



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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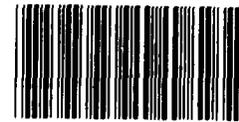
COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

FEBRUARY 28, 1980

B-197779

Ms. Joan Claybrook
Administrator, National Highway
Traffic Safety Administration
Department of Transportation

AGC 00425



111660

Dear Ms. Claybrook:

Subject: [Comments on the Agency's Plan to
Evaluate the Occupant Crash
Protection Standard] (CED-80-70)

We have reviewed the "Evaluation Plan for Federal Motor Vehicle Safety Standard 208--Occupant Crash Protection" prepared by the National Highway Traffic Safety Administration. Enclosed are our comments and suggestions on that plan which we are submitting for inclusion in Docket No. 74-14; Notice 15.

Our comments are being provided in response to the Safety Administration's announcement of publication and request for comments in the Federal Register on October 22, 1979 (vol. 44, no. 205, pp. 60771-60774). The announcement referred to the prior GAO recommendation calling for such an evaluation. Our consultant, Dr. Lindsay I. Griffin III, Manager of the Traffic Accident Research and Evaluation Program, Texas A&M University, assisted in our review and analysis of the plan. We limited our review to an overview of the potential for making the evaluation and of the data sources to be used and did not review the specific evaluation methodology to be used to assess the effectiveness of the standard.

We commend the Safety Administration for its diligent efforts in developing this plan to assess the effectiveness of one of its most significant motor vehicle safety standards. We believe the successful attainment of the objectives of this project will prove extremely beneficial to the highway safety community and will enhance the Safety Administration's credibility in its rulemaking functions.

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Our review of the plan indicates its success is highly dependent upon the expansion and full implementation of the National Accident Sampling System (NASS). Thus, it is important that the full complement of teams for this system be put into operation within the proposed timeframes. In the meantime, because of the long time period required for accumulating sufficient data from NASS, we are suggesting that further explanations be provided on the ways the data bases--The Fatal Accident Reporting System (FARS) and State accident data--will be used to provide interim answers. We believe that these additional details should be provided at the early outset of the evaluation process. Our specific concerns and suggestions are covered in more detail in our comments.

The success of any project of this nature depends upon the acceptance of and confidence in the final results as being authoritative and statistically sound. In this regard, we believe it is imperative that the Safety Administration have general agreement from all parties affected by Standard 208 concerning the types of data to be collected and the methods of analyzing that data. Since comments will be obtained from the NASS Advisory Committee, we suggest the Safety Administration publish these comments along with its disposition of them in a public document. In addition, we suggest the Safety Administration separate itself from the analysis and conclusions phases of the evaluation.

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We are sending a copy of this letter to the Secretary of Transportation.

We appreciate the cooperation and assistance given by Safety Administration personnel during our review and would also appreciate being advised of any actions taken on our comments and suggestions.

Sincerely yours,



Henry Eschwege
Director

Enclosure

U.S. GENERAL ACCOUNTING OFFICE
COMMENTS ON THE NATIONAL HIGHWAY TRAFFIC
SAFETY ADMINISTRATION'S EVALUATION PLAN
FOR FEDERAL MOTOR VEHICLE SAFETY
STANDARD 208--OCCUPANT CRASH PROTECTION
DOCKET NO. 74-14; NOTICE 15

The General Accounting Office reviewed the National Highway Traffic Safety Administration's plan for evaluating the actual use and performance of automatic restraint systems that will be required by Federal Motor Vehicle Safety Standard 208, effective September 1, 1981. The evaluation will be performed over the period from 1980 to 1986. Automatic restraints will be required on all large cars in model year 1982, on all medium-size cars in model year 1983, and on all small cars in model year 1984. We limited our review to an overview of the potential for making the evaluation and of the data sources to be used and did not review the specific evaluation methodology to be used to assess the effectiveness of the standard.

The Safety Administration has developed a comprehensive plan for evaluating automatic restraints in the real world. The plan identifies the data sources to be used in answering the major questions on the restraint's performance and effectiveness. However, we believe some refinements are essential if the plan is to be successfully implemented.

DATA SOURCES TO BE USED TO DETERMINE
THE EFFECTIVENESS OF STANDARD 208

The Safety Administration proposes to use three accident data bases to evaluate the effectiveness of Standard 208.

1. National Accident Sampling System (NASS)
2. Fatal Accident Reporting System (FARS)
3. Selected State accident data files

Of these three data systems, the Safety Administration has the most confidence in NASS:

"The NASS would provide the most authoritative results (i.e., accurate and unbiased, with measurable sampling error, and permitting detailed characterization of injury severity and other factors)." (See p. 48 of the plan.)

Although NASS will be the primary data source for the overall plan, not enough data from that system will be available until late in the evaluation period--1983-85 for measurements of injury reductions and even later for measurements of fatality reductions. In the meantime, FARS data and State accident data will be used to obtain initial effectiveness estimates and interim answers to some of the basic questions. FARS and State accident data are intended to provide only gross estimates of fatality- and injury-reducing effectiveness. NASS will be the ultimate source for precise estimates, such as air bag effectiveness with or without lap belts; frequency of injuries caused by restraint systems and effectiveness by crash severity and direction of impact.

UNCERTAINTIES IN OBTAINING RESULTS FROM NASS DATA

The Safety Administration indicates that authoritative results--accurate and unbiased with measurable sampling error--will be derived primarily from NASS. The plan provides a year-by-year list of probable evaluation accomplishments during the period from 1980 through 1986. According to the plan, precise results from NASS will not be available until the 1983-85 time frame for measurements of injury reductions, with even later time frames for measurements of fatality reductions.

The major difficulty which must be faced in using NASS data to evaluate Standard 208 is sample size. Table 8 in the appendix to the evaluation plan lists the required sample sizes which must be collected in order to evaluate the different restraint systems (air bag system, air bag alone, automatic belt system, automatic belt system when used, and the air bag plus lap belt) in terms of effectiveness in reducing Abbreviated Injury Scale (AIS) 2 or greater injuries (that is, moderate or greater injuries as rated on AIS). Two sample sizes are listed for each restraint system, an initial sample and a refined sample. The refined sample--the larger of the two--allows for a more reliable estimate of the effectiveness of a given restraint system.

From information provided in tables 8 and 9 in the appendix to the evaluation plan, we developed the following table. This table shows the dates when the Safety Administration expects to have initial and refined estimates of the effectiveness of different restraint systems in reducing AIS 2 or greater injuries.

ESTIMATES OF THE EFFECTIVENESS OF
DIFFERENT RESTRAINT SYSTEMS IN REDUCING
INJURY (AIS 2 OR GREATER)

<u>Date expected</u>	<u>Air bag system</u>	<u>Air bag alone</u>	<u>Auto. belt system</u>	<u>Auto. belt when used</u>	<u>Air bag plus lap belt</u>
10-1-82					
1-1-83			Initial estimate	Initial estimate	
4-1-83					
7-1-83	Initial estimate	Initial estimate	Refined estimate	Refined estimate	
10-1-83					
1-1-84	Refined estimate				

As this table shows, a refined effectiveness estimate for AIS 2 or greater injuries from the air bag alone and the air bag plus lap belt will not be available through the period covered in the above schedule. Indeed, not even an initial estimate of the effectiveness of the air bag plus lap belt will be available during that period. In fact, the plan does not show when or if these estimates will be available.

We believe that authoritative results on air bag effectiveness may not be achievable even within these time frames. The plan's milestone dates for effectiveness estimates shown in the above table are based upon the following assumptions:

(1) Automatic restraints are assumed to be about equally effective in reducing AIS 2 or greater injury (moderate through fatal) or fatalities alone. Some studies question this assumption. If the assumption is not correct, an even longer data collection period will be required to generate effectiveness estimates in reducing serious injury or fatalities. More importantly, if the evaluation is terminated after the initial results are obtained (based on AIS 2 or greater), this assumption could lead to erroneous conclusions on the automatic restraints' effectiveness in higher severity accidents. These accidents are those which most concern society and in which occupant restraints may be the most effective.

(2) It is assumed that a total of 75 NASS teams will be in operation by September 1, 1981. At the present time, the Safety Administration has funding authority for only 30 teams. If the Safety Administration is unsuccessful in obtaining the additional 45 teams, or obtaining them on schedule, then the data collection phase of the evaluation will have to be extended, and the effectiveness estimates of the different restraint systems will be delayed. In fact, other documents within the Safety Administration indicate that NASS may not be fully operational until 1982.

(3) It is assumed that the NASS teams will collect data on 100 percent of all accidents in their jurisdictions wherein a front seat passenger is seriously or fatally injured in a car equipped with automatic restraints. If this criterion is not met, the data collection phase of this project will have to be extended, and the effectiveness estimates of the different restraint systems will be further delayed.

(4) It is assumed that air bags will be put in 30 percent of all large cars (wheelbase greater than 114 inches), in 25 percent of all medium-size cars (wheelbase between 100 and 114 inches), and in 10 percent of all small cars (wheelbase less than 100 inches). These assumptions are tenuous for a variety of reasons outside the control of the Safety Administration. For example, more cars may be sold with automatic belts and fewer with air bags than envisioned in this scenario. Consequently, less time will be needed to develop refined effectiveness estimates of automatic belt systems, but more time will be needed to develop refined effectiveness estimates of air bag systems.

(5) It is assumed that some 11,000,000 new cars will be sold each year between 1982 and 1986. This sales level is assumed to be comprised of 20 percent large cars, 47 percent medium-size cars, and 33 percent small cars. If this projection does not hold up (that is, if a relatively larger portion of the vehicles sold during this period are small cars), then the number of air-bag-equipped cars on the road will be reduced. Consequently, the time required to determine the effectiveness of the air bag system in reducing injuries will be increased.

Changes in any of the assumptions described above would result in a significant reduction in the air bag fleet and thus extend the period required to get reliable answers on air bag effectiveness. For example, assume (1) a 25 percent downward shift in sales from large to medium cars and a downward shift from medium to small cars; and (2) use of the Safety Administration's scenario C for air bag

installation rates--10 percent for large cars, 10 percent for medium-size cars, and only a trace in small cars. These changes would result in a two-thirds reduction in the potential air bag fleet. The implication of this reduction in the air bag fleet would be a further increase in the time necessary to get estimates of fatality- or injury-reducing effectiveness of air bag systems.

A more significant implication is that the methodology as proposed does not indicate when and if sufficient data will be available to address some of the detailed questions such as:

- Fatality-reducing effect of specific restraint systems (air bags, air bags with lap belts, automatic belts when used or not used) (p. 26).
- Injury causes by injury level by contact point by restraint system (p. 28).
- Injuries caused by restraint systems by severity of injury by crash conditions (p. 29).
- Effectiveness by restraint system by crash severity by direction of force (p. 31).
- Relative effectiveness in exceptional situations (for example, out-of-position occupants, extreme temperatures or altitudes, unrestrained children, etc.) (p. 32).
- Unexpected problems with particular cars requiring prompt remedial action (p. vi).

The primary data source for answers to these questions is NASS and indepth accident investigations as noted on page 83 of the evaluation plan. Although the plan specifically recognizes the importance of getting answers to these questions, it falls short of describing the when and how. For example, the plan does not provide an estimate of when NASS will have data to provide an estimate of the fatality-reducing effect of specific restraint systems. The problems of the NASS sample size for determining this was apparently considered in earlier drafts of the evaluation plan but dropped from the final version released for public comment. On page 53 of the plan, reference is made to a "Table 3-1" for the NASS dates in providing reliable estimates of fatality reduction; however, we could not find a "Table 3-1."

Overall, our analysis indicates the Safety Administration's assumptions underlying NASS milestone dates may be

overly optimistic, and more realistic assumptions would extend its scheduled time frames. However, with the exception of ensuring the current NASS implementation schedule will be maintained, other determinants are outside the control of the Safety Administration. The rate of car sales with air bags or automatic seat belts and the actual accident experience with those cars are the major determinants which will have the greatest impact on the time schedule.

Because of its reliance upon NASS to furnish needed answers, we believe the Safety Administration should lend its full support to assuring that the system is implemented as soon as possible. Furthermore, since some factors are outside its control, we believe the Safety Administration should adjust its plan to reflect these circumstances as they occur. We believe the Congress and the public should be fully informed of such changes and their impact on the scheduled completion of the total evaluation.

PROBLEMS IN RELYING ON FARS DATA AND STATE
ACCIDENT DATA TO PROVIDE INTERIM ANSWERS

As noted earlier, even under optimistic assumptions, results from NASS will not be available until at least 1983-85 for measurements of injury reductions and even later for measurements of fatality reductions. Recognizing the need for interim answers, the Safety Administration plans to answer certain basic questions about the effectiveness of automatic restraints with the aid of FARS and State accident data, beginning in 1980.

The Safety Administration recognizes that these data bases are not as detailed or as reliable as the NASS data base, and therefore the estimates of effectiveness which will be produced from these data bases will be (1) less specific than the estimates of effectiveness produced with NASS data (for example, the State data will be used to assess the effectiveness of an air bag system, whereas NASS data will be used to assess the effectiveness of (a) an air bag system, (b) an air bag with lap belts, and (c) an air bag without lap belts), and (2) subject to greater error than NASS estimates.

The Safety Administration rightly believes, however, that the importance of Standard 208 demands that data collection on the worth of the standard should begin as soon as possible. In spite of the fact that this information will be less detailed and less rigorous than desirable, an assessment of the standard cannot be postponed until 1985.

While we agree with these statements, we believe some problems with the use of these data sources need to be addressed before data collection and analysis are initiated.

Difficulties in using FARS data to estimate the effectiveness of automatic belts and air bags and the need for upfront agreements

FARS will be used to provide interim answers of automatic restraint effectiveness in reducing fatalities. The FARS data file contains a census of all fatal traffic accidents which occur in the United States. The information in this data file is derived primarily from State accident report forms, supplemented with additional information made available by the States.

Automatic restraints' effectiveness in reducing fatalities cannot be assessed directly from data in the FARS file. While FARS contains data on fatal accidents involving vehicles equipped with automatic restraints and fatal accidents involving vehicles equipped with active restraints, it does not provide a direct measure of the exposure of those vehicles to accidents. Rather, some indirect measure of exposure--that is, some indirect measure of "risk of being involved in a fatal accident"--must be derived for the automatic-restraint-equipped and the active-restraint-equipped vehicles. Once this measure of exposure is defined, then fatality rates for vehicles equipped with automatic restraints and active restraints can be compared, and an estimate of the relative effectiveness of automatic restraints in reducing fatalities can be calculated.

The measure of exposure discussed in the evaluation plan to be used in comparing automatic and active restraints is "million vehicle-years" of operation. There are several problems with this definition of exposure. For example:

--Assume that a new car is driven 16,000 miles during its first year of operation and that an older car is driven 8,000 miles during the same time period. Both cars will have accrued a vehicle-year of exposure, but in fact the new car will have had a much greater opportunity to be involved in a fatal accident.

--Assume that new cars and older cars are driven an equivalent number of miles each year. But further assume that more new cars are driven by older drivers and more older cars are driven by younger drivers. If young drivers are generally involved in more severe accidents than older drivers, then even if miles of exposure are equated for new cars and older

cars, opportunity for involvement in a fatal accident is greater for older cars.

--Assume that new cars--large, medium, and small--equipped with automatic restraints are generally smaller than pre-Standard cars equipped with active belts. Even if exposure is measured by other criteria (miles driven, vehicle-years of operation, or age of driver) and is equated for both groups of cars, the potential for involvement in a fatal accident may be affected by vehicle size.

The Safety Administration recognizes the problems inherent in calculating fatality rates for vehicles equipped with automatic and active restraints:

"The fatality rate for one restraint system might be higher than for another because the cars are driven more miles per year or have more accidents per 1,000,000 miles, rather than because the restraints are less effective. In other words, there may be confounding by effects other than the restraint systems. There are analytic techniques for eliminating some of the confounding effects but they are not foolproof." (See p. 53 of the plan.)

We agree with the Safety Administration's comments on the difficulty of using FARS data to estimate the effectiveness of automatic restraints in reducing fatalities. However, we suggest that additional detail be provided in this area to resolve, or at least explicate, the difficulties inherent in making these estimates. For example:

- Can exposure be expressed in vehicle-miles rather than vehicle-years? If so, what effect would this changed definition of exposure have on estimated effectiveness?
- What variables or combination of variables in FARS will be used to control for the differences in the accident experience of automatic restraint vehicles and active restraint vehicles (for example, vehicle size, point of impact, single-vehicle versus multi-vehicle accidents, etc.)?
- What " * * * analytic techniques for eliminating some of the confounding effects * * *" in the FARS analysis will be employed?

We believe it is important these issues be agreed on beforehand. Failure to do so could result in the same situation that occurred regarding the evaluation of the pre-Standard air-bag-equipped cars where the various parties doing the analysis--the Safety Administration, General Motors, Insurance Institute for Highway Safety, etc.--using the same data, arrived at widely conflicting results. These widely different results from basically the same data created conflict, not acceptance.

Difficulties in using State data to estimate the effectiveness of automatic belts and air bags

As noted previously, NASS data will be used to estimate the effectiveness of different automatic restraint systems in reducing AIS 2 or greater injuries. Since these estimates will not be forthcoming for several years, the Safety Administration proposes to estimate the effectiveness of automatic belts and air bags in reducing injuries, the police reported serious and fatal injuries by analyzing State accident data files. In all, accident files from five or more States will be employed.

Effectiveness estimates calculated from State data will be less detailed than the analysis carried out with NASS data. For example, NASS data will be used to calculate the injury reduction effectiveness of the (1) air bag system, (2) air bag alone, (3) air bag plus lap belt, (4) automatic belt system, and (5) automatic belt when used. State data can only be used to calculate the injury reduction effectiveness of the (1) air bag system and (2) automatic belt system. The State data may not reliably indicate whether lap belts were being worn in the air-bag-equipped cars or whether automatic belts were being used in cars equipped with automatic belt systems.

While we support the use of State data to calculate injury reduction effectiveness estimates, we also recognize that using this data to make these estimates will be considerably more difficult than using FARS data to make comparable estimates of fatality reduction. For example, in choosing five or six States, it will be difficult to control for differences in geography, climate, vehicle density, traffic conditions, urban and rural mix, etc., to assure that the results will be representative of the Nation.

Another problem in combining different States' data is that the accident cases which are entered in the State files do not have a common definition. For example, one State may define an accident in terms of a \$25 damage minimum, another

may have a \$250 minimum. Partially as a result of these different accident definitions, the relative proportions of fatal to injury to property-damage-only accidents which occur in different States vary widely. It is not clear in the evaluation plan how the Safety Administration plans to combine accident data from five or six different States when those States have such different definitions for accidents.

An additional problem existing with the use of State accident data is that while most if not all States use the National Safety Council's injury scale (i.e., O, C, B, A, K), they do not uniformly apply the definitions. A 1972 study conducted by the Highway Safety Research Institute of the University of Michigan showed that in one State, of all the people who were injured in a traffic accident, approximately 64 percent received an "A" level injury; for another State, the comparable percentage is approximately 12 percent. Again, it is not indicated in the evaluation plan how the Safety Administration intends to combine injury information from different States.

We believe that if State accident data sources are used to assess the injury reduction effectiveness of automatic restraint systems, a simplistic combining of accident data from five or six different States is inappropriate. Actions must be taken to assure that data contained in a new multi-State data base has the same entry level threshold (for example, all towaway accidents) and has comparable definitions of variables. The Safety Administration suggests this process might be accomplished through a Limited Accident Reporting System (LARS):

"If the analysis of State accident data files for calendar years 1980 and 1981 should prove unsatisfactory due to data quality problems, NHTSA would implement an extension of FARS (Project No. 2) to selected classes of non-fatal accidents, the Limited Accident Reporting System (LARS)." (See p. 56 of the plan.)

LARS is an option in the Safety Administration's plan estimated to cost about \$6 million. Unfortunately, only one paragraph in the evaluation plan is devoted to a discussion of LARS. From this paragraph it is difficult to determine exactly how LARS will function. For example:

--Will LARS be operated in the same manner that FARS is, or will LARS involve bilevel reporting by one or more police agencies in five or six different States?

- "The LARS accident population would include crashes involving automatic restraint vehicles plus a suitable control group." (See p. 57 of the plan.) How will this control group be defined? By whom?
- "LARS could be further improved if States add questions on air bag deployment and automatic belt use to police accident reports." (See p. 57 of the plan.) Are these modifications conceived of as changes to the standard accident report form or as a supplemental form?

A specific project, such as LARS, will have to be undertaken to insure that the accident cases in the multi-State data system are consistent and reliable. Consequently, we suggest that the Safety Administration address the difficulties involved in such an undertaking in the very near future and in much greater detail than is currently provided in the evaluation plan.

NEED FOR UNIVERSAL ACCEPTANCE OF EVALUATION RESULTS

In our prior review of automatic restraints ^{1/} we recommended a task force comprised of representatives from the Safety Administration, the insurance industry, the automobile industry, and independent highway safety researchers be appointed to develop an evaluation plan. The intent of our recommendation was to avoid the previous conflicting interpretations in assessing the effectiveness of automatic restraint systems in the real world by having the evaluation performed as a cooperative effort among all affected parties.

In commenting on this recommendation, the Department of Transportation stated that it would prepare the evaluation plan rather than appoint a special task force for this purpose. At that time, the Department said it planned to publish its proposed evaluation plan for comment in the fall of 1979 and indicated it would have the plan reviewed by an advisory committee being established for the National Accident Sampling System. This committee would be composed of a broad spectrum of experts representing a wide variety of interests and expertise. With the publication of its plan in October 1979, the Safety Administration indicates it will seek comments from this NASS Advisory Committee.

^{1/}Report to the Congress entitled "Passive Restraints For Automobile Occupants--A Closer Look" (CED-79-93, July 27, 1979.)

We are still concerned about the universal acceptance of evaluation results, especially in view of the need for independence whenever possible and the fact that the Safety Administration developed this plan on its own. The importance of independent assessments on this matter was recognized by the Department of Transportation when it stated:

"The Department finds the methods used in the General Motors study to be of doubtful value in arriving at an objective assessment of the experience of the air-bag-equipped vehicles. General Motors is a vastly interested party in these proceedings, and the positions that it adopts are necessarily those of an advocate for a particular result. This is in no sense a disparagement; advocacy of desired outcomes by interested parties is an essential part of the administrative process. But if a study advanced by an interested advocate is to be seriously considered from a "scientific" viewpoint, it must be carefully designed to avoid dilution of its objectivity by the bias of the sponsoring party. The GM study fails that test." [Docket 74-14; Notice 10 (Final Rule of Standard 208), June 30, 1977]

For the very reasons that the General Motors' study was questioned, we feel that an evaluation of Federal Motor Vehicle Safety Standard 208 conducted entirely by the Safety Administration could also be called into question.

The success of any project of this nature is dependent upon the acceptance of and confidence in the final results as being authoritative and statistically sound. In this regard, we believe it is imperative that the Safety Administration have general agreement from all parties affected by Standard 208 concerning the types of data to be collected and the methods of analyzing that data.

In order to achieve acceptance of the results from its evaluation, we suggest that the Safety Administration:

- Publish the NASS Advisory Committee's comments and recommendations along with its disposition of them in a public document.
- Separate itself from the analysis and conclusion phases of the evaluation by having independent contractors perform this work.