ITS *at a glance*

Produced By The Department Of Transportation's Intelligent Transportation Systems, Joint Program Office

Covering: Advanced Travel Information Systems (ATIS) • Advanced Travel Management Systems (ATMS) • Advanced Public Transportation Systems (APTS) • Advanced Vehicle Control and Safety Systems (AVCSS) • Architecture • Automated Highway Systems (AHS) • Commercial Vehicle Operation (CVO) • ITS Issues

ITI Goal & Operation TimeSaver Initiative

Intelligent Transportation Infrastructure — A New National Goal

Operation TimeSaver Launched

U.S. Department of Transportation Secretary Federico Peña unveiled the Operation TimeSaver initiative at the annual meeting of the Transportation Research Board (TRB) in January. The Secretary set a national goal of building and deploying an Intelligent Transportation Infrastructure (ITI) across the US "to save time and lives and improve the quality of life for Americans."

Refering to the interstate program and moon landing, the Secretary's "call to action" stressed the importance for Americans of setting and committing to challenging goals. In laying out the vision and challenge of this new surface transportation goal, he called for a coalition of public and private sector partners to help with this ambitious effort. This article singles out and discusses key points from the Secretary's TRB speech.

Many places are doing exciting things in response to worsening congestion problems—see areas noted in **boldface** throughout the article. A lot more needs to be done.

Key Features of Operation TimeSaver

The TimeSaver initiative focuses on cities and suburbs—where the greatest mobility problems can be found. The Secretary set "very tangible targets" and committed the Department to measures of progress and annual reporting. Operation TimeSaver aims to reduce travel times by 15% regardless of mode—the equivalent of saving one week each year.

> The Secretary's speech spotlighted many new developments: a new national transportation goal, a new initiative, the ITI concept, a travel time reduction target, two to three model sites for early/full ITI deployment, ITI's nine elements, the targeting of 75 metropolitan areas for full ITI in 10 years, commitments to ITS beyond the metro areas, select high tech traffic controls currently in operation throughout the U.S., five new contracts for ITS architecture standards, and a new federal commitment to training.

The goal is to outfit 75 of the largest metropolitan areas with "complete" ITI in 10 years. The initiative also commits "to upgrading technology in 450 other communities, our rural roads, and interstates, as the need warrants." In recognizing the need for tangible ITI examples to gain broader support for the initiative, USDOT will announce a solicitation of two or three model sites for the full deployment of ITI.

While many areas currently operate individual traffic control systems, all elements usually are not linked. The components do not "talk and listen to each other." A complete ITI would integrate these elements and share real-time information on congestion and other problems affecting the functioning and use of the overall transportation network.

USDOT identified nine ITI components for the 75 targeted metropolitan areas—elements that are not yet present as an integrated package in any single area:

ITI Goal, continued on page 2

Welcome

ITS at a glance is a quarterly newsletter produced by the U.S. Department of Transportation's Intelligent Transportation Systems (ITS) Joint Program Office (JPO). This quarterly publication will highlight and share major ITS developments within USDOT.

References are provided for each article. Reproduction (in whole or in part) and broad distribution of this newsletter is strongly encouraged.

The JPO invites inquiries about articles and suggestions for ITS developments to be covered in future issues. For more information, please contact the JPO's Information Outreach Coordinator, Cindy McMickens at Tel: 202/366-6363 or Fax: 202/366-3302.

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The Timesaver Initiative and ITI Concept

The initiative promotes the application of advanced, currently available technologies to transportation system operation and usage. Many metropolitan areas have individual freeway, incident management, traffic signal, and transit management systems in place. The IT1 concept aims to integrate existing and new elements through "smart deployment."

Such deployment links together individual systems so that valuable information can be shared. The ITI will provide both travelers and system managers with up-to-the-minute travel information. In response to growing congestion problems, the integrated systems will:

- enable travelers to make more informed choices about alternate routes/modes,
- help emergency transportation providers respond more quickly to accidents and breakdowns,
- allow transit managers to improve the reliability of bus services, and
- keep commercial traffic flowing.

- Smart Traffic Signal Control Systems
- Freeway Management Systems
- Transit Management Systems
- Incident Management Programs
- Electronic Toll Collection
- Electronic Fare Payment
- Railroad Grade Crossing Controls
- Emergency Response Programs
- Traveler Information systems

Advanced Technology Already in Place

In enumerating the list of nine, Secretary Pena identified many areas where individual elements are already operating and delivering significant benefits by reducing congestion, squeezing more capacity out of the existing system, and improving the overall operation of the transportation network. For example:

- Lexington, KY's computerized traffic system has reduced stop and go traffic by 40%.
- The freeway management system in **Minneapolis,** which links ramp metering signals with accident detection and other components of the system, has increased freeway speeds by 35% and reduced accidents by 25%.
- **Denver's** transit management system tracks 800 buses by satellite, allowing real-time schedule adjustments. Soon **11,000** more buses in areas such **as Baltimore, Milwaukee,** and **Portland** will be outfitted with GPS receivers as satellite monitoring is extended to more of the nation's 60,000 buses.
- Incident management programs using freeway detectors and cameras, such **as San Antonio's** Transguide system, enable roads to be monitored and stalled cars to be removed 50% faster. This significantly reduces the degree and duration of congestion-50-60% of which is caused by accidents or other incidents during rush hours.
- Electronic toll collection facilities on New **York's** Tappan Zee Bridge replaced eight toll booths with five electronic lanes that sped up traffic from a crawl to 25 mph.
- **Houston's** new emergency response system allows emergency vehicles to control traffic signals, minimize slowdowns through intersections, and reduce critical response times.
- Traveler information systems in Seattle and **Boston** are allowing 30 - 40% of info system users to make their own decisions and adjust travel plans (e.g., choosing alternate routes or modes) based on up-to-the minute information provided to them.

The Problems-The Need for ITI in All Metropolitan Areas

Traffic has increased 30% in the past 10 years, with the number **of** cars on the road projected to increase 50% in the next decade. Stress-causing congestion robs Americans of two billion hours a year-wasted time that could be used in much more economically valuable, productive, and enjoyable ways.

The same congestion interferes with the movement of goods and employees, imposing $40 billion in costs on businesses. Gridlock also delays emergency vehicles, greatly exacerbating safety problems.

Cost

About $300 million-that's the cost to install IT1 in an urban area about the size of Washington, D.C., without any existing IT1 components. This figure is roughly the cost of six or eight miles of urban freeway or a large bridge.

However, costs are likely to be less than this ballpark figure because most places already have some elements in place that mainly need to be connected. As equipment is replaced or upgraded, areas need to "buy smarter" and be more "strategic in their investments," given the importance **of** component compatibility and connections in the future.

Problems and Costs in Perspective

A 34% increase in highway capacity is needed just to stay even with the anticipated growth in vehicle miles-traveled (VMT). In 50 cities this expansion would cost about $150 billion over the next decade-g such capacity increases could ever be found economically and environmentally feasible.

Currently, less than 60% of this VMT-offsetting capacity is being built. For the same 50 cities, implementing ITI virtually from scratch would cost $10 billion-and provide about two-thirds of the needed capacity.

Funding

Federal dollars, which some states are tapping into, are available to support almost 100% of the ITI. Beyond federal aid, more creative involvement of the private sector is needed in this era when road building is no longer a government monopoly.

ITI Goal, continued on page 3

Arizona and Missouri have found private sector **partners** to pay for infrastructure in exchange for right-of-way access for fiber **optic** cables. Currently, private funding of infrastructure in the U.S. sits at a low one percent level, far below levels in other countries.

Federal Role

Beyond launching the Timesaver initiative and providing funding support, FHWA and F'I'A are making "a significant investment in training," comparable to the training effort that accompanied the interstate program. Field people will be retrained with new technical capabilities, so that "civil engineers can become electronic and communications **experts.**"

Last year, USDOT awarded the national ITS architecture contract which has resulted in identification of priority standards. This year at the TRB annual meeting, the Department announced five contracts to begin fast tracking the development **of** those standards.

Advanced Vehicle Control and Safety Systems

Research Project Examines Vehicle Crashes and Potential ITS Countermeasures

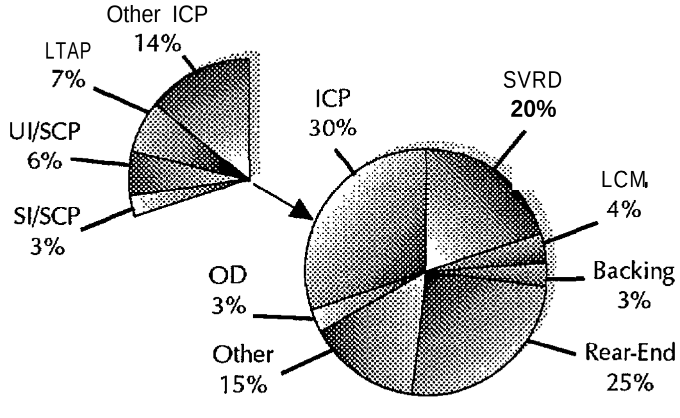
Overview

The National Highway Traffic Safety Administration (NHTSA) sponsors major research programs to facilitate and stimulate industry efforts to deploy and commercialize cost-effective and safety-effective Intelligent Transportation System (ITS) products.

As part of this research effort, the Volpe National Transportation Systems Center conducted a three-year project for NHTSA to identify the causes of crashes and possible ITS countermeasures. Battelle Memorial Institute and its subcontractor ARVIN/Calspan provided contract support.

This preliminary study accomplished its purpose of helping to guide continuing R&D on advanced-technology countermeasures. Additional studies are needed to determine the types and levels of ITS systems that warrant implementation.

Fig. 1–Types of Crashes: 1993 GES Data



KEY

SVRD Single Vehicle Roadway Departure
LCM Lane Change/Merge
OD Opposite Direction
ICP Intersection Crossing Path
SI/SCP **Signalized Intersection, Straight Crossing Path**
UI/SCP **Unsignalized Intersection, Straight Crossing Path**
LTAP **Intersection, Left Turn Across Path**

Potential Role for ITS Countermeasures

Recent advances in sensors, communications, processors, controllers, and driver system interfaces now allow for the design of ITS collision avoidance systems. These ITS "crash countermeasures" offer increased sophistication, reduced cost, and high reliability.

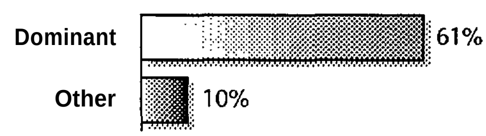
The Safety Problem

Approximately six million vehicle crashes and 40,000 fatalities occurred in 1993. Figure 1, based principally on General Estimates System (GES) Data, divides the six million crashes by type.

As noted in Figure 2, the four dominant crash types, accounting for about 61% of all crashes, are: rear-end, single vehicle roadway departure, intersection/straight crossing path, and left turn across path. The other 10% of crash types-lane

Crash Research, continued on page 4

Fig. 2–Common Crash Types



Dominant-Rear-End, Single Vehicle Roadway Departure, Intersection/Straight Crossing Path and Left Turn Across Path
Other-Lane Change/Merge, Backing and Opposite Direction

Fig. 3–Crash Causal Factors

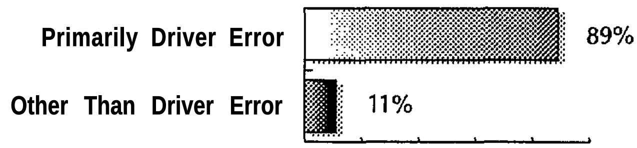
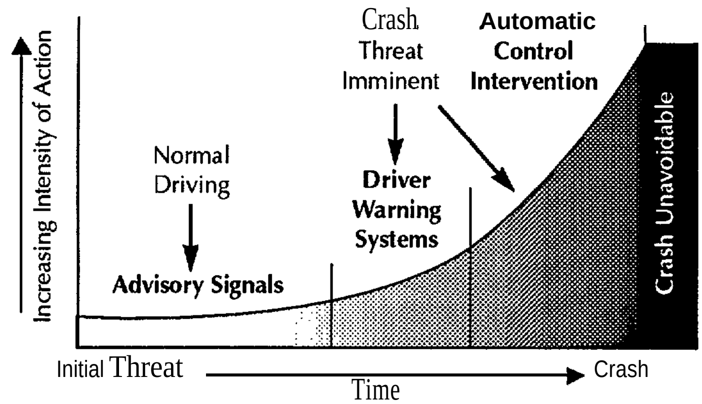


Fig. 4–Crash Causal Factors



change/merge, backing, and opposite direction-are also important. These three are distinct collision types representing a large number of crashes (each about 200,000/year). Together these seven types constitute 71% of all crashes and all could be reduced in number with ITS countermeasures.

Figure 3 shows that driver error accounted for 89% of the 1,183 target crashes examined in the three-year research project.

Research Challenge

A weak link exists between available technologies and the prevention of crashes. The best "mechanisms for intervention" for high-tech devices in crashes are not well understood. Candidate ITS solutions need to be analyzed in relation to the specifics of target crashes and to the capabilities and limitations of drivers. Potential ITS countermeasures can then be identified for further R&D.

Research Project

The three-year project represents the preliminary stage of examining vehicle crashes and potential ITS countermeasures. A June 1995 final report, prepared by the Research and Special Programs Administration at the Volpe Center, synthesized the results of analyzing 1,183 crashes. Nine crash types, shown in Figures 1 and 2, were examined.

Crash Avoidance System Categories

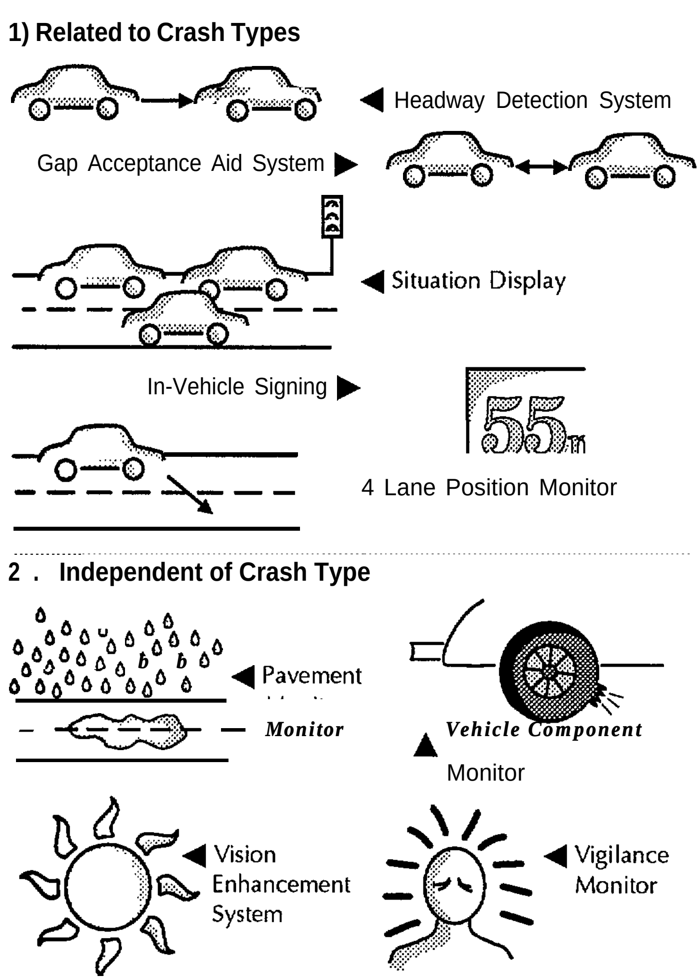
As noted in Figure 4, crash avoidance systems fall into three categories:

- Advisory-apply to potential collision situations; vehicle(s) not on a collision course; urgent crash avoidance is not necessary
- Warning-apply to imminent collision situations; vehicle(s) on a collision course; immediate driver action is needed
- Automatic Control Intervention-apply to avoiding an imminent collision where vehicles are on a collision course and driver intervention alone is not sufficient.

ITS Countermeasures

Figure 5 shows the two categories of ITS countermeasures applicable to crash type and causes examined in the project:

Fig. 5–ITS Countermeasures



- Related to Crash Type: Headway Detection system, Gap Acceptance Aid system, Situation Display, In-Vehicle Signing, and Lane Position Monitor
- Independent of Crash type: Vigilance Monitor, Pavement Condition Monitor, Vehicle Component Monitor, and Vision Enhancement System.

Findings & Follow-up

- The study identified many important issues associated with implementing effective ITS countermeasures. However, additional studies are needed to identify the best types and levels of ITS devices.
- NHSTA has several research efforts underway to:
  - establish functional and performance requirements for promising ITS crash avoidance systems for various crash types
  - test, evaluate, and develop performance specifications for driver vision enhancement systems and drowsy driver detection/warning systems

Source: USDOT, Volpe National Transportation Systems Center, Research **and Special Programs Administration,** ***Synthesis Report:*** **Examination *of Target Vehicular Crashes*** and ***Potential ITS*** **Countermeasures, June, 1995.**