CENTRIC

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
NATIONAL CENTER FOR STATISTICS AND ANALYSIS

June-September, 1977

PERSONNEL

The National Center for Statistics and Analysis has gained another Highway Engineer. Mr. Dan Daniels has joined the staff following nine years with the Office of Research, Federal Highway Administration. His experience is strongly related to his new responsibilities in our pedestrian, roadway and motorized bicycle research areas.

Dr. William L. Carlson, Assistant Professor of Economics, St. Olaf College, has begun a one year appointment as an Intergovernmental Personnel Act (IPA) employee. His areas of expertise include statistics and quantitative methods. During his stay he plans a review of car size and weight effects in accidents and an examination of State small car registrations and fatalities.

Terry Siani, a junior at Marymount College in New York, is spending her fall semester with NCSA as a co-op student trainee. Ms. Siani is majoring in Economics and will be working with the Information and Program Services Staff.

Susan Partyka, a Transportation Intern, is spending the final twelve weeks of her program with NCSA. Assigned to the Mathematic Analysis Division, Miss Partyka is conducting an analysis of the differences among the States in the circumstances of fatal accidents.

Sidney Kelly resigned from the Information Systems Division on October 7. He had been employed at the NCSA for more than one year. Mr. Kelly is now working for the National Guard.

CONFERENCES

International Association of Chiefs of Police (IACP) - The NCSA Director, William Scott, met with the Highway Safety Committee of the IACP to answer their questions and concerns about the National Accident Sampling System.

There seemed to be three major concerns of the committee. They are (1) that NASS would duplicate and perhaps interfere with their police accident investigation and reporting activities, (2) that it would result in a large number of federal bureaucrats underfoot investigating accidents, and (3) that it did not take into account or try to utilize existing expertise such as is found in the National Safety Council or at Calspan. These concerns had resulted in the introduction to the committee of a resolution which was critical of NASS and, if passed, might have prompted some agencies to fail to support NASS. Following Mr. Scott's presentation, the committee withdrew its proposed resolution.

American Association for Automotive Medicine (AAAM) - Mr. James Fell presented a paper entitled: "A Profile of Fatal Accidents Involving Alcohol" at the 21st Conference of the American Association for Automotive Medicine on September 16, 1977 in Vancouver, British Columbia. The paper is based upon accident studies conducted during 1971-1975, in Boston, Baltimore, Oklahoma City and Albuquerque.

Truck and Bus - The Center has two staff members participating on Administrator Claybrook's FMVSS 121 Task Force. The basic task force goal is to analyze all issues relating to this controversial air brake regulation. Vernon Roberts and Dr. Harry Weingarten are responsible for, respectively, assessing individual accident reports and fleet accident statistics to determine if any FMVSS 121 influences exist. Presentations on both areas were given to the September 20 meeting of the Department of Transportation Secretarial Truck and Bus Advisory Subcommittee. In addition, Dr. Kenneth Campbell of the Highway Safety Research Institute presented the methodology and current status on the NHTSA sponsored study to compare accident rates and operational costs for pre and post standard vehicles.

American Association for Automotive Medicine (AAAM) - James Hedlund addressed the Injury Scaling Subcommittee of the American Association for Automotive Medicine (AAAM) in New Orleans on October 23. Dr. Hedlund discussed several current NCSA accident investigation programs including the National Accident Sampling System, and the National Crash Severity Study.

Donald Reinfurt of the Highway Safety Research Center of the University of North Carolina also gave a presentation to this AAAM subcommittee. He presented interim results from the Injury Scaling Research Contract currently underway at HSRC. Dr. James Hedlund manages this contract.

FARS - The Annual Fatal Accident Reporting System (FARS) Workshop will be held November 1-3 in Fat City, Louisiana. Representatives from the 50 States and Puerto Rico will join the Information Systems Division staff for a series of problem solving sessions and topical presentations.

BRIEFINGS

TAC - Indiana University gave two briefings to NHTSA staff in Washington concerning the results of their five year study entitled: "Tri-Level Study of the Causes of Traffic Accidents."

The first briefing was given on July 27, 1977 and covered the overall causal results and statistics from the study. Topic areas included human, vehicular and environmental factors in accidents, vision test and knowledge test findings, a driver psychological profile study, and some motorcycle accident results.

The second briefing was conducted on August 18, 1977 and covered the results of six special data analysis tasks performed by the contractor during the past year. The topics included:

- o Potential benefits of various vehicle improvements for preventing accidents;
- o An evaluation of Indiana's periodic motor vehicle inspection;
- o Relationship between human causal factors and driver/environmental characteristics;
- o Driver characteristics and errors of accident and traffic violation conviction repeaters;
- o Reliability assessments of police reported accident data;
- o Supplemental accident causation assessments.

The briefings were given by Project Director John Treat, Dr. David Shinar, and Mr. Stephen McDonald.

REGRESSION ANALYSIS COURSE

A short course, Regression Analysis Techniques is being conducted within NCSA by Dr. William Carlson. This course for staff members will examine the regression model and its implications for data analysis. Participants will study both the underlying statistical principles and their application to highway safety problems by using existing NCSA accident data.

REPORTS

55 M.P.H. Limit - Ezio Cerelli has prepared a technical note on, "Estimating the Safety Effects of the 55 m.p.h. National Speed Limit." The publication number is DOT-HS-802-475. It is available through the NHTSA technical reference group.

Air Bags - The September 1977 edition of the "Transportation Safety Information Report" published by the Office of the Secretary of Transportation contains a feature article on automobile occupant restraints. A copy of this article is attached (1).

CONTRACTS

FMVSS 214 - A contract has recently been awarded to the University of Michigan Highway Safety Research Institute to develop a methodology for uniform measurement of occupant compartment intrusion during impacts. Particular emphasis will be directed toward side intrusion with respect to an evaluation of FMVSS 214 - Side Door Strength-Passenger Cars. James Kistle is Contract Technical Manager (CTM).

FMVSS 301.75 - Another contract has been awarded to the University of Michigan Highway Safety Research Institute to develop a workable methodology for the detection and measurement of fuel spillage in motor vehicle collisions. The contract relates to the evaluation of FMVSS 301.75, Fuel System Integrity, James Kistle is CTM.

Motorcycles - A modification to the Motorcycle Accident Factors Study, to determine by special autopsy the extent to which the safety helmet induces neck injury to helmeted riders killed in motorcycle crashes, was awarded to the University of Southern California on September 27, 1977. The study involves performing special head/neck autopsies on 280 helmeted and nonhelmeted riders killed in crashes in Los Angeles County during a 24 month period. The autopsy data will be analyzed in conjunction with related safety helmet data. Data collection should begin no later than January; the contract will last for 28 months. Henri Richardson is CTM.

Exposure Data - A contract has been awarded to the University of Michigan to develop a design for a national system to collect exposure data as a complement to the accident data gathered in NASS. The design should be completed by August, 1978. Glen Parsons is the CTM.

Pedestrians - Negotiations are underway for additional contracts in the Pedestrian Injury Causation Program. The initial contracts were awarded to Traffic Safety Research (San Jose), Calspan (Buffalo), and Southwest Research Institute (San Antonio). The completion date for all the contracts is 1980. The program will attempt to identify the pedestrian injury mechanisms and severity as related to motor vehicle design and associated direct costs. The pedestrian behavioral factors in urban intersection crossing accidents and the number of involved children will also be studied. Mr. Nicholas Tsongos is program manager.

Steering Columns - The statistical analysis tasks of Minicars' contract, "Subcompact Vehicle Energy Absorbing Steering Column Evaluation and Improvement", is nearing completion. The analysis is designed to determine those parameters associated with injury to unrestrained front seat occupants in Vegas and Capris. These data were extracted from the MDAI file and were supplemented with data on Escorts from Birmingham, England. Steve Cohen is CTM.

A report on this analysis along with a briefing at NHTSA's Washington, D.C. headquarters is anticipated. The results of the analysis will be used by the Office of Vehicle Systems Research to develop a sled test matrix for testing the Vega and Capri energy absorbing steering assemblies.

MANAGEMENT

Because of the rapidly expanding programs and in an effort to consolidate responsibilities, some of the contract technical management assignments within NCSA have been changed. These are as follows:

Contract	Manager
Washington Accident Investigation Team Dynamic Science	James Kistle
National Crash Severity Study Program Manager	Scott N. Lee
HSRI, Michigan	James Kistle
IRPS, Indiana	James Kistle
University of Kentucky	James Kistle
Dynamic Science, Los Angeles	James Kistle
SwRI, San Antonio	Paul Solomon
University of Miami	Paul Solomon
Calspan Corporation, Buffalo	Sharon Boyd
Quality Control, Calspan	Sharon Boyd
Pedestrian Injury Causation Study	
Traffic Safety Research, San Jose	Gary Toth
SwRI, San Antonio	Gary Toth
Calspan Corporation, Buffalo	Tom Noga
Quality Control, Calspan Corporation	James Hedlund

FATALITIES - FARS

The 1977 monthly fatality figures reported by October 1 are as follows:

January	2672
February	2819
March	3378
April	3636
May	3915
June	4101
July	4759
August	4463

SPECIAL REPORTS

A series of special reports based upon analyses of the Fatal Accident Reporting System (FARS) data have been planned. Topics include: motorcycles, heavy trucks, pedestrians-cyclists-mopeds, young drivers and selected State comparisons. These reports should become available during the next several months. Suggestions for additional topics are welcome.

VIN

Mr. Ezio Cerrelli attended the September meeting of the Society of Automotive Engineers (SAE) Vehicle Identification Number (VIN) Committee. The members represent domestic and foreign car manufacturers, insurance companies and the National Auto Theft Bureau. Considerable work is being done by a variety of organizations toward standardizing the Vehicle Identification Numbers. Many of these recommendations have similar characteristics, but few of them can meet current research needs. The Federal Motor Vehicle Safety Standard 115 relating to vehicle identification is being revised. The NCSA has reviewed the recommendations of various individuals, States, organizations and research groups and suggested a format which would also meet NHTSA requirements.

The proposed 16 character VIN includes separate fields for manufacturer identification, vehicle type, vehicle description, and model year, to meet research needs, as well as characters for assembly plant and serial number for State and manufacturer's use.

The resulting decision will affect domestic and foreign vehicle manufacturers, State and vehicle registration agencies and safety groups.

IPSS

The Information and Program Services Staff is constantly seeking ways to better serve the highway safety community. Special reports, fact sheets, improved response time to data requests, and in-house seminars are among the means used to disseminate information.

In a further effort to reach our users, the staff has designed a 6-panel free standing exhibit which will be shipped to conferences in addition to, or in lieu of participation by NCSA personnel. The exhibit displays information about current Center activities and comes equipped with a variety of appropriate literature. Requests for the display are welcome, and timely notification of future meetings would be appreciated.

Even before the IPSS became a formal entity, the staff were cognizant of the data needs of the community. Although some requests were dubitable, all have received the attention they deserve. Here are a few of the more interesting data requests we've received:

- Rabbit fatalities by age and sex;
- The number of accidents caused by menstruating women;
- The pass/fail rate for license applicants by race;
- The number of marriages and divorces in the U.S.;
- The number of people who cannot wear seat belts due to obesity or psychological problems.

CONTRACT AWARDS

Several contract awards were made during this quarter which relate to the National Accident Sampling System.

Zone Center - The contracts to establish zone centers for quality control and intermediate PSU management were awarded to the Calspan Corporation (northern zone), and Indiana University (southern zone).

PSU - In addition, these first 10 NASS Team Contractors have been selected and contracts awarded on September 30:

Northern Zone

PSU Site	Contractor
Erie County, Pennsylvania	Management Engineers, Inc.
Ulster County, New York	KLD Associates
Chicago	IIT Research Institute
Muskegon, Michigan	State of Michigan and HSRI
Delaware County, Pennsylvania	Franklin Institute
Skagit, San Juan, Washington	University of Southern California

Southern Zone

PSU Site	Contractor
Alabama	University of Montevallo
Arkansas	Texas A&M, TTI
Dallas County, Texas	Southwest Research Institute
Fort Lauderdale, Hollywood, Fla.	Kappa Systems

Training - The initial training course for the teams has been scheduled for November 7-18, 1977 and will be conducted by the Allen Corporation in Alexandria, Virginia.

Sample - The contract for designing and refining the sampling procedures in NASS was awarded to Westat, Inc. of Rockville, Maryland. This contract covers a broad range of activities from the selection of additional primary sampling units to the stratification of case investigations.

STAFF

Three important additions have been made to the NASS staff. Eugene Lunn has been assigned the role of Deputy Project Director, assisting Russ Smith in both planning and staff direction. Lee Franklin and Frances Bents have been assigned CTM responsibilities for both zone centers and their respective field teams. Working under the direction of Ernst Meyer, who is supervising the Pilot Test, Mr. Franklin will manage the Northern Zone and Ms. Bents, the Southern Zone.

Status Report - James Fell presented a paper entitled, "The National Accident Sampling System: A Status Report" (attachemnt 2) at the 21st Conference of the American Association for Automotive Medicine on September 15, 1977 in Vancouver, British Columbia. The paper was co-authored by Dr. Charles Kahane and NASS Project Director Dr. Russell Smith.

COUNTERMEASURES

The UPI recently reported on one way in which New Guinea citizens have been compensated for "societal loss."

Two 16 year-old girls, dressed in traditional wedding garb and smeared with pig fat, were given away by their families in compensation for a fatal highway crash.

About 10,000 persons watched the ceremony Monday at Pugalamp village in the Western Highlands district. The girls and about $25,000 worth of goods including pigs, birds, bamboo oil and a horse were the Jiga clan's compensation for causing a crash that killed three members of the neighboring Kumdi clan.

The girls will marry the nearest relatives of two men who were killed when their truck hit a tree that had fallen across a road. A woman also was killed. The Jiga's accepted responsibility for having chopped the tree down.

Ms. Frances D. Bents
Information and Program Services Staff
(NRD-30)
National Highway Traffic Safety Administration
2100 2nd Street, S.W. Room 3404
Washington, D.C. 20590
Phone (202) 426-4820

Fran Bents

Frances D. Bents
Editor

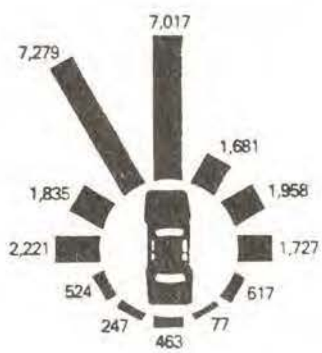
1

FEATURE OF THE QUARTER

AUTOMOBILE OCCUPANT RESTRAINTS

Last year, an average of 124 persons were killed each day in traffic accidents in the United States, for a total of more than 45,000 deaths during the year. Of this total, 25,000 (about 70 persons every day) were drivers or front seat passengers in automobiles. The cost to society of these motor vehicle crashes is a staggering $38 billion a year for deaths, injuries, medical care and rehabilitation, lost income, and property damage - an amount close to the annual amount spent on motor vehicle sales. It is estimated that each fatality costs society $287,175. These societal costs do not include the intangibles - the tragedy and heartbreak, the suffering and human loss of the victims, and the grief of their families.

Studies show that at least 50 percent of all passenger car occupant fatalities involve a frontal impact by at least one vehicle - for example, one car into another or into a fixed object such as a tree, bridge abutment, or a guard rail.



Front seat occupant fatalities
in 1976 by direction of impact

If a vehicle is moving at a given speed (say about 40 mph), and the vehicle is brought to an abrupt stop (as in a frontal collision), the occupants of the vehicle continue traveling at 40 mph until something stops them. In the case of a car crash, that "something" is usually the steering column, the dashboard, the windshield, or some combination of them.

This is where human injuries occur, in what is known as "the second collision." Auto safety engineers and designers have tried to deal with these "second collisions" by such things as padded dashboards, energy absorbing (collapsible) steering columns, and laminated safety windshields to help absorb the tremendous forces which are generated in a car crash. While these devices have been extremely helpful in reducing some injuries, they do not deal with the basic problem of how to prevent occupants from striking the interior of the car.

One possible solution to that problem has been available to every driver and car occupant for many years. Since 1964, most cars have been required to have safety belts, and since the 1969 model year, all cars have had to have both lap and shoulder belts as standard equipment. These belt systems are the best protection now available against death or serious injury in an automobile crash.

The major drawback to this solution is that so few people use their belt systems. In the U.S. today, only about 20 percent of front seat occupants and drivers wear their safety belts. Because of this poor usage, existing seat belts save the lives of only 2,600 front seat occupants, while about 25,000 others die annually in crashes. The difficulty is that safety belts are what are called "active restraint systems." That is, they require some kind of action, such as fastening a buckle, before they provide any protection. It is apparent that for 8 out of every 10 front seat occupants, the required action is ignored for a variety of reasons.

In the last decade, the Federal government, the National Safety Council, and other safety-oriented organizations have spent millions of dollars on campaigns to promote belt usage. But these efforts have had little effect in getting more occupants to "buckle up."

As for laws requiring the wearing of belts, after years of legislative jockeying, there has not been a single mandatory seat-belt-use law adopted in any one of the 50 states, and it is questionable whether such a law could ever be enforced. A recent Gallup poll indicated that 76 percent of the public opposes any law that would fine a person $25 for not using a seat belt when riding in an automobile. Only 17 percent favored such a law.

A second solution is also now at hand with devices called "passive restraint systems." Like the padded dashboards and other such devices, these passive systems provide protection against injury without the occupants having to take any action at all. The devices are there and available whenever a crash occurs.

Such restraints are similar to the passive protection embodied in many other public health measures such as innoculation programs, water fluoridation, and fire sprinkler systems. We don't wait for disease to strike, or dental cavities or fires to occur, and then try to treat them. We undertake preventive steps to try to keep such things from happening in the first place. It's the same with passive restraint systems. They are there, on immediate call when needed, to help prevent death or serious injury.

Currently, there are two basic types of passive restraint systems. The first is a safety belt system which is designed to move into place as each front seat occupant enters the vehicle and closes the door. There is no requirement for any action on the part of the occupant. Such a system is now installed in over 51,000 VW Rabbits in this country. As shown on the next page, the belt stretches from the door corner, across the chest of the occupant, and into inertia reel anchors. When the door is opened, it swings the belt forward, enabling the occupant to slide out of the car. When the door is closed, the inertia reel takes up the slack and the belt presses against the occupant.

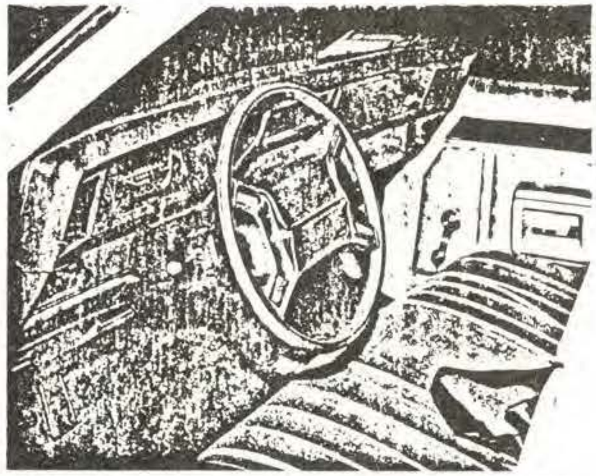
The Volkswagen Rabbit is presently the only car available with a passive seatbelt system.

The system works with surprising ease and feels like the standard shoulder belt. The inertia reel allows ample free movement. In a crash, or if any strain is felt against the belt, the reel locks and holds the occupant firmly. To keep an occupant from sliding under the seatbelt in a crash, VW has installed a padded tray under the dashboard, at knee level, which restrains the knees. The belts can be detached from the door frame at the touch of a button, but the car won't start until the belt is attached again.

This passive belt system has been offered by VW since January 1975. It is now standard equipment on deluxe model Rabbits and costs the firm under $100.

The second, and perhaps best known type of passive restraint is the air cushion system, often called the "air bag." Much has been written and said about air bags, but much of it has contributed little to public understanding about them.

An air cushion restraint system is composed of a few basic parts—a sensor or detector in the area of the front bumper, and in some systems a second sensor on the firewall; a passenger air bag and inflator hidden in the right side of the dashboard; a driver air bag and inflator packaged in the hub of the steering wheel; and knee restrains for the driver and in some systems for the passengers.



The interior of an air-bag equipped car. Note the air bag compartment in the steering wheel hub.

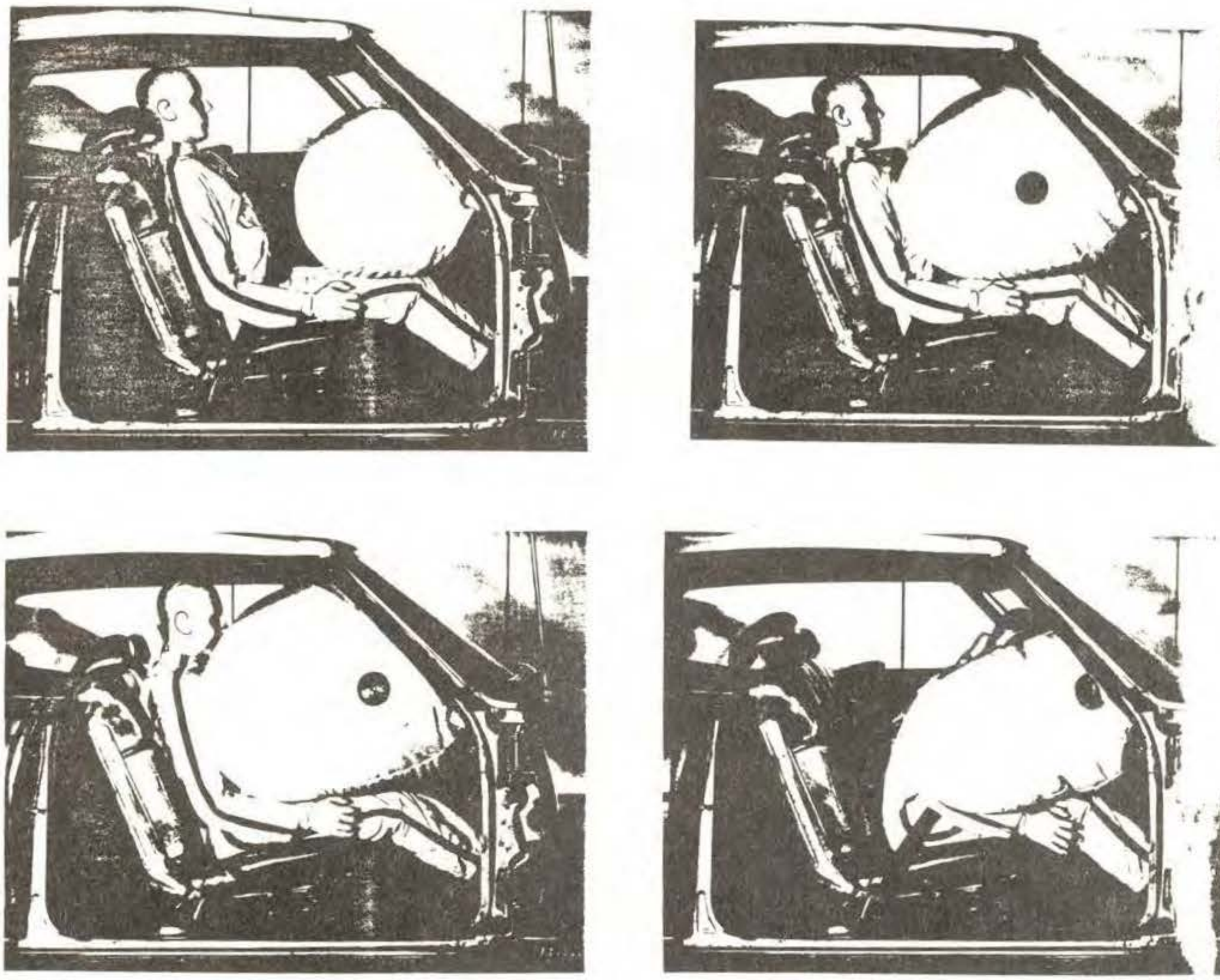
The system has an indicator lamp on the dashboard. When the ignition key is turned on, the lamp will glow for a few seconds to signify the system is working. During this time, the system is being charged to permit inflation in a crash, even if the auto battery is destroyed. When the light goes out, the system is operative.

If the car is involved in a serious frontal crash equivalent to a 10 to 12 mph crash into a solid barrier, the sudden deceleration (impact) causes the sensor to activate a gas inflator, which inflates the bag instantly to cushion the occupants from striking the interior of the vehicle. The occupants move forward into the bags, the knee restraints, special knee restraint bags, or lap belt keep them from sliding under the bags, and the air cushions absorb the impact forces.

The porosity of the bags allows the gas to escape even as they are being inflated. One of the most difficult things for the layman to conceive is the tremendous speed with which the entire process operates to prevent second collision injuries. The air cushions are fully inflated and partially deflated in about 1/25th of a second. That means that the complete process occurs so rapidly that it happens in the blink of an eye. However, that instant is all it takes to provide the necessary protection to keep an occupant from striking any hostile or harmful surface in the car.

Air bags have been under development since 1952, and have been tested not only in laboratory and experimental situations, but in more than 450 million miles of actual driving experience. There are over 11,000 air bag equipped cars on the highway today. One of the drawbacks to the system is that it can only be used once and then must be replaced (if the car is still worth fixing).

The Secretary of Transportation, on June 30, 1977, directed motor vehicle manufacturers to install automatic restraint systems for front seat occupants of new cars beginning with model year 1982 luxury and



An air bag and lap belt demonstration using a dummy as the occupant. The entire air bag sequence takes only 1/25th of a second.

standard-sized and phasing in other sizes of cars in the following two years.

In announcing an amendment to Federal Motor Vehicle Safety Standard No. 208, Occupant Crash Protection, the Secretary said the requirements would affect intermediate and compact cars built in the 1983 model year and 1984 subcompact and mini-sized vehicles. This means that by model year 1984, all new domestic and foreign cars sold in the United States must be equipped with passive restraints, such as air bags or passive belts which provide automatic protection in crashes up to 30 miles per hour. The Secretary, in making his decision, said the auto industry has been given a generous lead time of four years to begin installing passive restraints to ensure that the best available systems will be used, and thay they will have the highest possible reliability and quality.

The Department of Transportation estimates that, on a mass production basis, a full front seat air bag system will cost about $112 above the cost of current safety belt systems. This increase should eventually be offset by insurance savings that the consumer can expect because of reduced death and injury claims. If we compare the cost of a life-saving air bag to the price of commonly sold extras such as a vinyl roof at $120, power seats and windows at $300, aluminum wheels at $200, or a retractable sliding roof at $800, the cost is managable.

The two most frequently asked questions dealing with the reliability of the system involve accidental inflation of an air bag, and possible failure of a bag to deploy when it is needed in a crash.

In the more than 450 million miles of actual use, accidental air bag deployment in a vehicle in motion when there was no crash has occurred only three times. At this rate, the chance of an inadvertent deployment would be about one in a thousand if a person drove a car equipped with an air bag for a lifetime. Even if this did happen, inflation and deflation are so rapid, that there is little chance the driver would loose control of the vehicle. This was demonstrated by a series of 40 tests in which the bag was deployed without any forewarning to the driver. No loss of control was experienced.

As far as an air bag not working when needed, in well over 300 known crashes involving air bag equipped cars, only one failed to inflate when it should have – and that was in an early test model. The source of that failure has been identified and eliminated from later systems.

As far as consumer acceptance is concerned, a recent Gallup Poll indicates mounting evidence that the public is ready and willing to buy air bags. The survey, based on interviews with 1,526 adults, showed that 46 percent of the American public were in favor of requiring automakers to install air bags in all new cars, while only 37 percent were opposed, and 17 percent had no opinion. Interestingly, support is the strongest among the nation's youngest adults, 18 to 29, the age group that has the highest car accident and death rate.

In another survey conducted recently by the Insurance Institute for Highway Safety, nearly 80 percent of 1,017 people interviewed who were planning a new car purchase within three years said they preferred crash protection that requires no action by drivers and passengers each time they travel. Only 15 percent said they preferred completely active protection, such as standard safety belts.

While the Department of Transportation has carefully estimated the effectiveness of air bags and other passive restraint systems on the basis of extensive and controlled engineering and road tests, it is looking forward to the day when protection will be available to vehicle occupants at speeds of 50 to 60 miles per hour.

Testing programs by the Federal government, auto manufacturers, passive restraint suppliers, and other private industries such as auto insurance companies have provided clear and convincing evidence that passive restraint systems are workable, they are safe, and they are effective in reducing injuries and preventing death in many auto crashes.

The American motoring public, when it has a chance to experience and understand these systems, should agree that passive restraint systems represent the most significant advance in auto safety in decades.

SOURCE: This article is based on material submitted by the National Highway Traffic Safety Administration.

2

THE NATIONAL ACCIDENT SAMPLING SYSTEM

A STATUS REPORT*

by

Charles J. Kahane
James C. Fell
Russell A. Smith

National Center for Statistics and Analysis
National Highway Traffic Safety Administration

*Paper to be presented and published in proceedings of the 21st annual meeting of the American Association for Automotive Medicine, Vancouver, British Columbia, September 15-17, 1977.

THE NATIONAL ACCIDENT SAMPLING SYSTEM - A STATUS REPORT

Charles J. Kahane
James C. Fell
Russell A. Smith
National Center for Statistics and Analysis
National Highway Traffic Safety Administration
U.S. Department of Transportation

ABSTRACT

The implementation of the National Accident Sampling System is reviewed. Objectives are discussed in detail, including the production of national statistics and the planning needed to take advantage of the NASS in countermeasure evaluation. The underlying design philosophy for NASS is discussed. Misconceptions that have arisen in the design stages of the system are identified and explained.

The National Highway Traffic Safety Administration (NHTSA) is authorized to collect "adequate" statistical data on accidents and exposure to aid in the development, implementation and evaluation of Motor Vehicle and Highway Safety Standards and countermeasures. "Adequate" statistics must be sufficiently detailed to answer the question at hand, accurately representative of the national experience and current enough to keep apace of changes in the nation's traffic system. The National Center for Statistics and Analysis (NCSA) is the unit within NHTSA charged with collecting and analyzing accident and exposure data. Based on past experience, NCSA concluded that police-collected data alone do not provide enough detail on many needed statistics. On the other hand, detailed data collected by accident investigators under contract to NHTSA can only produce valid national statistics if it is collected according to an appropriate national sample design. Therefore, NCSA is implementing a National Accident Sampling System (NASS), which will consist of 35-60 small teams of accident investigators, under contract to NHTSA,which are situated throughout the United States. The location of each site, typically a county or group of counties, will be selected by probability sampling. Within each site, the team will investigate a probability sample of accidents and collect exposure data on a continuous basis (Continuous Sampling Subsystem). Additional accidents will be investigated or data elements collected on a one-time basis as needed to perform special studies (Special Studies Subsystem). NCSA selected the first ten NASS sites in June 1976 and is now awarding contracts to teams for a pilot test at those sites. (See Figure 1.)

NASS is described by a number of published and unpublished documents. The earliest was the Highway Safety Research Institutes' (HSRI) design for NASS [1]*, a contract report delivered to NHTSA in August 1975. A task force formed within NCSA reviewed and modified HSRI's design, developed further plans for NASS, and presented them at the Calspan Motor Vehicle Collision Investigation Symposium [2] in October 1975. In February 1976, NCSA's plans were reviewed by an Expert Panel, chaired by Prof. Susan Baker and including several other AAAM members. In March 1976, the authors formed the first permanent NASS staff within NHTSA. The NASS staff busied themselves with the implementation of NASS and made further revisions in the original design. The revisions were not publicized except for a Technical Note [3] about the selection of the first ten NASS sites.

Two recent reports on NASS have informed the public about recent changes. This is the second of these reports. The first one [4] describes the various projects that will be undertaken and gives a timetable for their implementation based on the perception in Fiscal Year 1977. It does not go into detail on why NASS is needed. In this report, on the other hand, considerable attention is devoted to clarifying NASS objectives, discussing appropriate uses of NASS data and explaining the "philosophy" behind the project.

NASS IMPLEMENTATION STATUS

Sampling Structure - The preliminary design for NASS [1] included a defined structure of 35 Primary Sampling Units** (PSUs) chosen from approximately 1100 PSUs representing the contiguous United States. Our implementation has modified this for several reasons. First, and most important, is the circumstance that a 35 PSU network contributes a substantial sampling error due to site-to-site differences or variations in measurements. This can be reduced only by achieving a system with more PSUs selected for data collection, hopefully as many as 50 PSUs. Second, it is not clear that sufficient and reasonable variables have been identified for measures of size and stratification. These parameters must be adequately defined and researched before a sampling structure can be identified. There is an intrinsic conflict here. Before a structure of 50 PSUs (or 35 for that matter) can be selected, the measure of size and the stratification variables must be identified; yet, without good national data it is difficult to

* Numbers in brackets [ ] indicate references listed at the end of the paper.

** A Primary Sampling Unit is an area, such as a city or county, in which accident data are collected.

predict "a priori" the best measure of size and stratification variables. Thus the NCSA has chosen to proceed with a preliminary sample of 10 PSUs which allow the opportunity to test many system concepts and to collect and analyze better data on which to base the sample design.

An important sampling structure study will be initiated this Fall to investigate the merits of variables other than population, urbanization and gas sales as stratification variables. NCSA is interested in such measures of size as vehicle population and fatalities. Other stratification criteria to be considered include roadway classification, annual precipitation, and terrian characteristics as well as urbanization.

Methodology and Field Protocol - A substantial body of work is underway on the development of methodology. Of interest here are methodologies that can be used in the level-2 "after-the-fact" type of investigation planned for NASS teams. The need for methodologies is based on the unequivocal requirement that each team operate with a set of procedures and measurement tools that are common to the study and not unique from team to team. This has been accomplished in large degree for many crash phase variables, such as vehicle damage (Collision Deformation Classification) [5] occupant injury (Abbreviated Injury Scale) [6] and delta-V (CRASH program).[7]

The greatest contribution forthcoming in this area must necessarily be in the precrash spectrum of data. A major contribution to NASS field methodology will come from the Accident Causation Methodology study to begin in late FY'77. Other precrash methodology studies underway include vehicle braking and handling characteristics and their contribution to accidents. A fuel leakage methodology for the postcrash area of study is also planned.

In all cases of methodology and field protocol, an increased emphasis will be placed on training, rather than the simple reliance on the skills of the field personnel to accurately and consistently record measurements. All field personnel will be given basic training and periodic refresher training. Special and advanced training will also be used for selected topics and in preparation for special studies.

System Output and Access - The Continuous Sampling Subsystem will collect data to create periodic statistics and to define the baseline or "national average" with respect to common highway safety phenomena. At this time, these statistics have been identified largely in the area of crash-phase phenomena. More complete definition of precrash phenomena will await the results of the accident causation methodology study. Some detail on the types of statistics planned is given in the section on NASS Objectives.

The focus of the Special Studies Subsystem will depend upon the current interests and data needs of NHTSA. Good examples of these today are the National Crash Severity Study and the Pedestrian Injury Causation Study, two precursors of NASS. A substantial portion of each of these ongoing studies is ordinarily included in the continuous subsystem. Such detailed data needs as that on fuel leakage, fires, passenger vehicle side structure performance and seat performance will likely be considered special study material and will not be collected on a continuous basis.

Data from the NASS will be available through the Information and Program Services Staff of the National Center for Statistics and Analysis. Specific data retrieval can be re-requested (e.g. the use of various restraint systems by passenger car size and crash configuration during 1977) or a data file can be constructed using a format and list of data elements defined by the user. Significant special data collection efforts such as those done under the Special Studies Subsystem will include a concomitant plan for analysis as well as data file construction.

NASS Pilot Test - In choosing the ten pilot test sites, population was the measure of size and urbanization was used as a stratification criterion. It is anticipated that upon further expansion, the sample will be redrawn using a technique that ensures a high rate of retention of the original sites so long as the basic sampling structure does not change substantially.

In essence the pilot test will determine the practicality of establishing accident research teams at randomly selected sites, and identify problems and the solutions associated with such new teams. Having accomplished this, the study will attempt to establish at each site the caseload that can be effectively handled in continuous sampling and with a special study. In these cases, data quality and quantity of missing data will be the significant evaluative criteria.

Integration of Existing Data Collection Network into NASS - The National Center for Statistics and Analysis presently has a number of data collection efforts underway. Of principal importance [4] are the networks for the crash severity study and the pedestrian study, each of which is a multi-contractor, multi-site study, and the accident causation study (two sites). These networks will be continued until the NASS network is prepared to assume a substantial load of special studies.

The important contribution of these systems is that it frees the fledgeling NASS network from specific data requirements, allowing NASS to concentrate on developing a sound management system and operational structure as well as to explore the concepts and variables needed for final system design. Once these objectives of the pilot test have been completed, the NASS can proceed to expansion toward its final design.

Implementation Schedule - The schedule noted in FIGURE 2 is substantially the same as noted in the implementation plan [4] with one important exception. Plans for expansion in FY'78 have been postponed until FY'79. This change is based on a desire to give NHTSA ample time to assimilate and evaluate the results of the pilot test and the sampling structure improvement project. This revised schedule reflects this change.

NASS OBJECTIVES

NHTSA has stressed that the primary objectives of NASS are to:

1. Estimate and disseminate annual national totals and rates of accidents and exposure, accident causes and consequences, at a level of detail not currently available.

2. Evaluate existing countermeasures, Motor Vehicle Safety Standards and Highway Safety Program Standards.

3. Provide data during the field test or demonstration phase of proposed standards and countermeasures to assist in evalating their likely accident and injury reducing benefit.

4. Provide a current and detailed accident and injury causation data base suitable for establishing priorities for and assisting in the design of future countermeasures.

5. Monitor changes and trends in the highway safety environment.

At this time, NHTSA management, the research and the highway safety community are virtually unanimous in agreeing that a data system accomplishing these objectives would be highly desirable. NCSA believes that some words of explanation are needed as to how NASS can accomplish these objectives and what cooperative efforts on the part of safety planners and decision makers are essential.

The five NASS objectives listed above will now be discussed in detail, with the exception of exposure data collection, which is only in a developmental stage and will probably not be implemented in the field for at least two years.

1. Estimation of national statistics - One of the most useful products from NASS will be an annual report of national totals and rates as estimated from NASS data. The report will permit a considerable level of detail heretofore unavailable in highway safety.

Most NASS statistics will be presented as national totals (e.g. "there were 25,000 pedestrians and occupants who sustained leg fractures, in traffic accidents in the United States in 1982"). Such national totals can be estimated directly from the NASS data, since NASS will be a probability sample of the nation's accidents. Each accident in the NASS sample has a known probability of selection based on the statistical sampling plan, and can be assigned a weight equal to the reciprocal of the probability, i.e., the accident in the sample "represents" a number of accidents in the nation equal to its weight. Thus, for example, if there are two occurrences of broken legs on the NASS data file, and the first one had probability of selection .0002 (weight = 5000) and the second, .00005 (weight = 20,000), one would estimate a total of 5,000 + 20,000 = 25,000 broken legs nationwide.* For some estimates, especially for fatality statistics, a ratio or post-stratified estimating technique will be used - e.g., if there are about 45,400 fatalities nationwide (derived from some source extraneous to NASS) and 25% of the NASS fatalities are automobile occupants subjected to $\Delta V<30$, one would estimate that there are 11,350 automobile occupant fatalities nationwide with $\Delta V<30$. Ratio and post-stratified estimates, when properly used, are more precise than the simple unbiased estimate.

Other NASS statistics will be presented as national rates (e.g., the rate of helmet usage by accident-involved motorcycle occupants was 75% in 1982). A rate is nothing more than the quotient of two national totals estimated from NASS - viz. the total number of helmeted occupants divided by the total number of motorcycle occupants involved in accidents. Still another category of NASS statistics are national measures of countermeasure effectiveness (e.g. helmets reduced head injury by 75% during 1980-85). A measure of effectiveness is no more than one minus the quotient of two national rates (suitably post-stratified) - viz.

$$E_{\text{helmets}} = 1 - \frac{\text{Injury rate for helmeted occupants}}{\text{Injury rate for non-helmeted occupants}}$$

It should be understood that each NASS statistic will be subject to sampling error, since NASS is based on a sample rather than a census of the nation's accidents. Many key NASS totals will have sampling errors (two standard deviations) one tenth as large as the total. Nevertheless, such sampling errors are small compared to current uncertainty about these totals. For instance, the usage of belts in accidents nationwide, the median speed of fatal involvements, the percent of deaths due to fire, and the percent of crashes caused by gross brake failure are all currently subject to much more than 10% rate of uncertainty. If it should be desired to increase the precision of NASS statistics, it will be necessary, above all, to increase the number of teams, <u>not</u> the number of cases per team. For the vast majority of NASS statistics, the between - PSU contribution to the variance appears to be substantially larger than the within-PSU contribution in a 35 PSU, 17,500 case sample.

*The reader may be assured that national estimates will not be made from only two NASS cases. The above example was merely made as simple as possible in order to illustrate the estimation technique.

Such national statistics will be the subject of an Annual Report. The principal topics of the Annual Report will be:

a. The Traffic toll - NASS will make it possible to describe in detail the toll of highway accidents and their consequences by giving estimates of the national number of injuries by AIS level, by type of disability suffered, by length of hospital stay and layoff from work and by specific type of injury. Fatalities will also be classified by specific type of lesion.

b. Detailed characteristics of fatal accidents, including accident severity, detailed and accurate description of accident configuration, roadway, vehicle, driver and occupant types, availability and use of countermeasures.

c. Detailed characteristics of injury accidents, where "injuries" are classified by their AIS levels, or by specific lesion type or by their consequences.

d. Injury and fatality rates per accident-involved occupant, for various types of accidents, vehicles, occupants.

e. Up-to-date measures of availability, usage in accidents and effectiveness of selected key countermeasures, such as occupant protection systems.

f. Accident and injury rates per unit of exposure. (Of course, this can be done only when the exposure data collection is implemented.)

2. <u>Evaluation of existing standards</u> - The implementation of a NASS system will not in itself guarantee the possible evaluation of all the standards but it is certainly a step in the right direction. The evaluation of a standard or countermeasure requires an experimental design which specifies, at the very least, what analytic technique is used to estimate the effectiveness of the countermeasure and what type and quantity of accident data is needed to employ the analytic technique successfully.

The data itself should be identified by two categories, one group influenced by the standard, and another group not influenced by the standard. Ideally, these two groups would be alike in all other respects. Unfortunately, existing standards largely defy such categorization.

The chief impediment to the evaluation of existing standards is that most of the standards were implemented on <u>all</u> cars manufactured after a certain date and <u>none</u> before that date. Thus the population with the standard is the new cars and that without the standard is the old cars. New and old cars differ in many respects besides the standard under study:

1. New cars are driven more miles per year;

2. New cars are driven more safely: their accidents have lower severity, less likely to be "at fault", less likely to be single-vehicle, more likely to be struck in the rear;

3. Noninjury crashes of old cars are often not reported to police, thereby biasing injury rates upward;

4. New cars are smaller in size;

5. New cars have fewer worn-out or defective components;

6. New cars are more likely to be furnished with safety standards other than the one under study.

It is nevertheless possible to evaluate a standard if one can identify one category of accidents <u>not affected</u> by the standard and another category affected by the standard. One could then collect accident data and determine the number of accidents (for an injury prevention standard, the number of injuries) in each cell of the 2 x 2 matrix shown in Table 1.

Table 1

	Cars without Standard (old)	Cars with Standard (new)
Accidents not affected by standard	A	C
Accidents affected by standard	B	D

The value of D expected if the standard were totally ineffective is $\frac{BC}{A}$. Thus, the difference of observed D and expected $\frac{BC}{A}$ is an estimate of the effectiveness of the standard.

There are two important conditions to be satisfied before this technique is justified:

a. the accident data should be complete and accurate otherwise cell entries may be seriously in error:

b. the two accident categories must be very carefully defined so that there is <u>no</u> factor that could make $\frac{BC}{A}$ different from D except for the standard itself.

The NASS system would contribute to this type of evaluation in the following ways:

(i) the NASS sites are nationally representative;

(ii) the NASS teams would collect data of sufficient accuracy and detail to permit classifying the accidents into the two well defined categories;

(iii) NASS data on accidents not reported to the police would be used to adjust for biases due to nonreporting of accidents involving older vehicles.

In the case of a Highway Safety Program Standard which is currently being implemented by only some of the States, one can use a similar matrix (see Table 2).

Table 2

	States without program	States with program
Accidents affected by Standard		
Accidents not affected by Standard		

Again, accurate data are needed to carefully define the categories of accidents affected and unaffected by the Standard and ensure that there are no effects not attributable to the Standard.

A special category of standards that can be more easily evaluated are those that require that hardware be installed in new vehicles, but whose correct usage depends on an action by the occupant. Seat belts and motorcycle helmets fall into this category. Here, the populations using and not using the standard have much more in common, but they are still not identical in all respects except for the standard. For example, belt users tend to have less severe accidents than non-users.

By mathematically weighting belted occupants in severe accidents more heavily, one may produce a belted "population" that has equally severe accidents as the unbelted population. By differential case weighting on the various appropriate factors (e.g. crash severity, vehicle weight, occupant age) one can produce belted and unbelted populations that are reasonably similar in all respects except belt usage. The difference in the weighted injury rates can be attributed to belts. This technique is called "post stratification" and it was used successfully by the University of North Carolina during the Restraint Systems Evaluation Project [9].

The NASS system would improve on that project because it would give weighting factors based on a nationally representative sample.

When, however, several standards aimed at the same target accident population are implemented simultaneously, it is impossible, even with NASS data, to determine which of the standards has caused the accident reduction. When a standard affects all types of accidents and its usage does not depend on action by the occupant, it is impossible to evaluate effectiveness by a straightforward technique that is widely accepted. A Highway Safety Program Standard, for example, that has been universally enforced in all of the States for many years cannot now be evaluated by NASS, since there are no control group data.

3. Assistance in the evaluation of proposed standards and demonstration programs - NASS would be most useful for the evaluation of proposed and future Motor Vehicle Safety Standards if such standards were implemented during a "trial" or "field test" phase on a random sample of the nation's new cars. This could be accomplished by introducing simultaneously, new cars with and without the countermeasure. If this were done on a random basis, for example, every other vehicle being equipped with the countermeasure, each population, with and without the countermeasure, would be distributed randomly over all confounding factors. Of course, this procedure would only be carried out for those new standards where it is ethical and practical to do so. For countermeasures whose life-saving potential and cost-effectiveness are nearly universally accepted even prior to their implementation in the field (seat belts and shatter-proof energy-absorbing windshields are good examples from the past), it would be unethical to exclude, at random, a large part of the new vehicle population from their protection. It would also be unethical, for a very expensive countermeasure, to ask the purchasers of new cars without the countermeasure to pay the same price for a new car as those getting a car with the countermeasure, yet random introduction of the countermeasure is virtually impossible if one group pays a different price for cars than the other. Random introduction of a countermeasure is not practically feasible if the countermeasure itself is so obstrusive or noticeable that its presence on a car would influence a significant number of purchasers to buy or not to buy that car.

Before initiating the field test of a new standard, the rulemaking group within NHTSA would work closely with the NASS staff to determine such matters as:

(i) how the standard's effectiveness shall be evaluated and what size sample of accidents is needed, based on preliminary assessments of effectiveness using laboratory tests, etc.;

(ii) what is the most cost-effective fraction of the new vehicle fleet on which to implement the standard (e.g. 1/2 or 1/10 ?);

(iii) how long will the random introduction be implemented on new cars, and how long will each NASS team monitor their accidents within the Special Studies Subsystem;

(iv) how will the random introduction of the standard be carried out (e.g. it is implemented on every car whose Vehicle Identification Number (VIN) ends in 1).

The evaluation of a demonstration program possibly leading to a Highway Safety Program Standard presents more difficulty than the field test for a Motor Vehicle Safety Standard. This is because, generally speaking, only the latter can be implemented on a simple or systematic random basis in the nation's new vehicle fleet. Demonstration projects are generally enforced upon 100% of the driving population in selected geographical areas and on 0% of the nation's population not driving in these areas. Moreover, it is usually not possible to select the areas at random, since the demonstration project requires extensive voluntary involvement by local officials.

Nevertheless, NASS can be extremely useful in evaluating future demonstration projects because NASS is based on a stratified sample of the nation's geographical areas. In other words, the working areas of NASS teams are fairly large geographic areas, such as a populous county or a contiguous group of less populous counties. This is very similar to the types of areas in which NHTSA demonstration projects have usually been located. Moreover, each NASS site is identified with the stratum to which it belongs. A stratum is a list of potential NASS sites similar with regard to urbanization, terrain, roadway systems, climate, etc. One site is chosen from each stratum for the implementation of a NASS team, but the remaining sites in that stratum should have roughly the same accident environment. The location of a demonstration project at one of the remaining sites in the stratum would put it in an accident environment quite similar to the NASS site.

Thus, the evaluation of a demonstration project would ideally involve the following steps:

(i) the group managing the demonstration project would work with the NASS staff to determine exactly what accident statistics are needed to measure the effect of the project. Statistical, financial and practical considerations would be used to optimize the number of locations and the duration of the demonstration project. The number of demonstration sites would be equal to the number of NASS teams, or 1/2 that number, or 1/4 or 1/8;

(ii) the group managing the demonstration project will obtain the list of potential NASS sites in each stratum.

They will select one of the sites from each stratum* and locate a demonstration at those sites.

(This selection should ideally be random, but in reality usually depends on the interest of local authorities in working on such a project.) This places the demonstration projects at a group of sites that matches the NASS system and is, moreover, nationally representative.

4. Data base for countermeasure design - A highway safety researcher or decision maker uses field accident and exposure data to help him select and design countermeasures long before they are actually implemented in the field. First, he needs field data to help establish prioritiesin highway safety: he needs to know what sorts of accident configurations are causing the greatest losses on the nation's highways. After selecting an area for improvement, he needs to understand enough about the causes of accidents and injuries in real-life highway situations that he can design a countermeasure that will be effective on the highway. Finally, he will rely on field data to define appropriate laboratory test and evaluation techniques that can give him a reliable judgement that the countermeasure should be field tested or mandated.

As an example, a researcher wanting to design a less injurious A-pillar would want to know what percentage of the nation's vehicle occupant injuries are caused by A-pillar contact. He would want to know what fraction of these are irrelevant to his project because they are accompanied by severe intrusion or more severe injury due to other components. He would like to know what part of the occupant's body is striking the pillar and what the crash speeds and forces were, so that he will know what level of energy must be absorbed and what is the maximum rate of absorbtion that occupants can tolerate. Finally, he would like to know at what angles the occupants are striking the pillar in order to determine if there would be an effective way to direct occupant movement away from the pillar rather than improve the pillar. He could then evaluate his device in the laboratory and judge its effectiveness.

The NASS will provide, through its Continuous Sampling Subsystem, a current, nationally representative file containing the basic information needed for countermeasure design in the pre-crash phase, the crash phase and the post-crash phase, including human, vehicle and environment data. The basic information can be supplemented, by additional data elements collected on the same accidents on a temporary

*If there will be as many demonstration sites as NASS teams, this means one demonstration site from each NASS stratum. If there are half as many demonstration sites as NASS teams, the NASS strata will be paired and one demonstration site is selected from each pair of NASS strata.

basis (i.e., within the Special Studies Subsystem) to the extent that this is feasible given current accident investigation technology. The NASS staff would work with the user to determine the duration and scope of such a special study.

5. Monitoring changes in the safety environment - There are two ways in which NASS can be used to monitor changes in accidents or exposure conditions. First, there are the ordinary statistics calculated from NASS Continuous Sampling Subsystem data and, to a large extent, published in the Annual Report. After NASS has been fully implemented for several years, it will be possible to draw trend lines and publish time series showing year-to-year changes. It should be kept in mind, however, that the sampling errors in NASS are moderately large and only fairly substantial (e.g. 5% or more in a year) or fairly persistent (e.g. 2% a year for five years) changes can be reliably detected.

A classic example of the other type of "change" that NASS should "monitor" was the very large drop in fatalities and injuries associated with nationwide adoption of the 55 mph speed limit. Since no adequate nationally representative data file was available immediately before or after the speed limit reduction, researchers are even now, more than three years later, trying to piece together "what" happened and "why." NASS data from the Continuous Sampling Subsystem could have shed considerable light on that problem by giving before-and-after distributions of highway speed limit in accidents, impact speed, precrash braking, exposure by time of day, age of driver, etc. Many other useful statistics, though would not have been available without a special study that adds data elements on a temporary basis. If such a special study is not initiated before the sudden change, there will only be "after" data with no "before" data with which to compare it.

That would obviously limit the usefulness of NASS to analyze the change. Therefore, in the future, whenever a substantial change in the environment is the result of a conscious decision by policy makers (e.g. the 55 mph speed limit) rather than a pure Act of Fortune, it would be highly desirable that the implementation include the initiation of a special study before unbiased data preceding the change are unavailable.

THE NASS PHILOSOPHY

The reader has seen that the NASS system, when fully implemented, will have quite a number of subsystems and structures and an array of objectives and user groups to satisfy. Nevertheless, there are a few guiding principles which influence all the members of the NASS staff and exert a unifying influence over the diversity of subsystems. These principles may collectively be called the "NASS philosophy." It draws heavily on NCSA's experience with previous accident investigation projects, the U.S. Census Bureau's approach to the Current Population Survey and the advice of the Expert Panel, chaired by Professor Susan Baker, that reviewed NASS during the Spring of 1976. The NASS philosophy is concerned primarily with how the NASS system interacts with data users and with the communities where NASS teams will work, with data systems design and quality control.

The NASS staff feels it is important to maintain frequent communication with the data users both inside and outside NHTSA. The cost-effectiveness of NASS, in the long run, is measured by the extent to which it satisfies user needs. In November 1976, a permanent Users' Committee was formed within NHTSA to advise the NASS staff on data needs and special study interests. An outside Users Committee composed of experts from the accident research community, statistical research community and motor vehicle and insurance industries is now being formed.

The NASS data will be a public resource available to all users. Members of the public will be able to purchase NASS tapes at nominal costs. NCSA staff members will perform special analyses on NASS data upon user request (just as they have already been doing on other less adequate data files for many years). The more important analyses will be published. The NASS Annual Report will be widely disseminated.

NASS teams will be in daily contact with State and municipal officials, private business people and the general public at their respective sites. It is important, therefore, that the team members be responsible and respected members and residents of the communities in which they work.

The interest and participation of police, hospitals and vehicle repair facilities is an absolute necessity for NASS. NASS relies on such agencies making available to team members the data they normally collect, promptly and completely. If the good will of these parties is to be maintained, it is important that they not be further burdened by requests for data that they do not normally collect. Any additional action by local agencies as part of a special study, therefore, has to be on a strictly voluntary basis.

The confidentiality of information volunteered in good faith to NASS team members by private citizens during interviews must be strictly guarded. This applies with equal weight to information given by police, doctors, and auto repairmen. All data, both automated and hard copy, will be stripped of identification of persons, time or place.

Since the NASS implementation is proceeding under conditions of uncertainty with regard to final budget, costs and exact user requirements, it is especially important that the NASS sample design be flexible enough to admit changes as suggested by information obtained during the implementation. The changes, however, must not excessively disrupt the existing system. The sampling approach of the Current Population Survey, which is extremely flexible, has been adopted, with appropriate modifications, by the NASS staff [3].

NASS data should be accurate and objective. Otherwise, all the advantage of having a probability sample of the nation's accidents whose sampling error is measurable is dissipated due to unmeasurable biases. NASS data elements should be restricted to what can be feasibly collected in the field, with reasonable accuracy and objectivity. NASS must not try to leap ahead of state-of-the-art accident investigation technology. Instead, technological developments sponsored by NCSA will be geared to improving NASS.

Quality of data collected by NASS teams will be monitored by the Zone Centers and Data Processing Centers, using a five-fold strategy:

1. Training of all field personnel on field techniques.
2. Observation and evaluation of teams in the field.
3. Periodic performance evaluation of team members.
4. Hard copy case review, by the Zone Center, of a sample of teams' cases.
5. Computerized consistency checking, at the Data Processing Center, of all cases.

MISCONCEPTIONS ABOUT NASS

It is appropriate at this point to dispell several misconceptions that have arisen concerning NASS. As indicated in earlier sections of this paper, several modifications have been made in the original HSRI design and some of the earlier NASS descriptions and, depending upon the results of the Pilot Study, several more will be made.

1. NASS Site Selection

That all NASS sites have been selected, but only the first 10 announced - The original design by HSRI [1] called for the selection of all NASS sites (they recommended 35) in one drawing, implementing 10 sites per year with teams. The NCSA staff modified that sampling scheme [3] and essentially adopted a selection technique similar to the U.S. Census Bureau's Current Population Survey (CPS) [9]. The CPS allows for the selection of a number of initial sites, and then a reselection of a greater number of sites with a high probability of retaining the initial sites within that reselection. The CPS also allows for substantial modifications of the sample whenever necessitated by changes in budget, operating costs, or by discovery of an improved sampling technique. The CPS scheme for reselection of PSUs is designed to permit retention of the vast majority of already sampled PSUs after any modifications without violating the concept of probability sampling. The scheme will also likely decrease the sampling error of NASS statistics. Therefore, only the first 10 NASS sites have been selected to date with the CPS scheme being used for subsequent selections.

That NASS sites are "high accident locations" - The term "high accident locations" implies specific roadway locations, areas, sections, cities or counties where the accident rate is much higher than is to be expected. Usually some measure of exposure such as average daily traffic (ADT), miles traveled, or population is used to calculate the rates. The NASS sample has not been designed to select only those areas where the accident rate is high. This would not give us nationally representative data.

2. NASS Teams

That NASS teams are MDAI teams - Because NASS is essentially replacing what was a network of Multidisciplinary Accident Investigation (MDAI) teams, the misconception that NASS teams will be made up of MDAI-type personnel has arisen. Although the NASS teams will be made up of highly trained professionals, they will not be medical doctors, PhD's in engineering, psychiatrists, etc. The make-up of the NASS teams for the most part will be trained technicians conducting level 2 investigations. They will be asked to fill out standard forms using primarily the formal training they will receive. They will not be performing in-depth, on-scene, full scope investigations with accompanying vehicle, driver and environmental "autopsies." A few MDAI teams will likely be sponsored by NHTSA, even when NASS is fully operational, but they will not be NASS teams.

That accident sites will not routinely be visited - Although "on-scene" investigations while the accident is working will not be conducted, accident sites will routinely be visited by the NASS teams as soon as possible after the crash. Photographs of the sites will be taken, physical evidence noted, skid marks measured, etc., as needed to meet NASS data requirements. Site visits will be conducted by the NASS teams on a routine basis since much information needed for accident reconstruction purposes and for highway and traffic engineering purposes cannot be obtained from any other source. "On-scene" investigations are possible in special study investigations.

3. NASS Zone Centers

That MDAI teams and Zone Centers are identical - The functions of the Zone Centers are vastly different from those of an MDAI team. The Zone Center's main responsibilities will be quality control of the NASS team data. This includes adherence to the sampling plans, proper interpretation of the data elements, reducing the amount of abandoned cases and missing data per case, and the monitoring of team field procedures. The Zone Centers will perform an intermediate management function for the NHTSA. They will make several visits to the NASS sites to help out with community relations, field procedures, and other team problems. MDAI experience will certainly help the Zone Centers perform these functions, but it is not a prerequisite.

The each Zone Center is solely responsible for training and data definitions for its own teams - One Zone Center is now in the process of defining all of the NASS data elements and developing codebooks for use by all teams. A separate training contractor will be conducting a formal training course for all NASS teams, using that codebook in the training process.

Zone Centers will make sure that the teams under their responsibility are consistently collecting and interpreting the data, encoding it properly and will help them with any field problems. Each Zone Center will use the training, the codebooks and their experience to perform these functions. NHTSA management will ensure that each Zone Center is performing these functions properly and consistently.

4. NASS Output

That NASS will evaluate all safety standards - It is impossible for any accident data system to evaluate all safety standards. Many safety standards simply are not amenable to evaluation via accident data systems. In addition, NASS by itself will not be the only accident system which will provide data for standards evaluation.

NASS will aid in the evaluation of a number of important standards, especially FMVSS 208. Many other standards will also be evaluated using NASS data, either via the CSS or Special Studies. Highway Safety Standards such as Motorcycle Helmet Laws (#3) and Alcohol (#8) can also be at least partially evaluated from NASS data.

That the Special Study Subsystem (SSS) is a "quick response" system - A special study conducted within NASS may be considered a "quick response" study if only a few data elements are collected over a short period of time (3-4 months) and the analysis of the data is rather simple. Studies such as this could be conducted within six months or so. However, there are several kinds of studies contemplated for NASS and, depending upon the question to be answered, may not be "quick response" at all. For example, we may want to collect special data concerning emergency medical services over a two year period. A study such as that could take three years, overall.

For the most part, a Special Study in NASS will involve collection of either more detailed data on the accidents already sampled or oversampling and collecting data on special kinds of accidents (e.g. rollover). In either case, the data are not needed on a continuous basis but the collection period may vary from a few months to a few years depending upon the requirement.

That NASS will provide meaningful statistics by vehicle year, make and model - The total number of accidents planned for NASS when it is fully implemented is approximately 17,500-20,000 per year. That is not enough cases to break out statistics by vehicle year, make and model. The cell sizes will simply be too small in most cases for any meaningful interpretations.

That NASS will collect actual data on the dollar costs of accidents - The NASS will provide information which will be used to estimate societal losses associated with accidents, but will not collect actual dollar costs per se. Data such as number of days hospitalized, number of work days lost, disability, etc., will be collected on each injured party in NASS accidents in order to aid in the calculation of these societal losses.

That NASS will be limited to reported towaway accidents - In order to produce national statistics on all accidents and in order to properly evaluate certain countermeasures, it will not suffice to sample only towaway accidents. The towaway criterion does establish a consistent definition for an accident that is invariant from site to site. Criteria for reporting accidents do vary from site to site. Sampling of accident phenomena in non-towawy crashes will be done on the basis of a definition that is consistent with the particular study objectives. It is not clear, for example, that non-towaway accidents make a significant contribution to injury phenomena; however, NCSA is open to that possibility and will explore this in the pilot study.

A similar consideration must be addressed to the unknown contribution of non-reported accidents. Thus, non-reported accidents will be studied in the formative stages of NASS data collection.

SUMMARY

The National Accident Sampling System is an ambitious project of the NHTSA to improve the accident data base for the traffic and highway safety community. In terms of data quantity and quality it is substantially greater than past efforts. Implementation of the system has begun, including the first establishment of randomly selected accident data collection sites. The complete system is not expected to be operational before 1982.

It has been emphasized in this report that NASS will not be effective without close cooperation and planning between analysts who require highway safety field data and those who are responsible for designing, implementing and operating the system. While every data need may not be met through the NASS, its success will establish a highly useful detailed data base that is truly national in character. Furthermore, its statistical character will permit actual sampling errors to be computed for such national statistics.

REFERENCES

1. O'Day, J., Wolfe, A. and Kaplan R., "Design for NASS: A National Accident Sampling System (Volume I-Text)", Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, performed under Contract No. DOT-HS-4-00890 with U.S. Department of Transportation, May 1976, publication DOT-HS-801-913.

2. Kahane, C.J., Lee, S.N., and Morganstein, D.R., "Office of Statistics and Analysis Plans for a National Accident Sampling System," National Highway Traffic Safety Administration, Motor Vehicle Collision Investigation Symposium, Volume I: Proceedings, Calspan Corporation, Buffalo, New York, August 1976, Publication DOT-HS-801-979, pp. 118-131, (revised March 1977, DOT-HS-802-300).

3. Kahane, C.J., "National Accident Sampling System: Selection of Primary Sampling Units", National Highway Traffic Safety Administration, NHTSA Technical Note, July 1976, DOT-HS-802-063.

4. Smith, R.A., Fell, J.C. and Kahane, C.J., "FY 1977 Implementation of the National Accident Sampling System", National Highway Traffic Safety Administration, NHTSA Technical Note, February 1977, Publication DOT-HS-802-260.

5. Automotive Safety Committee, Society of Automotive Engineers, "Collision Deformation Classification - SAE J224a", Technical Report J224a, Society of Automotive Engineers, Inc., New York, New York, February 1972.

6. Joint Committee of American Medical Association, Society of Automotive Engineers, American Association for Automotive Medicine, "The Abbreviated Injury Scale (AIS)", AAAM, P.O. Box 222, Morton Grove, Illinois 60053, 1976 Revision.

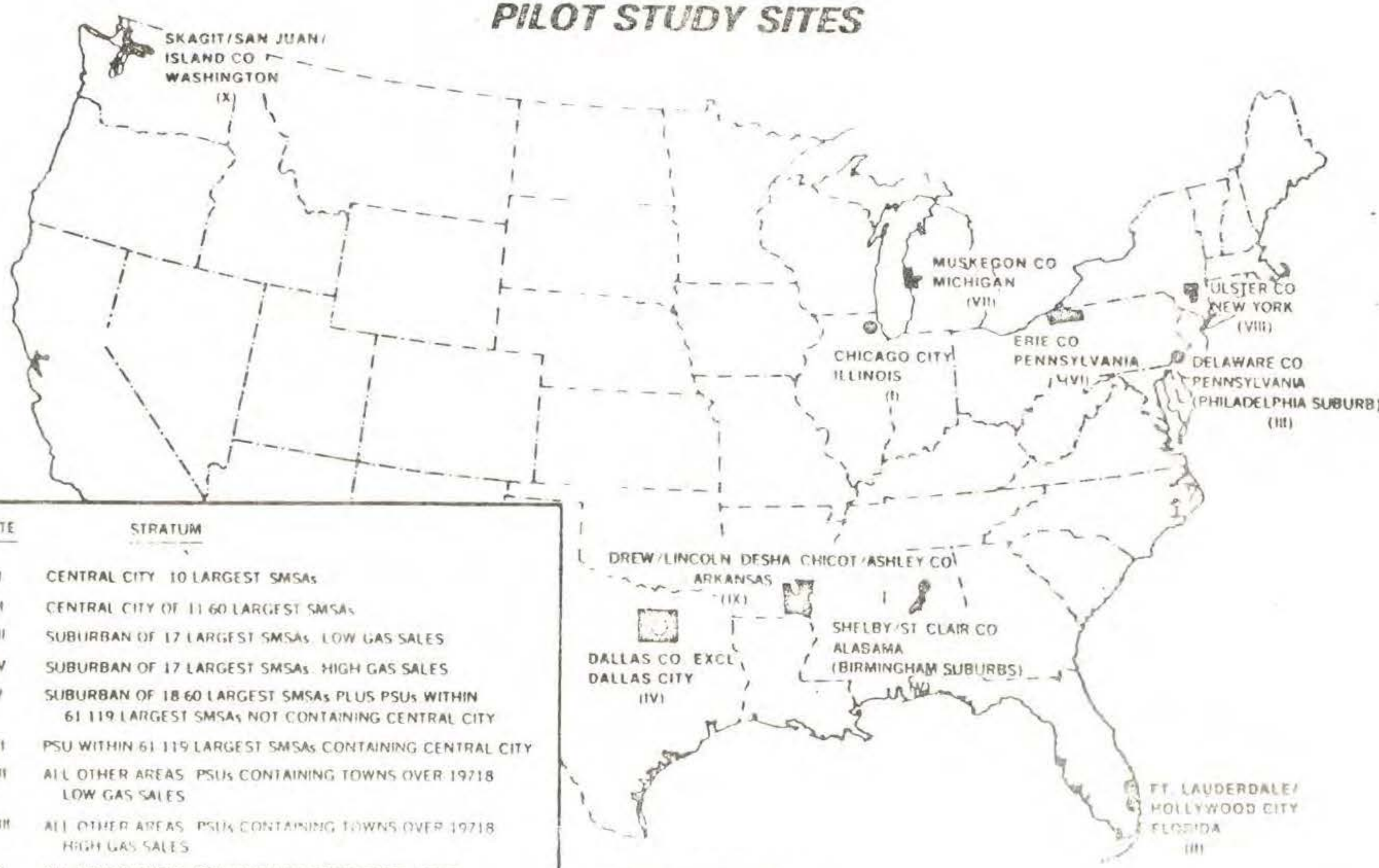
7. McHenry, R.R., "Extensions and Refinements of the CRASH Computer Program, Part II, User's Manual for the CRASH Computer", Calspan Corporation,performed under Contract No. DOT-HS-5-01124, Publication No. DOT-HS-801-838.

8. Reinfurt, D.W., Silva, C.Z., and Seila, A.F., "A Statistial Analysis of Seat Belt Effectiveness in 1973-1975 Model Cars Involved in Towaway Crashes", Highway Safety Research Center, University of North Carolina Chapel Hill,North Carolina, performed under Contract No. DOT-HS-5-01255, September 1976, Publication No. DOT-HS-802-035.

9. U.S. Bureau of Census, "The Current Population Survey, A Report on Methodology," Technical Paper No. 7, U.S. Government Printing Office, Washington, D.C., 1963.

NATIONAL ACCIDENT SAMPLING SYSTEM (NASS)

PILOT STUDY SITES



SITE	STRATUM
I	CENTRAL CITY 10 LARGEST SMSAs
II	CENTRAL CITY OF 11 60 LARGEST SMSAs
III	SUBURBAN OF 17 LARGEST SMSAs. LOW GAS SALES
IV	SUBURBAN OF 17 LARGEST SMSAs. HIGH GAS SALES
V	SUBURBAN OF 18 60 LARGEST SMSAs PLUS PSUs WITHIN 61 119 LARGEST SMSAs NOT CONTAINING CENTRAL CITY
VI	PSU WITHIN 61 119 LARGEST SMSAs CONTAINING CENTRAL CITY
VII	ALL OTHER AREAS PSUs CONTAINING TOWNS OVER 19718 LOW GAS SALES
VIII	ALL OTHER AREAS PSUs CONTAINING TOWNS OVER 19718 HIGH GAS SALES
IX	ALL OTHER AREAS. PSUs WITH NO TOWN OVER 19718 LOW GAS SALES
X	ALL OTHER AREAS PSUs WITH NO TOWN OVER 19718 HIGH GAS SALES

FIGURE 1

FIGURE 2. NASS IMPLEMENTATION SCHEDULE