

SAFETY SELLS: Market Forces and Regulation in the Development of Airbags

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CHAPTER 2: Getting to the First Automatic Occupant Crash Protection Standard: 1966-1970

The legislative history of the 1966 National Traffic and Motor Vehicle Safety Act never explicitly mentioned passive restraints. Still, in the first four years after its enactment, passive restraints — usually identified in the media with airbags — became the most controversial issue in the administration of that law.

It was a time of large scale unrest in the United States, specifically over the Vietnam War and race relations. A counterculture arose among college-age people and even teenagers that engendered a widespread distrust of established institutions, especially business. Consumerism, which had scored its most notable victory with the surprising passage of the 1966 law, was one of the milder, but possibly most influential and enduring, forms of that distrust. From now on, Ralph Nader and his allies and imitators would produce a steady flow of inquiries and charges about the safety and quality of American products and services. The automobile would never be far from the center of these concerns.

The passage of the first federal law specifically regulating its product showed that the American automobile industry was not politically all powerful. But its financial strength still seemed unshakable during these years. New car sales showed a long-term rise, with many short-term variations. Sales in 1966 were only slightly below the all-time high of 1965. In 1967 they fell 5.5 percent, but in 1968 they rebounded 15.8 percent and were essentially unchanged in 1969. A UAW strike against General Motors in 1970 contributed to a 12.3 percent decline in 1970 sales, while 1971 saw a 22 percent increase. The flaw in this apparently strong performance was the fact that domestic manufacturers' sales during this period never went above their 1965 high while import sales nearly tripled.¹ Nevertheless, the Big Three were still very big, and their defenses against regulation did not include the need for financial relief. But toward the end of this period the automobile insurance industry did begin to see federal auto safety regulation as one way of stemming the inflation in insurance premiums. Insurers started to move away from their traditional reluctance to challenge the automobile establishment.

In the middle of this four year-period, Lyndon Johnson felt obliged not to run again for the presidency, mainly because of the split in his own party caused by the Vietnam War. Spending on the war was also causing inflationary pressures that became obvious in 1968. Richard Nixon defeated Hubert Humphrey, but the Republican did not win by a landslide vote. Although the new administration had a more pro-business vocabulary than its predecessor, it did not begin with sweeping plans for deregulation.

1. U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States, 1990*, U.S. Government Printing Office, Washington, D.C., 1990, p.604. Cf. *The New York Times*, January 5, 1966, p.39; January 9, 1967, p.68; January 4, 1968, p.47; January 4, 1969, p. 39; January 7, 1970, p.55.

In fact, one of the pioneers of automobile safety legislation, Daniel P. Moynihan, joined Nixon's White House staff and played an occasional role in encouraging the development of passive restraints.

The Original Occupant Crash Protection Standard: Seat Belts

On October 15, 1966, President Johnson nominated Dr. William Haddon, Jr., to be the first director of the agency formed to administer the National Traffic and Motor Vehicle Safety Act. The agency was provisionally in the Department of Commerce, but when the Department of Transportation was officially formed in 1967, it was transferred to that department and became the National Highway Safety Bureau. During this period it was under the Federal Highway Administration. Early in 1970, Secretary of Transportation Volpe made the director of the bureau report directly to him, and later in the year Congress changed its name to the National Highway Traffic Safety Administration. To avoid confusion, that name or its initials, NHTSA, will be used throughout this study, except in references.

Haddon was confirmed without controversy. His most demanding and immediate task was to meet the requirement of the 1966 law that initial "interim" Federal Motor Vehicle Safety Standards (FMVSS) be issued by January 31, 1967, based on existing — mainly Government Services Administration — standards for federal vehicles. To do this with sufficient time for public comments, preliminary standards had to be published by November 30, 1966. Haddon met these deadlines, but there were loud complaints from Ralph Nader and his colleagues that the standards merely reflected what the manufacturers wanted. One of the early supporters of the idea of auto safety standards, William Stieglitz, protested the proposals by resigning as a NHTSA consultant. The domestic automobile manufacturers, on the other hand, complained that the standards were too tough on them compared with foreign companies. Haddon answered Stieglitz and Nader by noting that the law required him to issue "reasonable and practicable" standards, and that he had gone as far as existing information allowed.²

There was not much public discussion of another issue raised by the new standards, the conflict between the requirements that they be based on existing standards and that they be performance rather than design standards. Haddon tried hard to adapt existing standards to performance standards but was not always successful.³ For example, one of the new standards was Federal Motor Vehicle Safety Standard (FMVSS) No. 208, Seat Belt Installations. Lap belts had been included in the front seats of passenger cars since the beginning of 1964. The new standard required lap and upper torso restraints (called "shoulder harnesses" in the press) in the front outboard seats and lap belts in all other positions. This definitely was a design standard.

2. *New York Times*, February 1, 1967, p. 1, February 2, 1967, p. 32, and February 3, 1967, p. 1. See also *Motor Vehicle Safety Standards*, Hearings Before the Committee on Commerce, United States Senate, 90th Congress, First Session, March 20 and 21, 1967.

3. U.S. Department of Commerce, National Traffic Safety Agency, *Report on the Development of the Initial Federal Motor Vehicle Safety Standards Issued January 31, 1967*. Washington, D.C., March 17, 1967, p. iii.

There are no precise legal or other criteria for deciding when a performance standard begins to have design overtones. For example, a requirement for the installation of seat belts forces the use of one *design* solution to the general problem of occupant restraint. In this case, there has not yet been enough medical and engineering research to enable anyone to write an occupant restraint standard in more general, performance-based terms, indicating the forces to be applied by any means to restrain the body, avoiding mention of belts or other devices for achieving this. As a result, in the seat belt standard and others, the Agency incorporated some design overtones in the standards to make certain that the desired performance would be achieved.⁴

Some manufacturers, like Chrysler, complained that they could not gear up shoulder belt production before the beginning of the 1968 model year. But the shoulder belt requirement was seriously challenged in August 1967 when General Motors brought to NHTSA crash test films of unbelted rear-seat occupants who were shown being hurled forward in high-speed crashes to hit the heads of front-seat occupants restrained by shoulder belts. All major American manufacturers then announced that they would not install shoulder harnesses in their early 1968 model year cars, which would be produced before the standard actually came into force. Haddon appealed for performance data on shoulder belts. Volvo had been installing shoulder belts since 1959 and produced a study of 28,000 Swedish crashes. There had been no deaths in crashes under 60 mph when the belts were used, but there were deaths at speeds as low as 12 mph among unbelted occupants.⁵

The Volvo study estimated that its three-point belts had been used by only about 25 percent of drivers and 30 percent of front-seat passengers, and that 20-year-old drivers used the belts in 16 percent of cases while 45 year-olds were belted in 30 percent of cases.⁶ This level of three-point belt use in Sweden was higher than estimates of American lap-belt use, estimated at about 15-20 percent.⁷ NHTSA summarized the data by saying that a third of the motoring population claimed to wear lap belts when available, but visual checks reduced this to a fifth.⁸

Belts had to be actively fastened, and many car users found them cumbersome. In the Senate hearings on the initial safety standards, Senator Norris Cotton asked whether adding shoulder belts would

4. *Ibid.*, pp. 6-7. See also p. 83.

5. N.I. Bohlin, Passenger Car Engineering Department, AB Volvo, "A Statistical Analysis of 28,000 Accident Cases with Emphasis on Occupant Restraint Value," *Proceedings*, 11th Stapp Car Crash Conference, October 1967, Society of Automotive Engineers, New York, 1967, pp.455-478. For background, see comments by Haddon, *ibid.*, p. 3, and by Joan Claybrook, "Motor Vehicle Occupant Restraint Policy," National Academy of Sciences, *Conference on Risk Assessment*, June 1, 1981, pp.7-8. Also, see *New York Times*, August 22, 1967, p.41, August 23, 1967, p.51, August 24, 1967, p.28, and October 10, 1967, p.20.

6. *Ibid.* pp.475, 477.

7. Richard G. Snyder, Joseph Young, Clyde C. Snow, "Experimental Impact Protection with Advanced Automotive Restraint Systems: Preliminary Primate Tests with Airbag and Inertial Reel/Inverted-Y Yoke Torso Harness," *Proceedings*, Eleventh Stapp Conference, Society of Automotive Engineers, N.Y., 1968, p. 408.

8. National Highway Safety Bureau, "Crash Injury Reduction," May 2, 1969, a document printed in *Motor Vehicle Safety-1969*, Hearings Before the Committee on Commerce, United States Senate, 91st Congress, First Session, April 14 and 15, 1969, p.257.

not compound this problem. Haddon's answer was that they were a proven safety device, which could not in good conscience be kept out of the standard. He said he hoped that experience would lead to increased usage, adding:

We would far prefer to adopt only standards that pose no [usage] problem to anyone and that do not require any active cooperation on the part of the user. This is the approach, after all, which has been used in public health going back 50 and 100 years with such programs as pasteurization of milk, chlorination of water supplies, and so forth.... Unfortunately the state of the art, or rather the state of the technology in the highway safety field, is not quite that far along with respect to so-called restraint systems.⁹

The Airbag Issue Emerges

The airbag officially came to the attention of NHTSA in the spring or early summer of 1968, when Eaton, Yale, and Towne, a major supplier to the auto industry, gave a demonstration to Dr. Robert Brenner, deputy director of NHTSA. By then there had been at least 16 years of design and development of the concept. After the 1952 patent given to J.W. Hetrick, a 1953 patent was filed by R.W. Hodges for an airbag stored in the instrument panel to protect front-seat occupants. A 1955 patent was filed by H.A. Bertrand for inflatable bags to restrain everyone in the car, and that same year P.M. Maxwell patented the concept of an airbag trigger. By 1957 Ford was working on the concept, but apparently got no further than identifying the major problems, namely a trigger and gas that could inflate in the 40 milliseconds between the instant of the crash and the occupant's collision with the interior of the vehicle. In 1960 General Motors also did some work on the subject.

Serious developmental work began about 1964. Dr. Carl Clark, then at Martin Aircraft, presented a paper, along with two collaborators, to the 8th Stapp Car Crash Conference, reviewing work he had begun under contract to NASA on pre-inflated airbags in commercial aircraft. The paper ended with a suggestion for a similar device in automobiles that might be inflated by the driver, by abrupt braking, or by bumper contact.¹⁰ Eaton began working on the concept about the same time, testing a pre-inflated system in April, 1966. A month earlier Ford had become convinced that there was enough progress on the transfer of high pressure gas to justify a joint project with Eaton. Together they demonstrated the feasibility of transferring the high pressure gas to a low pressure airbag.¹¹ In 1967, Ford and Federal Aviation Agency researchers reported that baboons survived sled run impacts as high as 57 Gs without gross trauma when restrained by pre-inflated Eaton airbags, but that 40 Gs were fatal with the inertial

9. *Motor Vehicle Safety Standards*, p.112.

10. Carl Clark, Carl Blechschmidt, Fay Gordon, "Impact Protection With the 'Airstop' Restraint System," *8th Stapp Car Crash and Field Demonstration Conference*, Lawrence M. Patrick, ed., Wayne State University Press: Detroit, 1966, pp. 79-113.

11. Stuart M. Frey, "History of Airbag Development," in Department of Transportation, *International Conference on Passive Restraints*, May 11-12, 1970. Sponsor: North Atlantic Treaty Organization. Co-Hosts: U.S. Department of Transportation/U.S. Automobile Industry. General Motors Proving Grounds, Milford, Michigan, p. 26.

reel/inverted Y-yoke torso harness.¹² In January 1968, Eaton and Ford engineers presented a paper to the Society of Automotive Engineers outlining the airbag concept. An inflatable cushion, stowed folded behind the front instrument panel, would be inflated in a frontal collision by a sensor activating a detonator that released high pressure gas. The airbag would keep the driver and right front-seat passenger in place, dissipating 90 percent of the deceleration forces. Automatic upper torso restraint seemed feasible, but, according to the authors, the system still required lap belts for secondary or multiple impacts. Sensors had to be developed to signal within 20 milliseconds of a crash, and the ability of occupants to withstand the noise and pressure levels caused by the bag's detonation had to be shown. Reliability and serviceability also had to be dealt with. Nevertheless, the results of 42 high-G sled tests and one test into a crash barrier:

showed possible levels of survivability unapproached by any other known restraint system and indicated that potential solutions to the many problems of applying this system to the high production automobile may be found.¹³

This led *The New York Times* to carry a story in its January 14, 1968, edition on "A balloonlike airbag [that] could increase survival in automobile crashes by 50 per cent..." A spokesman for Eaton was cited as hoping that the system could be ready in three or four years, but a Ford spokesman said ten years was more likely. Eaton engineers were quoted as saying they hoped to develop other inflators at the side and top of the car to protect against nonfrontal crashes.¹⁴

On July 19, 1968, Haddon convened a meeting on airbags that had been requested by Eaton, Yale, and Towne to discuss four human factors:

1. effect of airbag deployment noise on the human ear,
2. pressure of the airbag impacting an out-of-position occupant,
3. testing with human volunteers to establish the correlation with test dummies,
4. driver reaction to inadvertent deployment.

Besides Eaton and NHTSA staff members, there were representatives present from American Motors, Chrysler, Ford, and General Motors. In his brief introduction, Haddon recalled his long-standing preference for passive safety measures.

[A] passive approach is, generally speaking, almost invariably far superior to any one that requires cooperation of drivers, or pedestrians, no matter what their competence might be... [T]he general area of passive devices is the way to go whenever possible... Also, we think with respect to the specific approach — although not necessarily the specific gadgets being discussed here — that the general approach of airbag restraint... is extremely promising from many, many standpoints, and is one to be furthered, if at all

12. Richard G. Snyder, Joseph Young, Clyde C. Snow, "Experimental Impact Protection with Advanced Automotive Restraint Systems: Preliminary Primate Tests with Airbag and Inertial Reel/Inverted-Y Yoke Torso Harness," *Proceedings*, 11th Stapp Conference, October 10-11, 1967. Society of Automotive Engineers, N.Y., 1968.

13. R.M. Kemmer, R. Chute, D.P. Hass, W.K. Slack, "Automotive Restraint System," SAE Paper 680033, January 8-12, 1968, p.9. See also Stuart M. Frey, Chief Body Engineer, Ford Motor Company, "History of Airbag Development," *International Conference on Passive Restraints*, May 11-12, 1970, pp. 23-28.

14. Quoted by Graham, from "Steel," December 30, 1968 pp. 9-10, as quoted in Graham, op cit. p. 56

possible... In fact, as far as I am personally concerned, after clearing up the side structure and head area and windshields, this is clearly, in my opinion, the highest priority that the industry and the Government and anyone else concerned with highway safety should have.¹⁵

The bulk of the meeting was a technical, collegial discussion of how to achieve solutions to the problems, with most attention paid to the noise issue. But at one point, with the issue of passivity obviously in mind, Haddon asked whether any of the work involved eliminating lap belts. One of the Eaton representatives answered that the shoulder harness could be eliminated but lap belts were still needed because of rollover crashes and impacts that were not head-on. Haddon commented:

[F]rom our standpoint, while we were very impressed with the reduction in death and injury you can get in the lap and shoulder harness, we recognize that not everybody cares for the shoulder harness, in particular... because... these are not always designed to be particularly comfortable. They have to be designed for people of different heights and weights, and so forth, that we would be very, very delighted, indeed, to see any such substitute for the shoulder harness, even if we would have to stay with a lap belt.¹⁶

One participant, Professor L. Patrick, a Wayne State faculty member, commented that airbags would be useful even for unbelted occupants since the majority of cars in crashes do not roll over. Haddon also was concerned about the need for real-world testing.

[W]e should pay extremely careful attention to avoiding a forced introduction of an approach before it has been completely evaluated.¹⁷

For all his interest in the development of airbags, Haddon did not volunteer to do any of the work in his bureau or to support any of it financially. His resources had been severely limited by budget constraints, but Joan Claybrook, who was Haddon's special assistant at the time, says he felt that developing technology was industry's function and that the agency should be an evaluator and standard writer.¹⁸ Both the Ford and General Motors representatives remained cautiously cooperative. Eaton was clearly leading the charge.

The First Steps Toward Standards Involving Airbags

During the rest of 1968 and throughout 1969, developmental research on airbags continued. Eaton worked with all the major American manufacturers, but other possible suppliers like Rocket Research, Thiokol, and Olin Mathieson also entered the field. The first airbag sled tests with human volunteers were held at Holloman Air Force Base. Haddon resigned in February 1969 at the request of John Volpe, Nixon's new transportation secretary.

15. "Proceedings," U.S. Department of Transportation, National Highway Safety Bureau, of Meeting on July 19, 1968, a typescript in the files of the Insurance Institute for Highway Safety, pp.4-5.

16. Ibid., p.41.

17. Ibid., p. 57.

18. Interview with Joan Claybrook, September 13, 1993.

For most of 1969 Robert Brenner was acting director of NHTSA, and he continued to give moral support to airbags. On April 14, 1969, he told the Senate Commerce Committee that airbags could be the answer to the vulnerability of very small cars in crashes with larger, heavier autos. This was a very brief comment in extensive testimony at an oversight hearing, but *The New York Times* took it as an occasion to review Eaton, Yale, and Towne's technology and to say that Ralph Nader found it exciting.¹⁹ NHTSA later submitted to the committee a document dated May 2, 1969, that gave a comprehensive review of seat restraint systems. Starting from an explanation of the difference between active and passive systems and the low usage of current active (belt) systems, it went on to describe the levels at which minor to moderate injuries would be experienced by a 200-pound man in a 30 mph crash. Although test data were limited, the paper gave estimates of 40 Gs for lap and shoulder belts and 80 Gs for airbags. After describing how the airbag worked in a frontal crash, and acknowledging the challenges of side crashes, the agency said it "anticipated that a first generation airbag type seat-restraint system will be installed in most 1972 model year and in some 1971 model year cars."²⁰

John Volpe was a liberal Republican who had been governor of Massachusetts. He was sympathetic to the death- and injury-reducing goals of federal auto safety regulation, but he was also, at first, skeptical of airbag technology. According to Joan Claybrook, the staff that remained after Haddon's resignation were convinced that airbags were the most important issue on the agency's agenda, and they feared that Frank Turner, the Federal Highway Administrator to whom Brenner now reported, did not share their enthusiasm. In the late spring of 1969, they arranged for the leadership of the National Motor Vehicle Safety Advisory Council to request a presentation on the subject at a time when Volpe would be present. When the presentation was made, complete with test films, Volpe immediately saw both the life-saving potential of airbags and their popular appeal.²¹ By June 17, *The New York Times* was reporting that Volpe was backing the use of airbags.²² He approved taking the first step in the regulatory process, the issuance of an Advanced Notice of Proposed Rulemaking (ANPRM) on June 26, 1969.

The ANPRM, as published in the *Federal Register*, had a title, "Inflatable Occupant Restraint Systems," that emphasized design rather than performance standards, an emphasis that permeated the existing occupant restraint standards FMVSS 208. The discussion in the notice became more general when it said that the Administrator:

19. *Motor Vehicle Safety-1969*, Hearings Before the Committee on Commerce, United States Senate, 91st Congress, First Session, April 14 and 15, 1969, p. 118; *New York Times*, April 20, 1969, p.92. Attached to Brenner's prepared statement, in supplementary data to support the authorization request for 1970 and 1971, was this sentence: "...efforts will be continued to develop more effective seat restraint standards equivalent to the airbag device which together with energy absorption design hold the promise of a major breakthrough in injury prevention." *Op.cit.*, p.43.

20. *Op.cit.*, pp.257-259.

21. Interview with Joan Claybrook, September 13, 1993. According to Robert Brenner, essentially the same presentation was given by Robert Carter to the August 27 public meeting; Federal Highway Administration, *Transcript of Proceedings, Meeting on Inflatable Occupant Restraint Systems (Airbags)*, August 27, 1969, p.8.

22. *New York Times*, June 17, 1969, p.49.

is considering the issuance of a Federal Motor Vehicle Safety Standard requiring the installation of, and specifying performance standards for, inflatable occupant restraint systems or other passenger occupant restraint systems which provide comparable protection in passenger cars, multipurpose vehicles, trucks, and buses.

The value of safety belts had been proven, the notice said, but few vehicle occupants were using them. Hence the need for “the prompt development and installation of passive restraint systems.” The airbag was “one very promising system, now in its final development stages.”

A device such as the airbag has enormous advantages over traditional restraint systems. It is automatic. It distributes the heavy loads generated in motor vehicle crashes over a large area of the body enabling occupants to experience much higher crash forces without injury. It cushions occupants during the crash.²³

For these reasons, and at the urging of the National Motor Vehicle Safety Advisory Council, a standard was being considered that required the installation of some sort of passive restraint “as soon as possible, and not later than January 1, 1972.” Comments and data were invited, within 90 days, on crash conditions for deployment, deployment and deflation times and positions, biomechanical standards such as loads on various human body parts, changes to be made in other standards, design considerations like reliability and serviceability, and environmental issues, costs, and production timing.²⁴

A later notice called for a public meeting on the issues raised in the ANPRM. It was held on August 27-28, 1969, with Acting Director Robert Brenner presiding. Dr. Robert Carter, a biodynamicist at NHTSA, gave the first presentation. After some generalities about the applied physics of force management, he concentrated almost entirely on airbags, noting that the airbag was “the most promising restraint system that we have seen to date,” a phrase that became a NHTSA cliché. Carter continued:

The airbag has two major advantages, as Dr. Brenner points out. It is a passive system. Therefore we have essentially 100 percent of the people experiencing crashes using their restraint. In addition to that, it provides an excellent load distribution of the forces over the body, which in turn will enable us to go to high total crash force or high G without injury.²⁵

The noise problem, a major theme at the July 1968 meeting, now seemed to Carter to have been solved. Ninety-one people had been tested at Wright-Patterson Air Force Base with an oversize airbag that was deployed in a Rambler. There was no damage or pain to ear drums. As for the inadvertent deployment issue, Carter reported that to date there had been none in road tests, and even when airbags were deployed at inappropriate times, drivers had had no problem handling their vehicles. Answering

23. Department of Transportation, Federal Highway Administration, [Docket No. 69-7; Notice No. 1], “Inflatable Occupant Restraint Systems,” Advanced Notice of Proposed Rule Making, *Federal Register*, July 2, 1969, vol 34, p. 11148.

24. Department of Transportation, Federal Highway Administration, [Docket No. 69-7; Notice No. 1], “Inflatable Occupant Restraint Systems,” Advanced Notice of Proposed Rule Making, *Federal Register*, July 2, 1969, vol. 34, p. 11148.

25. Federal Highway Administration, *Transcript of Proceedings: Meeting on Inflatable Occupant Restraint Systems (Airbags)*, August 27, 1969, pp.17,24.

those who feared that deployment forces would injure occupants, Carter said that in 40 sled tests with humans the most serious injury had been a bloody nose.²⁶

Although Carter noted in his presentation that there were still very limited data on airbag performance, none of the potential suppliers gave significant additional data in their presentations. Eaton, Olin Mathieson, Atlantic Refining, and others gave what were essentially sales presentations. Representatives of the American Automobile Association and the American Safety Belt Association professed neutrality, but raised again all the problems that Carter had tried to minimize. They made it clear that any action would be premature until all the problems were solved and reliability was established by substantial real-world testing. In fact, the safety belt manufacturers felt that “airbags at best can be and should be a complement for seat belts.”²⁷

Some independent researchers gave cautious support to airbags. Reporting on work at the Highway Safety Research Institute of the University of Michigan, Vernon Roberts said they would not campaign for or against the use of airbags, but in crash simulations with a 50th percentile male dummy, an inflated restraint system showed some improvement over the lap and shoulder belt combination. Although the lower torso could slide under the bag, Roberts said a change in airbag geometry could remedy this.²⁸ Wayne State Professor Lawrence Patrick drew on work he had done for Chrysler, where he concentrated on identifying problem areas, especially airbags mounted in steering wheels. With the airbag the same dimension as the steering wheel, nonlife-threatening fractures, were caused to the cadaver of a 76-year-old man hitting the wheel. Patrick also was concerned about the possibility that the gas used for inflation might vent in dangerous concentrations and that eyeglasses might become hazardous during bag deployment. But on the whole, he felt that the potential for reducing injury with airbags was high:

Frankly, I think that the development is in a state where we are not ready yet to put it into a car. But I'm quite sure that in a matter of a few years that the airbags will be used and that we will look back and say it is hard to believe that in a meeting such as this there was a large amount of opposition to such a device.²⁹

The three largest auto manufacturers gave extensive testimony supporting the concept of airbags, but stressing unsolved problems and the need for much more testing and development. Chrysler stressed the need for a broad vehicle standard based on objectively measurable criteria, but was also concerned both about product liability and consumer acceptance. The Ford presentation included all these points, but emphasized that it was working with Eaton to offer airbags in the right-front compartment of one of its standard models. A week earlier the press had carried a story citing Ford engineers predicting that 1971 model Mercurys would have such an airbag available.³⁰ This was part of a program aimed at real-world

26. *Ibid.*, pp. 20-25.

27. For the American Seat Belt Association, see *ibid.*, pp.69-72; for AAA see pp.109-116.

28. *Ibid.*, pp.89-97.

29. *Ibid.*, p.163. Patrick's statement is on pp.147-164.

30. *New York Times*, August 22, 1969, p. 70.

testing, but there were so many outstanding issues that Ford felt delaying the standard would be prudent. In any case, a lap belt would still be needed to prevent ejection. General Motors started its presentation with a similar, but more graphic list of problems, including a 5th percentile unbelted female dummy sliding completely under a bag in a crash, and a six year-old child dummy, resting against the instrument panel, being blown back with lethal force by the exploding bag. Although at the present state of the art lap belts were still needed, General Motors concluded that “a totally passive restraint system offers the greatest promise for increased occupant protection,” and said it was accelerating its airbag work.³¹ Meanwhile, representatives of Volkswagen and Mercedes-Benz said flatly that they could not meet the proposed 1972 deadline.

The day of his presentation, Stuart Frey, Ford’s representative and chief body engineer, attempted to demonstrate outside the meeting hall the deployment of an airbag, but when he pushed the button nothing happened. Ford’s embarrassment got national media coverage.³² In contrast, shares of Eaton, Yale, and Towne, the leader in airbag development, reached a new high in the stock market at the end of August, buttressed by *Automotive News*’ prediction that airbags would be required in all 1972 model cars.³³ Patents on Eaton’s airbag system had recently been granted to two of its engineers. In October it acquired a facility where it could produce pilot airbag systems for its customers, who now included the four largest American automakers and some foreign ones.³⁴

The First Proposed Standard for Passive Restraints

Comments received by NHTSA on the ANPRM repeated the positions taken in the August 1969 meetings. All foreign manufacturers joined the domestics in appealing for more time.³⁵ Possibly because of these pleas there was a fairly long delay in taking the next step, publishing a Notice of Proposed Rulemaking (NPRM). During much of this time, NHTSA had no permanent administrator. Some candidates had refused to be considered because of the position’s subordination to the Federal Highway Administration. According to Joan Claybrook, who was then working at NHTSA, Volpe wanted to be sure that the new administrator had a positive attitude toward airbags. He found his candidate in Douglas W. Toms, Washington State’s director of motor vehicles. Toms was a Republican who had been trained in the graduate traffic safety program at the University of Michigan and had done serious research on the subject. Volpe asked him to review NHTSA’s organization. When Toms proposed that the agency report

31. Federal Highway Administration, *Transcript of Proceedings: Meeting on Inflatable Occupant Restraint Systems (Airbags)*, August 28, 1969, p.213. For Ford, see *ibid.*, pp.233-240. The Chrysler presentations are in the previous day’s transcript, pp.127-146.

32. *New York Times*, August 29, 1969, p.58.

33. *New York Times*, August 31, 1969, section III, p.2.

34. Graham, *op.cit.*, p. 43.

35. National Transportation Safety Board, *op.cit.*, p.10.

directly to the secretary, his recommendation was accepted, and he was offered the position. His appointment was announced in December.³⁶

Toms issued the first NPRM for passive restraints on May 5, 1970.³⁷ The proposal delayed the passenger car passive restraint standard for a year from the January 1, 1972, date mentioned in the ANPRM, but in other respects was quite demanding. Protection was required for all positions and essentially for all types of crashes. For 1972, new cars without passive restraints would need improved lap and shoulder seat belts.

The notice reviewed again the low belt use rates. But it noted that a promising alternative to seat belts had emerged in the form of airbags, which would dramatically reduce highway deaths and serious injuries.

Most important (sic!), these systems are 'passive,' in that they require no prior effort by vehicle occupants. Similar basic passive protection may now also be achieved by other means such as deployable nets, extensive use of modern energy-absorbing materials on interior contact surfaces or combinations of these systems.

The notice also said that the highway death rate of over 50,000 per year and the even higher annual injury rate meant that:

improved passive crash protection must proceed with all possible speed. It is recognized that the effective dates proposed will make extensive demands on the resources of the automobile industry and its suppliers, and that to some extent they will require changes in the normal model-change and model year schedules of the industry. The costs of accelerated introduction of passive protection systems will, however, be far outweighed by the savings in lives and injuries. Any delay beyond the earliest possible dates by which basic protection can practicably be provided would therefore be unconscionable.

During 1972 new passenger cars could, as noted above, have either passive restraints or improved seat belts. The passive protection requirements were for all seating positions in a 30 mph frontal fixed barrier crash. Active systems would have to restrain both pelvis and upper torso without separate action. Seat belts, if used, had to meet detailed specifications like having integrated lap and shoulder belts and inertial reels, which allow belts to move freely under normal conditions but lock up in crashes.

On or after January 1, 1973, passenger cars would be required to meet the frontal crash test, and in addition a lateral impact test and a rollover test, by means requiring no action by vehicle occupants.

In each of the three crash modes noted above, the occupant could not be ejected from the vehicle.

36. Claybrook interview, June 21, 1993; Graham, op.cit., pp.42-43; New York Times, November 27, 1969, p. 74 and December 6, 1969, p. 20.

37. National Highway Safety Bureau, [Docket No 69-7; Notice 4] "Occupant Crash Protection; Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses, Notice of Proposed Motor Vehicle Safety Standard," *Federal Register*, volume 35, May 7, 1970, pp. 7187-7189.

Because development of passive protection systems had been concentrated on passenger cars, trucks of less than 10,000 pounds gross vehicle weight and multipurpose passenger vehicles had until January 1, 1974, to provide passive protection for all seating positions. But by January 1, 1972, those vehicles without passive protection systems had to provide seat belts in all seating positions, including upper torso restraints. Seat belt assemblies would be required at each seat in larger trucks and at the driver's position in buses.

The notice gave detailed criteria for measuring injury thresholds on anthropometric dummies that met Society of Automotive Engineers (SAE) Recommended Practice J963, along with a description of the types of crash tests required. NHTSA conceded that the crash test dummies might not yield totally reproducible results, but said that they were the best available.

Reactions to the Proposed Rule

The NPRM was issued a few days before an International Conference on Passive Restraints was scheduled to take place at the General Motors Proving Grounds in Milford, Michigan, under the sponsorship of the North Atlantic Treaty Organization (NATO). The Department of Transportation and the U.S. automobile industry were co-hosts. Daniel Patrick Moynihan, then a member of the White House staff, and NHTSA Administrator Douglas Toms, had initiated the meeting to inform foreign automakers about the technology of airbags so that they could meet the proposed standards. Volpe opened the conference declaring: "Our motto should be 'Get the bugs out of the bags,' or whatever devices work best. We must get our systems perfected at the earliest possible moment."³⁸ Up to now Eaton and Ford had been the leaders in airbag development. Although Stuart Frey, Ford's chief body engineer, gave a presentation recounting Ford's work with Eaton, General Motor's detailed account of its progress dominated the meeting. Frey revealed that testing in the summer and fall of 1969 had shown the following problems:

- a standing child might be subjected to impacts in the fatal range if his face was close to the bag deployment;
- in an angular car-to-car crash, bag deployment was delayed and ineffective;
- major deformation of the instrument panel occurred during deployment, including windshield breaking.³⁹

Tests showed that changing the design of the bag seemed to resolve the standing child problem, but the new design increased panel deformation. Ford's efforts up to that point had been limited to the right-front passenger position in a standard size car, assuming use of a lap belt to prevent ejection. The company had not yet worked on the differences between unitized and frame cars nor on side crashes.

38. Department of Transportation, *International Conference on Passive Restraints, May 11-12, 1970*. Sponsor: North Atlantic Treaty Organization. Co-Hosts: U.S. Department of Transportation/U.S. Automobile Industry. General Motors Proving Grounds, Milford, Michigan, p.4.

39. Stuart M. Frey, "History of Airbag Development," *ibid.* p. 31.

Any system as potentially dangerous as the airbag if it inadvertently fires, especially in multiple installations, must have a system reliability comparable to space craft...

As a high volume production device, the airbag restraint system is still in its infancy and a great deal of design and testing (and possibly invention) will be required before the Ford Motor Company would recommend this system for adoption as standard equipment on future vehicles.⁴⁰

In contrast to Ford, General Motors had been working on what it termed “air cushions” for all occupant positions. Edward Cole, president of General Motors since 1968, was supporting aggressive development of this technology. He also did not like seat belts, believing that air cushions would make driving safer and relieve people of the need to fasten belts.⁴¹ As he explained at the beginning of the conference:

The development of passive restraints for automobile occupants ought to be a top priority in our national efforts to reduce highway deaths and injuries. Many proposals have been made for passive restraint systems to replace the lap and shoulder belts. At this time, however, the inflatable air cushion appears to have by far the greatest potential.⁴²

GM engineers reported on substantial progress while emphasizing that there was still much work to be done. Different designs were shown for the driver, where the collapsible steering column would be supplemented by a knee cushion, and for the other occupants, where cushions of varying configurations would be used. A large cushion for rear-seat passengers seemed to restrain well enough in a frontal crash, but the noise level was unacceptable when it deployed at the same time as the frontal cushions. Although occupant protection had been demonstrated in 10-30 mph frontal impacts, head and chest injury severities had not been consistently within tolerance ranges, and the limitations of the test dummy did not allow testing for neck forces. Testing for different size occupants, dealing with the out-of-position child, and restoring clear vision to the driver a second after a possibly unintended deployment, were all problems that had to be solved. Also, the sensor placement and air cushions had to be adapted to a wide variety of vehicle configurations.⁴³ GM said that it had developed a crash sensor of superior speed with a low probability of inadvertent triggering, but that it too would have to be tested for durability and environmental conditions.⁴⁴ In fact, GM gave a separate presentation to underline the statistical logic behind the need for “large quantity, long term testing of production units” to establish the reliability of the air cushion systems in its various models.⁴⁵

Other manufacturers gave presentations that in each case included a statement about the need for more time to work on problem solving and testing. Chrysler reported on its work using black powder as a

40. Ibid. p. 32.

41. Interview with David Martin, December 20, 1996.

42. Ibid. “Conference Opening – Remarks,” p.7.

43. R.F. McLean, “Inflatable Air Cushion Status Report By General Motors Corporation,” *ibid*, pp. 35-42.

44. Trevor R. Jones, “Inflatable Passive Restraint System Crash Sensors,” *ibid*, pp.61-66.

45. Ronald G. Day, “Reliability Aspects of the Air Restraint System,” *ibid*, pp.101-106.

source of solid gas generation for the airbag. Toyota outlined its plans for a sensor based on radar. American Motors showed films of the tests done for it by Wayne State. Nissan also showed a film of its airbag, promised to report on another approach to passive restraints (a falling net system), and questioned why belt usage was not enforced by law.⁴⁶ Among the system suppliers, the Rocket Research Corporation seemed to be the most forward looking:

[W]e have studies underway now aimed at multiple impact capability, omnidirectional protection, and you can even project, if desired, a system whose deployment is an adaptive one in proportion to the severity of the crash... Ultimately you might have under a crash system, from any direction, panels or coverings which would spring out and virtually envelop the passenger in all directions...⁴⁷

During a question and answer panel at the end of the conference Toms said that he had considered compulsory seat belt usage legislation, adding “I don’t think Congress will do it and I don’t think there is any State legislature that will do it.”⁴⁸ Because seat belts were used so infrequently, Toms thought that it was counterproductive to consider passive restraints that would work only with belts. In fact, he said “our objective is to get to the point where we are with an entirely passive system as soon as possible.”⁴⁹ As for the lack of airbag production capacity, industry would have two years to remedy that, a goal Toms said was attainable.

We’ve come a long way in the last two to six months. I think we’re going to see an equal rate of progress in the next six months. It’s my hope that we’ll be in that position a couple of years from now.⁵⁰

Contoured airbags that wrapped around occupants were, Toms believed, good potential solutions for side impact and rollover collisions. Toms was against allowing a test of airbags as optional equipment because he feared, based on Ford’s experience in 1956, that the public would not buy them. But he did concede that product liability was an issue that should be discussed with Congress.

Ed Cole gave the last presentation at the conference, noting that General Motors was convinced of the technical feasibility of the air cushion system and was investing considerable resources to develop it by the earliest possible date. But he added that key issues like where to locate sensors for a range of vehicles and crashes and how to deal with an inadvertent deployment, loss of driver control, injury caused by deployment, and the overall problem of product reliability, were all still to be resolved.

I believe it is important to point out the undesirability — if not impossibility — of introducing air cushion restraint systems across the board on all cars at the same time. The fact that this would represent a tremendous expense for our customer could, I recognize, be accepted if our development testing indicates that its safety benefits are acceptably high. But the requirements of tooling and new manufacturing facilities to

46. Takuya Kitamura, “Nissan Passive Restraint Developments, *ibid.* p. 98.

47. *Ibid.* p.139.

48. *Ibid.* p. 144.

49. *Ibid.*, p. 150.

50. *Ibid.*, p.149.

produce such a volume of new equipment would be staggering if it were required for the entire industry in the same model year.

In conclusion, let me say that General Motors believes that our industry and other competent research and development organizations should aggressively pursue answers to unresolved problems of air cushion restraints as a number one safety priority... As far as General Motors is concerned we cannot say when our air cushion restraint system will be ready for volume production. We will do it as soon as possible, consistent with time requirements for thorough testing, necessary tooling and pilot production procedures to insure a high degree of manufacturing quality in volume production and reliability in the field.⁵¹

Volpe and Toms continued their public support for a standard requiring completely passive restraints, using airbags to illustrate its feasibility. At an Insurance Institute for Highway Safety symposium, after Volpe had strongly endorsed airbags, Toms explained their position to safety expert B.J. Campbell, who was advocating a combined seat belt/airbag system:

[A]irbags do work. Our standard does not say that the auto industry must use an airbag. It says only that they must use a passive restraint... Now B.J. (Campbell), you asked about why we are going completely passive with no active response on behalf of the occupant whatsoever. The simple answer to the question is, right now only 20 per cent to 30 per cent of the entire population are wearing lap belts. About 4 per cent are wearing upper torso (belts). We don't want to permit the industry to go to an airbag system that is active. If they design airbags that require the fastening of the seat belt, we are still not going to get the pay-offs we want. We feel that we want to protect that 80 per cent of the population who won't do anything...

If we thought we could depend upon people to fasten their seat belts, we'd be delighted to go to a lap belt, airbag system.⁵²

Six weeks after the NATO conference on June 24 and 25, 1970, the Department of Transportation held a public meeting on occupant crash protection in Washington. The one major change in positions taken by the automobile manufacturers was a schedule offered by General Motors as an alternative to the one in the NPRM. After further research and development in 1971, GM would produce 25,000 pilot components for testing between January 15 and April 15, 1972. In the 1973 model year, GM would expect to install 150,000 units. By the next model year capacity would be increased to one million units, and by the fall of 1974 (1975 model year) air cushions would be standard equipment in all passenger cars and light trucks.⁵³ There was no explanation of how GM had progressed to this very specific timetable from the indefinitely large testing it said was needed to establish reliability in its NATO conference presentation.

51. Edward Cole, "Concluding Remarks," *ibid* pp.155-156.

52. Address by Douglas W. Toms, Director, National Highway Safety Bureau, in Charles W. Wixom, ed., *Key Issues in Highway Loss Reduction*, Proceedings of the Insurance Institute for Highway Safety 1970 Symposium, Washington, D.C., June 9-10, 1970. pp. 181-182. For Volpe's statement see p. 73.

53. Presentation by David D. Campbell, Assistant Chief Engineer, Fisher Body Division, in U.S. Department of Transportation, National Highway Safety Bureau, *Public Meeting on Occupant Crash Protection: Transcript*, June 24, 1970, pp.34-47.

Stuart Frey continued to be Ford's spokesman, but with a more negative tone than before. He accused NHTSA of favoring a particular kind of restraint system, and stressed the potential of lap belts, whose use he claimed had gone from 7 percent in 1964 to 30 percent in 1968. Usage could rise, Ford believed, to 60 percent in cars equipped with belts, which would provide a benefit comparable to airbags' effectiveness. The new seat belts required would, however, prevent this, Ford claimed, because they were impractical and likely would not to be used. The torso restraints called for would have to fit all sizes of occupants, adjust automatically, and be operated with one hand, requirements Ford said could not be met, for example, in models with fold-down seats. Moreover, the automaker said that requiring use of inertial reels was an unnecessary design restriction. As for airbags, Frey continued to maintain that Ford was not opposed to them, but he said there was a need for considerably more testing, a claim he documented with crash test films. In one, a dummy's knee prevented deployment of the bag and its head went through the windshield, and in another a dummy was partially ejected when the car rolled over.⁵⁴

Representatives of the seat belt manufacturers joined Ford in criticizing the proposal for upgrading seat belt standards, and argued that design standards should not be imposed. As an alternative to other passive restraints, they proposed an interlock system, i.e., one that would prevent engine ignition if seat belts in occupied positions were not fastened.⁵⁵ Hammill Manufacturing, a division of Firestone, described another passive restraint, an automatically deployed blanket.⁵⁶ Road Research Laboratory of London, England, proposed a three-point passive belt.⁵⁷ Eaton, Yale, and Towne's representative had the ticklish job at the June meeting of encouraging NHTSA without contradicting its own chief customers: "The proposed rule making is all good, and we are optimistic the objectives can be reached. But not on the time table required by the proposed rule making." The timetable could not be met for all types and sizes of cars, for all seating positions, and for collisions from all directions including rollovers. Instead, Eaton wanted to concentrate on frontal crashes, where injuries and deaths were most numerous.⁵⁸ Lawrence Patrick of Wayne State made many of the same points as Eaton and went on to point out that some of the injury measurements required by the proposed rule could not be made. If the public was going to have to pay for the expensive upgrade of seat belts required by the rule for a single year, he concluded that a mandatory use law was needed to avoid a very wasteful investment.⁵⁹ Even Lowell Dodge, the director of the Center for Auto Safety, a new organization started by Ralph Nader and Consumers Union, doubted the need for a new safety belt standard although he favored the passive restraint rule. He also suggested acquiring some on-the-road experience with passive restraints by

54. Presentation of Stuart M. Frey, Chief Body Engineer, Ford Motor Co., *ibid.* pp.19-33.

55. Presentations of C.H. Pulley and Georege Johanessen, American Safety Belt Council, *ibid.* pp. 57-72.

56. Presentations by D.L. Wethe, President, and Roy L. Huber, Manager, Research and Development, Hamill Manufacturing, *ibid.*, pp.100-116,

57. Presentation by Gill Johns, Road Research Laboratory, *ibid.* June 25, 1970, pp. 18-20.

58. Presentation by Richard Brow, Vice President, Eaton, Yale, and Towne, *ibid.* pp.13-17.

59. Presentation by Professor L. M. Patrick, Wayne State University, *ibid.* June 24, 1970, pp.126-141.

requiring them in all cars bought by the federal government in 1972 and in a minimum percentage of manufacturers' production.⁶⁰

There were indeed efforts to encourage the availability of passive restraints in order to get some real experience with the devices before the standards went into effect. About the time of the Department of Transportation's June meeting, the National Transportation Safety Board had asked the General Services Administration to require passive restraints in federally purchased cars, and the National Motor Vehicle Safety Advisory Council urged passive restraints for both state and federal vehicles.⁶¹ Neither initiative succeeded. GSA did not ask for airbags or other passive restraints in its 1971 cars, although a spokesman said there was a plan to "retrofit" some federal vehicles with airbags, a plan never carried out. Officials in two states said they would require airbags on some 1971 cars, and three others had plans for 1972.⁶² These plans obviously came to nothing when the equipment did not become available. Late in June, the Department of Transportation announced contracts with American Machine and Foundry's Advanced Systems Laboratory, Republic Aviation, and General Motors to build experimental safety vehicles that would minimize injuries in 50 mph frontal barrier crashes and in two-car crashes at 75 mph. The contracts called for passive restraints.⁶³

The docket for the proposed passive restraint rule closed on August 3, 1970. There was little in the comments submitted that had not already been presented at the June public meeting or the NATO conference. Ford continued its theme that "an appropriate belt restraint system that is used can be as effective and may be more effective than an airbag." The manufacturer then broke some new ground by announcing that it was developing "an ignition interlock system that will require front seat occupants to connect the lap belts before the engine will start." Ford planned to test market the system before offering it widely. But Ford also outlined more specific plans for testing and producing airbags, although not nearly on the scale of GM's earlier proposal. Ford proposed installing 200-400 airbag units in 1971 model year vehicles. Any changes dictated by this first trial would be incorporated into 2,000-4,000 company owned models in 1972. In the 1973 model year, 20,000-40,000 vehicles in one model line would be available with airbags as a production option, followed by five other model lines in 1974. By January 1, 1975, all Ford car and light truck models would have airbags as options in the front right and center positions, provided that no hitches developed. Other parts of the lengthy submission repeated points Ford had made in June.⁶⁴

60. Presentation by Lowell Dodge, Director, Center for Auto Safety, *ibid.*, p. 224 ff

61. Insurance Institute for Highway Safety, *Status Report*, vol.5, no. 11, July 7, 1970, p. 5.

62. *Status Report*, vol. 5, no.14, p. 5.

63. *New York Times*, June 27, 1970, p. 56; *Status Report*, vol. 5, no. 11, p. 1.

64. Letter from J.C. Eckhold, Automotive Safety Director, Ford Motor Company, to National Highway Safety Bureau, Re: Occupant Crash Protection: Passenger Cars, Multipurpose Vehicles, Trucks and Buses (Docket No. 69-7; Notice 4), August 3, 1970. [Docket 69-07-NO4-084].

General Motors essentially stuck to its proposed schedule for making its air cushions standard in its 1975 models. GM also explicitly called for passive restraint standards to be delayed until January 1, 1975, for deletion of the rollover and angular impact tests, for revision of human tolerance values to reflect its understanding of the state of the art, and for elimination of the new seat belt requirements. Within this schedule GM said it might be possible to develop a radar-controlled sensor, which would solve many other air cushion problems.⁶⁵

Other manufacturers all insisted that they could not meet the January 1, 1973, deadline for passive restraints. The most optimistic, Renault, proposed a January 1, 1974, date for front passenger seats, with a one-year delay for other positions. Chrysler said it could meet the standard by 1975, and American Motors said it could provide passive restraints for front passengers by the 1976 model year. Volkswagen and the Japanese Automobile Manufacturers Association both said that they could meet the standard for front passengers only by January 1, 1975.⁶⁶

The docket also contained two identical letters from members of Congress, one signed by Senator Frank E. Moss and 20 other senators, the second by Representative Benjamin S. Rosenthal and 61 other members of the House. They urged that DOT keep the proposed rule, arguing that the benefit of saving 20,000 lives with highly reliable airbags far outweighed the short-term costs to the companies.⁶⁷ Allstate Insurance Company took its first stand on the issue by suggesting that NHTSA require airbags only for the front right passenger seat in 1973, with other positions covered the following year.⁶⁸ No other auto insurer submitted a comment to the docket on the issue. Nor did William Haddon in his new role as president of the Insurance Institute for Highway Safety (IIHS), a position he had taken almost as soon as he left NHTSA. But IIHS had begun to report on the issue in its newsletter, *Status Report*, and had afforded both Volpe and Toms a forum for spreading their views.

The Rule Is Modified

Before issuing its “final” passive restraint rule, the National Highway Traffic Safety Administration proposed on September 24, 1970, a modification of the interim restraint standard, effective January 1, 1972. The modification was an attempt to lower the cost of the interim standard by making changes “to reduce the necessity for redesign and retooling in certain areas.” Three options would be available during this period, the first one being passive restraints. The second option required lap belts only in all positions, then the current standard, but also required that certain injury criteria for 30 mph barrier crashes be met, a requirement that seemed to call for airbags. The third option required shoulder

65. “Comments of General Motors Corporation with Respect to Notice of Proposed Rule Making, Occupant Crash Protection, Docket No. 69-7,” August 3, 1970. [Docket 69-07-No.4-085]

66. *Status Report*, vol. 5, No. 14, August 17, 1970, pp. 2, 4.

67. National Transportation Safety Board, op. cit., vol. 2, p. 16.

68. Letter from Judson B. Branch to Douglas Toms, July 31, 1971, in NHTSA docket 69-07-No.4--109; also *New York Times*, August 5, 1970, p. 46.

restraints in front outboard positions, lap belts in all positions, and certification that the belts restrained a dummy in a 30 mph barrier crash; no injury criteria were included. The second and third options also required both audible and visible warning systems. Ignition interlocks were explicitly rejected because they could cause safety problems and were inconvenient.⁶⁹

Despite the appearance of willingness to make some concessions in the interim standards for occupant restraints, Toms still was making tough statements about the feasibility of passive restraints. He tried to buttress his position by referring as often as possible to the issue in generic terms — passive restraints rather than airbags. He asked New York State Senator Speno, the chairman of the National Motor Vehicle Safety Advisory Council, to join him in this effort. But Toms conceded nothing in his belief that passive restraints were superior to active belts, a position the manufacturers, led by Ford, were beginning to question:

And my point is that if you're well informed and you know what's going on, passive restraints are beyond the controversial point... If you want to argue whether they can get them in 10 million cars next year, sure that can be controversial. Or if you want to argue whether the industry wants to do it, that can be controversial. But if you talk scientifically whether it's better or not, that isn't controversial. They *are* better.⁷⁰

On November 3, 1970, the National Highway Traffic Safety Administration issued an occupant crash protection rule that made two important concessions to manufacturers' requests for more time, both to gear up production capacity and to develop technology. The front-seat passive restraint requirement for cars was delayed for six months, until July 1, 1973, essentially the 1974 model year, and the rear-seat requirement was postponed until July 1, 1974. As of the latter date, passive restraints would also be required in multipurpose vehicles and light trucks (of less than 10,000 pounds gross vehicle weight). Seat belts were not required, not even to address the problem of side impacts. NHTSA defended eliminating the seat belt requirement with undocumented arguments — that their low rate of usage meant that their cost was unjustified, that they reduced the effectiveness of air cushions in some high-speed impacts, and that they might be incompatible with some types of passive systems. Although NHTSA noted that passive systems other than airbags were possible, the agency suggested, obviously with airbags in mind, that manufacturers might use contoured seats and door cushioning to keep occupants in place. The passive restraints had to be effective in head-on crashes of 30 mph, although future requirements of 40 mph or higher were anticipated. The rule strengthened some injury criteria without explanation and referred to other changes that were being proposed, both in injury criteria and tests, in a parallel Notice of Proposed Rule Making. The new tests aimed to make both side-impact and rollover tests reproducible, and proposed a minimum speed of 15 mph for crash-deployed protection. With these new tests, the agency

69. National Highway Safety Bureau, [Docket No.69-7; Notice 6] "Occupant Crash Protection: Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses", *Federal Register*, vol. 35, September 25, 1970, pp. 14942-14943.

70. *Status Report*, vol. 5, No. 19, p. 7. For Toms' request to Speno, see *ibid*, No. 16, September 15, 1970.

proposed that passive protection against lateral crashes be effective July 1, 1973, and rollover crashes a year later. Little noticed, but significant in view of a later court decision, was NHTSA's reply to the comments that the dummy specifications in SAE Recommended Practice J963 were inadequate and incomplete. These dummies were, the agency held, "the most complete and satisfactory ones presently available." But it did add some specifications.⁷¹

The new rule provoked unanimous pleas for reconsideration from automobile manufacturers. In fact, Ford dropped its veneer of cooperative investigation and threatened to go to court to block the rule. These developments will be explored in the next chapter.⁷²

Summary

The idea of airbags preceded the federal law that called for motor vehicle safety standards. Shortly before the law was passed, Eaton, Yale, and Towne and Ford combined forces to try to develop this idea. They were clear that it was an automatic restraint, one that would diffuse the forces of the so-called second collision without any action being taken by occupants. The first administrator of NHTSA, Dr. William Haddon, was a public health professional, who was disposed to believe that automatic safeguards were always superior to voluntary ones. Apparently, he and his staff always saw the need for a more generalized passive (or automatic) restraint standard. Of course, the law under which they were operating required that standards be specified in terms of performance rather than technology. But it was clear during the development of the first rule that the standards were being formulated with the airbag in mind.

As airbags became the center of the rule-making process, the early spirit of cooperation among auto manufacturers, equipment suppliers, and regulators was replaced first by tension, then, toward the end of 1970, by outright antagonism in some cases. Eaton, Ford, and GM had early success dealing with some of the problems of airbags, such as storage and transmission of gas under high pressure, reliability of sensors, and reduction of forces on out-of-position occupants. This encouraged both the NHTSA staff and leadership to feel that solutions to all problems could be reached in a short time with enough investment and effort. And the number of lives that would be saved and injuries averted made it unconscionable not to mandate the effort. The manufacturers objected to the burden that was placed on them. Although the first "final" standard and accompanying proposal delayed rear-seat and rollover

71. National Highway Safety Bureau, Department of Transportation [Docket 69-7; Notice 7] Part 571-Motor Vehicle Safety Standards: "Occupant Crash Protection in Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses," *Federal Register*, vol. 35, November 3, 1970, pp. 16927-16931. National Highway Safety Bureau, Part 571, [Docket 69-7; Notice 8], "Occupant Crash Protection in Passenger Cars, Multipurpose Vehicles, Trucks and Buses, Notice Of Proposed Rule Making," *Federal Register*, Vol. 35, November 3, 1970, pp.16937-16939. The first is the "final" rule, the second the modifications in testing procedures and criteria.

72. Joan Claybrook believes that Henry Ford II was upset by the failure of the Ford airbag demonstration in August 1969, and began then to steer the company away from further work on airbags. Interview with Joan Claybrook, September 13, 1993. For Ford President Iacocca's threat to go to court, see *New York Times*, November 18, 1970, p. 29.

protection for a year after frontal crash protection for front-seat occupants, protection against lateral crashes was not delayed. There were no established methods for meeting the lateral crash standards, and, perhaps with the exception of GM, manufacturers still had to work out the detailed technology and testing of driver and rear-seat positions. Criteria for testing whether vehicles met the injury standards were, by the regulator's admission, incomplete, but they were the best available and, since lives were at stake, Toms and his associates thought they would have to do.

The November 1970 rules and proposals set the stage for controversy over the objectivity and practicality of what were, officially, passive restraint standards. But for most people, including the main players in the controversy, the issue was still really airbags. Airbags would replace seat belts, according to both General Motors and NHTSA.