: "If our total present know-how were really turned loose on the problem--if every jurisdiction did as good a job as the best cities are doing--we could cut down the total traffic accidents by two-thirds. We could reduce the figure of 36,000 killed in a year to 12,000."[70]

The National Safety Council announced in 1956 that safety work had resulted in a decline in the death rate in the postwar period and that a rise in the rate in 1955 had been reversed by increased safety activities.[71] NSC President Ned H. Dearborn testified that it would take "almost a miracle" to head off a record traffic death toll in 1956: "But this miracle can happen if the American people is sufficiently shocked by what is going on to stop doing the things that are causing these accidents. Courtesy, common sense, and care will do the trick."[72] Jesse W. Randall, president of Traveler's Insurance Company, referring to the insurance industry's participation in the highway safety movement in a speech before the Eastern Conference of Motor Vehicle Administrators in 1948, said: "Disturbing as the accident situation is today, I shudder to think what it might be were it not for these efforts and the fine work of your departments."[73] Louis Rothschild, Under Secre-

tary of Commerce for Transportation, reached a similar conclusion eight years later: "Bad as the traffic accident situation is in 1956, . . . I am sure that it would have been a lot worse without the sound program and intensive campaign conducted by dedicated workers from all public and private groups. . . ."[74]

Spokesmen for the highway safety movement continued to stress that the driver was the main cause of accidents. AAA safety expert Ernest M. Smith said in 1935: "The best car that any manufacturer ever made or can make is not fool proof against a fool driver."[75] Harry R. DeSilva, head of the Yale Bureau of Street Traffic Research, wrote in 1942, in a book entitled Why We Have Automobile Accidents, that "automobile accidents result primarily from human inefficiencies: . . ."

> Although our present roads have not been designed primarily from the safety point of view, they can be driven on with impunity. The automobile, also, in most respects a safe piece of machinery, can be used with a minimum of danger. It is the driver to whom we must impute the responsibility for the hazards presented by these instruments.[76]

DeSilva argued that drivers caused accidents because of "wilful human faults--selfishness, wastefulness; because of lack of driving skill, because of unwillingness to conform to reasonable driving regulations."[77]

The 1953 edition of the Traveler's Insurance Companies' highway safety booklet reported that of all the vehicles involved in fatal accidents, 96.4 percent were in "apparently good condition." President J. D. DeWitt concluded from this figure that the "accident problem can be solved only by those who do the driving and walking."[78] A spokesman for the Association of Casualty and Surety Companies stated three years later: "Inasmuch as the behavior of the driver behind the wheel is the most important element in the chain of events that leads to accidents, it follows that safe-driving behavior on the part of all motorists must be obtained--either by education or compulsion."[79] The same years, Rex M. Whitton, president of the Association of State Highway Officials, reported that his membership believed that "Driver failure or display of poor judgement [was involved] in 74 percent of all accidents," and ten years later, police officials came to the defense of the automobile industry, charging that the manufacturers were being used as a scapegoat when the driver was the primary cause of acci-

dents.[80]

One of the fundamental methods of improving the quality of driving was by setting standards which individuals would have to meet before they would be allowed to operate an automobile. Strict driver license laws requiring examinations to test the competence of operators were a major tenant of the highway safety movement's program and had been advocated early in the century, spurred by the fact that government licensing of drivers was widely practiced in Europe by 1900. In 1902, the AAA and the Automobile Club of America had called on the states to require examinations of all drivers before they were allowed on the road, but none of any significance were passed before 1906. In 1909, only twelve states required all drivers to obtain licenses, and in many of these states an examination was not required.[81] Outlook magazine argued in 1906 that all drivers should have to pass an examination,[82] while a highway safety group stated ten years later: "That it is unwise in one year, without the slightest investigation, to present licenses to 35,000 unknown persons to operate an engine so fraught with danger as a motor vehicle is, first and foremost, common sense."[83]

An article in Iron Age in 1928 called for stricter driver license laws,[84] and an observer four years later pointed out that extensive training was required of locomotive engineers even though the engine was held on the track and decisions made for them by signals. Yet the situation was different for automobile drivers:

> Millions of men, women and children, regardless of race, color and financial responsibility, few of them with mechanical training, many of them with little instruction in driving, . . . amuse themselves every pleasant weekend by driving their own engines faster than most locomotives go and do this on the public highways among thousands of other amateur engineers, each driving his own machine according to his own idea of speed. . . .[85]

The National Safety Council reported that a 1936 study of states showed that those with a driver license law had fewer fatalities per 100,000,000 vehicle miles than states with no driver license, while states with a well administered law had fewer than those with a substandard law.[86] H. M. Johnson, professor of psychology at American University and chairman of the committee on psychol-

ogy of the highway of the National Research Council, stated in the same year that the worst drivers must be taken off the road,[87] and Paul Hoffman of the Automotive Safety Foundation argued in 1939 that that was going to happen:

> Public opinion is rapidly crystallizing the idea that use of the highways is a privilege; that every normal person is entitled to use them, unless he abuses the privilege; and that abuse of the privilege must be followed by its withdrawal, whether temporarily or permanently, not so much for the purpose of punishing the offender, but rather to make the highways safe for those who know how to use their privilege without abusing it.[88]

An article in Atlantic had taken a more realistic, if cynical, view eight years earlier when it concluded: "In a country where nearly everybody wants to drive, nearly everybody is going to drive, and that settles for good the prospect of any adequate selection of drivers."[89] An English observer made the same point in 1966 when he argued that it was politically impossible for governments to deal seriously with the automobile problem, for to the public "the motor car has become not only essential to their economic survival but, . . . the most important symbol of status in their society."[90] Whatever the reasons, many states did not move to strengthen their driver license laws, and even those states which were able to get the highway safety movements' recommendations on licensing and examinations through their legislatures witnessed no real improvement in their automobile accident problem. In 1959, a Commerce Department study reported that "most attempts to use licensing as a method of driver selection have been unsuccessful and probably will continue to be until some insight into the basic nature of the driving task is obtained." The study continued to argue that the measures used in driving tests had little relation to highway safety and that driver selection tests had such low validity as to be worthless.[91]

Another important component of the highway safety program came to be "driver education." Whereas the school safety program had previously emphasized the instilling of safety principles in elementary school children which would last for life, in the mid-1930's the highway safety movement announced a driver training program which would not only teach teenagers how to drive, but also inculcate

the proper attitude toward the operation of an automobile, educating "a new race of drivers."[92] Text books for use in high schools were published, the program was widely promoted, and by 1940, courses of study had been accepted in twenty states and several hundred high schools were offering courses.[93] ASF President Paul Hoffman reported in 1939 that "There is a growing feeling that it is a public responsibility to teach safe driving:"

> One thing is . . . certain: the ultimate solution for teaching at least the philosophy of safe driving is to have it a standard part of the curriculum of every high school in the country. The essence of the instruction will necessarily be . . . [that] a safe driver is one who is expert and wants to avoid accidents.[94]

President Harry Truman supported Hoffman's contention in his opening remarks to the President's Conference on Highway Safety when he said that high school driver education was "an obligation we owe to new generations, to prepare them for living in a motor age."[95] The ASF supported the promotion of driver education programs through its grants, and automobile manufacturers came to make special provisions so that dealers could donate or loan cars to schools for use in driver education courses, emphasizing the importance of it in making sales.[96] In public industry leaders strongly emphasized the importance of driver education to solving the accident problem. In 1956, GM President Harlow Curtice announced that "within the last two years we in General Motors have greatly stepped up our efforts in this field, which were already substantial."[97]

Supporters of driver education asserted: "A course in driving in every school and university in the country would greatly cut the number of traffic deaths. Such instruction is not a luxury. It is not a privilege. It is a necessity and a duty."[98] The highway safety movement, the automobile industry, and the public accepted without question the assumption that driver education would reduce accidents, and a volume published by the AAA in 1955, entitled Driver Education Proves Its Worth, seemed to confirm this view. The report concluded that "in general, the results [of 'all studies of any consequence'] indicate that Driver Education courses reduce traffic accidents one half," although "it is quite likely that students volunteering for a driving course have a different attitude than those who do not volunteer to

take a course."[99]

Yet if the safety establishment and the public accepted driver education uncritically, there were questions raised about its efficacy from the first. E. George Payne, in an article entitled "Contemporary Accidents and Their Non-reduction" published in Educational Sociology in 1937, stated:

> Even if a program of safe driving could be carried out in all the high schools of America, . . . we would deal only with a limited number of the future drivers, and so far as we know, those who would drive safely anyway. The program is an interesting publicity stunt and bears no relation to the accident situation in the United States in the year 1937. Moreover, it will likely retard the development of a program which would get at the roots of the accident situation.[100]

Two other scholars, Herbert A. Toops and S. Edson Haven, writing in a book entitled Psychology and the Motorist published in 1938, charged that no one had been able to scientifically demonstrate that driver education had any effect: "we have no assurance--statistically watertight--that the individual may not be able to acquire by self-education a competence at least equal to that which the school can give him." They further argued that driver education not only might not reduce accidents, but could even have a negative effect.[101] A government study in 1959 agreed that there were no satisfactory studies to prove that driver education led to a reduction in accidents, but conceded that it was "entirely plausible" that it did cause the driver to make safer use of his vehicle.[102]

A critic writing three years later pointed out that, even if the AAA's conclusion that driver education reduced accidents by 50 percent was true, if driver education also increased the number of drivers by 50 percent, all the improvement would be lost. He further charged that the automobile industry was not only shifting the responsibility for accidents from itself to the public schools through its promotion of driver education, but that it also spent millions of dollars to encourage driving and car ownership among immature youth and then turned around and blamed drivers for accidents which occurred.[103] Another critic writing in 1968 repeated the claim that it had not been proven that driver education

programs had any effect,[104] and a year later, an article in Traffic Safety, published by the NSC, entitled "The Fallacy of the Untrained Driver," reported that the testing of young drivers was characterized by a primitive, unprofessional approach by "poorly trained people using inadequate sampling, inadequate control groups and inadequate followup periods." The author pointed out that these researchers assumed that because trained drivers had fewer accidents, the training was responsible.[105]

Driver education was not singled out alone for criticism. There were a few observers who called the entire highway safety movement into judgement and found it wanting. One cynic, writing in 1935, argued that "laws, rules, safety educational campaigns of the kind we have been having for twenty years" would not help very much because "all they do is try to teach caution and slow speed when all the time any thinking person must be aware that drivers want to go faster. . . ."[106] Another critic, E. George Payne, writing two years later, attacked the whole approach to the automobile accident problem and the role of the National Safety Council:

> The relative futility of these efforts in the face of constantly mounting accidents and hazards lies mainly, not in lack of concern about the accident problem, but in in the lack of intelligent attack upon the problem of accidents and the method of their prevention. The leadership of the safety movement is now and has been for a long time in the hands of an agency which has the appearance of a professional society or a public service agency. It is actually more nearly a trade association primarily interested in saving money for its members and incidently in saving human lives.[107]

Psychologists Herbert Toops and Edson Haven charged in 1938 that despite the wide use of the "three E's: Enforcement, Engineering and Education"--which they called "the program of the auto manufacturers"--enforcement "accomplishes little," engineering had not produced anything as yet, and education had not yet been "demonstrated satisfactorily from a statistical or scientific viewpoint. . . ."[108] As for the claims of safety organizations about the percentage reductions of accidents due to their work--or those which could result--Toops and Haven stated: "It is unreasonable to suppose that the

elimination of any one 'cause' of auto accidents will reduce them by as much as twenty percent. Progress always comes from a cumulation or summation of a large number of small improvements." They further pointed out that the much publicized 70 percent reduction in the fatality rate of Evanston, Illinois--from seven to two deaths per year--could be quadrupled by a single, multi-fatality automobile accident.[109]

Another writer criticized Paul G. Hoffman's claim in October, 1939, that safety work had saved 29,000 lives since 1935. He reported that Hoffman used estimated total automobile mileage as a basis for which to claim, in substance, that:

> 29,000 more people ought to have been killed in the last four years; that 29,000 more people were not killed during that period; that, therefore, 29,000 lives were saved and then [he] allocates three-quarters of these saved lives to three years during each of which there was an actual increase in automobile fatalities.[110]

This critic, Arthur W. Stevens, was moved to write a book on the subject of highway safety which was published in 1941. Stevens reported that the automobile industry was very disappointed when, despite all their financial contributions to the traffic safety movement and all the predictions that the situation would be brought under control, fatalities continued to increase. The response was first, in order "to present a more pleasing and self-congratulatory picture," to make an effort to switch from using the total number of cars registered in the country to making the estimated number of miles driven per year a basis for comparison to the number of deaths annually. Second, it was to emphasize that the safety work "was beneficial in preventing the loss of thousands of lives which otherwise would have been sacrificed."[111]

Stevens was especially critical of the switch from a fatality ratio based on the number of automobiles registered--which he argued furnished "an accurate and easily ascertainable standard"--to one based on deaths per 100,000,000 estimated miles driven per year--a new formula announced in Paul Hoffman's Seven Roads to Safety: "The attempted estimate of car mileage, based on the estimated gasoline consumption of thirty million vehicles is hopelessly inaccurate and unscientific." Stevens charged that, while government records did supply a fairly close approximation of the amount of gasoline

produced, this was the only factor which could be reasonably established: There was no way to determine how much was consumed by trucks and buses and non-automotive uses or how much evaporated in storage or was lost, so that there was no way of finding out how much actually got into the tanks of automobiles; finally, there was no way to determine an average miles per gallon for motor cars or how much was consumed in idling motors. He concluded that all these alleged mathmatical propositions, based on uncertain and speculative data, lent themselves to all kinds of error and distortion--and, thus, estimated car mileage based on this "furnishes only an inaccurate and unscientific standard, faulty beyond correction."[112]

Stevens went on to present a devastating critique of the fundamental approach of the highway safety movement to the automobile accident problem. He pointed out that despite twenty-five years of elaborate safety campaigns, new laws, tests, regulations, and penalties, the number of people killed annually in automobile accidents had risen from 1,758 in 1912 to 40,000 in 1937. In reviewing the accident record in 1934, Stevens concluded that the continual increases in deaths "indicated clearly that some factor, overlooked and neglected, had been sufficient to upset all prophecies and undo and render ineffective all good work done." He argued that the forgotten factor was the automobile, itself, and that poor design was the cause for the increase in accidents. Stevens pointed out that everyone in the safety movement agreed that the solution to the accident problem was education, but he argued that "instead of placing the 131,000,000 people of the country in one classroom," it would be more practical to teach the 100 to 200 top executives of the automobile industry about safe automobile design: "the possibility of improving safety by education would show a quicker return on time and effort invested if we could educate this smaller group to build and market a motor car which gives its operator a safe, adequate and decent view of the highway."[113]

Harry R. DeSilva, head of the Bureau of Street Traffic Research at Yale University, also prepared a study of automobile accidents which was published a year after Stevens' book, in 1942. DeSilva admitted that "by and large we have been muddling along in our efforts at curbing highway accidents, floundering in search of little remedies for large troubles, instead of giving the problem the serious attention it deserves." He went on to give a revealing description of the highway safety movement: "All too often progress in highway safety is

confused with the number of safety organizations in operation; the amount of money expended by them; the publicity given to safety propaganda in number of radio hours, inches of newspaper columns, thousands of pamphlets and posters distributed. . . ."[114]

If the highway safety movement tended to measure progress in its campaign of accident prevention against standards of the public relations profession, Arthur Stevens' charges about the validity of automobile accident statistics raised serious questions about the assumptions upon which the entire highway safety program was based. Safety professionals had long admitted that their data was not reliable. Paul Hoffman declared in 1937: "One of the greatest obstacles in the path of highway accident reduction and the promotion of public safety lies in the total lack of reliable, accurate, complete statistical data covering accidents on public thoroughfares." He pointed out that "The present lack of data makes it easy for any person to arrive at any desired conclusion and encourages the plethora of witch doctors currently springing forth with ill advised panaceas or profit motivated axes to grind."[115] Spokesmen for the highway safety movement continued to make these admissions at the same time that they were blaming the bulk of automobile accidents on the driver and carrying out campaigns to convince him to "drive safely." In April, 1949, the advisory group on highway safety research of the President's Highway Safety Conference pointed out the need for scientific research, claiming that this need had been recognized for twenty-five years: "Lack of authentic information leads to a regrettable, though understandable, search for panaceas--for the magic word that will solve everything. Much time, effort, and money are thus wasted."[116] The committee repeated its conclusion at a meeting in 1956 and recommended that such research be carried out by the Bureau of Public Roads with specific Congressional funding. Two research correlation conferences held by the National Academy of Sciences concurred in the need for research on automobile accidents, and an automobile insurance industry study by "three nationally recognized authorities" of the traffic safety problem concluded: "It is ironic that the motor vehicle is the child of continuous, costly research, yet the control of its use has developed through trial and error and often has been based on sheerest guesswork."[117]

A spokesman for the Institute of Traffic Engineers stated in 1956: "Despite assurances from some people that the causes of accidents and therefore the necessary

preventive and remedial measures are all well known, the basic causal facts have not yet been identified with any degree of certainty."[118] Professor Ross A. McFarland, a human factors specialist at the Harvard School of Public Health, wrote the same year that "A disappointingly large proportion of what has been written concerning vehicular accidents represents a superficial level of analysis . . . and over-generalizations from inadequate or improperly handled data have been taken to constitute the facts of accident causation."[119] Ray Ashworth, acting director of the Northwestern University Traffic Institute admitted in 1956: "We all, in this field, say somewhat glibly that the automobile and the highway are no longer responsible for more than, at the outside, a total of 20 percent of the accidents that are caused. But we do not know how well we know this."[120] Two years later, J. Stannard Baker, head of research and development at the Institute, characterized safety programs as being more or less "rule-of-thumb."[121]

In 1956, a spokesman for the National Safety Council, itself, admitted, "Past researches . . . have been fragmentary, inconclusive, and uncoordinated," resulting in voluminous statistics on accidents with little useful value.[122] Council general manager William G. Johnson repeated two years later: "Presently we have virtually no research in the field of street and highway traffic accident prevention. . . . And we have weak application of what we do know for the simple reason that the national traffic safety agencies of this country is inadequate and uncoordinated."[123] Leland S. Harris, executive director of the American Association of Motor Vehicle Administrators stated in 1959 that "one of the weakest links in the entire traffic safety movement is our lack of knowledge as to the real causes of accidents. Lacking information on the real causes of accidents, we have spent a great amount of time and effort concentrating on 'circumstantial' causes."[124] In 1961, Dr. John J. Conger pointed out in Research Review, a quarterly supplement to Traffic Safety, a publication of the NSC, that there were "pitfalls for the unwary in the complicated field of accident research:"

> As with so many other things in life, it does not follow that poor research is better than no research. Sophisticated research is badly needed in many areas of traffic safety. On the other hand, no research is better than poorly controlled research which may result in important social actions based on misleading find-

ings.[125]

A Bureau of Public Roads investigation of a representative sample of highways in Illinois in 1958 indicated that NSC estimates of the number of automobile accidents--fatal and non-fatal--could be off by 75 percent.[126] A Commerce Department study a year later concluded that there was a fundamental lack of carry-over from the thousands of accident reports prepared by police and drivers because of a lack of competent summarizers to interpret the reports and almost insurmountable problems in catagorizing the confused, inadequate data on a mass basis.[127] Speakers at a conference on passenger car design and highway safety in 1962, sponsored by the Association for the Aid of Crippled Children and Consumers Union, also criticized the safety movement, pointing out that "programs in accident reduction are not based in sound research nor is their effectiveness measured by scientific methods." As Dr. Irwin J. Bross, of the Roswell Park Memorial Institute, explained it, highway safety

> has shifted from a prescientific phase into a scientific phase. . . . Now this transition produces a lot of confusion. Most of the traditional approaches to safety were developed in the prescientific period when people felt no need to justify or make any scientific evaluation of their programs. An idea was proposed just because someone thought it was good, or it received a lot of publicity, or it was just a nice thing to do.[128]

One of the most brilliant critiques of the highway safety movement was delivered by Daniel P. Moynihan, who served in the U.S. Department of Labor in the Kennedy administration. Like Arthur Stevens in 1941, Moynihan also questioned the estimated total vehicle mileage figure used in determining the automobile fatality rate. He pointed out that total miles were "estimated from gasoline tax collections and an assumption about average miles per gallon for all vehicles on the road. It is, at best, a very questionable number--particularly in view of relatively rapid changes in vehicle power and performance."[129] Moynihan argued that increased gasoline consumption might merely be the result of less economical automobiles and increasing urbanization which meant more stop and go driving. Thus, total miles driven could be much less than estimated and the death

rate rising, rather than declining.

Moynihan went on to charge that although state, federal, and local authorities had been compiling statistics about deaths and injuries in automobile accidents since the mid-1930's, they had done the work in an almost uncritical manner which made the results nearly useless. He argued that the only complete and accurate statistic was the number of deaths because of the "ancient medieval institution of the coroner."[130] But Moynihan pointed out that deaths were just a subdivision of injuries and told little about the magnitude of the automobile accident problem; injury statistics were not even moderately reliable and were not weighted according to the extensiveness of the injury involved, so there was no way to tell if accidents were getting more serious or less severe.[131] He observed that the available statistics indicated that areas with the highest death rates had the lowest injury rates, and vice-versa. Safety professionals had always attributed this to the effectiveness of local highway safety programs, but Moynihan argued that it was merely a function of density and availability of medical care--accident victims in cities could be taken quickly to a hospital whereas those in rural areas died before receiving medical care. Moynihan charged that the safety professionals had "fundamentally dealt with fraudulent measures, with terms, with standards that simply did not exist then, or at least, turned out to be practically nonexistent." He concluded: "The people who are responsible for dissemination must be said to be misleading the American public. . . ."[132]

If the basic statistical data used by the highway safety movement was questionable, it was apparent that the safety professionals interpretation of the data might also be in doubt--and the most fundamental assumption was, according to the NSC, that the driver caused 80 percent of the accidents.[133] In an article in the Reporter in 1959, Moynihan charged that the NSC was doing a grave disservice by emphasizing individual responsibility for accidents: "The basic message of the enormous flood of material, publicity and information that emerges from the Safety Council is that accidents are caused by individual carelessness and can be prevented if drivers will only pay attention."[134] Moynihan argued:

> By emphasizing the individual's responsibility in automobile accidents, the Safety

> Council shifts public attention from factors such as automobile design, which we can reasonably hope to control, to factors such as the temperament and behavior of eighty million drivers, which are not susceptible to any form of consistent, overall control--certainly not by a bunch of slogans.[135]

He pointed out that although not much was known about accident causes, the available evidence pointed to the conclusion that crashes occurred when drivers got into situations where they could not respond correctly because the human mind could not work fast enough or it was already too late to take any corrective action. Moynihan argued that some accidents were caused merely by putting a number of vehicles together in one place at the same time.[136]

The NSC had itself estimated in 1956 that a driver made 200 observations every mile, twenty of which required a decision; the driver made a wrong decision once every two miles, one of which led to a near collision every 500 miles and to an actual crash every 61,000 miles.[137] A Commerce Department study three years later observed: "It does seem apparent . . . that the very nature of the driving task often forces the driver to the very limits of his capabilities, thereby increasing the possibility of accident producing responses."[138] Rex Whitten, Chief of the Bureau of Public Roads, expounded a similar view several years later when he stated: "I think the great majority of drivers most of the time are doing as well as we can reasonably expect. The real difficulty for drivers is that all too often the road and traffic situation facing them is just more than they can handle."[139] The Commerce Department report went on to state that for years the driver had been assigned the responsibility for nine out of ten accidents and thus he was "believed to be the principle medium for the improvement of highway safety . . . ""

> This assignment may have some value in the promotion of safety consciousness, but it is of doubtful validity in any broad study of the traffic accident problem.
>
> The assignment of the other two elements [the automobile and the highway] probably represents their lowest possible amount of contribution . . . and completely over-

> looks the fact that the interaction between all three creates the successful or unsuccessful driving operation.[140]

Two safety researchers expressed similar points of view the next year: "An accident is a complex interaction of human beings and environment involving a sequence of events and a multiplicity of causal factors. No single factor can ever be singled out as 'the' cause of an accident."[141] Two public health specialists charged in 1962 that the common practice of subtracting the percentage of accidents caused by drivers from 100 percent and then attributing the balance to the road and vehicle could not be defended on logical grounds because it implied a form of exclusion principle which was not consistent with the facts.[142] Another critic stressed the importance of looking at the accident problem as resulting from a failure in a total system: "Then, and only then, when each component is understood as an interacting variable in a complex situation, will studies of particular facets of the problem have real meaning."[143]

The NSC came in for specific criticism in regard to its use of holiday automobile accident death predictions as a method of promoting safe driving. An article in Nation in 1965 charged that the Council was an "accomplice before the fact" in automobile accidents because of its "ritual" before each long holiday weekend of predicting the number of people who would be killed and then using the total for the same announcement the following year.[144] Another critic called the predictions a publicity stunt: "If the toll goes over it shows the need for more funds for the National Safety Council. If it is less it shows how effective the council's warnings were." Furthermore, other observers charged that the holiday death tolls were little different from any similar number of days, but "nobody notices that, the council reaps its publicity, and Detroit is happy because it has taken the focus off the cars and put it on the driver and the road conditions."[145] Another critic asserted that safety campaigns like this, based on false assumptions, were a menace, serving only to add another disturbing element to the complex situation generating automobile accidents.[146]

The highway safety movement was not only criticized for blaming most automobile accidents on the driver, but also for not placing enough emphasis on the role of the vehicle. The last of the NSC's ten objectives in regard to traffic safety in 1956 was "To make the automobile as safe as possible in terms of both accident and injury

prevention, through better design and better maintenance."[147] In practice, however, the Council did not deal with the vehicle. In 1958, the New York Traffic Safety Policy Coordinating Committee proposed that the NSC expand its Annual Inventory of Traffic Safety Activities to include a yearly rating of the safety features of new automobiles by name and manufacturer, but the Council replied that this would be against policy.[148] This lack of emphasis on the vehicle drew increasing criticism in the late 1950's and early 1960's. Articles in Consumer Reports argued that the automobile industry was attempting to shift the responsibility for accidents from the automobile to the driver and was using NSC statistics for this purpose:[149] the manufacturers had "blamed most accidents on the driver and have largely ignored the well-established fact that technically feasible modifications of their cars could substantially reduce both the number and severity of accidents caused by driver inadequacies."[150] Another critic, writing in Nation in 1963, expounded a similar view, charging that the automobile companies gave generous support to organizations like the NSC which stressed driver responsibility for accidents in order to divert attention from the vehicle--and themselves--and to give the industry a responsible public image.[151]

Other groups within the highway safety movement were also singled out for criticism. An article in Consumer Reports pointed out that the Automotive Safety Foundation was spending $693,000 per year to support programs in safety education, traffic law enforcement, driver education, and highway research, but offered no support to studies of the automobile.[152] Other observers charged that the ASF was an important "invisible policy-making body"; since the automobile industry was the largest contributor to the highway safety movement, its views prevailed within the safety establishment--and, thus, it was apparent that no emphasis would be placed on the role of the vehicle, itself, in automobile accidents.[153] Washington reporter Elizabeth Drew observed in an article in Atlantic in 1966:

> The interlocking directorates and mutual dependence of virtually all safety groups on the same sources of revenue--the automobile industry and its commercial allies--produced a remarkable harmonious point of view. Traffic safety is preserved by careful driving, good car maintenance, vehicle inspection, traffic laws, and bigger and more highways; since a good traffic safety

> program is driver orientated, traffic safety is rightfully the province of state and local governments.[154]

The President's Highway Safety Committee also came up for comment. Daniel Moynihan of the Department of Labor reported:

> I served as a departmental representative on the body for a year before learning that the executive director was neither chosen or paid by the Federal government, but rather by the industry. This man presided over the expenditure of public funds, . . . and generally disported himself as the head traffic safety man in government although in fact he was a paid agent of the interests he ought at least to have been keeping an eye on.[155]

Moynihan and others charged that the automobile industry was exploiting the Presidential seal to promote its own policy on highway safety which emphasized driver responsibility for accidents. James Ridgeway revealed in an article in New Republic in 1964 that the Automobile Manufacturers Association had printed and distributed a pamphlet attacking federal intervention in highway safety using the presidential seal and that the executive director of the President's committee had used the seal in a letter praising Pure Oil Company which was published in a booklet entitled "What Motorists Really Think about Traffic Safety."[156]

Edward A. Tenny, in a book published in 1962 entitled The Highway Jungle, effectively summarized the reasons for the ineffectiveness of the automobile industry supported highway safety movement in dealing with the automobile accident problem. He pointed out that unlike industrial safety--in which the NSC had gotten its start, "in public safety enormous conflicts of interest emerge and great sacrifices are called for." For example, "the desire of the auto industry to sell a million more cars in a given area may be in conflict with the capacity of the road system there to accommodate any more."[157] And he charged that since business controlled the safety movement, no action would be taken that might hurt sales:

> The movement began with commerce, is presently controlled by commerce, and will in the future continue in commercial hands

> until the public acts on its own behalf. Commerce gives as much safety as is consistent with its economic well-being. If a deadly device promotes sales, the auto makers install it.[158]

Tenny concluded: "the problem is much too big for private control, and . . . the conspicuous failures in Engineering, Enforcement, Education buttress this argument."[159]

If all the criticism had any effect on the individuals and groups within the highway safety movement, there was little evidence of it in public. Even the insurance industry which was facing, for the first time, public resentment of rising premiums due to increasingly costly automobile accident claims continued to adher to the time-worn "Three E's." In 1966, Russell J. Brown, president of the Insurance Institute for Highway Safety--who had been a "safety professional" for sixteen years--offered the following prescription on "How To Stop the Highway Slaughter" in an article in Nation's Business: conduct a national study of the economic impact of automobile accidents; undertake an intensive, nationwide program to overhaul all public records relating to highway traffic; greatly accelerate training programs for highway safety personnel; intensify private and government research on automobile accidents; and develop a specially designed, centralized program of public safety education.[160]

NOTES

[1]Safety First League, Highway Safety, p. 16; Literary Digest, Nov. 14, 1936, p. 36; Annals of the American Academy of Political and Social Science, CXVI (Nov., 1924), 174.

[2]U.S. Congress, House, Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings before the Committee on Interstate and Foreign Commerce, House of Representatives, 89th Cong., 2nd sess., 1966, pt. 2, 1190. Ford dropped its membership during the Depression and did not rejoin until 1947 (ibid.).

[3]Interview with Paul G. Hoffman, October 28, 1969; Kathleen A. Smallzried and Dorothy J. Roberts, More Than You Promise: A Business at Work in Society (New York: Harper & Brothers, 1942), p. 306-307.

[4]Ibid.,; Graham, "Safeguarding Traffic," p. 178.

[5]Graham, "Safeguarding Traffic," p. 178.

[6]Hoffman, Seven Roads to Safety, p. viii; Erskine Bureau for Street Traffic Research, Street Traffic Bibliography (Cambridge, Mass.: Erskine Bureau for Street Traffic Research, Harvard University, 1933), p. i.

[7]Hoffman Interview.

[8]Price, "Automobile Industry Should Lead in Safety," p. 1187.

[9]Ibid.

[10]Ibid., "Automobile Industry Should Stimulate Safety Campaigns," Automotive Industries, Jan. 3, 1924, p. 17; ibid., "Why the Automotive Industry Should Lead in Accident Prevention," ibid., Jan. 24, 1924, pp. 175-76.

[11]Eugene Whitmore, "Is the Automobile Industry Facing a Crisis in Sales?" Sales Management, Jan. 8, 1927, p. 17.

[12]"Safety Crusades Foster Good Will Toward Automotive Industries," Sales Management, Mar. 3, 1928, p. 381.

[13]Graham, "Safeguarding Traffic," p. 179.

[14]"Oil Companies Enter Safety Campaign," Safety En-

gineering, Apr., 1932, p. 170; E. G. Stankey, "Safe Driving Featured in Oil Company Advertising," National Petroleum News, Mar. 11, 1936, p. 59.

[15]Hoffman Interview.

[16]J. C. Furnas to the author, Feb. 12, 1970; Furnas and Smith, Sudden Death, p. iii.

[17]Furnas and Smith, Sudden Death, p. 1.

[18]Ibid., pp. iii, 8-9; J. C. Furnas, "--And Sudden Death," Reader's Digest, Aug., 1935, pp. 21-26.

[19]Reader's Digest, Jan., 1936, p. 1.

[20]Paul G. Hoffman, Highway Safety--A Review and Forecast: The SAE David Beecroft Memorial Lecture, October 14, 1947 (Detroit: Society of Automotive Engineers, 1947), p. 12.

[21]Ibid.; Hoffman Interview; Hoffman, Seven Roads to Safety, p. ix.

[22]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 100.

[23]Hoffman, Seven Roads to Safety, p. ix; American City, Mar., 1935, p. 69; Literary Digest, Nov. 14, 1936, p. 36.

[24]Hoffman Interview.

[25]"Safety Foundation Formed," Automotive Industries, June 5, 1937, p. 825; Hoffman, Seven Roads to Safety, pp. 59, 77.

[26]Hoffman, "Highway Safety," pp. 9-10; ibid., Seven Roads to Safety, pp. ix, 58, 77.

[27]"Safety Foundation Formed," p. 825.

[28]Ibid., 829.

[29]Ibid.

[30]Hoffman, Seven Roads to Safety, p. 8.

[31]Interview of Paul G. Hoffman by Boake Carter of the Columbia Broadcasting System at Station WABC, broadcast Jan. 21, 1936, text in Packard Corporation Group,

Studebaker Collection, Syracuse University Manuscript Collections, Syracuse, New York.

[32]Hoffman, Seven Roads to Safety, p. 59.

[33]Ibid., p. 8.

[34]Ibid., pp. viii, 58, 59.

[35]Ibid., pp. 61-69.

[36]Ibid., pp. 66-69.

[37]Ibid., pp. 71-73.

[38]Ibid., p. 59.

[39]Ibid., pp. viii-ix.

[40]South Bend Tribune, Mar. 23, 1939, clipping in 1939-40 Scrapbook, Studebaker Collection.

[41]Reader's Digest, Jan., 1936, p. 2; Literary Digest, Nov. 14, 1936, p. 36.

[42]"It Can Be Done," Scientific American, Apr., 1937, p. 216.

[43]Harold G. Hoffman, "Traffic Fatality Rate Is Lowest in History," Weekly Underwriter, Nov. 12, 1938, p. 993.

[44]Hoffman, Seven Roads to Safety, p. xii.

[45]Ibid., p. vii.

[46]Ibid., pp. 2-3.

[47]See, for example, "Paul G. Hoffman's Address to Illinois Manufacturers' Association," South Bend Tribune, Jan. 27, 1937, clipping in 1936-40 Scrapbook, Studebaker Collection; Hoffman, "White Line Isn't Enough," Saturday Evening Post, Mar. 26, 1938, pp. 12-13; ibid., "She Shall Have Safety," Good Housekeeping, July, 1939, pp. 48-49; ibid., "Winning the War on Traffic Accidents," Popular Mechanics, Oct., 1939, pp. 568-71; ibid., Traffic Safety Today's Gains--Tomorrow's Goal [an address delivered at the annual luncheon of the Automotive Safety Foundation, Oct. 16, 1939, in New York City], ([Detroit: Automotive Safety Foundation, 1939]).

[48]Hoffman, Traffic Safety, pp. 1-2; ibid., Highway Safety, pp. 13, 14.

[49]Ibid., Highway Safety, p. 3.

[50]The fourth National Conference on Street and Highway Safety was held May 23-25, 1934.

[51]Quoted in Stevens, Highway Safety, pp. 123, 124-25.

[52]The Federal Trade Commission did undertake an intensive study of the marketing of automobiles, the results of which were published in 1939 as the Report on the Motor Vehicle Industry (Washington: U.S. Government Printing Office, 1939).

[53]M. R. Darlington, Managing Director, Auto Industries Safety Committee, Inc., to author, Sept. 17, 1969.

[54]Hoffman, Highway Safety, p. 16; South Bend Tribune, Mar. 13, 1946, clipping in Studebaker Collection; "Terrible Toll," Time, May 20, 1946, p. 16.

[55]Hoffman, Highway Safety, pp. 7, 16; President's Highway Safety Conference, Action Program (Washington: President's Highway Safety Conference, 1946), p. 9.

[56]Presient's Highway Safety Conference, Action Program (Washington: President's Highway Safety Conference, 1949), p. 11.

[57]Commerce Dept., Federal Role in Highway Safety, 1959, p. 15; AMA, Automobiles of America, p. 134; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 1, p. 414.

[58]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 233.

[59]President's Action Committee for Traffic Safety, Crusade for Traffic Safety (Washington: President's Action Committee for Traffic Safety, 1954), foreword.

[60]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 62.

[61]James Ridgeway, "Car Design and Public Safety," New Republic, Sept. 19, 1964, p. 9, quoted in Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 1, p. 239;

O'Connell and Myers, Safety Last, p. 61.

[62]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 385.

[63]Ibid., p. 62.

[64]"$1.5 Million for Safety," Automotive Industries, May 1, 1962, p. 21.

[65]Helen Leavitt, Superhighway--Super Hoax (Garden City, N.Y.: Doubleday, 1970), p. 32.

[66]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 101.

[67]"$1.5 Million for Safety," p. 21.

[68]Earl Hall, Role of Public Information: Annual Beecroft Lecture (Detroit: Society of Automotive Engineers, 1952), p. 5.

[69]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 863.

[70]Ibid., p. 239.

[71]"Safer," Time, Apr. 18, 1955, p. 25; "Little Less Death," Time, Dec. 10, 1956, p. 25; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 186-87.

[72]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 225.

[73]Jesse W. Randall, "Insurance Side of Highway Safety," Vital Speeches, June 15, 1948, pp. 514-15.

[74]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 62.

[75]Furnas and Smith, Sudden Death, p. 23.

[76]DeSilva, Automobile Accidents, pp. vii, xiv.

[77]Ibid., p. xiv.

[78]"How Accidents Are Caused," Newsweek, Apr. 13, 1953, p. 81.

[79]House Committee on Interstate and Foreign Com-

merce, Traffic Safety, Hearings, 1956, p. 883.

[80]Ibid., p. 893; "Police Chiefs Hit Auto Industry Scapegoat for Accidents as One-Sided Drum Solo," Insurance, July 9, 1966, p. 7.

[81]Flink, America Adopts the Automobile, pp. 174-75, 177.

[82]"Regulation of Motor-Cars," Outlook, Aug. 25, 1906, p. 919.

[83]Safety First League, Highway Safety, p. 12.

[84]W. H. Meese, "Why so Much Talk about Safety?" Iron Age, Apr. 5, 1928, p. 935.

[85]Parlin and Bremier, Passenger Car Industry, p. 13.

[86]Hoffman, Seven Roads to Safety, p. 20.

[87]H. M. Johnson, "Born To Crash," Collier's, July 25, 1936, p. 28.

[88]Hoffman, Seven Roads to Safety, p. 20.

[89]Humphrey, "Man Killer," pp. 828-29.

[90]Black, Man and Motor Cars, p. 21.

[91]Commerce Dept., Federal Role in Highway Safety, 1959, p. 34.

[92]Tenny, Highway Jungle, pp. 23-24.

[93]Ibid., p. 62; Hoffman, Seven Roads to Safety, p.11.

[94]Hoffman, Seven Roads to Safety, pp. 11, 13.

[95]Quoted in ibid., Highway Safety, p. 17.

[96]Business Briefs, Aug. 25, 1957, a confidential publication for dealers by the Ford Motor Company, reprinted in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1966, pt. 1, p. 755.

[97]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 385.

[98]Herbert A. Toops and S. Edson Haven, Psychology

and the Motorist (Columbus, O.: R. G. Adams and Co., 1938), p. 234.

[99]Tenny, Highway Jungle, pp. 112-13. In 1961, Michigan State University offered a new course to prepare instructors to teach mentally handicapped children how to drive (ibid., p. 167).

[100]Quoted in ibid., p. 64.

[101]Toops and Haven, Psychology and the Motorist, p. 237.

[102]Commerce Dept., Federal Role in Highway Safety, 1959, p. 33.

[103]Tenny, Highway Jungle, pp. 112-13, 156, 159.

[104]Boodman, "Safety and Systems Analysis," p. 504.

[105]Gerald Driessen, "The Fallacy of the Untrained Driver," Traffic Safety, Mar., 1969, p. 17.

[106]Sherman, If You're Going To Drive Fast, pp. 11-12.

[107]Payne, "Contemporary Accidents," quoted in Tenny, Highway Jungle, p. 64. Paul Hoffman admitted in 1939: "Too often I have seen safety meetings adjourn to a near-by bar where the conferees consumed a few reaction-time-slowing drinks, then got in their cars and drove home" (Seven Roads to Safety, p. 14).

[108]Toops and Haven, Psychology and the Motorist, pp. 236-37.

[109]Ibid., pp. 235, 255.

[110]Stevens, Highway Safety, pp. 148-49.

[111]Ibid., pp. 144-45.

[112]Ibid., pp. 31, 144.

[113]Ibid., pp. x-xi, 121-22, 144-45.

[114]DeSilva, Automobile Accidents, pp. viii, xix.

[115]Quoted in South Bend Tribune, May 26, 1937, clipping in 1936-1940 Scrapbook, Studebaker Collection.

[116]Quoted in House Committee on Interstate and Foreign

Commerce, Traffic Safety, Hearings, 1956, p. 92.

[117]Ibid., pp. 90-92.

[118]Ibid., p. 891.

[119]Ibid., p. 90.

[120]Ibid., p. 312.

[121]Ibid., Research Needs in Traffic Safety, Hearings, 1958, p. 271.

[122]Ibid., Traffic Safety, Hearings, 1956, p. 88.

[123]Ibid., Research Needs in Traffic Safety, Hearings, 1958, p. 255.

[124]Ibid., Motor Vehicle Safety, Hearings, 1959, p.95.

[125]Quoted in Tenny, Highway Jungle, p. 171.

[126]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 1, pp. 257-58.

[127] Commerce Dept., Federal Role in Highway Safety, 1959, p. 66.

[128]Association for Aid of Crippled Children, Passenger Car Design, p. v.

[129]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 1, p. 264; Dwight M. Blood, "Some Inconsistencies in Statistics of Intercity Automobile Travel," Papers, Fourth Annual Meeting, Transportation Research Forum, December, 1963, pp. 85-91; Daniel P. Moynihan, "U.S. Traffic Accident Statistics Useless? Solution of National Tragedy Hindered," Trial, June-July, 1965, p. 12, quoted in O'Connell and Myers, Safety Last, pp. 45-46.

[130]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1966, pt. 2, pp. 1318-19.

[131]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 1, pp. 260-61.

[132]Quoted in O'Connell and Myers, Safety Last, pp.

43, 46.

[133]Dreyfuss, "Car Detroit Should Be Building," p. 352.

[134]Daniel P. Moynihan, "Epidemic on the Highway," Reporter, Apr. 30, 1959, reprinted in Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 1, p. 314.

[135]Ibid.

[136]Ibid., p. 315.

[137]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 476.

[138]Commerce Department, Federal Role in Highway Safety, 1959, p. 31.

[139]Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-1966, pt. 2, p. 889.

[140]Commerce Dept., Federal Role in Highway Safety, 1959, p. 29.

[141]Edward A. Suchman and Alfred L. Scherzer, Current Research in Childhood Accidents (New York: Association for the Aid of Crippled Children, 1960), pp. 9-10.

[142]Association for Aid of Crippled Children, Passenger Car Design, p. 4.

[143]Ibid., pp. 87-88.

[144]"Passing the Buck," Nation, Sept. 27, 1965, p.154.

[145]O'Connell and Myers, Safety Last, pp. 53, 54. A Bureau of Public Roads study done in cooperation with the National Safety Council concluded that holidays were more hazardous than corresponding non-holiday periods. Commerce Dept., Federal Role in Traffic Safety, 1959, p. 88-89.

[146]Robert L. Schwartz, "The Case for Fast Drivers," Harper's, Sept., 1963, pp. 65-66, 67.

[147]Moynihan, "Epidemic on the Highway," p. 319.

[148]Ibid.

[149]Dreyfuss, "Car Detroit Should Be Building," p.352.

[150]Klein and Haddon, "Prospect for Safer Autos," p. 176.

[151]Nader, "Detroit Makes Your Choice," p. 215.

[152]Klein and Haddon, "Prospect for Safer Autos," p. 176n.

[153]Interview with Dr. William Haddon, Jr., Oct. 22, 1969; O'Connell and Myers, Safety Last, pp. 60-61.

[154]Drew, "Politics of Auto Safety," p. 96.

[155]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1966, pt. 2, p. 317.

[156]James Ridgeway, "Car Design and Public Safety," New Republic, Sept. 19, 1964, p. 96; O'Connell and Myers, Safety Last, p. 61.

[157]Tenny, Highway Jungle, p. 25.

[158]Ibid., p. 156.

[159]Ibid., p. 166.

[160]Russell J. Brown, "How To Stop Highway Slaughter," Nation's Business, Aug., 1966, p. 31.

CHAPTER VII

THE ORIGINS OF AUTOMOBILE DESIGN FOR CRASH PROTECTION

The highway safety movement continually stressed that there would be few if any automobile accidents if drivers operated their vehicles safely. The automobile manufacturers extended this line of reasoning to argue that since their products were not responsible for accidents, they were under no obligation to design automobiles for this possibility but merely for safety under normal operating conditions. This argument was accepted, uncritically, not only by the public and the highway safety movement, but by the courts as well. However, there were members of the medical profession--and a few other individuals--who, upon seeing the results of this policy, began to call for automobile design which would minimize the injuries resulting from what they came to see as the large number of inevitable highway accidents.

Despite the general acceptance of the assumption that it was not normal for motor vehicles to be involved in accidents, there was one aspect of automobile design which presented such a potential hazard in the event of a collision that it was the object of considerable concern almost from the time of its first use--glass. Early windshields sometimes fractured as a result of the normal stresses of operating an automobile on the highway, and a minor collision or a rock thrown up by a passing vehicle could completely shatter a windshield, sending a shower of razor-edged pieces of glass flying through the interior of the motorcar. A front-end collision in which the driver and passengers were thrown forward into the windshield could prove even more hazardous, and when the first fully enclosed body styles were introduced--featuring glass windows on all four sides--many people were, at first, understandibly hesitant about purchasing and riding in them.[1]

As a result of this concern, attention was focused on developing possible substitutes for plate glass, and two European inventors independently came up with ideas for shatter-resistent glass early in the century. French scientist Edouard Benedictus came up with his discovery accidently in 1904, but quickly saw its application to the problem of flying glass in automobile accidents.[2] By 1910, he had developed a satisfactory, but expensive and short-lived, shatter-resistent glass which nonethe-

less found use during World War I in the lenses of gas masks and aviator's goggles and in the windows of automobiles, airplanes, and boats. English inventor John C. Wood conceived the idea of cementing a layer of celluloid between two pieces of glass and took out patents on the development in Britain and the United States in 1905 and 1906.[3] Wood's shatter-resistent glass came to take the brand-name of "Triplex" and was manufactured in England where it also was used during the war.

However, it was not until 1926 that there was an effort to produce shatter-proof glass in the United States. Amory L. Haskell, a former vice president of the General Motors Export Company, purchased the rights to manufacture Triplex glass in America in 1926. Haskell bought a plant in New Jersey, undertook an advertising campaign stressing the merits of shatter-resistent glass, and then attempted to sell his product to the automobile industry. He met with little initial success, although General Motors' Yellow Cab division did adopt the glass for the partitions between driver and passengers in its taxis.[4]

During the 1926 model year both the Rickenbacker and "safety" Stutz featured varieties of "shock proof" glass as American manufacturers moved to develop their own versions of the product, but in the same year Triplex made a tremendous breakthrough when the Ford Motor Company determined to adopt safety glass.[5] Production of the Model T had halted in May, 1927, and the assembly line was being converted to produce the new, more powerful Model A. Henry Ford was concerned about the possibility of an increased number of accidents since the new model was much faster than the old one and most people were not used to high speed driving. Ford's confidential secretary, E. G. Liebold, later quoted him as saying: "We can't put that car out on the public! We'll kill them all!"[6] Then in July, a test car operating on a public highway collided with a Model T at 50 miles per hour, throwing prominent Ford designer Harold Hicks into the plate glass windshield, cutting him badly. In Hicks' words, "The two Fords [Henry and Edsel], looking at the wreck of that car, decided right then that we must have laminated glass in the windshield."[7] Safety glass was a great deal more expensive than conventional glass and there were many problems involved in producing it in the large quantities needed, but Henry Ford, in his characteristic way, brushed aside considerations of cost and production difficulties, and ordered that the new glass be installed in the windshields of all the new models. Thus, when the Model A

finally appeared in late 1927, it was not only the lone car in the low or medium priced class with the new windshield, but one of the few cars of any price in which it was available.[8]

Ford featured the glass prominently in its advertising, and made some rather over-enthusiastic claims about its qualities: "All the new Ford cars have a Triplex shatterproof glass windshield--so made that it will not fly or shatter under the hardest impact. This is an important safety factor because it eliminates the dangers of flying glass. . . ."[9] Former Ford executive, William Knudsen, general manager of Chevrolet, strongly recommended to General Motors president Alfred Sloan that Ford's action be matched by Chevrolet, and Lammot du Pont, president of E. I. du Pont de Nemours and Company, wrote to Sloan in August, 1929, to report that his company still had enough surplus capacity to produce safety glass for all the windows of Chevrolet if the order was placed quickly before other requests were received.[10] However, Sloan replied:

> . . . two or three years ago I would have felt that perhaps it was a desirable thing for General Motors to take an advanced position similar to what it did on front wheel brakes, but the way things stand now with our volume increasing at a decelerated rate, I feel that such a position can do no other than to materially offset our profits.[11]

In April, 1932, du Pont wrote to Sloan again in regard to safety glass, urging him to "encourage its use, rather than discourage or be apathetic."[12] By this time, however, Sloan had learned of a newly developed tempered safety glass which was much less expensive than the laminated type. In a letter to a General Motors executive in November, he wrote:

> I am certainly of the belief that this glass is not as good as our so-called non-shatterable glass. On the other hand, if we furnish glass of this type at very little extra and standardize it, it is going to save the American public an enormous sum of money, and . . . it will be a tremendous improvement over our present untreated glass.[13]

By 1933, however, the question of whether General Motors

--or any manufacturer--should install safety glass as standard equipment became a moot one as a large number of states moved to require it by law, with some legislation taking effect as early as January, 1934.[14] At a meeting of the National Automobile Chamber of Commerce, Sloan made "the very strong point that compulsory use of safety glass in cars was very costly and meant many millions of dollars of expense to buyers of cars," and the NACC went on to agree on a policy in regard to safety glass.[15] First, the requirement of safety glass for windshields would be accepted but with an effort to have the requirement take effect in all states at "some even date so manufacturers could properly prepare for it" and specify no particular type of safety glass. In regard to other parts of the automobile, the manufacturers were to point out the "excessive cost" of putting it in all windows, to provide figures indicating that less than 25 per cent of the public was willing to pay extra for it, and to propose, therefore, that the states "Leave to industry the plan of encouraging the use of the glass in other parts of the car at as low cost as possible."[16] The NACC effort to prevent the requiring of safety glass in all windows was unsuccessful but the less expensive tempered glass was allowed in all locations except for the windshield when the American Standards Association's code was adopted in 1935. However, American manufacturers used laminated glass in side windows until after World War II, probably because it would have been difficult at the time to convince the public that tempered glass was as safe as the more familiar laminated type.[17] Byron C. Foy, head of DeSoto Motor Car Corporation, called safety glass "one of the truly great discoveries of our generation. Every year it prevents thousands of accidents from causing grievous bodily injuries."[18]

If the adverse effect of automobile glazing on the occupants of a vehicle in the event of a collision was questioned and its hazards ameliorated by the voluntary and legislated installation of safety glass, the consequences of violent contact between the occupants and other parts of the automobile were not widely recognized, despite the fact that the results were demonstrated daily in accidents in all parts of the nation. J. C. Furnas' 1935 Reader's Digest article, "--And Sudden Death," which was read by millions of Americans, offered a detailed description of the safety hazards of automobile design under crash conditions. "The best thing that can happen to you--and one of the rarer things," he wrote, "is to be thrown out as the doors spring open so you have only the ground to reckon with" rather than

"the lethal array of gleaning metal knobs and edges and glass inside the car," even though "you strike with as much force as if you had been thrown from the Twentieth Century Limited at top speed."[19] He went on to give an accurate portrayal of physical laws which applied during automobile collisions:

> Collision, turnover or sideswip, each type of accident produces either a shattering dead stop or a crashing change of direction--and, since the occupant--meaning you --continues in the old direction at the original speed, every surface and angle of the car's interior immediately becomes a battering, tearing projectile, aimed squarely at you--inescapible. There is no bracing yourself against these imperative laws of momentum.
>
> It's like going over Niagara Falls in a steel barrel full of railroad spikes.[20]

Furnas pointed out that passengers were injured by splinters from the wooden parts of the body, by flying glass, or sometimes "instantly killed by shattering their skulls on the dashboard." He went on to state: "The driver is death's favorite target. If the steering wheel holds together it ruptures his liver or spleen so he bleeds to death internally. Or, if the steering wheel breaks off, the matter is settled instantly by the steering column's plunging through his abdomen."[21]

The purpose of Furnas' article was not to advocate safer design of automobile interiors--and this alternative was not even mentioned--but rather to frighten people into driving safely so that accidents would not occur in the first place.[22] It is doubtful that "--And Sudden Death" had the hoped-for effect--despite the wide notoriety it achieved--and neither did it bring about a questioning of motor vehicle design. There was one individual, however, who did raise the issue--Detroit plastic surgeon Dr. Claire L. Straith who early witnessed what the interior of an automobile could do to the bodies and, most particularly, to the faces of the occupants in a collision. As he stated in 1957, "It's a slaughter. I have seen the torn and mutilated victims of crashes for nearly four decades. At least we have the chance to help the victims, the ones lucky enough to survive, to return to normal appearances."[23]

In the early 1930's, Straith installed seat belts

and crash padding in his own automobile, and designed three types of crash panels--one of which was a padded dashboard mounted on springs to absorb shock--which he patented in 1935 and 1937. Beginning in 1934, he held periodic conferences with representatives of the automobile industry urging them to redesign automobile interiors in order to minimize injuries when accidents occurred. He also visited meetings of automobile engineers showing slides of the disfigured victims of automobile accidents and lecturing on design improvements.[24]

In 1935, Straith was able to talk with Walter P. Chrysler, founder and head of Chrysler Corporation, who was interested enough to send the surgeon to meet with the corporation's chief engineer. The latter also reacted positively and assigned an engineer to work on Straith's ideas. Experimental dashboard designs were built, and in the fall of the following year, the new 1937 Dodge appeared with an interior designed with safety in mind. Inside and outside door handles were curved into the door to minimize the chance of injury or of catching the clothing of a passenger or pedestrian. Window regulators were almost flush, while the windshield regulator (many automobiles still featured windshields that opened for ventilation) was completely encased like a folding tape measure. All the buttons on the instrument panel were designed to be flush when not in use, and the lower edge of the dashboard was raised to minimize knee injuries. Finally, the top of the front seat back was padded with sponge rubber to eliminate the usual hard areas where a rear seat passenger might impact in a collision.[25]

Other manufacturers adopted some of Chrysler's innovations while public concern over safety remained high in the later 1930's, including Paul G. Hoffman's Studebaker Corporation. Studebaker had been using safety as a tertiary sales theme since 1934 when it switched to welded, all-steel bodies--which were called "Battleship Construction" and tested by rolling off a 104 foot cliff to demonstrate their superiority over wood-framed bodies.[26] This and other crash testing were used to insure that the company's cars would survive rollovers, which statistics indicated still constituted a significant proportion of all automobile accidents. It took considerable effort to make the new-style slanted windshield posts strong enough so that they would not collapse on rollover, and a stronger, more expensive door latch was required to keep doors from opening under the strain. Hoffman also concluded that accident records

indicating people were being injured by the interiors of automobiles were serious enough so that the dashboard should be redesigned as Chrysler had done.[27] A 1939 Studebaker advertisement proclaimed: "Look at These Safety Features Built into the '39 Studebaker: the world's strongest and safest steel body [plus] wider vision, responsive direct action steering, feather-touch hydraulic brakes, . . . safety glass all around [and a] safety smooth instrument panel."[28] The following year, the inside door handles were recessed for safety.[29]

The Straith-inspired design changes brought praise but also served as a catalyst to induce other individuals to call for further improvements. An editorial in Scientific American in 1937 stated that automobile designers must go "as far as practicable in making the whole interior of a motor car a safety interior."[30] Former automobile manufacturer Eddie Rickenbacker admitted in an article in Collier's that "a nice little knob or other protruding gadget is likely to produce deplorable results," if a passenger were to hit it in an accident, but he pointed out that automobile engineers had been devoting a lot of time to preventing injury to occupants in the event a collision should occur. He reported that the instrument panel was "getting smoother and smoother until there are practically no knobs or bumps in it," transparent plastic was being used instead of glass to cover instruments and clocks, the front seat back was being padded, and the body exterior smoothed and protruding gadgets eliminated to minimize injuries to pedestrians.[31] A survey of motor vehicle administrators in 1938 indicated the majority favored the recessing of robe rails on the back of front seats as well as knobs on dashboards,[32] and a study of the automobile published in the same year by Consumers Union recommended further design changes:

> Removal of projections and padding of sharp edges in the interior of cars, begun by Chrysler in 1937, is of aid in reducing minor injuries to passengers. Knee injuries and skull fractures occur from striking the instrument panel, which needs further modification. The steering wheel and steering column should be designed (as the former is in many cars) to collapse or bend under impact, without developing sharp points to penetrate the driver's body.[33]

Highway safety authority Harry R. DeSilva, writing in 1942, observed: "Competition for sales forces manufacturers to divert a large amount of car value into salesworthy gadgets and style features. From this overemphasis on styling, safety has suffered."[34] DeSilva's comment went directly to the point. The annual model change required new styling of the interior, as well as the exterior, and when the new models appeared after the war, the "safety smooth" dashboards, recessed door handles, and other small improvements had been replaced by new and different, but usually less safe, designs. A promising beginning of automobile design for crash protection had been brought to a halt by the demands of the annual model change. Chrysler safety engineer Roy Haeusler later reported that there was no way to evaluate the effectiveness of his company's instrument panel design, and, thus, no way to justify its retention--so it was changed for styling purposes.[35]

Dr. Claire Straith did not give up his campaign for improved automobile design, and shortly after the war, he visited one of the new motorcar manufacturers, the Tucker Corporation, organized in 1946. Straith showed company founder and president Preston Tucker and designer Alex Tremulus his own car which was equipped with a crude crash pad and padded steering wheel. Tucker then invited his entire engineering group to listen to the plastic surgeon and view the color slides he showed of accident victims. A Tucker stylist who was present reported:

> he described with unfailing accuracy the styling of the gash marks on each face, and compared them to the offending styling objects such as the radio grille of a particular car or the heater knob. . ... It made an impact on all of us. We immediately revised our thinking, relative to the interior of the car.[36]

Tucker designers immediately revamped the planned interior of the automobile after hearing Straith speak. The interior door handles were replaced by push buttons which were less likely to cause injury or be opened unintentionally in an emergency; all the control knobs were placed on the left side of the instrument panel; crash padding was placed around the entire circumference of the interior and across the rear of the front seat; the rear-view mirror was made out of silver-plated plexiglass and mounted on a break-away standard; and the windshield was floated in sponge rubber designed to

break away when 100 pounds of force per square inch was applied since medical authorities reported that 125 pounds per square inch pressure on a human skull could cause a brain concussion.[37]

Preston Tucker, himself, had an "obsession with safety," according to one associate, and the automobile contained many safety features in addition to those influenced by Dr. Straith. Tucker insisted that enough room be left under the "crash board cowl" for a "safety chamber" into which the driver andfront passengers could duck in an emergency, just as mechanics had done in early racing cars, and the entire passenger compartment was protected by "safety steel bulkheads," front and rear. The bumpers of the automobile were curved to deflect minor blows, and the body frame, while completely surrounding the passenger compartment, tapered toward the front and rear to deflect major collisions. The rear-engine design of the Tucker was said to not only provide better weight distribution and more effective braking, but also to eliminate heat and fumes from entering the passenger compartment. The concern for safety even had an impact on the name of the car; the original "Tucker Torpedo" was changed to "Tucker '48" because the company wanted to emphasize safety rather than speed.[38]

Original plans for the automobile called for the installation of highly effective disk brakes, an automatic head-light dimmer, and a third "cyclops" headlight mounted in the center of the grill which turned with the front wheels to point around corners when turning. These features were eliminated in order to reduce costs, although a fixed third headlight was included to provide extra illumination.[39] Preston Tucker had many other ideas about safety. He felt that the steering shaft was the greatest cause of serious injury in automobile accidents. He hoped to eliminate it entirely by 1950 and substitute a flexible cable or a dual system of hydraulic lines leading to a steering wheel on a cantilevered mount which would collapse under impact. The company had applied for patents on this system as well as on a speedometer that would warn a driver, both visually and audibly, when a pre-selected speed had been exceeded. Tucker also suggested a single, front driver's seat mounted in the center of the car for maximum forward visibility and a periscope for increased rear vision. Serious consideration was given to two other ideas designed to help keep the driver's eyes on the road--a fuel gauge and engine warning lights mounted above the rear window to be viewed through the rear view mirror

and a speedometer mounted on the hood.[40] A Tucker designer reported that although a prototype hood-positioned speedometer was approved overwhelmingly by everyone who viewed it from the driver's seat, "we received tremendous resistence from the sales people who accused us of stripping the interior of so much that is usually ornamental as well as functional that the end result was something akin to the sterility of a padded cell." Experiments were undertaken with projecting the image of the speedometer on the windshield, but the sales department objected to this also. Finally, a conventional speedometer was adopted, but the numerals were made larger than the accepted size for easier reading.[41]

Tucker designers also considered the installation of seat belts and undertook a survey in an attempt to determine what the reaction of the public would be. As one Tucker stylist put it, "Although the safety value of seat belts was obvious to those of us designing the car, the Tucker sales department maintained that the presence of safety belts would imply that the automobile was dangerous." Interviews with racing car drivers revealed a wide range of opinion, but airline hostesses and executives reported that passengers disliked seat belts, and the Tucker Corporation decided not to adopt them.[42]

The Tucker Corporation ran into financial difficulties and was liquidated shortly after the first production models came off the assembly line in 1948.[43] However, another new automobile manufacturer with innovative ideas about automobile safety--the Kaiser-Frazer Corporation--did overcome its early difficulties and survive for several years to produce cars with a number of safety features not found in other automobiles. The first Kaiser-Frazer series, produced from 1947 through 1950, was based on a Frazer design which offered good weight distribution and better than average visibility, and featured push buttons rather than interior door handles which the corporation stated were less prone to catching on clothing or being opened accidently, by children or in a collision.[44]

However, as the time approached to design a completely new model, President Edgar J. Kaiser placed increased emphasis on safety. As industrial designer Brook Stevens, who worked on the new Kaiser automobile, later reported, "Edgar Kaiser, out of his unique approach to any problem, was instrumental in having the engineering department and his design consultants consider passenger safety and comfort, particularly on the new 1951

line of cars. . . ."[45] Kaiser was aware of accident studies which indicated that the greatest number of fatalities were due to the occupants striking the windshield or instrument panel, especially when the latter was covered with knobs and other protuberances, and he directed that his interior designers consider this.[46] When the new Kaiser was unveiled, safety was used as the theme, and the company claimed that its models had the "safest-front seat in the world," including a "pop out" windshield which loosened under severe impact from the inside, a padded crash panel, recessment of all controls below the crash pad, slender windshield posts which eliminated corner blind spots, and an emergency brake mounted on the right side of the driver for more natural use and for accessibility to the passenger in the event the driver was incapacitated. Protruding plastic tail lights were added in 1952 which were visible from the side as well as the rear.[47] Henry J. Kaiser announced: "I firmly believe that the '52 Kaiser's new front seat protection represents the greatest safety-engineering advance in 30 years, . . . an advance that will bring greater peace of mind to thousands of American motorists and their families."[48]

In 1953, the Kaiser was called "The World's First Safety-First Car," and Edgar Kaiser called the horsepower race "ridiculous," especially "in the face of a rising highway accident toll and threats of increasingly stringent traffic legislation." He argued that moderately powered Kaiser automobiles offered plenty of acceleration and performance, and also provided excellent fuel economy:

> Instead of greater horsepower and speed, we have been directing our attention to greater safety--safety in design to provide the driver with every safeguard to prevent him from having an accident. And additionally, to provide him and his passengers with protection if he does have one.[49]

In 1954, the new Kaiser featured a "steering turret," extending from the dashboard behind the steering wheel, which contained instruments and controls. A horn bar replaced the conventional horn ring, and a safety-padded bolster was added to the top of the front seat for the protection of rear seat passengers. Despite its innovativeness in safety design, Kaiser--like Tucker before it --could not compete with the giants of the oligopolistic automobile industry, and in 1955 the company ceased all

production of passenger cars.[50]

In 1948, Dr. Claire Straith, now the head of the plastic surgery division of Harper Hospital in Detroit, spoke before the annual meeting of the American Society of Body Engineers, and according to a report in Automotive Industries, he "painted a rather depressing picture of the facial and head injuries sustained in motor-car accidents."[51] In the same year, Straith joined with the accident prevention bureau of the Detroit police department to conduct a study of automobile accidents. At Straith's request, the department collected the statistics for one month on all passenger car accidents involving person injury. The investigation revealed that almost 70 percent of those injured were riding in the right front seat of the automobile involved so that they were thrown into the instrument panel. Straith predicted that such "guest passenger" injuries would increase with higher speeds and emphasized, as he had done before, "the need for better interior design in automobiles." Specifically, he recommended that all knobs, cranks, drop-down ash trays and sharp edges be removed from the dashboard and a rubber crash pad substituted; the lower edge of the dash be raised and padded; all instruments and controls be placed on the left side of the dashboard behind the steering wheel--with a horn rim under, rather than on top of it--mounted on a collapsible steering column; and, finally, that the windshield be hinged so that it would be forced outward before reaching the breaking point.[52]

By 1948, Claire Straith was not the only doctor studying automobile injuries and making suggestions for modifications of automobile design. In June, Dr. Fletcher D. Woodward, a member of the Department of Otolaryngology at the University of Virginia Hospital, delivered an address entitled "Medical Criticism of Modern Automotive Engineering" before the section on Laryngology, Otology and Rhinology at the annual meeting of the American Medical Association. Dr. Woodward reported that he had been greatly concerned--as was the entire medical profession--over the great postwar rise in deaths and injuries in automobile accidents, and it had occurred to him "that by studying the types and mechanisms of these injuries certain facts could be determined which would prove that many of these deaths and injuries could be prevented by modifications in automotive design."[53]

Woodward's studies of automobile accident victims revealed the predominence of certain types of injuries

which could be directly associated with specific features of vehicle design: "These are injuries to the face and head, . . . usually caused by impact of the head against the dashboard, the windshield or the rear of the front seat. Crushing injuries to the chest of the driver when he is driven against the steering wheel. . . ."[54] Woodward pointed out that despite all the safety campaigns, automobile accidents continued to increase: "Our highways are becoming increasingly laden with cars driven by average persons, and it appears inevitable that these machines will continue to collide, pass on turns, fail to observe stop signs, leave the road at high speeds and afflict mankind much as they have in the past."[55] Thus, he argued, it was now time to shift the emphasis of the attack on the accident problem from the driver to the vehicle itself.

Woodward pointed out the effectiveness of cooperation between engineering and medicine in reducing injuries, especially in airplanes, during the war, and he went on to make a number of suggestions for the redesign of automobiles to prevent or reduce accidents when the inevitable accidents occurred. Woodward recommended a welded, body-frame construction with a shock absorbing front bumper to better protect the passengers, windshield and windows made of plastic rather than glass to reduce injuries, and window openings large enough to serve as escape hatches in an emergency. He suggested that car interiors be redesigned to remove all projecting knobs and handles and to include crash pads on the dashboard and the back of the front seat, a hydraulic steering column which would absorb energy--preventing injury to the driver in a crash, and latches to prevent folding seats from forcing passengers forward in a sudden stop. Woodward also recommended "safety belts, such as are used as standard equipment in aircraft," pointing out that "their use might well be one of the most effective single factors in preventing serious injury."[56]

Woodward concluded his talk, which was published in the October 30, 1948, issue of the Journal of the American Medical Association, by arguing that aircraft crash studies had proven that it was "at present possible to build motor cars capable of withstanding collisions, leaving the road at high speed and overturning, with great reduced likelihood of injury to their occupants, as well as reducing the likelihood of such accidents."[57] Woodward criticized the automobile industry for not having already applied the principles leaned in aircraft design and urged a cooperative effort by the industry and

the medical profession to attack the problem.

One of the individuals involved in aircraft crash research was Air Force Colonel John P. Stapp, another physician. Stapp held a Ph.D. in biophysics as well as an M.D. and entered the Air Force after completing his medical internship in 1944. Shortly after the end of the war, Stapp began twelve years of research on the effects of mechanical force on living tissues, the results of which established fundamental criteria for aircraft and automobile safety design, as well as for aircraft ejection systems and space flights. The work resulted from a need to learn what types of force humans could survive in aircraft crashes, and experiments were begun in 1947 at an Aeromedical Facility Stapp founded at Edwards Air Force Base in California using a rocket sled which was accelerated and then rapidly decelerated in order to simulate the forces involved in a crash. Stapp, himself, served as a volunteer in many of the experiments which demonstrated that a human could withstand very high crash forces if properly restrained and protected.[58]

By 1948, Stapp was convinced that the knowledge gained in his research could be applied to automobile crashes as well as to those of aircraft. Thus, in 1953, when he was asked to undertake research into automobile crashes which were killing a large number of military personnel, Stapp agreed. Although expenditures for ground vehicle crash research were not specifically authorized, Stapp stretched his budget for aircraft research to the limits in order to undertake as many automobile experiments as possible at the new Aeromedical Field Laboratory he had established at Holloman Air Force Base in New Mexico. Anesthetized chimpanzees, hogs, and black bears were used to test the effectiveness of seat belts as well as aircraft safety harnesses, in rocket sled experiments, and they were impacted against steering wheels as well as cockpit designs in simple swing tests in order to determine the types of injuries produced.[59]

In 1955, Stapp began actual car crash experiments using surplus military vehicles and let two contracts for other crash testing--one to Dr. Derwyn Severy of the Institute of Transportation and Traffic Engineering at the University of California, Los Angeles, to undertake controlled crash experiments, and another to ProfessorJames J. Ryan of the Mechanical Engineering Department of the Institute of Technology at the University of Minnesota to apply crash protection theories he had

developed to a military and a civilian vehicle. In that year, a Society of Automotive Engineers committee working on standards for automobile seat belts agreed that it would be valuable to meet with Stapp and learn first hand about his deceleration experiments which had received national publicity in 1954. Donald D. Blanchard, a SAE staff member, contacted Stapp, and together they invited the committee, plus Severy, Ryan, and other individuals involved in crash research, to a conference at Holloman Air Force Base where Stapp and his associates arranged demonstrations of the various experiments then being conducted.[60]

The meeting was so well received that, through the cooperation of Stapp and the SAE, it became an annual event--the Annual Automotive Crash Research Field Demonstration and Conference--featuring formal papers as well as demonstrations. At the third conference in 1957, Professor Severy showed films of his controlled crash experiments, and several of Stapp's associates reported on the Aeromedical Laboratory's research on seat belt deceleration in regard to humans as well as animals. Field demonstrations of the rocket sled and swing test also featured human volunteers as well as animals. Professor Ryan demonstrated the hydraulic bumper and roll-over bar he had developed for an Air Force weapons carrier, using a dummy in a 25 mile per hour crash into a barrier which produced no damage to either vehicle or occupant. Next, Ryan and a University of Minnesota graduate student drove a passenger car Ryan had built, which featured a hydraulic bumper and modified interior, into a fixed barrier at 20 miles per hour. Although its retractible steering wheel failed to operate, Ryan received only a minor cut. Later, four Aeromedical Laboratory volunteers demonstrated the effectiveness of seat belts by riding in a passenger car which was driven into a barrier at 12 miles per hour.[61]

The conferences served to make Stapp's unorthodox research--especially the use of human volunteers for automobile crashes--visible and subject to criticism. Perhaps influenced by the lobbying of some of the automobile manufacturers, Congressional committees overseeing the military budget threatened to cut off all funds for aeromedical research unless the automobile crash testing was ended, and so Stapp was forced to phase out this aspect of his work in 1958. Professor Ryan was able to secure a contract from the United States Public Health Department in order to continue his research for two additional years, and Professor Severy was also able to continue his crash testing by finding other sources

of funding.[62]

Although physicians like Straith, Woodward, and Stapp were among the first to suggest that automobiles be designed for crash protection, there were other individuals who reached similar conclusions. One such man was Frank J. Crandall, vice president and chief engineer of the Liberty Mutual Insurance Company of Boston, Massachusetts:

> In 1950 I made an analysis of the automobile accidents in the country and it looked like we had met the point of least return. We decided that if we couldn't eliminate the causes, the next step was to try to design against the injury to the passenger, and since 1950 we have been working on this project in order to try to design the proper packaging principles so that we could have a crash and still reduce the injuries.[63]

In 1951, Liberty Mutual contracted with the Cornell Aeronautical Laboratory at Buffalo, a non-profit research organization connected with Cornell University, to undertake a study of how passengers moved within an automobile in a crash and the probability of their hitting objects within the vehicle which could cause an injury. The project was placed under the direction of Edward R. Dye of the Industrial Division who had already been conducting in-house research on automobile crash protection. After four years of research both organizations agreed that the knowledge acquired in the work should be applied to designing an automobile "which would afford occupants maximum crash protection" in order to demonstrate that such a safe car could be produced. Basic principles of crash protection were followed by making the body strong enough to protect the passengers from most external force, securing the doors so that crash forces would not open them, restraining the passengers so that they would not strike the interior of the car during a crash, and removing "such dangerous objects as knobs, mirrors, and sharp edges." In addition to carefully "packaging" the passengers, the driver's workspace was carefully designed "to lessen the chances of an accident by increasing visibility, simplifying controls and instruments, and lowering the carbon monoxide of his breathing atmosphere." Finally, dangerous protrusions on the exterior of the car were eliminated to lower the risk of injury to pedestrians. Theoretically, the design would allow occupants to survive a 50 mile

per hour collision unhurt.[64]

Although the safety car received a considerable amount of attention, it had little impact on the automobile industry, which dismissed it as impractical.[65] In 1961, in an attempt to demonstrate that safer design was practical, Liberty Mutual took several standard 1960 Chevrolet sedans and modified them, adding twenty-four safety features including safety capsule seats, a collapsible steering column, a dual braking system, and roll-over bars. One writer stated that these changes would add no more than ten dollars to the cost of producing an automobile.[66] However, a spokesman for one automobile manufacturer said: "We think this is a fine job of dramatizing the need for auto safety. But we wonder if the American public will accept these features."[67] John F. Gordon, president of General Motors, told the 1961 National Safety Congress: "It is completely unrealistic even to talk about a foolproof and crashproof car. This is true because an automobile must still be something that people will want to buy and use."[68]

Whether design for crash protection was unrealistic or not given the nature of competition in the unregulated automobile industry, more and more physicians in the early 1950's came to agree with Liberty Mutual's Crandall that attention had to be focused on preventing injuries in the increasing number of what appeared to be inevitable accidents. A California physician, William W. Harper, who served as a consultant on automobile accidents, concluded after fifteen years of work with insurance companies and police departments and the study of 3,000 accidents: "We have spent too damn much time worrying about the cause of accidents. It's time we started worrying about the causes of injuries."[69] Harper summarized what his experience had taught him about the protection of the occupants of an automobile in a collision:

> The physics of injury tells us something which seems paradoxical: If the occupant wore the car, as he would a suit of armour, the crushing of the car exterior in a collision would absorb tremendous amounts of impact energy and protect him from bodily injury. The occupant would be spared injury unless his passenger space became extensively crushed. But for some unexplained reason the teachings of physics have never been understood or accepted by the motorist--so, rather than "strap on"

> the vehicle and take advantage of its protective armor in a crash, the motorist watches the vehicle crash relatively slowly to a stop and then dashes himself violently to pieces against its interior! This makes no sense at all, but it is still standard practice after 50 years of automobile accident history.[70]

Harper recommended the installation of seat belts, improved attachment of seats to keep them from breaking loose in a crash, and the padding of and removing of knobs from the dashboard.

In 1952, Dr. William Liggett, the new president of the Colorado State Medical Society, appointed a committee on automotive safety to examine the problem of automobile accidents in depth, and a year later the chairman of the group, Dr. Horace E. Campbell, reported to the Society's House of Delegates that, after studying the writing of Straith, Harper and other researchers, it had concluded that nothing could reduce the injury rate in automobile accidents as much as the application of safety engineering to the automobile itself. The committee recommended impact windshields and instrument panels, seats and doors which could withstand collisions, and the universal installation of seat belts. The House of Delegates responded to the committee's report by passing a resolution calling on the automobile industry to install seat belts meeting Civil Aeronautic Administration standards for aircraft belts in all automobiles and to design automobile seats and doors to withstand the impact of collisions. This resolution was forwarded to all automobile manufacturers along with a letter stating: "We implore the motorcar manufacturers to include in their seasonal changes increasing emphasis on safety." Other medical societies were notified and urged to also write to the manufacturers.[71] Dr. Jacob Kulowski of St. Louis, Missouri, called for better automobile design, especially in regard to the dashboard, at a meeting of the American Medical Association later in the year, showing pictures to prove his point.[72]

At the annual meeting of the American Medical Associationin June of the following year, two resolutions concerning automobile safety were placed before the Association's house of delegates. Dr. George A. Unfug, representing the Colorado delegation, introduced a resolutioncalling on the AMA to do everything possible to reduce the automobile death and injury rate and recommending that the automobile industry equip all cars with

seat belts and design seats and doors which could withstand impacts with forces of 10 to 15 G's (the force of gravity). Dr. Jesse D. Hamer, representing the Arizona State Medical Association, also recommended that all new automobiles be equipped with seat belts and further called for "rollover bars, non-energy-storing padded dashboards, recessed knobs, and securely locking doors" on all future motorcars. The Reference Committee on Hygine, Public Health, and Industrial Health combined these two into a modified resolution, which was adopted by the House of Delegates, stating: "Resolved, that the American Medical Association recommends to the motorcar manufacturers of America that they consider equipping all automobiles with safety belts and, furthermore, that they give increasing emphasis to safety in design of all automobiles."[73]

The American College of Surgeons, meeting in February, 1954, recommended that automobile manufacturers emphasize occupant safety as a fundamental part of design and include seat belts capable of withstanding the force of at least 20 G's. At a clinical congress of the College held in November as part of a symposium on trauma, a series of papers on automobile accidents was delivered.[74] The remarks of one of the speakers, Dr. Horace E. Campbell, were printed in the December issue of the College's journal, Surgery. In the article Campbell pointed out that for the previous twenty years over 38,000 people had been killed and over 1,500,000 injured annually in automobile accidents, and he charged:

> These deaths, for the most part, occur because the motorcar manufacturers make no provision whatsoever for the control of the occupants when they must decelerate rapidly. What happens to the motorcar rider under conditions of rapid deceleration is left entirely to chance, with the results recorded previously. Anywhere from 70 to 90 per cent of these deaths and injuries need never have occurred if the most rudimentary provisions had been made for the control of deceleration, that is, the safety belt as used in airplanes.[75]

Campbell reported that the seat belt had been universally used in airplanes since World War II and had saved thousands of lives even though it had changed little since that time. He stated that physicians had led the way in using the automobile and that they should now lead the public in the adoption of safety belts and in the demand

for safer automobile design. He concluded: "Motorcar manufacturers advertise at great cost the thrills and satisfactions of increased acceleration. It is time that they pointed out in their advertising the even more abiding satisfaction of controlled deceleration."[76]

In February, 1955, the Committee on Trauma of the American College of Surgeons, prompted by the discussion of automobile accidents at the November clinical congress, approved a resolution requesting that:

> the board of regents of the college recommend to the motorcar manufacturers of America that they stress occupant safety as a basic factor in automobile design, to include (1) doors which will not open on impact, (2) seats and cushions which will not become displaced on impact, (3) energy absorbing interiors, (4) adequate safety belts or other passenger-stabilizing devices that will resist impacts of at least 20 G's. . . .[77]

The resolution further pledged the cooperation of the College with the automobile industry in the effort to improve the safety of automobiles. The board of regents approved the resolution and sent out seventy-five copies of it to automobile manufacturers, insurance companies, the National Safety Council, the Automotive Safety Foundation, and other organizations. The College decided that the automobile accident situation warranted the establishment of a separate subcommittee on the subject.[78]

The American Medical Association also established a committee on medical aspects of automobile injuries and deaths, which was chaired by Dr. Fletcher Woodward, and an editorial in the Association's Journal in June, 1955 entitled, "Wanted--Safety Devices for Automobile Passengers," called for seat belts, improved interior design, more effective door latches, energy-absorbing steering columns and dashboards, elevated seat backs, and energy-absorbing body material, bumpers, and front ends. The essay struck a rather critical note in its conclusion: "Admittedly, an extensive change in the design of the structure of automobiles would be expensive. Nevertheless the widespread adoption of safety devices would not cost much, comparatively speaking, when introduced on a mass production basis, and probably not as much as changing the style contours periodically."[79]

What was perhaps the most detailed and comprehensive medical criticism of automobile design, however, appeared in the November 5 issue of the JAMA--an article by Dr. C. Hunter Sheldon of Pasadena, California, entitled, "Prevention, The Only Cure for Head Injuries Resulting from Automobile Accidents." The author reported that American physicians were "up in arms" against the growing number of fatalities in automobile accidents; neurosurgeons were especially concerned because it was they who had to try to cope with the head and neck injuries which accounted for nearly 70 percent of all the highway deaths. Sheldon argued that the reason the public was not similarly aroused was that these fatalities were accepted as accidental. He pointed out that accidents and injuries were not synonymous even though they were chronologically related; accidents were caused by a variety of factors but injuries were caused primarily by the "faulty interior design of the automobile." Sheldon stated that no aspect of the interior was designed from a safety standpoint, and, thus, it was surprising that anyone emerged from a collision unhurt. He argued that proper interior design could prevent 75 percent of the fatalities and pointed to the safety record in jalopy races due to modifications of conventional automobiles as proof that this was possible: "Serious injuries are rare because the potential injury-producing factors present in the average private automobile have been eliminated."[80]

Sheldon offered a detailed examination of the weaknesses of automobile design, offering suggestions for their improvement. He stated that 25 to 30 percent of fatalities resulted from occupants being thrown through automobile doors which had sprung open and pointed out that the average door latch would disconnect if a separation of a mere nine-sixteenth of an inch occurred between the door and the door frame, which could happen in even a minor collision due to flexing of the body. The author reported that not only did movable front seat backs in two door models swing forward in a crash, pushing the occupants of the front seat forward, but inadequately secured seats and seat cushions came loose during crashes, hitting occupants with enough force to cause fatal injuries. Furthermore, low seat backs were responsible for whiplash injuries to the necks of occupants which Sheldon reported were the most disabling of non-fatal injuries.[81]

Sheldon stated that while there was evidencd of some improvement in interior design, there were still knobs and projections on all automobile dashboards which would

produce skull fractures when a person was thrown into them in a collision. He pointed to rear view mirrors and arm rests as hazards, and reported:

> The Cadillac has a prominent knife-like projection just above the instrument panel. It was designed to prevent reflection of the instrument lights onto the windshield. To accomplish this minor task, they have produced as lethal a device as is seen on any American passenger car. Chrysler has added a new gear shift lever that projects straight out from the dashboard. This defies all concepts of passenger safety.[82]

Sheldon praised automobile manufacturers for efforts to improve steering wheels, and for deciding to offer seat belts. However, he criticized the latter for being inconvenient to use and argued that the public would not adopt seat belts fully until they were improved: "Eventually a method must be developed whereby the passenger is automatically and instantaneously restrained during a crash. Such a mechanism can be designed that will become activated by a sudden deceleration."[83]

Sheldon reported that although many articles had been written on the problem, scientific studies carried out, and ideas put forward, no progress had occurred because automobile manufacturers claimed that they could not make the changes unless the public asked for them and was willing to pay for the features. The author concluded that this was a difficult argument to accept since the industry's success had been based on selling new features to the public, many of which were designed to reduce the hazards of driving. He conceded that it would be too risky for one company to undertake a complete safety program alone, but that joint action could solve the problem:

> The industry could decide the entire matter without outside intervention, but, considering their past performance with regard to safety devices, I doubt seriously if there is any likelihood of such an occurrence. If left to them, a new but minor change would be made each year as fitted their over-all plan, as has been done in exterior styling and design. Such a delaying action may be a satisfactory policy in business but not in a matter of health

> and public safety. Translated into medicine it would be comparable to withholding known methods of lifesaving value.[84]

Dr. Sheldon pointed out that if an epidemic disease claimed 38,000 lives in one year and the medical profession did nothing to halt it, there would be a Congressional investigation, and he concluded his article by saying, "Possibly that is the only solution to the problem of auto deaths."[85] At a December meeting of the American Medical Association, a resolution was passed which urged the President of the United States "to request legislation from Congress authorizing the appointment of a national body to approve and regulate standards of automobile construction,"[86] and both Sheldon and Dr. Horace Campbell lobbied on behalf of the measure with their patients. Sheldon discussed automobile safety with Senator Paul H. Douglas, upon whom he had operated, and Campbell, the personal physician to the family of Mrs. Mamie Eisenhower, wrote to President Dwight D. Eisenhower on the subject. Campbell received a letter from presidential aide Sherman Adams stating that the matter was being referred to the chairman of the President's Committee on Traffic Safety, Eisenhower's personal friend Harlow H. Curtice, president of General Motors.[87]

NOTES

[1]General Motors, Design for Safety, p. 31; Eugene W. Lewis, Motor Memories: A Saga of Whirling Gears (Detroit: Alved, 1947), pp. 206-07.

[2]Byron C. Foy, "Building Safety into Automobile Glass," Scientific American, Sept., 1932, p. 164.

[3]Sinsabaugh, Who Me? p. 266; "Substitute for Glass in Automobiles," Scientific American, May 1, 1915, p. 401.

[4]Thomas A. Calhoun, "From Novelty To Limelight in Three Years: Triplex Safety Glass Company," Sales Management, July 13, 1929, p. 65; Sinsabaugh, Who Me? p. 265.

[5]AMA, Automobiles of America, p. 82; Sinsabaugh, Who Me? p. 267.

[6]Liebold Reminiscences, X, 846.

[7]"The Reminiscences of Mr. Harold Hicks," Ford Motor Company Archives, Oral History Section, July, 1952, II, 149-51, typewritten transcript in Ford Motor Company Archives; Nevins and Hill, Ford: Expansion and Challenge, p. 450.

[8]Nevins and Hill, Ford: Expansion and Challenge, p. 456.

[9]Gillam, Products Liability, p. 86. Ford was sued on a basis of this claim in 1932 when an individual was injured by chips of glass from the windshield of a Model A. Ford lost the case on a second appeal after a retrial, and began calling its glass merely "safety glass" thereafter. (Ibid.)

[10]Lammot du Pont to Alfred P. Sloan, Aug. 6, 1929, and Sloan to du Pont, Aug. 9, 1929, both reprinted in Senate Committee on Small Business, Planning, Regulation, and Competition, Hearings, 1968, pp. 964, 966.

[11]Sloan to du Pont, Aug. 9, 1929, ibid., p. 966.

[12]du Pont to Sloan, Apr. 11, 1932, ibid., p. 967.

[13]Sloan to Donaldson Brown, Nov. 28, 1932, ibid., p.

968. General Motors argued, in their 1934 Automobile Buyers' Guide, that if the safety glass "is not of the highest quality--proof against disintegration and discoloration--it really becomes less safe than ordinary glass." General Motors, Automobile Buyers' Guide, p.22.

[14]Gillam, Products Liability, p. 126.

[15]Alfred Reeves, vice president NACC, to Roy D. Chapin, June 22, 1933, Chapin Papers.

[16]Ibid.

[17]"Safety Glass Is Used in All 1936 Automobiles," National Safety News, Dec., 1935, p. 26; House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety Standards, Hearings, 1961, p. 185. The major American manufacturers switched one by one to tempered glass in the postwar period despite criticism from glass manufacturers that the latter was much less safe. Ibid., pp. 65-66, 152-55.

[18]Foy, "Building Safety into Automobile Glass,"p.164.

[19]Furnas and Smith, Sudden Death, p. 3.

[20]Ibid.

[21]Ibid., pp. 3-5.

[22]J. C. Furnas to author, Feb. 12, 1970.

[23]Quoted in Charles C. Weber, "Plastic Surgeon Devotes Life To Improving Safety Features," Detroit Free Press, Mar. 16, 1957, clipping in Automotive History Collection, Detroit Public Library, Detroit, Michigan.

[24]Ibid.,; Ed Wing, "Car Makers Use Doctor's Idea," Detroit Free Press, Oct. 16, 1955, clipping in Automotive History Collection, Detroit Public Library. In 1935, C. J. Strickland, the founder and first president of the Automobile Safety League of America placed aircraft seat belts in his automobile and began to advocate factory installation, gathering support from physicians, airplane pilots and safety engineers. Automobile Seat Belt Council, Chronological History of Seat Belts; Business Week, June 11, 1966, p. 192.

[25]"Dodge for '37 with Roomier Bodies Engineered for Safety," Automotive Industries, Oct. 17, 1936, p. 522; House Committee on Interstate and Foreign Commerce,

Traffic Safety, Hearings, 1956, p. 569; "Decade of Automotive Development," pp. 34, 535; Dr. Horace E. Campbell to Congressman Kenneth E. Roberts, Mar. 15, 1961, in House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety Standards, Hearings, 1961, p. 64; Interview with Roy C. Haeusler, Chrysler safety engineer, Sept. 5, 1969; Conversation with Ward Ross, retired Chrysler engineer, Sept. 9, 1969.

[26]J. Geschelin, "Studebakers Have All-Steel Bodies," Automotive Industries, Oct. 7, 1933, p. 422; "Studebaker 1934" and "Studebaker 1935," advertising brochures in 1934 Scrapbook, Studebaker Collection.

[27]Hoffman Interview, Oct. 28, 1969.

[28]Studebaker ad in South Bend Tribune, Feb. 26, 1939, clipping in 1936-1940 Scrapbook, Studebaker Collection.

[29]Newsweek, Oct. 16, 1939, p. 54.

[30]"The Biologist Looks at the Motor Car," Scientific American, Apr., 1937, p. 216.

[31]Edward V. Rickenbacker, "Why Your Car Is Safe," Collier's, Nov. 6, 1937, p. 48.

[32]"Motor Vehicle Administrators Give Views on Car Design," p. 132. Colorado motor vehicle administrator Basil R. Creighton worked with his physician father to develop a coroner's report sheet for use in fatal automobile accidents, and by 1938 it was evident from these reports that 75 percent of the fatal injuries were above the shoulder. Although the information was not publicized, Creighton did communicate it to the automobile industry, Chrysler's vice-president in charge of engineering. Interview with Basil R. Creighton, Oct. 29, 1929.

[33]Palmer and Crooks, Millions on Wheels, pp. 55-56.

[34]DeSilva, Automobile Accidents, p. 241.

[35]Haeusler Interview.

[36]AMA, Automobiles of America, p. 114; Alex Tremulis, "Epitaph for the Tin Goose," Automobile Quarterly, IV (Spring-Summer, 1965), p. 59; Alex Tremulis to the author, June 16, 1970.

[37]Tremulis, "Epitaph for the Tin Goose," p. 59;

Charles T. Pearson, The Indomitable Tin Goose: The True Story of Preston Tucker and His Car (London: Abelard-Schuman, 1960), p. 213; Ken W. Purdy, "What about Mr. Tucker and His Dream Car?" True, Jan.,1949, p. 40; "Tucker Innovations," Automotive Industries, Aug. 15, 1947, p. 39; "The Tucker Motor Car," company sales brochure, reprinted by Jurden Moore, Riviera Beach, Florida, 1960.

[38]Tremulis, "Epitaph for the Tin Goose," pp. 59-60; Pearson, Indomitable Tin Goose, pp. 18, 27; "Tucker Motor Car."

[39]Tremulis, "Epitaph for the Tin Goose," p. 60; Pearson, Indomitable Tin Goose, p. 18; "Tucker Innovations," p. 39.

[40]Tremulis, "Epitaph for the Tin Goose," p. 60; Pearson, Indomitable Tin Goose, p. 18.

[41]Tremulis, "Epitaph for the Tin Goose," p. 60.

[42]Ibid.

[43]Smith, Wheels within Wheels, pp. 146-47.

[44]Edgar F. Kaiser, "We Chose Safety over Horsepower," Cars, June, 1953, p. 26; Richard M. Langworth, managing editor, Kaiser-Frazer Quarterly, to the author, Oct. 7, 1929; Floyd J. Clymer, Independent Test Report and Investigation of Kaiser-Frazer Cars (Los Angeles: By the author, 1947), p. 32.

[45]Kaiser, "We Chose Safety," p. 24; Brooks Stevens to the author, Feb. 9, 1970.

[46]Kaiser, "We Chose Safety," p. 78.

[47]Time, Feb. 20, 1950, p. 79; Kaiser, "We Chose Safety," p. 78; Langworth to author, Oct. 7, 1969; "'52 Kaiser Set To Bow Here Today," press release, Kaiser-Frazer Corporation, Mar. 14, 1952, pp. 1-2, in possession of Kaiser Industries, Oakland, California; "New '52 Kaiser Brings You the World's Safest Front Seat!" sales brochures in the possession of Kaiser-Frazer National Owners Club, Inc.

[48]Quoted in sales brochure, "New '52 Kaiser Brings You the World's Safest Front Seat."

[49]"1953 Kaiser: World's First Safety-First Car!"

sales brochure in possession of Kaiser-Frazer National Owners Club, Inc.; Kaiser, "We Chose Safety," p. 24.

[50]"Horsepower Boost, New Styling Mark 1954 Kaiser Line," press release, Kaiser Willys Sales Division, Willys Motors, Inc., Feb. 1, 1954, pp. 2-3, in possession of Kaiser Industries; "New '54 Kaiser Special," sales brochure in possession of Kaiser-Frazer National Owners Club, Inc.; AMA, Automobiles of America, p. 136.

[51]Automotive Industries, Dec. 1, 1948, p. 44.

[52]Ibid.,; Weber, "Plastic Surgeon Devotes Life to Improving Safety Features,"; American Mercury, May, 1949, pp. 597-98; "Auto Death Seat," Newsweek, June 14, 1948, p. 52.

[53]House Committee on Interstate and Foreign Commerce, Research Needs in Traffic Safety, Hearings, 1958, p. 292; Fletcher D. Woodward, "Medical Criticism of Modern Automotive Engineering," Journal of the American Medical Association, CXXXBIII (Oct. 30, 1948), pp. 627-31.

[54]Woodward, "Medical Criticism of Automotive Engineering," p. 627.

[55]Ibid., pp. 628-29.

[56]Ibid., pp. 629-30.

[57]Ibid., p. 631.

[58]Interview with Col. John P. Stapp, Oct. 30, 1969.

[59]Ibid.

[60]Ibid.; James J. Ryan to the author, Jan. 21, 1970; Interview with Donald D. Blanchard, Oct. 28, 1969; "The Development of the Stapp Automotive Crash and Field Demonstration Conferences, 1955 to 1959" (mimeographed report circulated at 1959 conference).

[61]Stapp interview; Blanchard interview; Ryan to author, Jan. 21, 1970; "Development of the Stapp Automotive Crash and Field Demonstration Conferences."

[62]Stapp interview; Ryan to author, Jan. 21, 1970.

[63]House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 88.

[64]Edward R. Dye, "Designed for Living," Research Trends, V (Fall, 1957), 2; "Built-In Automobile Safety: Surviving a Head-On Smashup," Newsweek, Sept. 24, 1956, p. 83; American Seat Belt Council, Chronological History of Seat Belts; Interview with Norris D. Schumaker, engineer, Cornell Aeronautical Laboratory, Sept. 3, 1969.

[65]"Design for Living on the Road: Cornell Aeronautical Laboratory Prototype," Business Week, Sept. 29, 1956, p. 128; "Unique Car Embodies Wealth of Built-In Safety Features," Automotive Industries, Oct. 1, 1956, p. 39; "Safety-First Car Result of Five-Year Program Sponsored by Liberty Mutual," Eastern Underwriter, Nov. 1, 1957, p. 36; Atlantic, Feb., 1958, p. 20; Ralph Nader, "The Safe Car You Can't Buy," Nation, Apr. 11, 1959, pp. 310-13.

[66]"Safer Autos," Newsweek, May 1, 1961, p. 60; O'Connell and Myers, Safety Last, p. 116; Ralph Nader, "Detroit Makes Your Choice," p. 215.

[67]"Safer Autos," p. 60.

[68]New York Times, Oct. 18, 1961, p. 38, quoted in O'Connell and Myers, Safety Last, p. 22.

[69]William W. Harper, "Prevention and Reduction of Injuries in Traffic Collision," Journal of Criminal Law, Criminology and Police Science, XLIII (Nov.-Dec., 1952), pp. 515-29, quoted in Horace E. Campbell, "Deceleration, Highway Mortality, and the Motorcar," Surgery, XXXVI (Dec., 1954), pp. 1056-57; "Safe Accidents," Time, Oct. 19, 1953, p. 86.

[70]Harper, "Prevention and Reduction of Injuries," pp. 1056-57.

[71]House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, pp. 44-45; William A. Liggett to the author, Dec. 11, 1969; Dr. Horace E. Campbell to the author, Nov. 14, 1969. The first chairman of the committee, Dr. MacDonald Wood, equipped his automobile with seat belts with combined shoulder straps. Campbell to the author, Nov. 14, 1969.

[72]"Drinks and Dashboards," Time, Dec. 14, 1953, p.59.

[73]Abstract of Proceedings of the House of Delegates of the American Medical Association at the Annual Meeting in San Francisco, June 21-25, 1954, in House Commit-

tee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 50-51.

[74]American Seat Belt Council, Chronological History of Seat Belts; Bulletin of the American College of Surgeons, Mar.-Apr., 1955, in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 281-82.

[75]Campbell, "Deceleration, Highway Mortality, and the Motorcar," p. 1056.

[76]Ibid., pp. 1056-58.

[77]Reprinted in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 257; "Trauma Committee Recommends Built-In Safety for Autos," Bulletin of the American College of Surgeons, May-June, 1955, in ibid., p. 38.

[78]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 257-58, 290-91.

[79]"Wanted--Safety Devices for Automobile Passengers," Journal of the American Medical Association, June 11, 1955, quoted in ibid., p. 39.

[80]Sheldon, "Prevention, The Only Cure for Head Injuries," p. 981.

[81]Ibid., pp. 981-83.

[82]Ibid., p. 984.

[83]Ibid.

[84]Ibid., p. 985.

[85]Ibid., pp. 985-86.

[86]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 49; ibid., Research Needs in Traffic Safety, Hearings, 1958, p. 40; ibid., Motor Vehicle Safety, Hearings, 1959, p. 271.

[87]Paul J. Halpern, "Consumer Politics and Corporate Behavior: The Case of Automobile Safety" (Ph. D. thesis in Government, Harvard University, 1972), p. 10.

CHAPTER VIII

"SAFETY DOESN'T SELL": THE DEVELOPMENT OF SAFETY RESEARCH IN THE AUTOMOBILE INDUSTRY

In the post World War II period, none of the American automobile manufacturers had specially designated automotive safety engineers or departments. There was no apparent consumer demand or significant governmental pressure for automotive safety, and, thus, no way to pass on the costs of research, development and adoption of design changes to improve the safety of automobiles. Furthermore, there was a fear that discussion of safety might raise doubts in the minds of consumers and government officials about the safety of automobile transportation and that the introduction of safety features by one firm might bring cries of unfair competition from the rest of the industry. Therefore, the automobile manufacturers continued to support the public's original conception of the highway safety problem as one of driver responsibility for accidents, as institutionalized in the highway safety movement. The industry stressed the proven safety and reliability of the automobile and its continual improvement by progressive and innovative manufacturers. The industry also pointed to statistics which indicated that automobiles rarely caused accidents as support for the assumptions that it was not normal for one to be involved in a crash and that even a perfect motor vehicle could not overcome defects in drivers and highways.

By the late 1940's and early 1950's, however, there came to be a growing awareness within the industry that the small but increasing demand for design for crash protection by members of the medical profession and others was significant enough so that it would be wise to keep abreast of developments in the area. One by one, the major manufacturers either officially or unofficially assigned the responsibility to an individual or set up an automotive safety department. Although the number of engineers involved was insignificant compared to the thousands of specialists working on automobile design and the knowledge, interest and effectiveness of each was varied, the impact of these automotive safety engineers on design for crash protection was not insignificant--both in a positive and negative sense.

Ford Motor Company did not appoint an official automotive safety engineer until about 1955, but Alex L. Haynes of the Ford engineering staff evolved into one

through the late 1940's and early 1950's. Haynes, who had joined Ford in 1945 after eight years in the aviation industry, received his master's degree in mechanical engineering in 1948 and rose rapidly through Ford's research department. Anticipating future problems was a part of his responsibility, and he soon came to feel that automobile accidents would become a major concern. As a result, Haynes began to survey the literature in the field and to write letters and visit individuals involved in the area of crash injury research. In 1950, he was directed by the vice president in charge of engineering to visit Cornell Aeronautical Laboratory to investigate the automobile crash research going on there which Henry Ford II had learned about through a conversation with the vice president of the Laboratory.[1]

Chrysler Corporation appointed an automotive safety engineer about 1952. Paul C. Ackerman, vice president in charge of engineering, had been involved in a minor accident in 1950 in which the occupant of the other car involved was killed, and this event motivated him to investigate research on crash safety and to attempt to promote interest in the subject within the corporation. When he received little response, Ackerman asked Roy C. Haeusler, a veteran of fifteen years with Chrysler, to set up an Automotive Safety Department in order to "enhance the reputation of the Corporation in regard to safety." Ackerman hoped that Haeusler, who was known for his ability to bring divergent groups together, would be able to work with the many different groups involved in designing an automobile. Furthermore, realizing that there were those in the corporation who were not sympathetic to safety, Ackerman made Haeusler directly responsible to his office.[2]

General Motors established what was apparently the largest department dealing with automotive safety within its engineering staff around 1950. However, the engineer in charge, Howard K. Gandelot, a former test driver, was, unlike Haynes and Haeusler, not very open-minded about design for crash protection. Gandelot's years as a test driver had apparently convinced him--as it had other professional drivers and test pilots--that accidents were an act of God and it was of little use to design with this possibility in mind. Furthermore, he was strongly loyal to General Motors and often tended to interpret recommendations for design improvements for safety as criticism of his company.[3]

Haynes, Haeusler, and Gandelot, and their respective staffs, were the engineers with the responsibility for

keeping abreast of research in automotive safety for the major manufacturers in the automobile industry in the late 1940's and early 1950's. Ironically, the most significant developments in crash injury research were largely due to the work of one man--a self-trained engineer and pathologist named Hugh DeHaven--laboring at first alone and using his own resources. DeHaven became involved in crash injury research as a result of his interest in aviation. He spent a great deal of time at an aircraft manufacturing plant in Ithaca, New York, learning all he could about airplanes while he was a student at Cornell University in 1916. When the United States entered World War I, DeHaven yearned to fly, and so he left college and went to Canada to join the Royal Flying Corps when he failed to meet the requirements of the U.S. Army Air Corps. It was during his not-very-thorough flight training, that DeHaven made his first observations about crash injury. Pilots wore safety belts--five to six inch wide leather belts with a large, narrow metal buckle--but merely to keep them from falling out of the cockpit rather than for crash protection. Trainees were instructed to fold their arms and place their heads on them on the instrument panel in the event of an impending crash. DeHaven did crash, and having followed his instructor's advice, received no head injury, but he did suffer lacerations, two broken legs, and a large bruise on his abdomen and associated internal injuries--including a ruptured pancreas--which nearly proved fatal.[4]

DeHaven had witnessed airplane crashes and talked with individuals who had experienced them before his own accident occurred, and during his six month recovery in the hospital, he spent a great deal of time thinking about crash injury. When DeHaven returned to active duty, he was given as one of his duties the job of rushing to local airplane crashes which happened frequently around the training field, and he had an opportunity to study crashes and related injuries in great detail and numbers. DeHaven was soon able to determine the cause of his internal injuries--the safety belt. When he was thrown forward by the force of the crash, jackknifing over the belt, the large, narrow buckle was forced into his abdomen. In his investigation of other accidents, he began noting the obvious causes of injuries and made recommendations to his superiors for design changes, particularly in the cockpit, which would minimize injury in the event of a crash, but his suggestions were treated with disdain by pilots who felt that death was part of the risk of flying.[5]

DeHaven left the Flying Corps with the end of the war and entered the business world as a designer of automatic machinery and fluid transmissions for automobiles where he was successful enough so that he was able to retire at an early age in 1933. However, he witnessed a minor automobile accident in 1935 which revived his interest in crash injury research and launched him on an entirely new career. As DeHaven later reported the event:

> The cause of the accident was loss of control--a skid on a wet road. The car left the road, bounced across a ditch and wound up on its side in some tall brush. The driver was thrown forward and to the right. His head struck a sharp steel knob used for manual operation of a windshield wiper. This knob penetrated his right frontal sinus and tore across his nose and into the area above his left eye. His injuries instead of being minor were disfiguring, disabling and dangerous. It was a frightening demonstration that engineers in 1936 had no more contact with causes of injuries than they had in 1917. I again realized that engineers didn't know--and that nobody knew--how many times people were hurt or killed by things that could be easily changed. I had seen identical injuries in airplanes and I naturally wondered if ten, or a hundred, or a thousand people had been thrown against this knob in automobiles--and if using a rubber knob would have eliminated their injuries.[6]

DeHaven decided to seek support for the establishment of a crash injury project, and, although he felt the principles learned could be applied to both aircraft and automobiles, his main interest was still aviation. Just as important, he felt that crashes were having a particularly significant and visible economic impact on the small avaition industry by retarding the expansion of private and commercial uses of aircraft. DeHaven wrote letters to government agencies, airlines, and aircraft manufacturers arguing that his "Crash or Emergency Safety" could remove barriers to growth by locating and eliminating causes of injury and death in crashes.[7]

DeHaven's arguments fell on skeptical ears for most

people assumed that the human body was relatively fragile and unable to survive a crash of any magnitude. To this DeHaven responded by asking for an explanation of the "95% of automobile and air crash injuries where fatality was registered in the same crash with survivals." His answer was that "One hit something hard enough to sustain fatal injuries--the other didn't."[8] It was obvious that head injuries were the "most common cause of instant death in transportation accidents," and DeHaven remembered that his World War I investigation of airplane crashes had revealed that a main factor in determining if a pilot suffered a head injury was whether or not the structure his head hit would give or not. And so while he continued to lobby for his research project, he also began a study of head injuries in the wards of New York City's Bellvue Hospital in an effort to determine how much force a human head could withstand. He soon discovered that a simple fall on an unyielding surface, such as ice or concrete, could result in a skull fracture or concussion, but "a very small amount of yield or shielding gave dramatic protection for the head." DeHaven's Bellvue observations led to an experiment in which he dropped eggs--representing human heads--onto a foam rubber mat from varying heights to see how much force they could withstand before breaking. DeHaven's next step was to document what he had learned scientifically, and for this purpose he chose a study of free falls.[9]

DeHaven had noted that just as there were "miraculous escapes" from what otherwise would have appeared to have been fatal airplane or automobile crashes, there were also remarkable cases where persons had fallen or jumped from great heights and survived. Whereas in the former it was often difficult, if not impossible, to calculate the speed at which the crash occurred or the precise objects struck by an individual, free falls allowed a precise calculation of impact velocity and objects hit. And so in 1938, DeHaven began a combined engineering and pathological examination of attempted suicide jumps and falls which produced dramatic results. He was able to convincingly document through the numerous free fall cases he studied that the human body was far less fragile than had been commonly thought and could survive a force of 200 times the force of gravity for short periods; the structural environment was the main cause of injury, and it could be "altered to eliminate or greatly modify many causes and results of mechanical injury."[10]

DeHaven was able to get an article containing eight

of his case studies published in the American Medical Association's journal, War Medicine, in July, 1942, in which he concluded: "It is reasonable to assume that structural provisions to reduce impact and distribute pressure can enhance survival and modify injury within wide limits in aircraft and automobile accidents."[11] The free fall study and its publication proved to be a crucial breakthrough for DeHaven and his crash injury research proposal for it demonstrated the validity of what many of the people he had contacted viewed as "crackpot" theories. This documentation enabled him to obtain the support of the Safety Bureau of the Civil Aeronautic Board and, later, of the Committee on Aviation Medicine of the National Research Council. Dr. Eugene F. DuBois, the chairman of this committee and head of the Department of Physiology at the Cornell Medical College in New York City applied for and was granted funds from the Office of Scientific Research and Development to support DeHaven's crash injury research on a modest basis as a joint CAB-NRC project based at the College.[12]

DeHaven decided, even before his project officially began in 1942 and he hired his staff of three persons, to utilize survivable small plane crashes where seat belts and shoulder harnesses were used as subjects for study to prove his theories, since controlled experiments were impossible because of the danger involved. CAB Air Safety Investigators were given brief training sessions by DeHaven to prepare them to properly record the data needed, which included careful estimates of impact speeds and stopping distances that would allow a judgement to be made as to the force and severity of the crash and photographs of the accident scene and all aspects of the aircraft itself. The investigators were also asked to give special medical forms prepared by the NRC to the physicians who treated those injured in the crash. The data from investigators and physicians was to be combined into individual case studies and analyzed by the Crash Injury Research staff in an attempt to determine what caused the injury. In addition to the field studies, a head impact study was undertaken at the CIR laboratory under a contract with the Office of Naval Research in order to provide engineering data to offset the hazards discovered. Plastic headforms were catapulted at objects with different energy-absorbing characteristics at different speeds.[13]

Both the field studies and the laboratory experiments again confirmed DeHaven's theories and proved that seat belts and shoulder belts caused no injury. In 1944,

DeHaven reported his findings in a paper delivered before the American Society of Mechanical Engineers and published in the Society's journal, Mechanical Engineering, in April. DeHaven commented on engineering design to package passengers and concluded that the rates of and severity of injuries "could be varied by engineers through modifications in the design of objects most frequently hit by people in accidents."[14] DeHaven summarized his findings in an editorial written for the Journal of the American Medical Association in 1946 and reported that certain aircraft manufacturers had already made notable improvements in the design of the instrument panels and control wheels of their aircraft as a result of CIR studies.[15]

DeHaven repeated in the JAMA article the same point he had made in his 1942 study in War Medicine: "Much that is being learned about airplane crashes has applicability in the field of motor car accidents."[16] Although he considered crash injury principles applicable to automobiles as well as aircraft, DeHaven was not in a position to expand his project to include studies of motorcar crashes. The Crash Injury Research program was terminated at the end of the war, but three aircraft manufacturers who felt the project should continue put up money to keep it operating, and later support was obtained from the Civil Aeronautical Authority, the Army and Navy, the Aircraft Owners and Pilots Association, and the Aircraft Industries Association. However, funding was provided on a year-to-year basis, and the budget was only sufficient to retain a staff of four people. Despite these limitations, DeHaven continued to gradually expand the number of public agencies contributing data on small plane accidents. The Indiana Aeronautics Commission began cooperating with CIR in 1947, and in late 1948, the Indiana State Police were approached about assisting in the operation. After an agreement was reached, DeHaven visited State Police headquarters in Indianapolis to give two lectures on the project and its accident reporting procedures.[17]

During the preliminary discussions with the Indiana State Police, a CIR representative met Corporal Elmer C. Paul, who reported to him that he wanted to undertake an automobile crash injury research project. Paul had worked in an automobile repair shop while attending school and became familiar with automobile construction. This knowledge was put to use later when he began investigating automobile accidents as a member of the Indiana State Police. Paul was able to evaluate the effects of different types of accidents with considerable accuracy, and he

noted that his fellow officers often drew incorrect conclusions about the speeds involved after viewing the damage to the vehicles and the occupants. Paul saw that oftentimes people were killed or seriously injuried in relatively minor accidents at low speeds. He was puzzled by this, and after a National Safety Council course at Northwestern University's Traffic Institute further whetted his interest, Paul enlisted the assistance of the personnel at his State Police post in a study of fatal automobile accidents. The data gathered during the first year indicated that a large number of the injuries and deaths were due to faulty design of automobile interiors. Paul urged his superiors to undertake a comprehensive investigation of accidents. In 1950, a series of conferences were held between officials of the State of Indiana, the Indiana State Police, Northwestern University's Traffic Institute, and Cornell Crash Injury Research, and as a result, in 1951 a statewide study of rural, fatal accidents was approved, and an Automobile Crash Injury Department was established with Paul as its Director.[18]

Special accident report forms were developed in cooperation with the Traffic Institute and CIR, troopers were issued cameras, and the support of the Indiana State Medical Association was enlisted to urge physicians to cooperate by filling out medical reports on the accident victims. A data collection system was set up, and Paul supervised the analysis and interpretation of the information as it came in. At the end of the first year of operation, a preliminary report was released on the Auto Crash Injury Research Project, whose goal was cited at this time as being "to determine how automobile users are being injured as a means of preventing crash injury by eliminating existing vehicular hazards." The main conclusions of the study of 605 rural traffic fatalities in 1951 were that the forces involved in many traffic accidents were survivable, but that many people were killed or injured "by the placement and design of equipment and furnishings in vehicle interiors." The investigation revealed that skull and neck injuries were the cause of death in 52 percent of the accidents and that 54 percent of fatal head injuries were received inside the vehicle "when the occupant was thrown forward against the steering wheel, windshield, instrument panel, radio control knobs, or other interior projections." The report concluded that while the findings were not felt to be conclusive, "it still is good evidence that the tragic results of traffic crashes can be minimized by making car interiors safer."[19]

After another year of gathering data, Superintendent Robert A. O'Neil appeared before the Traffic Section of the National Safety Council's 1952 National Safety Congress to present the findings of Sergeant Paul's Auto Crash Injury Research Project. The most significant finding of the investigation of 495 rural fatal automobile accidents was that forcible ejection was one of the causes of fatal injury. At least one door opened in over 80 percent of the accidents studied, and 54.8 percent of all the doors in the vehicles involved came open; 33.7 percent of the occupants were thrown out--and 46 percent of these people were killed. Of all the fatalities in the study, 47 percent were killed when they were thrown from the car. As the report pointed out: "Severity of injury is usually increased when an occupant is thrown from the vehicle."[20] However, the interior offered as many hazards as ejection. The major causes of fatal injuries for occupants who remained in the automobile were the doors, the steering wheel assembly, the instrument panel, the windshield area, and the top. Of the fatal injuries, 49 percent were to the head, 25 percent to the chest, and 15.4 percent to the neck. In the opinion of the investigating officers, 49.5 percent of the accidents which had claimed 43.5 percent of the fatalities were definately survivable; only 28.5 percent were classed as not survivable while 22 percent were questionable.[21]

At the time of the first contact with Paul, DeHaven had ordered the CIR staff to cooperate in any way possible with the Indiana State Police. This had led to CIR involvement in the planning of the Indiana Automobile Crash Injury Research project and in periodic conferences at which methods of analysis and future data collection were discussed. DeHaven published an article in Public Safety in 1950 in which he again emphasized that automobiles as well as airplanes could be designed to minimize injuries in crashes, and he decided shortly thereafter that if the Indiana program revealed that worthwhile information could be obtained from a study of automobile crashes, CIR should attempt to implement a full scale project similar to its aircraft program. Although the Indiana study had its weaknesses, DeHaven was soon convinced that automobile crash injury research was worthwhile and began laying plans for a CIR project.[22]

DeHaven carefully paved the way for his automobile crash injury project by presenting a paper entitled, "Accident Survival--Airplane and Passenger Car," at the annual meeting of the Society of Automotive Engineers in Detroit in January. DeHaven stressed that "A good many

of the developments now being used to increase crash safety in aviation should be useful to cut the rate of crash injuries in passenger cars." He pointed to the problems tentatively identified by the Indiana study and the methods used by stunt drivers as evidence that "packaging the passenger"--as had long been done in transporting physical objects--would yield significant results. DeHaven concluded that the use of seat belts and shoulder harnesses, which had proved so effective in minimizing injury in aircraft crashes, was "not even on the horizon as a means of increasing automotive safety," because of "psychological problems," but that automotive crash injury research could identify aspects of interior design which were consistently injuring people and serve as a basis for design changes.[23] Interestingly enough, DeHaven stressed to his audience that the fault for the slow progress in protecting people in collisions did not lay entirely with engineers:

> [The fault] lies chiefly with medical groups who have accepted any and all injuries--without endeavoring to understand their causes. Without medical data engineers have been completely in the dark as to what the body can and cannot stand. Engineers have not known what force the head and body can tolerate--or how often people are dangerously hurt--and by what.[24]

General Motors was the first of the automobile manufacturers to react to DeHaven's move into automotive crash research. In late 1951, Howard K. Gandelot was assigned the task of establishing an acquaintanceship with DeHaven in order "to gain additional first-hand information regarding their [CIR] proposed activities and to ascertain whether any degree of control could be exercised in behalf of General Motors to mitigate their statements pertaining to automotive safety in future publicity releases."[25] Gandelot met DeHaven, and Edward R. Dye of the Cornell Aeronautical Laboratory who was accompanying him, at the annual meeting of the SAE in Detroit on January 16, 1952, and he invited them both to visit the GM Technical Center the next day where they met the vice president in charge of engineering, Charles A. Chayne and discussed the general subject of automotive safety.[26]

Because of the connection between CIR and the Indiana State Police Automobile Crash Injury Research project--and the publicity the activities of the latter

were receiving, Gandelot and a representative of the GM Field Operations Section visited Indianapolis in April to meet Paul and gather first-hand information on the project. Director Paul, now a Sergeant, was very pleased by the visit, for General Motors was the first automobile manufacturer to inquire about his department's activities, but he was blunt in expressing his opinion that the industry was not especially interested in building safer cars or in his investigation of accidents. Although Gandelot concluded upon examining Paul's data that a complete reanalysis of all the accident reports would be necessary in order to make the information of value to any particular manufacturer, he assured Paul of GM's interest and drove him to Detroit for a two day visit in August. There he was shown some of the activities of the Styling Section, engineering tests on automobile bodies, and operations of the proving ground, and he participated in a luncheon discussion with the Safety Group.[27]

Paul's trip to Detroit apparently convinced him that GM was actively working on automotive safety, and when Superintendent Robert A. O'Neil addressed the National Safety Congress in October, he stated: "We have already established a close working relationship with the General Motors Corporation, the first of the big manufacturers to recognize the need of crash injury research in automobile engineering and design."[28] The "close working relationship" proved valuable the following March when a resolution was introduced in the Indiana Legislature condemning the automobile industry in harsh terms for not utilizing Automobile Crash Injury Research data as a basis for improving the safety of their products. Gandelot called Paul "pointing out that the statements in the resolution were not at all factual and could expose the fact that his crash injury research program had not supplied any specific information to the manufacturers and jeopardized any future interests of the manufacturers in his crash injury research program."[29] Paul obtained the aid of the superintendent to convince the authors of the bill to delete the critical portions and make it merely a commendation of the work of the Automobile Crash Injury Research Department; the superintendant later used his influence in the legislature to keep the bill in committee where it died quietly.[30]

Alex Haynes of Ford also contacted Sergeant Paul and visited him, but in December, 1952, Hugh DeHaven invited representatives of the automobile manufacturers, casualty and automobile insurance companies, highway safety movement, police, civilian and military research

groups, and medical profession to an automobile crash injury research planning conference at the Cornell University Medical College. Throughout the spring and summer the CIR staff had studied the Indiana Automobile Crash Injury project and met with State officials to discuss some of the weaknesses of the program with a view to developing a standardized approach which could be used throughout the country. The problems included inadequate medical and accident report forms and lack of technical and clerical manpower at police headquarters to analyze the data. In July a special medical form was prepared by CIR and in October, DeHaven and the state police superintendent met and agreed that the analysis of the data collected would be handled by CIR. The next step was to hold a planning conference to develop an accident report form which would include data of value to the major groups concerned with automobile accidents.[31] Howard Gandelot of GM and Alex Haynes of Ford both attended the conference, and Chrysler, Packard, Studebaker and the Automobile Manufacturers Association also sent representatives. In his opening remarks to the conference, DeHaven referred to an article entitled "Are Car Manufacturers Killers?" which had appeared in the January issue of Magazine Digest as an example of an increasing number of unfair attacks on automobile engineers and manufacturers "who have not had any crash-injury data to show what is happening to their products."[32] DeHaven also deplored the misinterpretations of the Indiana Crash Injury Research finding that 66 percent of fatal accidents could be classed as survivable, arguing that there was not enough data available to be able to make a judgement as to how many people might be spared, as some sensational articles had done. DeHaven concluded:

> Logically, improvements can be made but they cannot be realistically based on observations and reports from only a few accidents. A statistically reliable sample must be developed in order to provide engineers and manufacturers with specific information for judging how much time, ingenuity and money should be spent on what--in order to provide optimum safety results.[33]

DeHaven then announced that the proposed first step in establishing a reliable sample which would provide the data needed would be a small pilot study based on cases of survivors of fatal crashes--because it was difficult to get exact injury data on fatally injured

persons since autopsies were rarely performed--provided by the Indiana State Police. A representative of one of the automobile manufacturers pointed out that because of the annual model change, a very large sample would be necessary to provide sufficient information on each model. DeHaven and a CIR statistical advisor replied that the small study would be used to test methods which would be later applied in an expanded program. The remainder of the two day session consisted of a series of round table discussions in which the conferees considered the various types of data to be collected--and some of the problems involved in doing so--and reached a consensus on types of information which should be included. CIR officials reported that analytical and statistical information derived from the study would be made available to automobile manufacturers, insurance companies, and other interested groups.[34]

Before the conference ended, it was suggested that DeHaven appoint an advisory council to be available for further consultation during the operation of the pilot study, and by prearrangement of Howard Gandelot, the automobile manufacturers were represented by officials of the AMA and SAE, "so as to keep the automotive representation on an industry-wide basis." The conference also agreed that "no useful purpose would be served" by issuing a press release.[35]

In addition to the new accident reporting form approved at the planning conference, an IBM coding system was developed for storing and retrieving accident information. The new forms were put into use by the Indiana State Police in April, 1953, and the next month John O. Moore, formerly in Flight Safety at Republic Aviation Corporation, joined CIR to act as administrator of the automotive program "in view of the present and proposed expansion of activities."[36] Initial funding of the project came from the Commission on Accidental Trauma of the Armed Forces Epidemiological Board after a study had indicated that military manpower losses from vehicular accidents exceeded casualties in the Korean War. However, Commission chairman, Dr. Ross A. McFarland of the Harvard School of Public Health, was not satisfied with either the quantity or quality of the data being received from Indiana.[37]

During the spring and summer of 1953, members of the CIR staff met with officials of the Indiana State Police on several occasions in an effort to convince them to expand the project to include all accidents rather than just fatal ones and to obtain better cooper-

ation from physicians in filling out the medical reports. In May, DeHaven and Moore visited Indianapolis with a proposal that the Indiana program be restricted to two representative counties, but be expanded to include all accidents involving injuries and that an effort be made to obtain full cooperation of doctors in these areas in filling out the medical reports. However, the state police had become increasingly resentful of CIR involvement in their program, and Sergeant Paul, in particular, opposed the narrowing of his state-wide project and appealed to General Motors for support.[38]

As a result of this impasse, Moore arranged a meeting in June with state officials in North Carolina, which had a strong public health program, that led to an agreement on the basis CIR desired. Visits by DeHaven to Maryland and Connecticut resulted in similar agreements. Virginia was signed up soon thereafter, and eventually sampling areas were established in eighteen states. Ironically, Indiana, the pioneer in automobile crash injury research, was dropped from the CIR program.[39] Early in 1954, DeHaven was able to report that the initial work of setting up the methods of reporting and collecting data had been completed--closely following the plan proposed at the 1952 conference--and that the results of the program were now demonstratable. In March, CIR research was separated into an automobile and an aircraft division, and in November, DeHaven wrote to McFarland to report that these recent developments "virtually assure the continuence and success of this project." With both programs placed in capable hands, DeHaven tended his resignation as Director as of January 1, 1955.[40]

Cornell Automobile Crash Injury Research issued its first report, "A Study of Automobile Doors Opening under Crash Conditions," in August, 1954, which supported the Indiana findings that door openings in accidents were "a common occurrence" and that "ejection significantly increases the risk of moderate through fatal injuries, and is demonstrated as a serious safety problem."[41] However, Alex Haynes of Ford was already involved in crash injury research before the report appeared. Unlike some of the old line automotive engineers like Howard Gandelot of GM, Haynes--perhaps partly due to his aircraft engineering background--had been enthusiastic about the ACIR program as outlined at the 1952 planning conference for he felt the data to be provided was just what automotive engineers needed to deal effectively with the growing problem of accidents. Haynes did not wait for the first ACIR reports, but began investigations in 1953 on some of the areas to which the preliminary data from Indiana

had pointed. Ford engineers were working on designs for a collapsible steering column and a safety door latch design in response to the problems of drivers being injured by the steering assembly and occupants being ejected through open doors as early as February, and in November crash testing was begun.[42]

As a result of visits to the Cornell Aeronautical Laboratory, Haynes decided that crash testing would be necessary in addition to the statistics ACIR would supply in order to really study the problem effectively, and he went to great pains to do the work scientifically so that the results would be meaningful. The first step was to bring an automobile into a laboratory and simulate a crash by swinging heavy steel pendulums into it. Haynes soon discovered that the Indiana reports were true--at certain degrees and angles of impact the doors would pop open--and various types of safety locks and latches were tested to find ones which would resist opening under stress. Other components were also given laboratory tests. A prototype of the collapsible. steering column designed earlier, which would collapse up to four inches if the driver was thrown into it during a crash, was completed in April and tested in January, 1954. At the same time two types of recessed hub steering wheels--designed to collapse either four or six inches and at the same time distributing the force over a wider area of the driver's chest and preventing him from impacting on the hub of the steering column--were built and tested repeatedly beginning in February in order to determine the correct structural requirements needed to achieve the proper energy absorbing characteristics.[43]

On February 22, 1954, Haynes gave a presentation on his crash research program before the Ford Product Planning Committee and was given approval to continue his research and to move into more extensive testing. Ford had purchased its first seat belts and shoulder strap and harness assemblies in January and February, and in March they were installed in an automobile in anticipation of an actual crash test. In the same month work on energy absorbing instrument panels was begun, and various configurations and materials were evaluated. Haynes had read of the research on head injuries at nearby Wayne State University in Detroit, and after visiting the university he worked out an arrangement whereby the medical researchers there would test Ford's instrument panel designs using human cadavers in order to establish an index of skull fractures and concussions. The first of these experiments was begun in September, and in the

same month testing of seat belts was undertaken. On October 6, 1954, the first of a series of full scale collision tests were begun at the Ford proving ground where the various components developed were examined under actual crash conditions. Automobiles, containing anthropomorphic test dummies, were run into each other and into stationary objects at various speeds. Each vehicle was instrumented and the crash was recorded on high-speed sound tape and movie film in order to obtain information on the areas hit by passengers most frequently, the forces imparted to the vehicle and its occupants, and the performance of the various new safety features.[44]

In November, a number of the safety components which had been developed were installed on a 1953 Lincoln sedan. The features consisted of a one inch thick vinyl-covered padding on the instrument panel and sun visors, a deep dish steering wheel with its hub recessed three inches, safety door locks, and front and rear seat belts. Haynes argued in a November 18 memorandum that the problem of automobile accidents was very important and that Ford should attempt to take the lead in safety:

> Speaking for Engineering, our current effort compares in adequacy with that of our competitors. We feel that in some cases, particularly the work at Engineering Research, we are leading the industry. However, we do not intend to let up in our efforts, but will attempt to maintain an expanding program.[45]

Shortly thereafter, what came to be called the "safety package" was shown to the top management of the Ford Division, including assistant general manager Robert S. McNamara.[46]

Like Haynes, McNamara had also come to the conclusion that automobile accidents were a problem which the industry had a responsibility to deal with--and he felt that if it did not, the government might intervene. Furthermore, he felt the emphasis on speed, horsepower, and racing in the advertising of some manufacturers encouraged people to demand automobiles which were less safe and to use them in an irresponsible way. As a result of these views, McNamara responded enthusiastically to the safety package. Just as important, he came to see in it the opportunity to increase the sales of the 1956 Ford models and at the same time disprove the widely-held industry theory that references to safety would hurt sales. In 1955, sales records had been set in the

industry but the Ford had not fared well in comparison with the rakishly styled Chevrolet with its powerful new eight cylinder engine whose performance was heavily emphasized in GM advertising, and 1956 looked even worse for the new Ford which featured only minor styling changes. McNamara was convinced that he could sell safety and saw the safety package as a means of preventing a disastrous sales record in 1956.[47]

McNamara had to fight a major battle within the Ford Motor Company to get approval for the adoption and promotion of the safety package for many of the older Ford and former GM executives shared the belief that reference to the possibility of an accident would be a deterent to sales, and others questioned the effectiveness of the safety features. McNamara pointed to proposed Congressional investigations of automobile accidents as evidence of the need to take action and to the first ACIR reports as proof that the safety package had value. He was able to win approval for his proposal and soon a "crash" program was undertaken to incorporate the safety features into the 1956 Ford models. Haynes' engineering group went all out to push the package through but lead time requirements prevented any more than the inclusion of "add-on" components.[48]

The safety door latches posed little problem, and, in fact, they were added to the 1955 models as a running change late in the model year. Although tests had been run on a collapsible steering column, the design was complex and posed production and service life problems which could not be solved in the time available, and so a dished steering wheel with its hub recessed six inches was adopted with energy absorbing characteristics within the limits of human tolerances as established in the experiments of Colonel John P. Stapp. The wheels were tested using human cadavers at Wayne State and an anesthetized hog by Stapp, and they were found to be an improvement over conventional wheels which collapsed under very little energy, exposing the hub of the steering column. It was also impossible to completely redesign the instrument panel, but it was modified considerably, and it and the sun visors were covered with safety padding consisting of polyphenalcloric material with excellent energy absorbing characteristics. The padding was designed to reduce facial injury by protecting against torn or wrinkled dashboard metal and to distribute force over a larger area, as well as to absorb energy. In addition to padding the sun visors to protect occupants thrown into the windshield header, the rear view mirror mount featured two ball joints allowing it to swing for-

ward if hit and the glass was backed by a plastic material to reduce the possibility of it falling out if shattered.[49]

Ford did little testing of combination seat and shoulder belts, concluding that they had little chance of public acceptance. Furthermore, as Haynes reported: "We would have to completely redesign our rear compartment to make provisions for a properly installed shoulder harness." Seat belts, it was felt, were much more likely to be used by the public. The floor structure of the new model was reinforced to provide an adequate attachment point for the belts, but when it came to the belts themselves, Ford engineers faced a problem.[50] Although aircraft type seat belts had been used in automobiles by stunt and racing drivers since 1922 and by a few physicians, pilots, engineers and others in their personal cars since the 1930's, there were no standards for the manufacture or installation of seat belts for automobiles.[51]

A CIR study of 1,039 survivors of light plane crashes released in 1953 reinforced its earlier findings that seat belts offered considerable protection and did not injure wearers. Many safety authorities saw the report as having direct application to the use of seat belts in automobiles, and in 1954 the American Medical Association's House of Delegates recommended that the automobile manufacturers consider equipping all cars with seat belts.[52] In November of that year, Tom Boate, manager of the accident prevention department of the Association of Casualty and Surety Companies proposed that the American Standards Association establish minimum standards for seat belts in order to protect users from inadequate ones, and many seat belt manufacturers supported the recommendation. The Automobile Manufacturers Association, however, took the position that "it would be premature and not a productive expenditure of time and effort . . . ," and reported that the SAE was already working on the subject, although the results would not be completed "within the near future." The ASA called a general conference on the subject, despite AMA objections, which voted in favor of the ASA establishing seat belt standards, but the association eventually deferred to SAE.[53]

The AMA position apparently had something to do with the views of General Motors which had strong reservations about seat belts. GM safety engineer Howard Gandelot chaired a newly established AMA vehicle safety committee which studied the subject of seat belts and concluded

that "seat belts are not essential for safe driving":

> The principle concern of the engineers is the possible effect of the seat belts on the occupants of automobiles which encounter major collisions. Until it is factually known whether seat belts, during major collisions, provided increased protection for the wearer or cause increased bodily injury, it would be unethical for the engineers or the vehicle safety committee to recommend their use.[54]

One observer concluded that General Motors hoped to get an AMA agreement not to support seat belts--which might have reversed the trend toward the use of seat belts for years--but Ford and Chrysler had refused to approve the report and it was never made public.[55]

It was not until January, 1955, that the technical board of the SAE appointed its first seat belt committee made up of representatives of the automobile manufacturers, automobile parts suppliers, and manufacturers of seat belts and component parts. Even while the committee worked, interest in and sales of seat belts increased. The Junior Chamber of Commerce joined with the Irving Air Chute Company, a parachute manufacturer and one of the leading producers of automobile seat belts, in a campaign to encourage their use, and they were promoted on the local level in programs called "Operation Life-Belt."[56] Neither Chrysler nor Ford waited for the SAE committee to complete its study, but rather they both announced in the Spring of 1955 that seat belts would be made available as optional equipment. American Motors made a similar announcement, but General Motors at first took the position that it would not offer seat belts, arguing that not enough was known about the medical problems involved. Chevrolet division offered a combination lap belt and shoulder harness which attached to the floor behind the rear seat, and GM engineers pointed out that a passenger wearing only a seat belt could be jack-knifed into the instrument panel or steering wheel in case of an accident. Later in the year, however, the corporation apparently decided to go along with the rest of the industry and make seat belts optional equipment on its 1956 models.[57] At the October, 1955, meeting of the National Safety Congress, sponsored by the NSC, safety engineers from Ford, GM, and Chrysler joined John Moore of ACIR in a panel discussion which reached a favorable conclusion on the use of seat belts, and after the Congress the NSC board of governors approved the Council's

first policy statement recommending the use of safety belts in automobiles. The SAE seat belt committee did not issue its report until the next month and then merely recommended that automobile seat belt assemblies meet the requirements of the Civil Aeronautics Administration for aircraft belts.[58]

Although General Motors was slow in moving to endorse and offer seat belts and was apparently not engaged in extensive crash injury research, it did move more promptly to develop and adopt improved door locks. Both GM and Chrysler, like Ford, were made aware of the problem of door openings through the early reports of the Indiana State Police. As GM vice president Charles Chayne reported:

> It so happened that our general lock and body development programs had reached a stage where we could see a practical solution to this problem. The designs were completed, tested, and without waiting for a model change, were released for production so they made their first appearance on General Motors cars early in the 1955 model run. In fact, by mid-year, all our production cars carried this feature.[59]

Chrysler also adopted a new interlocking door latch on some of their models in the spring of 1955 which they privately concluded was much superior to the GM design.[60] Interestingly enough, General Motors' relationship with Sergeant Paul and his Indiana accident study--which had been used as a basis for the new latch design--was strong enough so that the corporation refused to cooperate with ACIR after Indiana was dropped from the project.

At the time of the original presentation of the Ford safety package to the top management, the first ACIR data was used as justification since it was based on a larger and more reliable sample than that from Indiana. However, McNamara noted that the ACIR findings were based on only 500 case histories, and when he was informed that the size of the sample was limited only by availability of funds, he suggested that Ford support the project with the hope that an expanded sample would be able to measure the effectiveness of the safety package. ACIR director John Moore was approached and expressed great interest, but pointed out that it would be improper for ACIR to accept funding from a single manufacturer. Ford arranged a meeting which was attended by GM, Chrysler, and Studebaker-Packard, and while Chrysler agreed

to contribute, General Motors refused on the recommendation of Gandelot and Chayne, who reported that they had their own sources of information. Moore was disturbed by the GM refusal, especially in the light of the well-known support of medical research by chairman of the board Alfred Sloan, and he arranged secret meetings through private contacts with both Sloan and Chayne, but the former refused to reverse the decision. However, Moore concluded that the support of two manufacturers was sufficient, and Ford and Chrysler made grants for an expanded ACIR program late in 1955.[61]

At the time the decision was made to make safety a major component of the promotion of the 1956 Ford, Robert McNamara--who became a vice president of the company and general manager of Ford Division early in 1955--assigned to Holmes Brown and John Morris of the public relations department the responsibility of developing a massive promotional campaign in cooperation with the J. Walter Thompson advertising agency.[62] As Brown and Morris learned about crash protection and the Ford safety package, they became very enthusiastic and proposed some highly ambitious objectives in their first presentation to management:

1. Establish Ford Motor Company as safety research headquarters in the minds of potential customers, and do it before GM and Chrysler announce the program they are currently developing.

2. Bring additional buyers into the market for 1956 cars and, by the uniqueness of our safety features, make Ford Motor Company customers out of them.

3. Make certain that Ford Motor Company receives credit for pioneering this revolutionary development brought about through its extensive safety research program at Engineering Staff.[63]

As a platform from which to launch the promotion of the safety package, the proposal called for Ford to sponsor a two day safety forum to which all the safety critics would be invited, that would be held in Dearborn "just after Labor Day weekend when the nation's attention will be focused on traffic accidents." The forum would consist of a "straight-from-the-shoulder review" of the Ford safety research program and the development of the safety package, round table discussions for safety specialists, special sessions for the press, and demonstra-

tions of crash testing. It was felt that the safety experts, "in their enthusiasm, are likely to give public endorsement to the Company's safety program and Ford, Lincoln, and Mercury safety features." The forum would be carefully "built-up" through a series of press announcements through July and August about the Ford safety research program, the availability of seat belts,and then of the forum itself, its program, and those who would be attending. In order to further increase public attention to the meeting, the Ford grant to ACIR would be announced there, but the highlight of the affair would be the dedication of a Ford Safety Research Unit and the establishment of an annual safety symposium.[64]

The "follow-up" was just as important. On September11 a press packet would be distributed to all daily and selected weekly newspapers on the safety features, including photographs--"teaser type publicity aimed at having the effect of increasing interest in the new Fords and heading off the attempts of competitors." The packet would also include material for editorial writers. On September 12 a nationally syndicated newspaper series would be released, written by the Ford public relations department but signed by a well-known racing driver, praising the automotive safety developments pioneered by Ford on the new models. The Ford Television Theater on September 15 would carry a four-minute "institutional-type commercial emphasizing safety," and from September 19 through 20 Ford safety advertising would begin in newspapers and on radio and television. September 20 and 21, press packets on the 1956 Ford with emphasis on safety would be released in anticipation of the introduction of the new models on September 23, at which time safety pamphlets and displays would be made available in Ford showrooms.[65]

The program was approved largely as written, and in September, Henry Ford reported that approximately 30 percent of the advertising budget would be used to promote the safety package. He stated that it was not "a merely commercial proposition [but] I would be less than honest, of course, if I denied that we hope this safety package will help up sell 1956 automobiles."[66] The response of the safety experts was, as predicted, enthusiastic--Claire Straith, Hugh DeHaven, Fletcher Woodward, John Stapp, and Elmer Paul, among almost 100 others, attended the Ford Safety Forum. John Moore allowed the use of ACIR data, helped write some of the advertising, and appeared in a Ford television presentation. The American College of Surgeons permitted its April, 1955, resolution calling for "Built-In Safety for Automobiles"

to be used in Ford advertisements. The college concluded that the resolution had served as a "catalyst" for the 1956 safety developments, and contrasted the Ford reaction with that of General Motors, whose safety engineer had told the surgeons to mind their own business.[67]

The response of the news media to the Ford announcements on safety were as enthusiastic as that of the safety experts and physicians. A Ford public relations report issued in November estimated that the publicity on the safety package and forum had been carried in newspapers with a circulation of over 100,000,000 readers. Ten major news and general magazines had featured articles on Ford safety, including Time, Newsweek, Business Week, Saturday Evening Post, and True. All of the television networks and many independent stations had devoted time to the safety features, including a network news program with an estimated 22,000,000 viewers, and a Ford safety film was being shown on television as well as in movie theaters and drive-in theaters.[68]

Public reaction to the Ford safety advertising was equally gratifying to the public relations department. A national survey conducted one month after the new models were introduced revealed that almost 60 percent of all car owners understood what the safety package was designed to do and associated it with the Ford Motor Company, and a survey taken at the Chicago Automobile Show revealed that 31 percent of those who indicated that they would like to buy a Ford gave safety as a reason.[69] The demand for seat belts caught the company by surprise, and its suppliers were unable to increase their production fast enough to keep dealers supplied. However, General Motors, Ford's largest competitor, did not respond favorably to the safety campaign. There were reports of "snide insinuations about safety," the use of anti-seat belt propaganda, and outright pressure on Ford executives by their GM counterparts to "lay off" safety. Just as important, in December Chevrolet Division, emphasizing styling and performance, raced into a commanding lead over Ford, putting McNamara in deep trouble, inside and outside of the company.[70]

At this crucial juncture, McNamara became ill and was forced to take a vacation in order to recuperate, and after a reassessment of the advertising campaign, Ford's top management, including former GM executive Ernest R. Breech, ordered the public relations department to deemphasize the safety theme and promote per-

formance and styling, instead. At least one Ford executive was greatly distressed by this decision and considered resigning in protest to what he felt was giving in to pressure from the competition. Ford did not best Chevrolet in 1956 or sell as many units as it had in the previous record breaking sales year, and this was widely interpreted within the automobile industry as support for the widely held theory that "safety doesn't sell." Ford personnel involved in the promotional campaign, however, argued that the safety campaign had helped prevent a disastrous sales loss in 1956 and pointed to the great popularity of the optional padding--which was ordered on 43 percent of all cars produced--as evidence that safety did sell. Just as important, they reported that studies had indicated that the Ford safety package was minimizing injury and death in automobile accidents: the safety door locks were reducing door openings by up to 60 percent and the safety steering wheel had cut crushing injuries to the chest by 50 percent.[71] However, although Ford did not drop its safety package, it did not introduce any new safety features or use safety prominently in its advertising again until the 1960's.

In the late 1950's, General Motors vice president in charge of engineering, Charles Chayne, apparently began having some second thoughts about General Motors' position on design for crash protection. Finally, in November, 1961, just before he retired, Chayne and safety engineer Howard Gandelot put together a presentation on automotive safety at the GM Technical Center to which all the top executives were invited. Displays of steering wheels and dashboards were featured and the program clearly emphasized that the interior design of GM cars was less safe than that of Ford, Chrysler, or American Motors products. The presentation shook the audience--which had taken for granted that GM products were superior to the competition--to such an extent that the top executives, beginning with President John Gordon, stood up, accepted partial responsibility for the deficiences, and pledged to make GM cars the safest in the industry. Some members of management expected radical changes to result from the meeting, and the styling staff did send out two types of dashboard designs for consideration for use on the next year's models: contoured and rounded safety panels along with the then stylish, sharply pointed "meat cleaver" designs--so called within the corporation because of the effect they had on passengers who were unfortunate enough to be thrown into them. However, with the emotionalism of the Chayne

demonstration now subsided, the choice between safety or styling was a forgone conclusion. In the competition for sales within the automobile industry, it was styling that sold cars.[72]

NOTES

[1]Interview with Alex L. Haynes, Sept. 10, 1969.

[2]Haeusler interview.

[3]Stapp interview; Haeusler interview; interview with Hugh DeHaven, Oct. 1, 1969.

[4]DeHaven interview; Hugh DeHaven, "Beginnings of Crash Injury Research," luncheon address at 12th Stapp Car Crash Conference, Detroit, Michigan, Oct. 29, 1968, manuscript in Hugh DeHaven Papers, in the possession of DeHaven, Lyme, Conn.; A. Howard Hasbrook, "The Historical Development of the Crash-Impact Engineering Point of View," Clinical Orthopaedics, VIII (1956), 268-274, reprinted in William Haddon, Jr., Edward A. Suchman, and David Klein, Accident Research: Methods and Approaches (New York: Harper & Row, Publishers, 1964), p. 549.

[5]DeHaven interview; DeHaven, "Beginnings of Crash Injury Research."

[6]DeHaven, "Beginnings of Crash Injury Research."

[7]Ibid.; DeHaven interview; DeHaven to James C. Edgerton, Bureau of Air Commerce, June 2, 1936, DeHaven Papers.

[8]DeHaven interview; DeHaven to Edgerton, June 2, 1936, DeHaven Papers.

[9]DeHaven interview; DeHaven, "Beginnings of Crash Injury Research"; "Miracles Wholesale," draft of article, ca. 1937, DeHaven Papers.

[10]DeHaven interview; Haddon, Suchman and Klein, Accident Research, p. 546; Hugh DeHaven, "Mechanical Analysis of Survival in Falls from Heights of Fifty to One Hundred and Fifty Feet," War Medicine, II (July, 1942), 586-596.

[11]DeHaven, "Mechanical Analysis of Survival in Falls," p. 596.

[12]Ibid., "Beginnings of Crash Injury Research."

[13]DeHaven interview; "Research on Crash Injuries," Journal of the American Medical Association, June 8, 1946, p. 524; Hugh DeHaven, "Cushion That Impact!"

Public Safety, May, 1950, pp. 9-11; House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 106.

[14]Hugh DeHaven, "Mechanics of Injury under Force Conditions," Mechanical Engineering, Apr., 1944, pp. 264-68.

[15]"Research on Crash Injuries," p. 524.

[16]Ibid.

[17]DeHaven interview; Crash Injury Research, "Interim Report, July 1 to December 31, 1947," and "Bi-Monthly Report, February-March, 1949," both in DeHaven Papers.

[18]Crash Injury Research, "Bi-Monthly Report, Feb.-Mar., 1949" and "Semi-Annual Progress Report, January, 1951," DeHaven Papers; Conversation with Elmer C. Paul, Sept. 25, 1969; "What Causes Auto Injuries," Business Week, Sept. 12, 1953, p. 87; Herbert Yahraes, "How We Can Have Safe Cars," Colliers, Jan. 10, 1953, p. 16. Paul claims to have had no knowledge of CIR before the Hasbrook visit and was credited by DeHaven as being the "originator of automobile crash injury research" (DeHaven interview).

[19]"Auto Crash Injury Research Project Opens Door to Traffic Death Control," Indiana State Police Progress Report for 1951.

[20]National Safety Council, Current Topics in Traffic Safety as Presented in Sessions of the Traffic Section of the 40th National Safety Congress, October 23, 1952; Indiana State Police Auto Crash Injury Research, Annual Report, released Oct. 1, 1954, 5th edition, 1961, pp.1, 5-6, 9.

[21]Ibid., pp. 3-6, 6a.

[22]DeHaven interview; DeHaven, "Cushion That Impact," pp. 8-11, 27.

[23]Hugh DeHaven, "Accident Survival--Airplane and Passenger Car," preprint of a paper presented at the SAE Annual Meeting, Hotel Book-Cadillac, Detroit, Michigan, Jan. 16, 1952, pp. 1-4, DeHaven Papers.

[24]Ibid., p. 6.

[25]Memorandum on the development of crash injury research, in the possession of the author, p. 8.

[26]Ibid.

[27]Ibid.

[28]Ibid.; National Safety Council, Current Topics in Traffic Safety, 1952.

[29]Memorandum on the development of crash injury research.

[30]Ibid.

[31]"Developments in Automotive Program, July 1, 1952 to June 30, 1953," Crash Injury Research report in DeHaven Papers.

[32]Haynes interview; "Notes on Planning Conference: Auto Crash Injury Research, Cornell University Medical College, December 16-17, 1952," p. 2, DeHaven Papers.

[33]"Notes on Planning Conference," p. 3.

[34]Ibid., pp. 3-4, 6.

[35]Ibid., p. 8; Memorandum on the development of crash injury research.

[36]"Developments in Automotive Program, July 1, 1952 to June 30, 1953," p. 4, CIR memorandum; Crash Injury Research, "Summary Report for the Fiscal Year, July 1, 1952-June 30, 1953," p. iii, both in DeHaven Papers.

[37]Interview with John O. Moore, Sept. 2, 1969; American Seat Belt Council, Chronological History.

[38]Memorandum on the development of crash injury research, pp. 10, 13.

[39]"Developments in Automotive Program"; Moore interview.

[40]DeHaven to Dr. Wilson G. Smillie, Feb. 1, 1954, memorandum in John O. Moore Collection, New York State Department of Motor Vehicles Research Library, Albany; DeHaven to McFarland, Nov. 4, 1954, DeHaven Papers.

[41]John O. Moore and Boris Tourin, "A Study of Auto-

mobile Doors Opening under Crash Conditions: The Relationship between the Opening of Front Doors and the Area of the Passenger Automobile Sustaining the Principle Impact," Aug. 1, 1954, p. ii, Moore Collection.

[42]Haynes interview; Chronology of safety developments prepared by Robert H. Fredericks, Ford Motor Company, ca. 1954.

[43]Haynes interview; Fredericks, Chronology of safety developments; A. L. Haynes to F. N. Platt, Nov. 18, 1954.

[44]Haynes interview; Fredericks, Chronology of safety developments; Haynes to Platt, Nov. 18, 1954; "Developing and Testing Safety Devices," Automotive Service Digest, Aug., 1955, p. 30.

[45]Haynes to Platt, Nov. 18, 1954.

[46]Fredericks, "Early Ford History in Automobile Crash Injury Research," Sept. 16, 1965, p. 2.

[47]Interview with Robert S. McNamara, Oct. 30, 1969; Haynes interview.

[48]McNamara interview; Haynes interview.

[49]Haynes interview; Haynes testimony and Ford Motor Company, "Report to the Public on the National Safety Forum," 1955, both in House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 31, 34, 435-36, 441.

[50]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 32, 444, 454-55.

[51]American Seat Belt Council, Chronological History of Seat Belts.

[52]Hugh DeHaven, Boris Tourin, and Salvatore Macri, "Aircraft Safety Belts: Their Injury Effect on the Human Body," Crash Injury Research Publication, July, 1953, in Moore Collection; American Seat Belt Council, Chronological History of Seat Belts; U.S. Congress, House Committee on Interstate and Foreign Commerce, Automobile Seat Belts, Hearings before a subcommittee on the Committee on Interstate and Foreign Commerce, House of Representatives, 85th Cong., 1st sess., 1957, p. 10.

[53]Harold Mehling, "Big Three Fight Over How Safe to Make Your Car," Bluebook, Oct., 1955, pp. 44-45; Amer-

ican Seat Belt Council, Chronological History of Seat Belts.

[54]Mehling, "Big Three Fight," p. 41.

[55]Ibid.

[56]American Seat Belt Council, Chronological History of Seat Belts; "For Safer Motoring, Fasten Your Safety Belt!" Safety Maintenance and Production, Apr., 1955, p. 75; Ford Field, Apr., 1955, p. 16; "Surgeons Advocate Auto Safety Belts," Science News Letter, May 14, 1955, p. 312.

[57]American Seat Belt Council, Chronological History of Seat Belts; Mehling, "Big Three Fight," pp. 40, 42; J. C. Louton and T. W. Ruster, "Restraint Systems, Design and Performance Parameters," in Proceedings, Automotive Safety Seminar, Safety Research and Development Laboratory, General Motors Proving Ground, Milford, Michigan, July 11-12, 1968, sect. 16, pp. 1-2; Senate Committee on Government Operations, Federal Role in Traffic Safety, Hearings, 1965-66, pt. 2, p. 664.

[58]American Seat Belt Council, Chronological History of Seat Belts; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 299.

[59]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 363.

[60]Haeusler interview.

[61]Fredericks, "Early Ford History in Automobile Crash Injury Research," p. 2; Moore interview. A GM representative later reported that the refusal to support ACIR was based on doubts about the reliability of ACIR data and on the fact that information could be obtained from Sgt. Paul much more quickly. Interview with Robert Forster, Sept. 9, 1969.

[62]Nevins and Hill, Decline and Rebirth, p. 382; Conversation with Holmes Brown, Oct. 30, 1970; Conversation with John Morris, Mar. 11, 1970.

[63]Ford Motor Company, "Program To Provide Maximum Public Impact for Announcing Ford Motor Company's Safety Research Program in Conjunction with Introduction of the 1956 Ford Family of Fine Cars," 1955.

[64]Ibid.

[65] Ibid.

[66] Newsweek, Sept. 19, 1955, p. 78.

[67] Charles F. Moore, Jr., Vice President-Public Relations to newspaper editors, news release, Sept. 7, 1955, Ford Archives; Fletcher N. Platt to DeHaven, Aug. 8, 1967, DeHaven Papers; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 257-57, 266.

[68] "Excerpts from Report on Results of Automobile Safety Project, dated November 15, 1955."

[69] Press release, News Bureau, Ford Division of the Ford Motor Company, Nov. 18, 1956.

[70] Printer's Ink, Aug. 24, 1962, p. 48; House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 486-87, 494.

[71] House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, p. 493; Ford press release, Nov. 18, 1956; McNamara interview.

[72] Interview with David L. Lewis, May 14, 1969; Dan Cordtz, "The Face in the Mirror at General Motors, Fortune, Aug., 1966, p. 208.

CONCLUSION

By the mid-1950's the automobile safety issue had come to the attention of a few members of Congress. Hearings were held and legislation was introduced, but no significant bills were passed until the mid-1960's. With industry representatives leading the President's Committee on Highway Safety and the philosophy of driver responsibility formally accepted by the federal government, the automobile industry saw no real threat of significant governmental intervention in its affairs. Thus, the manufacturers were completely unprepared for the rapid rise of automobile safety to the status of a national issue in 1965, and the industry's inept response helped guarantee the federal regulation it so strongly opposed.

Three United States Senators discovered automobile safety in 1956 and attempted to have the Senate hold hearings on the problem. Senator Paul H. Douglas of Illinois was operated on by automobile safety critic Dr. Sheldon Hunter who lectured Douglas on the hazards of vehicle design. Moved by Hunter's arguments, Douglas introduced a resolution calling for a Senate investigation of highway safety, but it was defeated. Senators Margaret Chase Smith of Maine and John Blatnich of Minnesota likewise tried and failed to get the Senate to take action on automobile safety, but Senator Smith was able to attach an amendment to the Federal Aid Highway Act of 1956 directing that the Secretary of Commerce undertake a three year study of highway safety.[1] It was in the House of Representatives where the first automobile safety hearings would be held.

In 1952, Kenneth A. Roberts, a Democratic Congressman from Alabama, held hearings on the hazards posed by abandoned electrical refrigerators when a child in his district suffocated after accidently locking himself inside one. Roberts introduced a bill requiring magnetic latches, which could be opened from the inside, on all new refrigerators sold in the United States. The bill passed, setting a precedent for device-setting safety legislation. In September 1953, bachelor Roberts was married, and on the couple's honeymoon, their car was badly damaged in a rear end collision. Roberts opened the trunk expecting to find their china and crystal wedding gifts shattered, but to his surprise, the carefully packaged fragile items were intact.[2]

In March 1954, Roberts was one of several Congress-

men shot in an attack on the House of Representatives by Puerto Rican nationalists. While recovering from his wounds, Roberts, deeply moved by his brush with death, considered what he might do as a Congressman to save the lives of others. Recalling his rear end collision, Roberts concluded that people could be protected from injury and death if properly packaged, and realized how little attention had been given to ways of making automobiles safer. The next year, Roberts began to push the idea of a special sub-committee to investigate the safety issue, and on January 5, 1956, he introduced a resolution calling for the establishment of a sub-committee of the House Interstate and Foreign Commerce Committee to study traffic safety. Another Congressman had introduced a similar resolution a year earlier, but the House Rules Committee endorsed Roberts' proposal and it was approved by the House.[3]

When the hearings opened in Washington, D.C. in July, Congressman Roberts stated, ". . . I think I speak for the sub-committee when I say that we are not out looking for villains, and we are not out to destroy industry. We are out to do something about this tragic situation facing the American people." Roberts observed that with the increase in automobiles in use and in miles driven, it would require "the combined efforts of the best brains and the best minds in our country" to keep injury and death on the highways under control.[4] In fact, Roberts hoped that a conciliatory approach would bring voluntary action on the part of the automobile industry once the facts were on the record. Therefore, he took a low-key, technical approach to the problem, carefully attempting to avoid sensationalism. After introductory sessions in the Capitol, the sub-committee went on the road, holding the bulk of its hearings in the Mid-West near the center of the automobile industry. Committee members visited the laboratories and test facilities of Chrysler, Ford, and General Motors, and then testimony was taken from motor car executives and engineers, and from safety officials and physicians. Physicians assumed that the facts would speak for themselves as to the need for safer automobile design, but industry officials argued that despite all the evidence presented, more data was needed before design changes could be made.[5]

The odds of the Roberts Committee having any real impact were remote. A sub-committee composed of Congressmen, little known outside their own districts, without the support of the administration or a well-organized pressure group had little chance against the

largest manufacturing industry in the country. But Roberts and his fellow committee members did not give up. When it became obvious that the automobile industry would not take any action voluntarily, Roberts tried other approaches, looking at federal intervention as a last resort. In 1957, the Roberts Committee held hearings on seat belts, but the weight of the testimony supported public education to encourage their use rather than legislation requiring their installation on new automobiles, as some physicians suggested.[6]

In 1958, Roberts held hearings on a resolution, introduced by sub-committee member John V. Beamer of Indiana, that the states take the initiative on auto safety. The resolution passed but when this approach also bore no immediate results, Roberts decided to use the federal government's fleet of automobiles to test readily available safety devices such as seat belts. In hearings held in 1959 on the committee's bill to require the General Services Administration to specify certain safety features on motor vehicles purchased by the federal government, both the GSA and the auto industry spoke in opposition. Despite this, the GSA bill passed the House of Representatives in that and the next two sessions of Congress. Finally, in 1964, Roberts worked out an arrangement with a Senate Committee chairman which resulted in the reporting out of the GSA bill. Despite the opposition of the industry, the bill passed both houses of Congress. Roberts' next plan was to introduce legislation requiring safety devices on all automobiles, assuming that they proved effective on government vehicles. However, in November 1964 he found himself defeated after fourteen years in the House by a Goldwater Republican.[7]

During the years when Congressman Kenneth Roberts was doggedly pursuing the automobile safety issue, a number of Senators became interested in the subject, and with the election of a reform-minded Democratic administration in 1960, the climate in the capitol became much more favorably inclined toward government intervention, particularly after the overwhelming victory of the party in the 1964 elections. That year, Freshman Senator Abraham A. Ribicoff, who had been elected in 1962 after serving as Secretary of Health, Education and Welfare, was made chairman of the previously little known subcommittee on Executive Reorganization of the Government Operations Committee. Ribicoff had asked his aide Jerry Sonosky to suggest possible topics for his committee to investigate. Then the Senator read a review of a book edited by Dr. William Haddon, Jr. entitled Accident

Research which mentioned the concept of the "second collision" in automobile crashes. Ribicoff was intrigued by the idea because it challenged his view as Governor of Connecticut that speed was the cause of accidents.[8]

Ribicoff was not the only Senator pursuing the issue of automobile safety. Gaylord Nelson of Wisconsin had picked up Kenneth Roberts' unfinished task by introducing a bill to apply GSA safety requirements to all automobiles. Warren G. Magnuson of Washington, chairman of the powerful Senate Commerce Committee, was holding hearings on a tire safety bill introduced by Nelson, and was upset with Ribicoff for encroaching on what he felt was the Commerce Committee's jurisdiction. However, it was the Ribicoff hearings which attracted most of the attention of the media, and ultimately created an environment where federal regulation of the automobile industry became a political reality.[9]

One of the advisors to the Ribicoff Committee was a young lawyer named Ralph Nader who became interested in the problem of auto safety as a student at Harvard Law School. His thinking was stimulated by an article in the Harvard Law Review, and then he discovered the research of the Cornell Aeronautical Laboratory and the Roberts Hearings and went on to write his third year thesis on auto safety. After graduation he opened a law office in Hartford, began writing articles on auto safety, and worked on auto safety and consumer protection legislation in the Connecticut legislature.[10]

In 1963, Daniel P. Moynihan, Assistant Secretary of Labor for Policy Planning, invited Nader to serve as a consultant on highway safety. Moynihan had been introduced to the problem of automobile accidents in the mid-1950's while working as an aide to New York Governor Averill Harriman, and he was moved to write a perceptive and provocative article on the subject entitled "Epidemic on the Highways," which was published in the Reporter in April 1959, shortly after one of Ralph Nader's articles appeared in the Nation, and the two met the following year.[11]

Moynihan carried his concern about automobile safety with him when he joined the Department of Labor in 1961. When he learned that no department had overall responsibility for safety, he decided that a study of the federal role in highway safety ought to be undertaken. Nader agreed to write the report in 1964, and he gave up his law practice to move to Washington. Nader was an obvious choice to assist the staff of the

Ribicoff Committee. He was recommended to Ribicoff aide Sonosky, who was impressed with Nader's knowledge of the subject, and Nader was soon sharing the results of his years of research with the committee staff. At the same time Nader had agreed to write a book on dangerous automobiles for Grossman Publishers. When he missed his first deadline, Richard Grossman went to Washington and worked with Nader to complete the book, which Grossman titled Unsafe at Any Speed, and published late in 1965.[12]

Nader's assistance to the sub-committee enabled the hearings to begin in mid-March 1965 with testimony by federal officials which attracted little public attention. In June Ribicoff introduced his first piece of safety legislation, an amendment to a tax bill which would have made a portion of a planned cut in the automobile excise tax dependent on the installation of the seventeen safety features required for federal vehicles under GSA standards. Ribicoff saw this as a moderate approach which would not penalize the automobile industry. The amendment passed the Senate, but the administration and the industry opposed it, and the House refused to accept it.[13]

Ribicoff was very upset by the failure of his amendment. He countered with a bill to use the funds from the remaining excise tax to finance a National Traffic Safety Center under the Department of Commerce, and decided to invite the presidents of the automobile companies to testify in July. Ribicoff began politely, but soon began to ask tough questions, some of which had been suggested by Ralph Nader. The hearings excited the audience and attracted the media. The presence of television cameras, in particular, enticed Senator Robert F. Kennedy to attend the session and he also used questions suggested by safety experts to grill the automobile executives.[14]

The automobile officials were not prepared for the July hearings in Washington. The first round in March had given little indication that they would be any different than those conducted by Kenneth Roberts almost a decade earlier. The industry agreed through the Automobile Manufacturers Association to oppose federal regulation and argue for a voluntary approach. Industry leaders used the same arguments advanced during the previous sixty years. General Motors executives defined safety as "reliability" and argued that their products were safe. Then Ribicoff asked for details of their recall campaigns which revealed that the industry had quietly recalled 8,000,000 automobiles in 426 campaigns.

General Motors testified that it had spent only $1,250,000 on safety research in 1964, a year when the corporation had earned $1,700,000,000 in profits.[15]

Auto executives were shaken by the experience and the press was shocked by their poor performance. Even the Wall Street Journal was critical, and many supporters of safety legislation came to see it as the crucial turning point in creating a climate in Congress conducive to the passage of a meaningful automobile safety bill. President Lyndon Johnson concluded that the time was ripe for action on auto safety, and he ordered his special assistant, Joseph A. Califano, to work up a transportation program for 1966 which included a traffic safety bill.[16]

After the publication of Unsafe at Any Speed, which was very critical of the Corvair produced by General Motors' Chevrolet Division, Ralph Nader began to suspect that he was being followed. Then on February 11, 1966, Capitol policemen apprehended two private detectives who were trailing the lawyer, and on March 9, General Motors admitted that it had investigated Nader. The GM Legal Department suspected that he might be financially involved in some of the more than 100 suits filed against the corporation in regard to the Corvair, which would have discredited Nader as an expert witness. When an initial investigation turned up nothing, a decision was made to check into the lawyer's private life in search of other ways to destroy his credibility.[17]

Since Nader had been a witness before the Ribicoff committee, the Senator immediately invited General Motors President James Roache to testify at a special hearing on the matter on March 22. General Motors hired Theodore C. Sorensen, former aide to President John F. Kennedy, to serve as Roache's lawyer, and Sorensen advised Roache to apologize. However, the damage had already been done. The President, Congress, and the public were outraged at what appeared to be an attempt by a huge corporation to intimidate an individual critic. A number of observers have concluded that it was the General Motors investigation of Ralph Nader which made a tough automobile safety bill inevitable.[18]

In April President Lyndon Johnson publicly criticized the industry for its "picayunish" opposition to safety legislation, and stated, "We can no longer tolerate unsafe automobiles."[19] Shortly thereafter, the Automobile Manufacturers Association dropped its opposition to federal regulation, announcing a compromise

position which accepted federal safety standards but required the participation of the states and the industry in the standard-making procedures. The AMA hired well-known Washington lawyer Lloyd Cutler to direct industry lobbying efforts, and he, James Roache and Henry Ford II met with members of the Senate Commerce Committee, where the administration's bill was being considered, to present the AMA-proposals. However, the moral overtones of the automobile industry's conduct and the fast pace of events made opposition difficult. Even the automobile dealers, suppliers, and labor unions declined to lend their support. Ultimately, the one success of the entire lobbying effort was the deletion of criminal penalties for violation of the act.[20]

The final draft of the National Traffic and Motor Vehicle Safety Act was checked and approved by Lloyd Cutler and Ralph Nader, sitting in separate rooms while committee staff members rushed from one person to the other. This version was unanimously approved by the Commerce Committee and then by the entire Senate on June 24, 1966. The House of Representatives approved the bill on August 17, and President Johnson signed the act into law on September 9 at a formal ceremony to which Ralph Nader was not invited.[21]

The act established the National Traffic Safety Agency with the sole power of setting safety standards for new automobiles sold in the United States. When the new 1968 models were unveiled in the fall of 1967, they were not only longer, lower, wider, and more powerful, with fashionable new styling, but they also included seventeen safety features required by federal law.[22] The government regulation of automobiles which American automobile manufacturers had advocated at the turn of the century had finally come to pass, and the industry, now long used to laissez faire, would have to accomodate itself to the new situation.

NOTES

[1]Halpern, "Consumer Politics and Corporate Behavior," p. 18; House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 3.

[2]Interview with Kenneth A. Roberts, October 29, 1969; O'Connell and Myers, Safety Last, p. 214.

[3]House Committee on Interstate and Foreign Commerce, Traffic Safety, Hearings, 1956, pp. 85, 185.

[4]Ibid., p. 185; Halpern, "Consumer Politics and Corporate Behavior," p. 151.

[5]Roberts Interview; Halpern, "Consumer Politics and Corporate Behavior," pp. 11, 20, 158; House Committee on Interstate and Foreign Commerce, Motor Vehicle Safety, Hearings, 1959, p. 49; Ibid., Traffic Safety, Hearings, 1956, p. 455.

[6]Halpern, "Consumer Politics and Corporate Behavior," pp. 25, 157.

[7]Ibid., pp. 24, 25, 30-32, 39, 40; House Committee on Interstate and Foreign Commerce, Research Needs in Traffic Safety, Hearings, 1958, p. ii; Roberts Interview.

[8]Commerce Department, Federal Role in Highway Safety, 1959, pp. 103-104; Drew, "Politics of Auto Safety," p. 95; Interview with Abraham A. Ribicoff, October 30, 1969; Charles McCarry, Citizen Nader (New York: Saturday Review Press, 1972), p. 89; Robert F. Buckhorn, Nader: The People's Lawyer (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972), p. 4.

[9]Halpern, "Consumer Politics and Corporate Behavior," p. 42; James J. Flink, The Car Culture (Cambridge, Mass.: MIT Press, 1975), p. 216; Drew, "Politics of Auto Safety," pp. 96, 97.

[10]Ribicoff Interview; McCarry, Citizen Nader, pp. 56, 72, 73; Buckhorn, Nader, p. 45; House Interstate and Foreign Commerce Committee, Traffic Safety, Hearings, 1965, pt. 2, pp. 826, 851, 860-61.

[11]McCarry, Citizen Nader, pp. 72, 73.

[12]Ibid., pp. 6-7; Drew, "Politics of Auto Safety," p. 95; Buckhorn, Nader, p. 7.

[13]Halpern, "Consumer Politics and Corporate Behavior," pp. 48, 49, 50, 51; Buckhorn, Nader, p. 7.

[14]Halpern, "Consumer Politics and Corporate Behavior," pp. 52-54; Buckhorn, Nader, p. 8; Business Week, July 10, 1965, p. 26; Drew, "Politics of Auto Safety," pp. 96, 97.

[15]Business Week, July 10, 1965, p. 26; Cordtz, "Face in the Mirror at General Motors," p. 208; Drew, "Politics of Auto Safety," pp. 99, 100; Flink, Car Culture, p. 216; McCarry, Citizen Nader, pp. 82, 83.

[16]Halpern, "Consumer Politics and Corporate Behavior, p. 57; Cordtz, "Face in the Mirror at General Motors," p. 210; Drew, "Politics of Auto Safety," p. 97.

[17]McCarry, Citizen Nader, pp. 12, 19; Buckhorn, Nader, pp. 8-10, 17, 22-25, 29; Cordtz, "Face in the Mirror at General Motors," p. 210.

[18]Cordtz, "Face in the Mirror at General Motors," p. 210; Buckhorn, Nader, pp. 25, 29; Drew, "Politics of Auto Safety," p. 99.

[19]Business Week, April 26, 1966, p. 42.

[20]House Interstate and Foreign Commerce Committee, Traffic Safety, Hearings, 1966, pt. 1, p. 235; Drew, "Politics of Auto Safety," pp. 100, 101; Halpern, "Consumer Politics and Corporate Behavior," p. 164.

[21]Drew, "Politics of Auto Safety," p. 100; Halpern, "Consumer Politics and Corporate Behavior," pp. 131, 135.

[22]Flink, Car Culture, p. 217.

SELECTED BIBLIOGRAPHY

Manuscript Collections

Automotive History Collection. Detroit Public Library, Detroit, Mich.

Chapin, Roy D., Papers. Michigan Historical Collections, University of Michigan, Ann Arbor.

Davis, Francis W., Papers. Belmont, Mass.

DeHaven, Hugh, Papers. Lyme, Conn.

du Pont, Pierre S., Papers. General Motors, 624-6. Eleutherian Mills Historical Library, Wilmington, Del.

Ford Motor Company Archives. Henry Ford Museum, Dearborn, Mich.

Joy, Henry Bourne, Papers. Michigan Historical Collections, University of Michigan, Ann Arbor.

Moore, John O., Collection. New York State Department of Motor Vehicles Research Library, Albany.

Packard Corporation Group. Studebaker Collection. Syracuse University, Manuscript Collections, Syracuse, N.Y.

Peck, D. Cameron, Collection. Automotive History Collection. Detroit Public Library, Detroit, Mich.

Studebaker Collection. Syracuse University, Manuscript Collections, Syracuse, N.Y.

United States Government Documents

U.S. Congress. House. The Federal Role in Highway Safety. Letter from the Secretary of Commerce Transmitting the Report on the Investigation and Study Made to Determine What Action Should Be Taken by the Federal Government to Promote the Public Welfare by Increasing Highway Safety in the United States, Pursuant to Section 117 of the Federal Aid Highway Act of 1956. H. Doc. 93, 86th Cong., 1st sess., 1959.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Motor Vehicle Safety. Hearings before a subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, on H.R. 5389, 86th Con., 1st sess., 1959.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Motor Vehicle Safety Standards. Hearings before the Subcommittee on Health and Safety of the Committee on Interstate and Foreign Commerce, House of Representatives, on H.R. 903, H.R. 1341, and H.R. 2446, 87th Cong., 1st sess., 1961.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Research Needs in Traffic Safety. Hearing before a subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 85th Cong., 2nd sess., 1958.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Traffic Safety. Hearings before a subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, 84th Cong., 2nd sess., 1956.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Traffic Safety. Hearings before the Committee on Interstate and Foreign Commerce, House of Representatives, 89th Con., 2nd sess., 1966.

U.S. Congress. Senate. Committee on Commerce. Motor Vehicle Safety Standards. Hearings before the Committee on Commerce, U.S. Senate, on the implementation of the National Traffic and Motor Vehicle Safety Act of 1966, 90th Cong., 1st sess., 1967.

U.S. Congress. Senate. Committee on Commerce. Tire Safety. Hearings before the Committee on Commerce, U.S. Senate, on S. 1643, 89th Cong., 1st sess., 1965.

U.S. Congress. Senate. Committee on Commerce. Traffic Safety. Hearings before the Committee on Commerce, U.S. Senate, on S. 3005, 89th Cong., 2nd sess., 1966.

U.S. Congress. Senate. Committee on Government Operations. Federal Role in Traffic Safety. Hearings

before the Subcommittee on Executive Reorganization of the Committee on Government Operations, U.S. Senate, 89th Cong., 1st sess., 1965.

U.S. Congress. Senate. Committee on the Judiciary. Administered Prices. Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, 85th Cong., 2nd sess., 1958.

U.S. Congress. Senate. Committee on the Judiciary. A Study of the Antitrust Laws. Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, 84th Cong., 1st sess., 1955.

U.S. Congress. Senate. Committee on the Judiciary. Economic Concentration. Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, 89th Cong., 1st sess., 1965.

U.S. Congress. Senate. Committee on Small Business. Planning, Regulation, and Competition: Automobile Industry. Hearings before subcommittees of the Select Committee on Small Business, U.S. Senate, 90th Cong., 1st sess., 1968.

Books

American Seat Belt Council, Inc. Chronological History of Automotive Seat Belts. New Rochelle, N.Y.: American Seat Belt Council, Inc., 1964.

Anderson, Rudolph E. The Story of the Automobile: Highlights and Sidelights. Washington: Public Affairs Press, 1950.

Arthur D. Little, Inc., for the Automobile Manufacturers Association, Inc. The State of the Art of Traffic Safety: A Critical Review and Analysis of the Technical Information on Factors Affecting Traffic Safety. Cambridge, Mass.: Arthur D. Little, Inc., 1966.

Association for the Aid of Crippled Children and Consumers Union of the United States, Inc. Passenger Car Design and Highway Safety: Proceedings of a Conference on Research. New York: Association for

the Aid of Crippled Children and Consumers Union of the United States, Inc., 1962.

Automobile Manufacturers Association, Inc. Automobiles of America. Detroit: Wayne State University Press, 1968.

Black, Stephen. Man and Motor Cars: An Ergonomic Study. New York: W. W. Norton & Co., Inc., 1966.

Buckhorn, Robert F. Nader: The People's Lawyer. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

Chandler, Alfred D., Jr., ed. Giant Enterprise: Ford, General Motors, and the Automobile Industry; Sources and Readings. New York: Harcourt, Brace & World, 1964.

Clymer, Floyd, ed. Floyd Clymer's Historical Motor Scrapbook, No. 3. Los Angeles: Clymer Motors, 1946.

Curtice, Harlow H. Meeting the Challenge Ahead. New York: General Motors Corp., 1954.

DeSilva, Harry R. Why We Have Automobile Accidents. New York: John Wiley & Sons, Inc., 1942.

Doolittle, James R., ed. The Romance of the Automobile Industry. New York: Klebold Press, 1916.

Flink, James J. America Adopts the Automobile, 1895-1910. Cambridge, Mass.: MIT Press, 1970.

_____. The Car Culture. Cambridge, Mass.: MIT Press, 1975.

Ford Motor Company. Ford at Fifty. Dearborn, Mich.: Ford Motor Co., 1953.

Frankel, Lee K. The Increasing Automobile Hazard: An Address Delivered before the Association of Life Insurance Presidents at New York, Dec. 7, 1917. New York: n.p., 1917.

Furnas, Joseph C., and Smith, Ernest M. Sudden Death and How to Avoid It. New York: Simon and Schuster, 1935.

General Motors Corporation. Automobile Buyers' Guide. New York: General Motors Corp., 1954.

_____. Buick Division. Buick's First Half-Century. Detroit: General Motors Corp., 1952.

_____. Design for Safety. Detroit: General Motors Corp., 1965.

_____. Motorists' Handbook. New York: General Motors Corp., 1940.

Gillam, Cornelius W. Products Liability in the Automobile Industry: A Study in Strict Liability and Social Control. Minneapolis: University of Minnesota Press, 1960.

Hoffman, Paul G. Highway Safety--A Review and Forecast: The First S.A.E. David Beecroft Memorial Lecture, October 14, 1947. Detroit: Society of Automotive Engineers, 1947.

_____, in collaboration with Neil M. Clark. Seven Roads to Safety: A Program to Reduce Automobile Accidents. New York: Harper and Brothers, Publishers, 1939.

Indiana State Police Auto Crash Injury Research. Annual Report, 1954. 5th ed. Indianapolis: Indiana State Police, 1961.

McCarry, Charles. Citizen Nader. New York: Saturday Review Press, 1972.

National Conference on Street and Highway Safety. Ways and Means to Traffic Safety: A Summary of All Recommendations of the National Conference on Street and Highway Safety. Washington: National Conference on Street and Highway Safety, 1930.

National Safety Council. Accident Facts. Chicago: National Safety Council, 1968.

Nevins, Allan. Ford: The Times, the Man, the Company. New York: Charles Scribner's Sons, 1954.

_____, and Hill, Frank E. Ford: Expansion and Challenge, 1915-1933. New York: Charles Scribner's Sons, 1957.

O'Connell, Jeffrey, and Myers, Arthur. Safety Last: An Indictment of the Auto Industry. New York: Random House, 1966.

Palmer, Dewey H., and Crooks, Laurence E. Millions on Wheels: How to Buy, Drive, and Save Money on Your Automobile. New York: Vanguard Press, 1938.

Parlin, Charles C., and Bremier, Fred. The Passenger Car Industry: A Report of a Survey Made by Charles C. Parlin, Manager, and Fred Bremier, Assistant, Commercial Research Division, Curtis Publishing Company. Philadelphia: Curtis Publishing Co., 1932.

Pearson, Charles T. The Indomitable Tin Goose: The True Story of Preston Tucker and His Car. London: Abelard-Schuman, 1960.

President's Highway Safety Conference. Action Program. Washington: President's Highway Safety Conference, 1946.

Rae, John B. American Automobile Manufacturers: The First Forty Years. Philadelphia: Chilton Co., 1959.

Safety First League. Highway Safety. Boston: Safety First League, 1916.

_____. Safety First and the Auto. Boston: Safety First League, 1915.

Sherman, Roy W. If You're Going To Drive Fast. New York: Thomas Y. Crowell Co., 1935.

Sinsabaugh, Christopher G. Who Me? Forty Years of Automobile History. Detroit: Arnold-Powers, Inc., 1940.

Sloan, Alfred P., Jr. My Years with General Motors. Edited by John McDonald and Catherine Stevens. New York: Doubleday & Co., Inc., 1964.

Sloss, R. T. The Book of the Automobile: A Practical Volume Devoted to the History, Construction, Use and Care of Motor Cars and to the Subject of Motoring in America. New York: D. Appleton & Co., 1905.

Smith, Philip P. Wheels within Wheels: A Short History of American Motor Car Manufacturing. New York: Funk & Wagnalls, 1968.

Stevens, Arthur W. Highway Safety and Automobile Styling. Boston: Christopher Publishing House, 1941.

Stuart, Frederick, ed. Factors Affecting Determination of Market Shares in the American Automobile Industry. Hofstra University Yearbook of Business, Series 2, Vol. III. Hempstead, N.Y.: Hofstra University, 1965.

Tenney, Edward A. The Highway Jungle: The Story of the Public Safety Movement and of the Failure of "Driver Education" in the Public Schools. New York: Exposition Press, 1962.

Toops, Herbert A., and Haven, S. Edson. Psychology and the Motorist. Columbus, Ohio: R.G. Adams & Co., 1938.

Travelers Insurance Company. Motor Vehicles and Safety. Hartford, Conn.: Travelers Insurance Co., 1915.

Articles

Billings, Curtis. "The Nut That Holds the Wheel: A Primer for Motorists." Atlantic, Oct., 1932, pp. 439-45.

Boodman, David M. "Safety and Systems Analysis, With Applications to Traffic Safety." Law and Contemporary Problems, XXXIII (Summer, 1968), pp. 488-511.

Brokaw, Jim. "Ford Black Flags Racing." Motor Trend, Feb., 1971, pp. 65-67, 84.

Brown, Robert L. "Derring-Do in Detroit." Sales Management, Apr. 17, 1964, pp. 25-29.

Calhoun, Thomas A. "From Novelty To Limelight in Three Years: Triplex Safety Glass Company." Sales Management, July 13, 1929, p. 65.

Campbell, Horace E. "Deceleration, Highway Mortality, and the Motorcar." Surgery, XXXVI (Dec., 1954), pp. 1056-58.

Cordtz, Dan. "The Face in the Mirror at General Motors." Fortune, Aug., 1966, pp. 116-19.

Crider, John H. "Speed with Ease." Scientific American, Dec., 1936, pp. 330-32.

Cusick, Robert L. "State Authorities Make an Issue of Speed Advertising." Automotive Industries, Aug.

4, 1928, p. 145.

DeHaven, Hugh. "Cushion That Impact!" Public Safety, May, 1950, pp. 9-11, 27.

_____. "Mechanical Analysis of Survival in Falls from Heights of Fifty to One Hundred and Fifty Feet." War Medicine, II (July, 1942), pp. 586-96.

_____. "Mechanics of Injury under Force Conditions." Mechanical Engineering, (Apr., 1944), pp. 264-68.

Drew, Elizabeth B. "Politics of Auto Safety." Atlantic, Oct., 1966, pp. 95-102.

Dreyfuss, Henry. "The Car Detroit Should Be Building." Consumer Reports, July, 1958, pp. 351-55.

Fales, Dean A. "Design Suggestions for Safety." Automotive Industries, June 15, 1940, p. 563.

Furnas, J. C. "--And Sudden Death." Reader's Digest, Aug., 1935, pp. 21-26.

Graham, George M. "Safeguarding Traffic: A Nation's Problem--A Nation's Duty." Annals of the American Academy of Political and Social Science, CXVI (Nov., 1924), pp. 174-75.

Halpern, Paul J. "Consumer Politics and Corporate Behavior: The Case of Automobile Safety." Ph. D. thesis in Government, Harvard University, 1972.

Humphrey, Seth K. "Our Delightful Man-Killer." Atlantic, Dec., 1931, pp. 724-30.

Jaderquist, Eugene. "The Horsepower Race." Atlantic, June, 1954, pp. 56-58.

Kaiser, Edgar F. "We Chose Safety over Horsepower." Cars, June, 1953, pp. 24-26, 78.

Klein, David, and Haddon, William, Jr. "The Prospect for Safer Autos: The Proposed Specifications for Government Bought Cars Raise Hopes and Questions Alike." Consumer Reports, Apr., 1965, pp. 176-81.

Leighton, George R., and Nicholson, Joseph L. "Has the Automobile a Future?" Harper's, June, 1942, pp. 63-73.

Moynihan, Daniel P. "Epidemic on the Highways." Reporter, Apr. 30, 1959, pp. 16-23.

Nader, Ralph. "Fashion or Safety: Detroit Makes Your Choice." Nation, Oct. 12, 1963, pp. 214-16.

Price, C.W. "Automotive Industry Should Lead in Safety Movement." Automotive Industries, Dec. 13, 1923, p. 1189.

Quinn, Hugh. "Abernathy's Plea To Eschew Speed Appeal Unlikely To Affect Auto Ads." Advertising Age, Jan. 28, 1963, p. 10.

"Research on Crash Injuries." Journal of the American Medical Association, June 8, 1946, p. 524.

Rickenbacker, Edward V. "Why Your Car Is Safe." Collier's, Nov. 6, 1937, pp. 15-17.

"Safety." Consumer Reports, May, 1954, pp. 210-11.

"Safety Foundation Formed." Automotive Industries, June 5, 1937, p. 825.

Sheldon, C. Hunter. "Prevention, The Only Cure for Head Injuries Resulting from Automobile Accidents." Journal of the American Medical Association, CLIX (Nov. 5, 1955), pp. 981-86.

Shidle, Norman G. "All This Talk abcut Speed." Automobile Industries, June 18, 1927, pp. 925-27.

Sinks, Alfred H. "Those Big Fat Cars: Detroit's Big Package and How It Grew." Harper's, Apr., 1959, pp. 56-64.

Tremulis, Alex. "Epitaph for the Tin Goose." Automobile Quarterly, IV (Spring-Summer, 1965), pp. 56-60.

"Wanted: Some Speedy Action on Speed Advertising." Printer's Ink, Oct. 6, 1927, pp. 94, 96.

"What's Become of the Engineers?" Consumer Reports, May, 1953, pp. 218-19.

Woodward, Fletcher D. "Medical Criticism of Modern Automotive Engineering." Journal of the American Medical Association, CXXXVIII (Oct. 30, 1948), pp. 627-31.

Yahraes, Herbert. "How We Can Have Safe Cars." Collier's, Jan. 10, 1953, pp. 16-17.

Periodicals

Advertising Age. Feb. 25, Nov. 1, 1938; Sept. 19, 1960; June 18, 1962; Mar. 11, July 22, 1963; May 17, Dec. 13, 1965.

Atlantic. Nov., 1908; June, 1932; Feb., 1958; July, 1965.

Automotive Industries. 1919-1966.

Business Week. Feb. 17, 1932; Jan. 11, 1936; Nov. 22, 1947; Sept. 12, 1953; Sept. 22, 29, 1956; July 20, 1957; Mar. 9, 1963; July 10, 1965; June 11, 1966; Sept. 14, 1968.

Collier's. Jan. 6, 1912; June 6, 1925; Mar. 14, 1931; July 25, 1936; Nov. 6, 1937; May 6, 1939.

Consumer Reports. Oct., 1950; Aug., 1952; May, 1953; May, 1955; Apr., 1956; Apr., 1957; Sept., 1963; Apr. 1965; Apr. 1966.

Consumers Research Bulletin. Nov., 1951; Apr., Nov., 1952; June, 1954; Jan., Oct., 1956; Aug., 1962; Sept., 1963; Nov., 1966.

Literary Digest. July 1, 1922; Feb. 3, 1923; Jan. 10, Apr. 25, May 16, Oct. 17, 1925; May 26, 1926; Aug. 20, 1932; Jan. 13, 1934; Oct. 24, Nov. 14, 1936.

Nation. Oct. 10, Dec. 12, 1907; Aug. 27, 1930; Dec. 22, 1956; Apr. 11, 1959; July 23, 1960; Sept. 27, 1965.

National Safety News. Oct., 1930; Mar., Dec., 1935; Jan., 1936.

National Underwriter. Mar. 2, 1944; Aug. 30, 1945; Dec. 6, 1956; Nov. 25, 1966.

Newsweek. June 14, 1948; Apr. 13, 1953; Sept. 19, 1955; Sept. 24, 1956; May 1, 1961; July 26, 1965; Apr. 6, 1970.

Outlook. Aug. 25, 1906; Jan. 2, Apr. 17, May 29, 1909; Sept. 30, 1911; Mar. 24, 1926; Apr. 27, 1927.

Popular Mechanics. Oct., 1920; Oct., Dec., 1922; Aug., 1923; Aug., 1934.

Printer's Ink. Dec. 29, 1921; July 21, Sept. 1, 1927; May 3, 1928; Nov. 7, Nov. 21, 1958; Aug. 17, 1962; July 8, 1966.

Safety Engineering. Apr., 1932; Sept., 1933; Nov., 1934; Feb., Nov., Dec., 1936; Apr., 1937; Jan., Mar., 1938.

Sales Management. Jan. 8, 1927; Mar. 3, 1928; Jan. 15, 1936; Apr. 17, 1964.

Science Digest. June, 1953; Sept., Oct., 1956; Sept., 1957.

Scientific American. Nov. 9, 1907; Oct. 15, 1910; July 29, 1911; Jan. 6, 1912; July 18, 1914; May 1, Sept. 25, 1915; Apr. 22, July 8, 1916; Feb. 26, June 11, 1921; Oct., 1922; Dec., 1923; July, 1924; Oct., 1931; Sept., 1932; Nov., 1933; Aug., 1936; Apr., 1937; Jan., 1938.

Time. May 20, 1946; Sept. 21, Oct. 19, Dec. 14, 1953; Jan. 17, Apr. 18, 1955; Dec. 10, 1956; Jan. 28, 1957; Apr. 19, 1963; Jan. 24, 1964; Oct. 1, 1965; Apr. 1, 1966.

Weekly Underwriter. Nov. 12, 1938; July 3, 24, Oct. 23, Sept. 4, 1954; Apr. 27, 1957.

INDEX