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A V I N G L I V E S

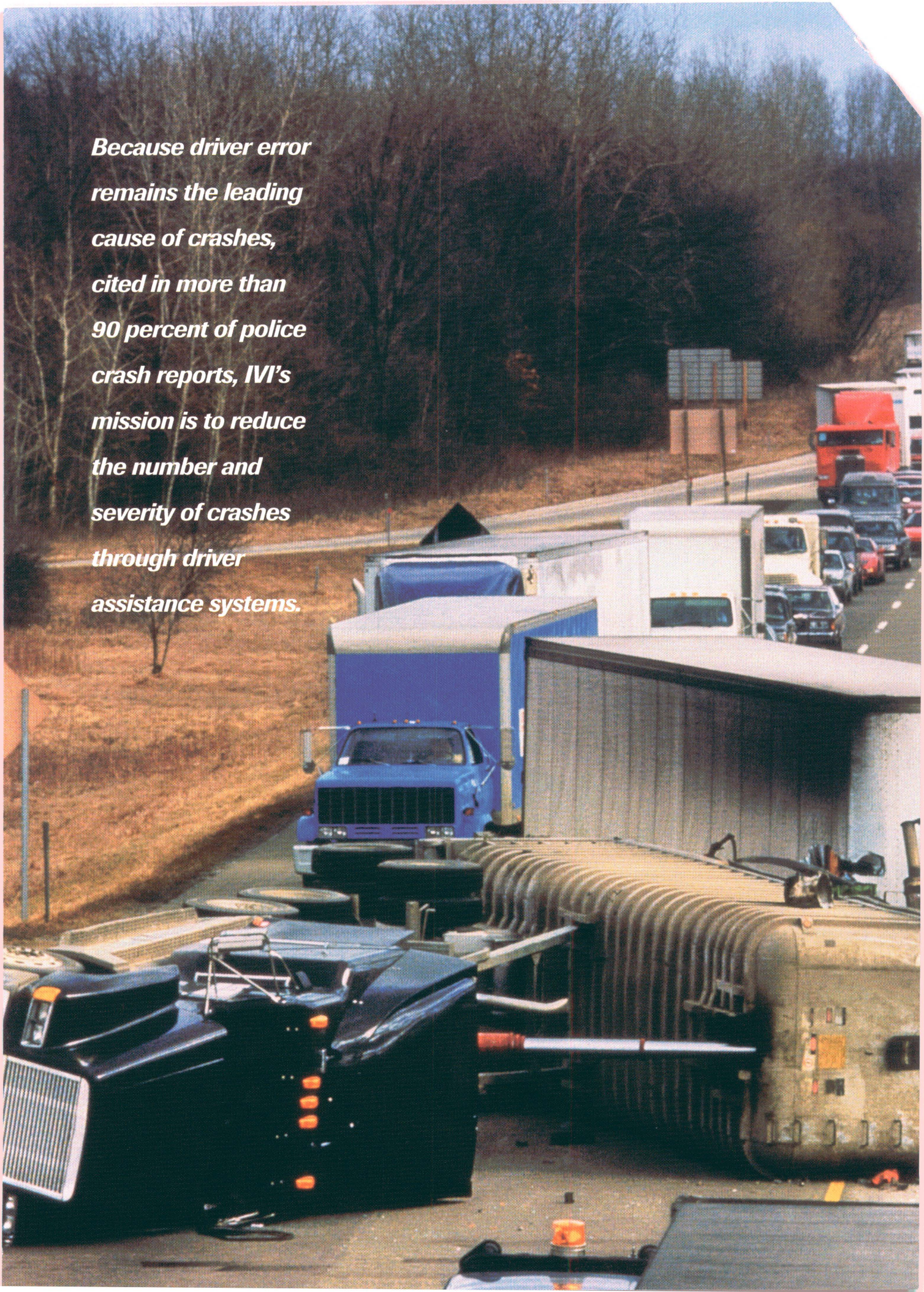
THROUGH ADVANCED VEHICLE SAFETY TECHNOLOGY

Intelligent Vehicle Initiative 2001 Annual Report

U.S. Department of Transportation

Federal Highway Administration

CONTENTS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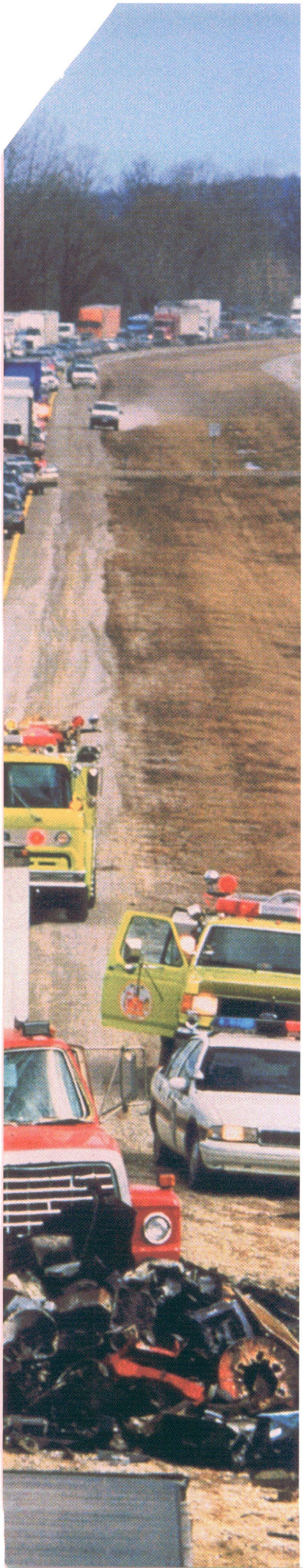
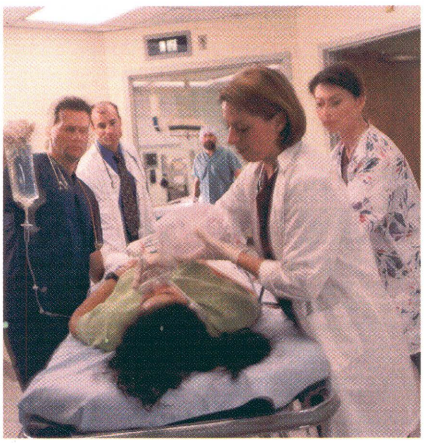


IVI Program Overview

This Annual Report provides an overview of the Intelligent Vehicle Initiative's (IVI's) progress and accomplishments during fiscal year 2001. The 1998 Transportation Efficiency Act for the 21st Century (TEA-21) authorized IVI as part of the USDOT's Intelligent Transportation Systems (ITS) program.



IVI's Mission: Prevention of Highway Crashes and the Fatalities and Injuries They Cause

Each year more than 41,000 Americans die as a result of 6 million crashes on our Nation's roadways—the equivalent of 115 each day, or one every 13 minutes.

While the magnitude of the highway death toll is shocking, the impact of highway injuries is even more far-reaching. Traffic crashes injured 3.2 million Americans in 2000. Crash survivors often sustain multiple injuries and require long hospitalizations. Crashes cost society more than $150 billion a year and consume a greater share of the Nation's health care costs than any other cause of illness or injury.

Ironically, these disturbing statistics follow dramatic progress in reducing the number of deaths and injuries on the Nation's highways. U.S. Department of Transportation (UDSOT) programs that promote vehicle safety improvements and fundamental changes in driver behavior have saved more than 250,000 lives and $700 billion over the last four decades. Widespread use of seatbelts and airbags has greatly improved the survival rate of crash victims.

Yet, as the statistics show, reduction of highway fatalities and injuries remains an urgent public health concern. Demographic trends point

IVI is Improving Safety Under Three Driving Conditions

Based on an analysis of crash statistics, the IVI addresses three driving conditions where there is the greatest opportunity to improve safety.

Normal Driving Conditions

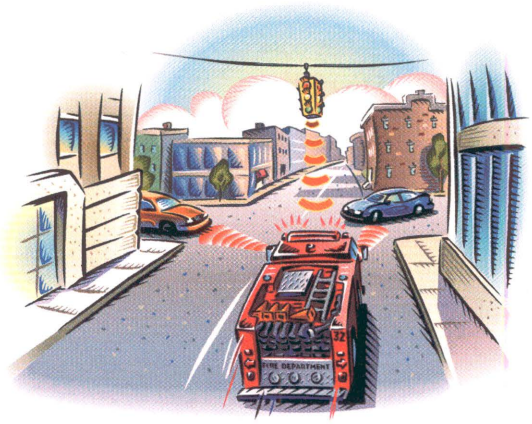
To increase safety under normal driving conditions, the IVI Program encourages the design of in-vehicle communications and information systems that drivers can operate without distraction.

Degraded Driving Conditions

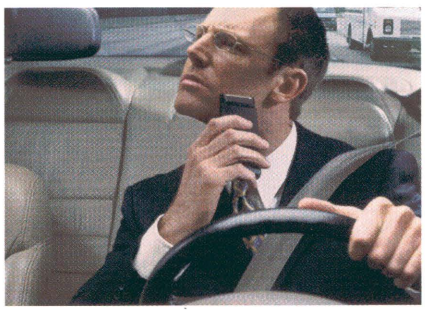
To increase safety in conditions where the risk of a crash is increased, the IVI Program encourages accelerated commercialization of driver warning systems. Examples of degraded driving conditions include reduced visibility, driver fatigue, or narrow lanes.

Imminent Crash Situations

To prevent crashes in dangerous situations where they otherwise would occur, IVI encourages accelerated commercialization of crash avoidance systems.



toward an increasingly hazardous driving environment, making it clear that new safety interventions must be developed if we are to continue to make progress. Significant forecast population growth will bring even more vehicles and drivers to our already-congested highways. The population of the youngest drivers, ages 16 to 24—those most likely to be involved in traffic crashes—will increase by 19 percent by 2020. At the same time, the aging of the Baby Boomers will produce a large generation of older drivers,



passengers and pedestrians with special safety concerns.

Technology offers new safety solutions, but it also poses new problems. We must prevent in-vehicle technology from becoming a dangerous driver distraction. The National Highway Traffic Safety Administration (NHTSA) estimates that driver inattention of all sorts caused 20 to 30 percent of the 6.3 million accidents reported in 2000.

Because driver error remains the leading cause of crashes, cited in more than 90 percent of police crash reports, IVI's mission is to reduce the number and severity of crashes through driver assistance systems. These safety systems, now in various stages of development, will warn drivers of dangerous situations, recommend actions, and even assume partial control of vehicles to avoid collisions.

Prevention: A New Direction for USDOT Safety Programs

IVI's focus is to prevent crashes by helping drivers avoid hazardous mistakes. This is a significant new direction for USDOT safety programs, which, in the past, have focused on crash mitigation (that is, alleviation of the severity of crash-related injury to persons and property).

The objectives of USDOT's IVI activities are:

- Preventing driver distraction, and
- Facilitating accelerated development and deployment of crash avoidance systems.

Preventing Driver Distraction

Through the IVI, USDOT is working to prevent driver distraction by ensuring the safety (under normal conditions) of in-vehicle information and communication systems such as:

- Cellular telephones;
- In-vehicle computers;
- Route guidance and navigation systems; and
- Adaptive cruse control.

IVI research is exploring the implications of in-vehicle technologies on driver behavior. Objectives are to:

Four Vehicle Platforms

The IVI addresses four classes or "platforms" of vehicles. Various types of crash avoidance technologies are being tested in the four vehicle platforms. In most cases, lessons learned about the effectiveness of various crash avoidance technologies will transfer across platforms.

By analyzing the unique problems that each type of vehicle encounters in its typical driving environment, the results of IVI research and field tests will help vehicle manufacturers decide which driver assistance systems should be installed in each type of vehicle.

- **Light vehicles**
  Passenger vehicles, light trucks, vans, and sport utility vehicles (SUVs)
- **Commercial Vehicles**
  Heavy trucks and Interstate buses
- **Transit Vehicles**
  Non-rail vehicles operated by transit agencies
- **Specialty Vehicles**
  Emergency response, enforcement, and highway maintenance vehicles

Partners are contributing over $40 million to the IVI through cooperative agreements with USDOT.

Private Sector Partners

- 3M Corporation
- AssistWare Technology, Inc.
- DaimlerChrysler Research and Technology North America, Inc.
- Delphi Delco Electronics Systems
- Ford Motor Company
- Freightliner Corporation
- General Motors Corporation
- Gillig Corporation
- Mack Trucks, Inc.
- McKenzie Tank Lines, Inc.
- Navigation Technologies Corporation
- Navistar International Transportation Corporation
- Nissan Technical Center North America, Inc.
- Praxair, Inc.
- Raytheon
- Toyota Technical Center U.S.A., Inc.
- TRW
- US Xpress Leasing, Inc.
- Visteon Corporation
- Volvo Trucks North America
- X-Meritor-Webco

Public Sector Partners

- Ann Arbor Transportation Authority, Michigan
- California Department of Transportation
- City of Hutchinson, Minnesota
- McLeod County, Minnesota
- Minnesota State Patrol
- Minnesota Department of Transportation
- Pennsylvania Department of Transportation
- Port Authority of Allegany County
- San Mateo County Transit
- Virginia Department of Transportation

University Partners

- California PATH
- Carnegie Mellon University
- Johns Hopkins Applied Physics Laboratory
- University of Iowa
- University of Michigan Transportation Research Institute
- University of Minnesota
- Virginia Tech Transportation Institute

Association Partners

- American Trucking Association
- Intelligent Transportation Society of America (ITS America)

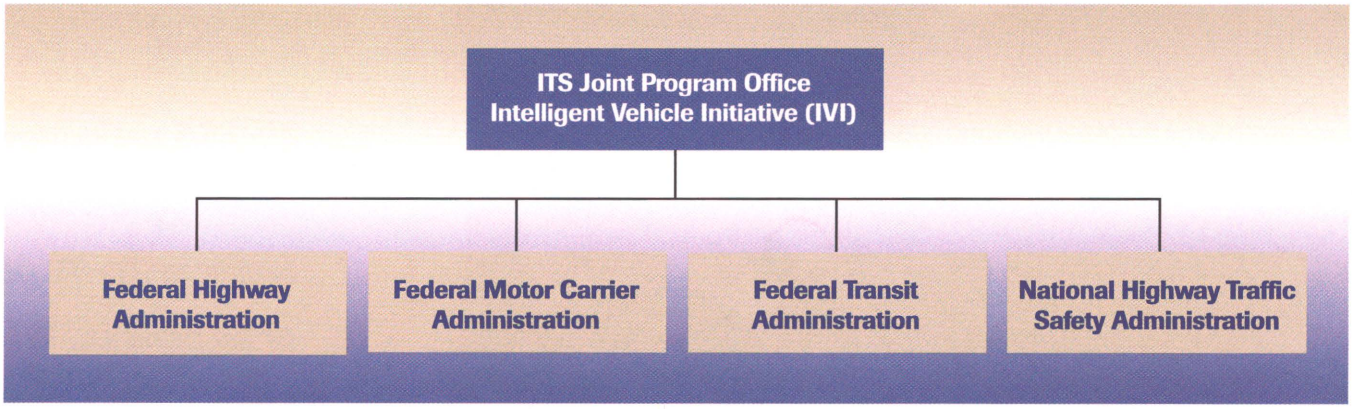
- Improve understanding of the nature and extent of the driver distraction safety problem;
- Develop and apply methods to measure the effects of technology and driver characteristics on driving performance;
- Develop human factors guidelines to aid in equipment design; and
- Develop integrated approaches to reduce the distraction caused by in-vehicle devices.

Facilitating Accelerated Development and Deployment of Crash Avoidance Systems

The vehicle industry, the highway industry, and local governments play the leading roles in the development and deployment of crash avoidance systems. Through the IVI, the Federal government is helping industry to produce better safety systems more quickly. Objectives of the Federal program are to:

- Define safety system performance requirements;
- Evaluate safety system effectiveness; and
- Encourage the market availability of effective IVI safety systems and services.

The IVI program facilitates the development of crash avoidance systems by identifying promising opportunities to help drivers avoid crashes; demonstrating the feasibility of proposed technology solutions; and evaluating the practicality of technologies on real roads with real drivers.



IVI is a Public-Private Partnership

Manufacturers ultimately will develop and deploy IVI safety systems in standard vehicle product lines, and the motor vehicle industry is a key IVI partner. Fleet operators and State and local transportation agencies are other important stakeholders and partners, and will play a vital role in deployment of IVI services.

Four USDOT agencies participate in the IVI: the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the Federal Transit Administration (FTA), and the National Highway Traffic Safety Administration (NHTSA). The USDOT's Intelligent Transportation Systems (ITS) Joint Program Office coordinates the IVI. The Intelligent Transportation Society of America (ITS America) coordinates private sector participation in IVI through four steering groups representing the four vehicle platform types (light vehicles, commercial vehicles, transit vehicles, and specialty vehicles).

IVI Program Funding

TEA-21, USDOT's authorization legislation, is the principal source for IVI program funding. Among the priority areas for research and development called out in Section 5207 of the legislation are crash-avoidance technologies; and integration of intelligent technologies to link infrastructure, vehicles, and traffic control devices. The legislation calls for cost-sharing of operational tests and demonstration of these technologies, with the Federal share not to exceed 80 percent.

The chart below depicts the total funds obligated under IVI for each platform area since fiscal year 1998.

Across the four vehicle platforms, the IVI budget allocation was divided among seven IVI problem areas, as shown in Figure 2.

Fig. 1. Total funds obligated under IVI by platform area (1998-2001)

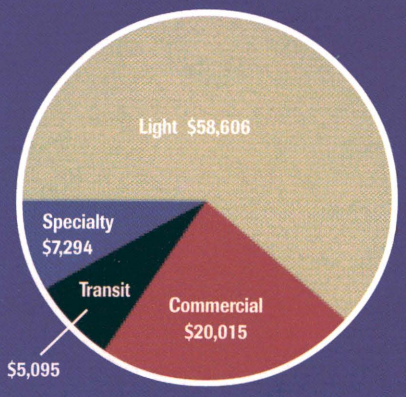
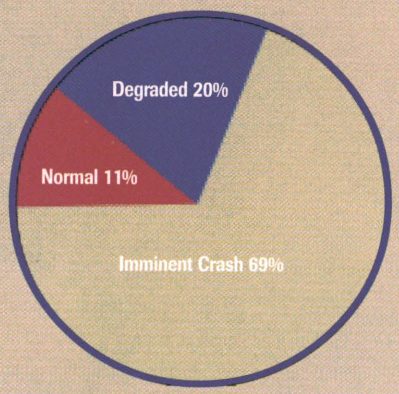
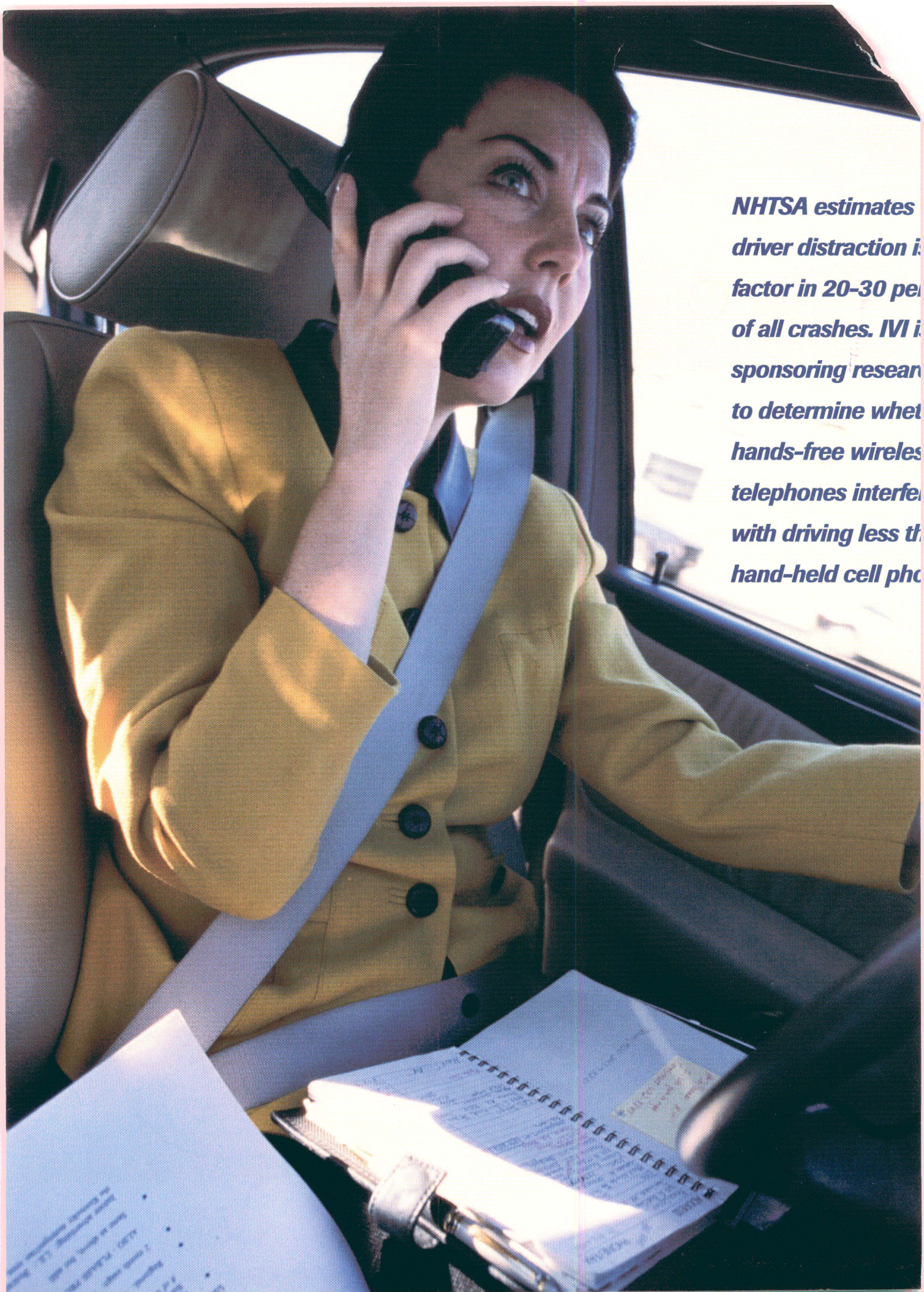


Fig. 2. Total funds obligated under IVI by problem area (1998-200)

Normal Driving	**11%**
Degraded Driving	**20%**
Vehicle stability	**11%**
Driver condition monitoring	**6%**
Vision enhancement	**3%**
Imminent Crash	**69%**
Rear end	**34%**
Road departure	**18%**
Lane change/merge	**9%**
Intersection	**8%**

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2001 Progress & Accomplishments

Safety of In-Vehicle Information Systems

Distracted driving exploded as a major public issue in 2001. New York became the first State to enact legislation prohibiting use of hand-held wireless telephones while driving, and dozens of other State legislatures considered bills to limit cell phone use behind the wheel. NHTSA Executive Director Robert L. Shelton told a House transportation subcommittee that cell phones have become a significant highway safety concern.

While the public debate revolved around in-vehicle use of wireless telephones, within the transportation community there is growing concern about the safe use of many other in-vehicle communication and information technologies that are coming on line, or are in development.

USDOT's past research highlights both the complexities of measuring driver distraction and the difficulties involved in trying to establish a causal link between driver distraction and crashes. Ongoing and future research will focus on documenting the relationships among in-vehicle technologies, behavior, and the increased risk of a crash. Highlights of this year's progress related to driver distraction issues are presented below.

Driver Distraction and Workload Studies

In 2001, IVI investigated the implications on driver distraction and workload of three in-vehicle technologies:

- Wireless telephones;
- In-vehicle computers that provide Internet access; and
- Integrated information systems.

Reports on these three studies, expected late in calendar year 2001, are expected to address the following issues:

Cellular telephones: Do hands-free wireless phone conversations interfere less with driving than hand-held conversations? Is hands-free dialing safer than manual dialing?

In-vehicle computers: For selected in-vehicle computer transactions, such as retrieving e-mail messages, how do voice commands compare with visual or manual interfaces for driver distraction potential?

Integrated information systems: What are the benefits of information integration for safety-related driver information systems?

Crash Avoidance Metrics Partnership

In 2001, USDOT joined in partnership with DaimlerChrysler, Ford Motor Company, General Motors, and Nissan Motor Company to develop Driver Workload Metrics. The goal of this Crash Avoidance Metrics Partnership (CAMP) is to develop practical, repeatable driver workload measures to assess the safety of various driver tasks. These workload measures will then be used to provide guidance for the design of in-vehicle systems that are safe to operate while a vehicle is in motion.

Naturalistic Driving Study

Approximately 300 cars belonging to volunteer drivers will be instrumented with data collection systems under a pilot study being conducted for USDOT by the Virginia Tech Transportation Institute (VTTI). The study will provide detailed information on all of the events leading up to a crash, or a near-crash event. This study will provide information about drivers' performance in their own vehicles

Three hundred drivers have volunteered to have their cars instrumented so USDOT can learn more about driver behavior and crashes.

in real traffic conditions (as opposed to most driver performance studies, which occur in a controlled environment, or result from analysis of crashes after they occur). Based on the results of the pilot study, broader research involving thousands of instrumented vehicles is being planned in cooperation with industry and transportation agencies.

Data collection is scheduled to begin in 2002 and to continue for one year.

Technologies to Improve Driver Performance in Degraded Driving Conditions

Reduced visibility, inclement weather, driver fatigue and other degraded driving conditions make crashes more likely to occur. By improving the driver's perception of the driving environment and the driver's perception of his or her own physical condition, technology can reduce the probability of a crash.

Through detailed analysis of the factors contributing to crashes, IVI research projects have identified promising solutions for the safety problems caused by degraded driving conditions. Work is now under way to demonstrate and evaluate these solutions.

Driver Condition Monitoring

NHTSA estimates that approximately 100,000 crashes each year are caused primarily by driver drowsiness or fatigue. In 1998, drowsiness and fatigue contributed to 1,400 crash-related fatalities. Driver fatigue is a factor in 18 percent of single-vehicle, large-truck fatal crashes, and in 3 to 6 percent of all fatal crashes involving large trucks.

USDOT is currently evaluating devices to warn truck and bus drivers when they become drowsy, in preparation for a field operational test (FOT) in 2002. Previous research had determined that measuring the degree of closure of the driver's eyelids is a valid method for measuring drowsiness. The current evaluations are verifying that a system provided by Attention Technologies accurately measures eyelid position and provides a meaningful warning to the driver. The FOT will evaluate the system benefits in actual driving conditions.

Vision Enhancement

Approximately 39 percent of all crashes and 53 percent of fatal crashes occur at night or during other degraded visibility conditions, according to 1998 statistics. Reduced visibility is a factor in 2.5 mil-

IVI
ON THE MARKET

Several products that help drivers cope with degraded driving conditions have been—or soon will be—introduced to the market. Federal IVI research activities have facilitated their development and introduction.

General Motors introduced Night Vision™ technology as an option in the 2000 Cadillac DeVille, and has since made it available on other models. The infrared-sensing device used in GM's system was the subject of a Technology Reinvestment Project managed by USDOT. This Technology Reinvestment Project successfully reduced the cost of Night Vision™ and accelerated its introduction by three to four years. The Technology Reinvestment Project also is credited with increasing the uses of night vision technology for both the civilian and military sectors.

Attention Technologies is commercializing a system that informs driver of their level of drowsiness. This product, which can detect driver drowsiness by a direct, unobtrusive measure of eyelid closure, was developed under a cooperative agreement among USDOT, Carnegie Mellon University and Virginia Polytechnic Institute.

lion crashes a year, including 15,000 fatal crashes. USDOT is currently analyzing data to determine the impact on driver performance of Cadillac's Night Vision™ System—the first commercially available vision enhancement system.

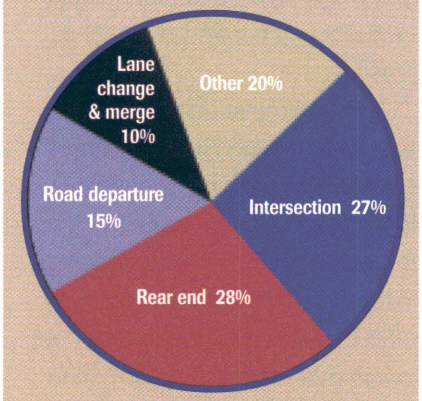
Vehicle Stability

Commercial vehicle rollover crashes do not occur frequently, but when they do, they often are fatal. Fully half of large truck driver fatalities occur in trucks that roll over. USDOT is working with the Society of Automotive Engineers, heavy vehicle manufacturers, and their suppliers to develop objective, repeatable tests to measure the performance of electronically controlled brake systems. Initial testing will be conducted under controlled conditions on a test track. An FOT to assess the safety benefits of the brake systems for vehicles on public roads will take place in 2002.

Crash-Avoidance Technology

As Figure 3 shows, four types of collisions account for nearly 80 percent of highway crashes: (1) intersection collisions; (2) rear-end collisions; (3) road departure collisions; and (4) lane change and merge collisions. USDOT has identified promising technology approaches for preventing each of these leading types of collisions, ranging from driver warning systems to vehicle control devices. Under IVI, numerous FOTs of crash avoidance systems,

Fig. 3. Distribution of Crash Types



installed on different vehicle platforms, are under way or planned.

Commercial and Specialty Vehicles: Near-Term Field Operational Tests

The USDOT's near-term activities are focused on driver assistance programs that are expected to be available in the marketplace by 2003. These projects are in the final stage of research, which involves validation that the solutions are practical, effective, and beneficial.

Four FOTs that are currently under way involve commercial and specialty vehicles. When these tests are completed, they will yield a better understanding of the benefits of each of these safety systems. The evaluations will answer these questions:

- Do drivers drive more safely with the system than without it?
- Do vehicles equipped with the system have fewer crashes than vehicles without the systems?
- How many crashes, injuries, and fatalities could be avoided if all large trucks operating in the United States were equipped with the system?

Rear-end collision warning system: Rear-end collisions account for approximately 1.8 million crashes annually, or approximately 28 percent of all crashes. In 1998, rear-end collisions resulted in 855,000

Volvo trucks and US Xpress are field testing a rear-end collision warning system that includes adaptive cruise control and advanced braking on 100 new trucks.

injuries and 1,570 fatalities. Volvo Trucks–North America and US Xpress, Inc. are partnering with USDOT to conduct an FOT of a rear-end collision warning system that includes adaptive cruise control and advanced braking. Although collision-warning systems are widely deployed in commercial vehicles, this project is the first independent evaluation of the performance and benefits of a collision-warning system in commercial service on public roads.

The rear-end collision warning system is a radar-based device that provides both visual and audible warnings to the driver. The driver is warned of objects that are close in front, and in the same lane—such as stopped, or slower-moving, vehicles.

The adaptive cruise control system uses the same radar to maintain the driver's preset speed and following distance. The tractors are equipped with electronically controlled disc brake systems, which offer improved stopping distance over conventional brake systems. The 100 test vehicles operate in commercial service on public roads throughout the United States. On-road testing started in December 2000 and will be completed in May 2002.

Multiple IVI systems: Mack Trucks and McKenzie Tank Lines are partnering with USDOT to evaluate the benefits of three IVI systems: a trucker advisory system, an automatic collision notification system, and a lane departure warning system.

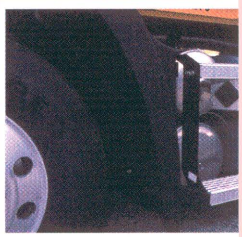
The trucker advisory system uses a satellite-based location system and a map database to warn drivers when they are approaching a geographic location that has a high frequency of commercial vehicle crashes.

The automatic collision notification system sends an emergency signal by satellite communications to the fleet operators' emergency control center if the vehicle is involved in a crash. This enables company officials to contact the appropriate local authorities with information about the driver, cargo type, and precautions that may be necessary. Among other benefits, automatic notification can speed response to a hazardous material incident.

The vehicles are also equipped with a lane departure warning system, which alerts the driver when the truck inadvertently drifts out of its lane. The lane departure warning system uses vision processing to "read" the road ahead to determine the position of the host vehicle in the lane.

The FOT will involve a fleet of 36 tanker trucks that carry hazardous materials. On-road testing started in June 2001 and will be completed in October 2002.

Rollover stability system: Rollovers account for about half of driver fatalities when large trucks crash. Freightliner Corporation, Praxair, Inc., and the University of Michigan Transportation Research Institute (UMTRI) are partnering with USDOT to conduct an FOT of



Mack Trucks and McKenzie Tank Lines are evaluating a trucker advisory system, an automatic collision notification system, and a lane departure warning system.

Freightliner Corporation and Praxair, Inc. field tested a rollover stability driver warning program.

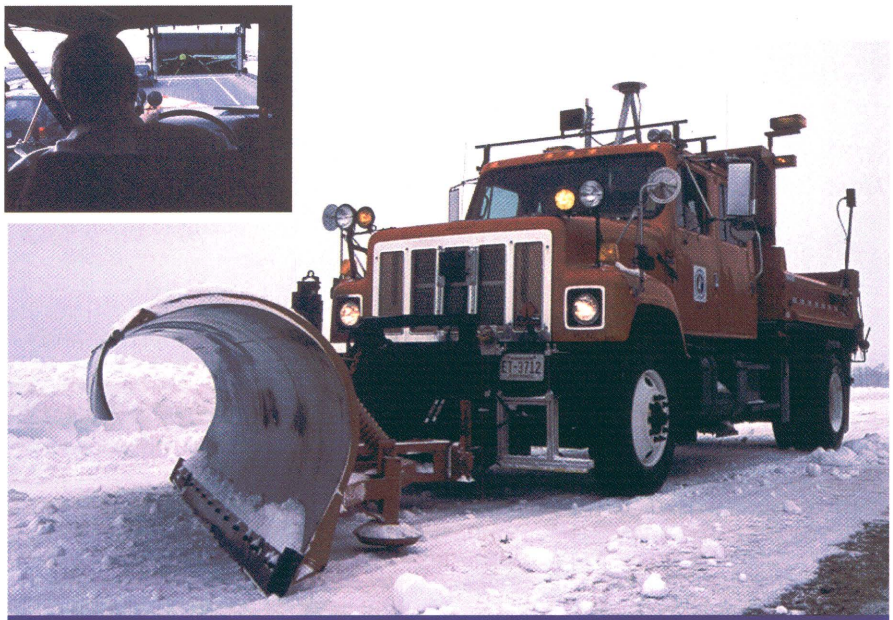
a Rollover Stability Advisor/Control System (RSA/C), with a Lane Tracker device. This system warns drivers if they are approaching the rollover threshold for their vehicle. Road testing on six tractors began in September 2000 and was scheduled for completion in September 2001.

The UMTRI human factors researchers are debriefing Praxair drivers using questionnaires and focus group sessions to determine subjective reactions to the system. These results will be related to measurements that show how each person actually drove in relation to their rollover management margin. In addition, the perspective of the Praxair managers on the system application, both as an in-vehicle element and as an aid in giving feedback to drivers for the prevention of rollover, will be documented.

Snowplow crash avoidance:

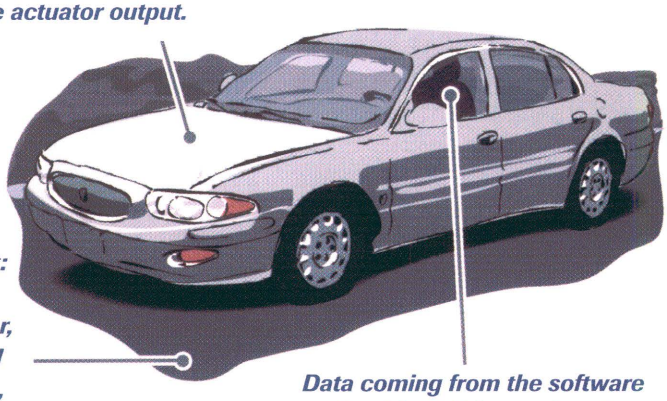
Because snowplows must operate under low-visibility conditions (fog, rain, snow, blowing snow, and darkness), often they are involved in crashes. In one snowbelt State alone, an average of 37 rear-end crashes where other vehicles hit snowplows occurred each year between 1991 and 1997.

The Minnesota Department of Transportation, Navistar, the University of Minnesota, 3M Corporation and USDOT are conducting an FOT of driver assistance technologies to reduce the number and severity of snowplow crashes involving other vehicles and roadside obstacles. Plows equipped with driver assistance technologies—such as magnetic roadway tape with on-board sensors, collision warning systems, GIS mapping, 360-degree radar obstacle detection devices, auditory warnings, and external light warning systems—are being tested on State and county highways under low-visibility conditions. Data collection will take place from November 2001 through July 2002.



Plows equipped with driver assistance technologies, such as magnetic roadway tape with on-board sensors, are being tested on State and county highways under low-visibility conditions.

The advanced adaptive cruise control/forward collision warning system being developed by GM gathers information—data about the car's functions and movement, the driving environment, and the driver's activities—and adds it up to determine the ongoing threat of a collision. It responds to threats by sounding alerts or altering the car's cruise control speed.



In 2002, ten production Buick LaSabres will be equipped with rear-end collision avoidance systems for real-world testing.

Light Vehicles: Mid-Term Field Operational Tests

Passenger Cars: Rear-End Collision Avoidance Systems: As previously noted, rear-end collisions account for approximately 1.8 million crashes annually, or approximately 28 percent of all crashes. In 1998, rear-end collisions resulted in 855,000 injuries and 1,570 fatalities.

In the most comprehensive FOT of automotive collision avoidance systems ever undertaken in the United States, General Motors Corporation, Delphi Delco Electronics Systems, and USDOT are cooperating in testing a rear-end collision avoidance system for a passenger vehicle.

The first phase of the five-year project involves development and testing of prototype vehicles equipped with rear-end crash avoidance technology. This phase began in 1999 and will be completed in November 2001. During the second phase, two pilot vehicles will be built for further testing and validation. In 2002, ten production Buick LeSabres will be equipped with the system for real-world testing.

Passenger Cars: Road Departure Collision Avoidance Systems: About 15 percent of crashes are single-vehicle road departure crashes. In 1998, more than 500,000 injuries and 13,000 fatalities resulted from 937,966 road departure crashes.

USDOT is partnering with the University of Michigan Transportation Research Institute, Visteon Corporation, and AssistWare Technology, Inc. in an FOT of a system designed to help drivers avoid road departure crashes. The system warns drivers when they are about to drift off the road and crash into an obstacle, or when they are traveling too fast for an upcoming curve. The system has the potential to prevent road departure crashes caused by driver inattention, distraction, drowsiness, or excessive speed.

Light Vehicles: Long-Term Research

Lane-Change Collision Avoidance Systems: Lane change and merge crashes accounted for approximately 600,000 crashes in 1998, or roughly 10 percent of crashes. They occur most often on metropolitan arterial streets.

Lane-change collision avoidance systems are in the early stages of development. During development of the preliminary performance specifications, which were published in September 2000, experts noted that additional information on how drivers behave during lane-change maneuvers is needed. A study to collect and analyze these data will be completed in 2001.

Blind spot detectors, which

address part of the lane-change problem, are commercially available. USDOT has is conducting a study to determine if the short detection range of these systems is dangerous in high-relative-speed situations. This study will be conducted on a driving simulator because of the inherent risk involved.

Intersection Collision Avoidance: Intersections are among the most dangerous locations on U.S. roads. Approximately 1.7 million crashes occurred at intersections in 1998 (2.7 percent of total crashes), causing more than 6,700 fatalities.

Intersection collisions are complex problems. Deployment of intersection collision avoidance systems is thus a long-term objective.

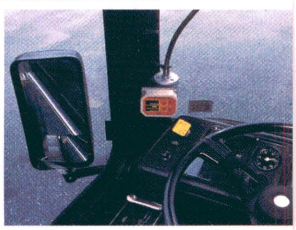
USDOT is currently collecting real-world, pre-crash data in order to better understand the events that precede an intersection collision, which a crash countermeasure must address. The System to Assess Vehicle Motion Environments (SAVME), developed by USDOT, is collecting data at intersections in Columbus, Ohio.

An FOT of a system that helps drivers avoid intersection crashes by warning them if they are going to violate a stop sign or traffic signal is planned. This will be USDOT's first assessment of a "Cooperative System"—that is, a system involving interaction between the roadway and the vehicle. Although most of the intersection crash avoidance system will be vehicle-based, the roadway must transmit the timing for the traffic signal to the vehicle.

USDOT is partnering with the California, Minnesota, and Virginia Departments of Transportation to support research on the roadway-based portions of cooperative intersection collision warning systems. The three States will work closely with the light-vehicle manufacturing industry and other partners to maximize opportunities to develop effective cooperative systems.

Transit Collision Avoidance Systems

USDOT is partnering with transit properties in Pennsylvania, California, and Michigan to evaluate tech-



One hundred buses in Pittsburgh are equipped with side collision warning systems.

IVI
ON THE MARKET

Assistware has introduced a lane departure warning system that will warn drivers if the vehicle begins to drift off the road. This system is available as an option on new models offered by many heavy truck manufacturers, or as an aftermarket product. It is derived from a system that was developed by Carnegie Mellon University under a cooperative agreement with USDOT to develop performance specifications for Road Departure Collision Warning Systems. Although this system is commercially available, this project will provide the first independent evaluation of performance and benefits on public roads in commercial service.

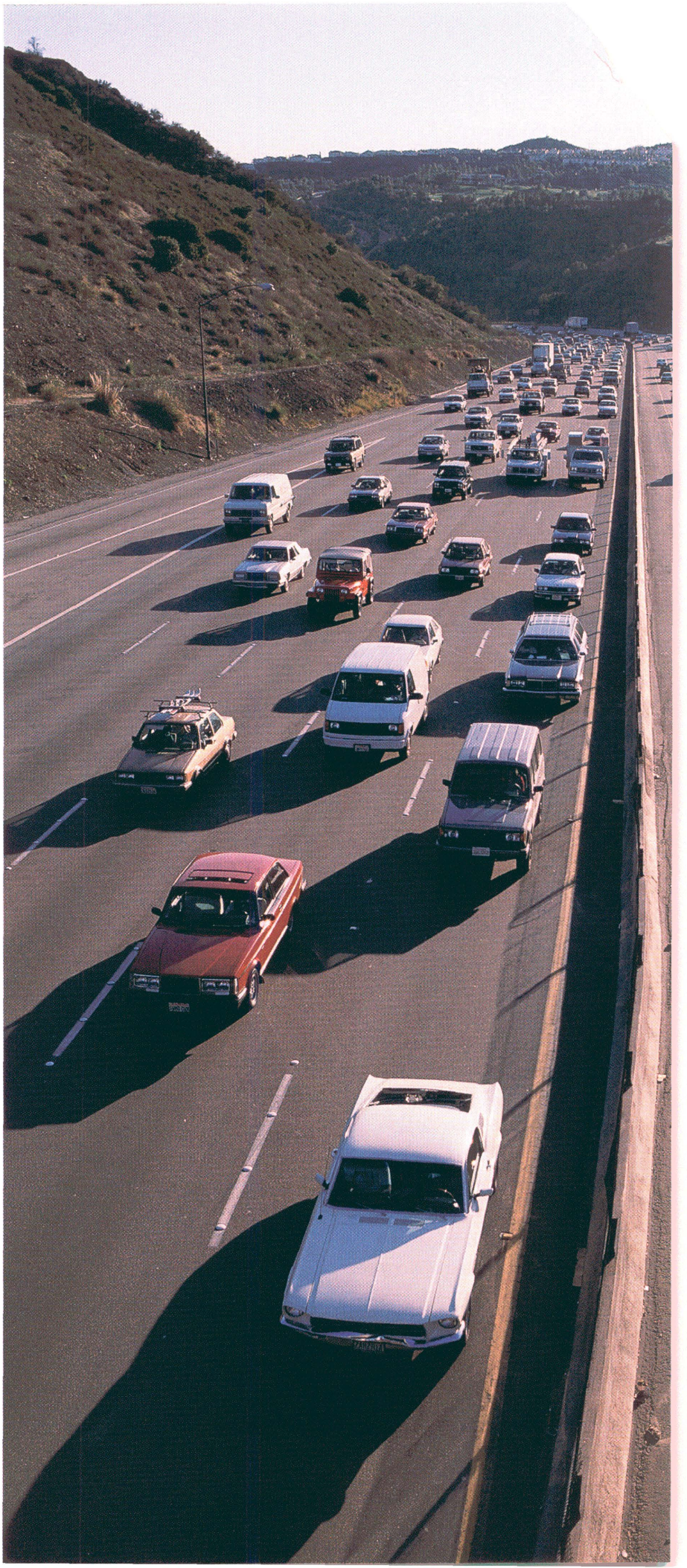
Freightliner has introduced a rollover advisory system in their heavy trucks. This product, which will warn drivers if they are approaching the rollover threshold for their vehicle, is derived from a system that was developed by the University of Michigan Transportation Research Institute under a cooperative agreement with DOT.

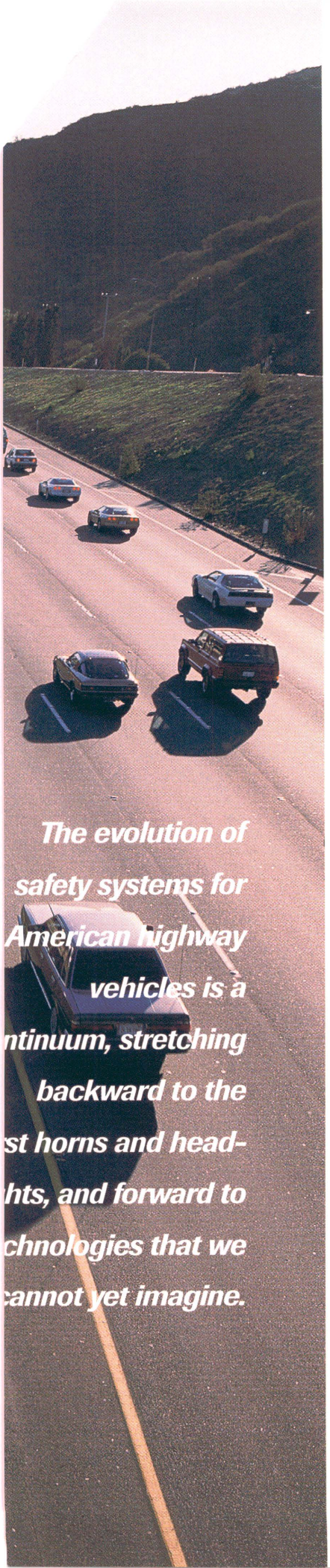
nology that helps drivers avoid the most prevalent types of transit crashes.

In Pittsburgh, Pennsylvania, 100 transit buses are equipped with side-collision warning systems. The one-year operational test of the collision avoidance systems began in April 2001. Partners are USDOT, the Port Authority of Allegheny County, Carnegie Mellon University, the Pennsylvania Department of Transportation, and Collision Avoidance Systems.

In Michigan, the Ann Arbor Transportation Authority is evaluating a system that prevents other vehicles from crashing into the back of transit buses. Most crashes of this type happen during the day in normal lighting conditions. In most cases the driver of the vehicle that crashes into the bus takes no evasive action and does not even slow down before hitting the bus. This system will use radar to sense the imminent crash and attempt to warn the violating driver with a flashing warning.

The Transit System in San Mateo, California (Samtrans), in partnership with the California Department of Transportation (Caltrans) and PATH, is evaluating a collision avoidance system that warns transit drivers of an impending collision with the vehicle ahead. The system has been installed on two buses and tested for six months. Bus routes will vary in order to obtain a wide variety of operating scenarios.





Looking Down the Road

The Future of Vehicle Safety Technology

"Deploying safer systems sooner" succinctly summarizes the Intelligent Vehicle Initiative's (IVI's) overriding objective. IVI partnerships enable vehicle manufacturers and fleet owners to put new safety technologies on the road more quickly, where they can save lives that otherwise would be lost.

The Nation's investments in the IVI will bear fruit very quickly. Some of the driver assistance technologies for commercial vehicles (heavy trucks) and specialty vehicles (snowplows), which currently are being evaluated through the IVI, are already in the marketplace. In 2004, advanced safety systems for snowplows, also being evaluated through the IVI, will become commercially available.

By 2006, light vehicle manufacturers will be in a position to bring rear-end collision-avoidance systems into the marketplace, based on the results of the IVI field operational tests (FOTs) on Buick LaSabres that will begin in 2002. Shortly thereafter, light vehicles equipped with road-departure collision-avoidance systems may be brought to market, based on FOTs scheduled for 2003-2006.

Looking further down the road, the IVI expects to deliver ever-more-sophisticated and effective lifesaving technologies over the next 10 to 20 years. The development of integrated collision-avoidance systems and other advanced crash avoidance systems involves complex technical challenges. We have confidence that IVI will meet the challenges through sustained cooperative effort.

USDOT will continue driver behavior research to help manufacturers design safer in-vehicle systems to ensure that the new safety technologies introduced in the vehicles on American roadways will not produce additional driver distraction and driver error.

The evolution of safety systems for American highway vehicles is a continuum, stretching backward to the first horns and headlights, and forward toward technologies that we cannot yet imagine. The IVI partner organizations are proud to contribute to the long legacy of American ingenuity.

For More Information

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-OP-02-005		

4. Title and Subtitle	5. Report Date
Intelligent Vehicle Initiative 2001 Annual Report – Saving Lives Through Advanced Vehicle Safety Technology	12/1/01
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Raymond Resendes	

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Federal Highway Administration US Department of Transportation 400 7th Street, SW Room 3416 Washington DC 20590	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Federal Highway Administration US Department of Transportation 400 7th Street, SW Room 3416 Washington DC 20590	14. Sponsoring Agency Code HOIT - 1

15. Supplementary Notes

16. Abstract

This Annual Report provides an overview of the Intelligent Vehicle Initiative's (IVI's) progress and accomplishments during fiscal year 2001. The 1998 Transportation Efficiency Act for the 21st Century (TEA-21) reauthorized IVI as part of the USDOT's Intelligent Transportation Systems (ITS) program.
Each year more than 41,000 Americans die as a result of 6 million crashes on our Nation's roadways—the equivalent of 115 each day, or one every 13 minutes.

Technology offers new safety solutions, but at the same time poses new problems. We must prevent in-vehicle technology from becoming a dangerous driver distraction. The National Highway Traffic Safety Administration (NHTSA) estimates that driver inattention of all sorts caused 20 to 30 percent of the 6.3 million accidents reported in 2000. Because manufacturers ultimately will develop and deploy IVI safety systems in standard vehicle product lines, the motor vehicle industry is a key IVI partner. Fleet operators and State and local transportation agencies are other important stakeholders and partners, who will play a vital role in deployment of IVI services. Four USDOT agencies participate in the IVI: the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the Federal Transit Administration (FTA), and the National Highway Traffic Safety Administration (NHTSA). The USDOT's Intelligent Transportation Systems (ITS) Joint Program Office coordinates the IVI. ITS America coordinates private sector participation in IVI through four steering groups representing the four vehicle platform types (light vehicles, commercial vehicles, transit vehicles, and specialty vehicles).

17. Key Word	18. Distribution Statement
Intelligent Transportation System, Intelligent Vehicle Initiative, Traffic Safety, Crash Avoidance, Commercial Vehicle, Transit Safety, Driver Distraction	No restrictions. This document is available to the public from the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	20	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized