The National ITS Program: Where We've Been and Where We're Going

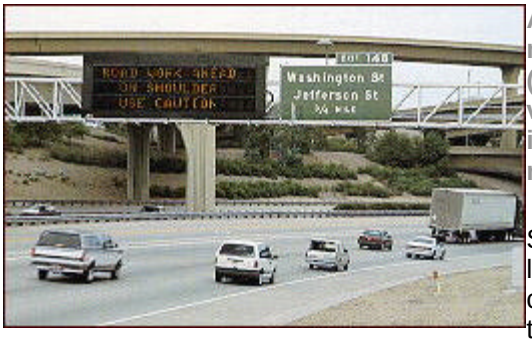
by Christine M. Johnson

> *"It is the policy of the United States to develop a National Intermodal Transportation System that is economically sound, provides the foundation for the nation to compete in the global economy, and will move people and goods in an energy efficient-manner. The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future."*
> -- Intermodal Surface Transportation Efficiency Act, Section 2

With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, Congress established a new era for transportation, calling for more efficient and safe use of existing highway and transit infrastructure and emphasizing intermodalism -- the seamless integration of multiple transportation modes. In this spirit, Title VI of ISTEA established the Intelligent Vehicle-Highway Systems Program -- later renamed the Intelligent Transportation Systems (ITS) Program -- prescribing the "widespread implementation of intelligent [transportation] systems to enhance the capacity, efficiency, and safety of the federal-aid highway system and to serve as an alternative to additional physical capacity of the federal-aid highway system."

During the past five years, the National ITS Program, administered by the U.S. Department of Transportation (DOT), has advanced the state of the technology, demonstrated substantial public benefits, fostered new models of institutional cooperation, and begun to change how Americans travel. The program laid the foundation for an information and communications infrastructure that will enable the nation to realize the vision set forth in ISTEA: to manage the multiple transportation facilities and components as one unified system for greater customer service, efficiency, safety, and quality of life.

What's the Mission?



Advanced traffic and freeway management systems use monitoring, information-gathering, and control (automation) strategies to improve traffic flow. This variable message sign, for example, provides real-time information to drivers about incidents, alternative routes, and safety.

Surface transportation systems -- the networks of highways, local streets, bus routes, and rail lines -- are the ties that link communities and facilitate commerce, connecting residents to work, homes, schools, services, and each other.

During the past 20 years, however, transportation systems have struggled to keep pace with America's growing and changing travel needs. The General Accounting Office has projected that congestion in metropolitan areas could worsen by 300 percent to 400 percent over the next 15 years unless significant changes are made. Traffic accidents claim more than 41,000 lives each year. And many of the administrative systems supporting commercial freight and mass transit services are antiquated and cumbersome.

Intelligent transportation systems offer promising solutions that respond to these pressing challenges. These systems are diverse and versatile, combining telecommunications, computer, and sensing technologies to provide real-time information to both traffic managers and travelers on traffic, weather, navigation, and vehicle diagnostics -- in much the same way the air traffic control system does for air traffic -- to achieve greater system efficiency, safety, and convenience. In the future, ITS will provide vehicles with crash-warning and collision-avoidance capabilities that will dramatically enhance our surface transportation system's safety.

Since 1991, the National ITS Program has pursued research, technology development, and field testing and has promoted deployment of first-generation ITS applications. In this work, it has become clear that the primary barriers to using this technology to achieve the ISTEA vision are not technical, but institutional. The program has, therefore, engaged in a host of institutional research efforts to encourage partnerships; resolve jurisdictional conflicts; protect personal and organizational privacy; and identify antitrust, procurement, insurance, and liability issues. The program also examines human behavior and response related to the safety and usability of ITS products and services.

The National ITS Program can be divided into six broad areas of interest:

- *Enabling research* focuses particularly on the comprehensive system architecture and associated standards. Research lays the foundation for national compatibility among all ITS components. This area of interest investigates human factors to ensure that ITS services are safe and user-friendly . In addition, research also attempts to improve the capabilities of technologies, such as communications and location-referencing systems, that enable ITS services to function effectively.

- *Advanced metropolitan travel management systems* include a great range of ITS services that address traffic management, traveler information, and transit management. Services include advanced traffic management systems (ATMS), advanced traveler information systems (ATIS), and advanced public transportation systems (APTS).

- *Advanced rural transportation systems* (ARTS) apply many of the ITS services in other categories to address the specific safety and mobility problems of diverse rural communities.

- *Commercial vehicle operations* (CVO) can be enhanced through advanced technologies and information networks to increase productivity and efficiency for both fleet operators and state motor carrier regulators. The federal ITS/CVO program focuses particularly on ITS applications to safety, inspection, and other regulatory processes associated with commercial vehicles.

- *Advanced collision-avoidance and vehicle safety systems* aim to improve safety for drivers and pedestrians through human-centered vehicles equipped with technologies that can warn or help the driver to avoid impending crashes or can automatically signal for help immediately after a collision.

- *Automated highway systems* (AHS) will support the potential of vehicles equipped with crash-avoidance technology. DOT's research is centered on the potential benefits and feasibility of a smart vehicle that can communicate with a smart infrastructure. Because AHS will share many subsystems with collision-avoidance systems, such as vehicle-based sensors, computational elements, and the driver interface, the two research programs are closely coordinated.

What Has Been Funded?

ISTEA authorized a net total of $645 million for the program's funding from fiscal year (FY) 1992 to 1997. At the end of FY 1996, $531.8 million of the ISTEA funds had been authorized for expenditure. This amount was supplemented by $459.3 million in funds from the General Operating Expense budget (including $20 million in FY 1991) for total funding of $991.1 million through FY 1996. At the end of FY 1996, all but approximately $12 million of the $991.1 million had been obligated. Roughly 40 percent of total program funding has been directed by Congress.

DOT has worked diligently to build partnerships with state and local governments, academia, and the private sector in conducting three major activities of the program: basic and applied research, field testing, and deployment support.

Basic and Applied Research

The ITS Program has sought to adapt existing and emerging information and control technologies to meet basic, everyday transportation needs. Since 1991, about 30 percent of ITS Program funding has supported research and development efforts to improve the state of the art of enabling technologies,

advanced metropolitan travel management systems, rural ITS applications, CVO, collision-avoidance systems, and AHS. Funding has specifically supported development of the National ITS Architecture and essential standards. In addition, DOT developed and enhanced analysis tools and methods, such as simulation models, to allow transportation professionals to more accurately monitor and control traffic, assess new technologies, and evaluate the impact of ITS services.

Operational Tests/Priority Corridors

About 57 percent of obligated funds has supported field testing and demonstration projects as part of operational tests or the ITS Priority Corridors Program, and 73 percent of this amount was directed by Congress. These efforts provide a crucial bridge between the laboratory and large-scale deployment.

By 1996, DOT had launched 83 field operational tests across the nation. These tests are providing valuable information on the benefits of individual ITS services and on the means to overcome institutional barriers to deployment. In these tests, DOT is breaking new ground in developing public-private partnerships, and state and local agencies are forging new institutional arrangements. Both the technical tests and the issues involved with solving procurement and institutional problems have taught us much.

The ITS Priority Corridors Program, created by ISTEA, has been extremely effective in teaching us about the institutional arrangements necessary to advance intermodal approaches to regional and multistate transportation needs. In March 1993, DOT designated four locations that met the ISTEA Section 6056(b) criteria as ITS priority corridors: the Northeast Corridor along Interstate 95, stretching through six states from Maryland to Connecticut; the Gary-Chicago-Milwaukee Corridor; the Houston metropolitan area; and the Southern California Corridor centered around Interstate 5 and Interstate 10 from Los Angeles to San Diego.

Deployment Support

State and local governments need assistance in overcoming the complex obstacles to adoption and deployment of advanced technology. The ITS Program has spent roughly 13 percent of its funding to facilitate understanding, acceptance, and deployment of ITS services. These programs include technical workshops, forums that bring together elected officials and transportation professionals, and training programs to build the essential professional capacity to support advanced transportation systems.

In particular, the Early Deployment Planning Program has provided funding and technical assistance to local and regional agencies to develop plans to apply ITS solutions to local problems. Ninety early deployment plans (EDPs) are serving as key mechanisms for incorporating ITS into the traditional transportation planning process. A survey of 13 areas found that at least 29 ITS projects, which are valued at more than $210 million, have been initiated directly because of the EDPs.

What Have We Accomplished?

Advanced traveler information systems provide pre-trip and en route travel information through a variety of media, such as this kiosk. The user of this information include travelers, traffic managers, and transit operators.

The ITS Program has made great progress in bringing a set of research concepts to the point of national deployment (for first-generation ITS services) and in making breakthrough developments in in-vehicle safety and information systems. The following paragraphs outline 11 significant achievements of the ITS Program.

Defined a Vision for the ITS Program and Charted a Course to Achieve It

In 1992, DOT and ITS America published complementary ITS visions and strategic plans. In March 1995, the two organizations jointly published the *National ITS Program Plan*, written cooperatively to guide the development and deployment of ITS

services. The plan provided the foundation for DOT's efforts to develop "road maps," which began in mid-1995. These road maps mark milestones and critical paths for achieving key program objectives. Both the strategic and program plans are "living" documents that have been progressively refined through research and detailed subprogram strategic planning.

Launched an Aggressive Research and Technology Program

The National ITS Program has helped ITS evolve from relatively visionary concepts to viable and attractive solutions for transportation problems. To a large degree, general concerns about the technological limitations of ITS have either been refined to specific questions or resolved. Among its many achievements, the program has advanced the development of new concepts, such as real-time adaptive traffic control; improved vehicle-tracking technologies used in public transportation, emergency response, and CVO; developed guidelines to help ensure that traffic management systems and in-vehicle navigation displays are user-friendly and safe; and promoted architecture and standards to ensure that ITS services are compatible and interoperable. The program's most significant accomplishment may be the breakthroughs it has made in showing the value and, in several cases, the technical feasibility of smart vehicles that can sense objects, avoid collisions, monitor driver alertness, and provide route-guidance information. DOT is now poised to launch a major series of operational tests and begin integrating these systems in a human-centered, in-vehicle configuration.

Tested and Proved the Viability of Numerous Technologies and Applications

DOT's 83 operational tests, 28 of which are completed, are demonstrating the viability of first-generation ITS technologies and services. These tests have identified and resolved technical issues; created new models of institutional cooperation; and shown how technologies can reduce congestion, improve emergency response time, increase transit system productivity and passenger convenience, and reduce the environmental impact of transportation. We are now seeing products and services refined by the operational test program -- such as Boston SmarTraveler's real-time travel information service and Help Inc.'s Pre-Pass electronic clearance system for trucks -- become self-sufficient and competitive in the marketplace.

Developed a National Architecture to Support ITS Services

In June 1996, the United States became the first country to develop a National ITS Architecture. This was the result of an unprecedented effort to provide a flexible and expandable framework for the development and deployment of ITS. Instead of a single design, the architecture provides an inclusive setting within which different designs can be implemented and yet can operate compatibly. The architecture identifies how existing infrastructure can accommodate ITS additions and technological evolution. It also provides a framework for the development of national standards to ensure interoperability of conforming products from competing vendors.

Began Development of Standards for Hardware and Software Compatibility

Standards allow communications, surveillance, monitoring, and computer processing systems to "speak" to each other; provide design guidance to manufacturers; and reassure purchasers that their systems will be compatible with other ITS elements. In 1996, DOT signed cooperative agreements with five standards development organizations (SDOs) to accelerate the development and acceptance of standards in five critical areas: in-vehicle and traveler information systems, traffic management and transportation planning systems, electronics and communication message sets and protocols, roadside infrastructure, and unique short-range communication strategies. Other standards have also been identified and are being pursued by national and international standards organizations. Two of the program's early achievements are the National Transportation Communications ITS Protocol (NTCIP) that facilitates wireline communication between traffic management centers and roadside equipment and the "Smart Bus Bus" suite of standards that allows integration of electronic functions on transit buses. (The first "bus" in "Smart Bus Bus" refers to a transit vehicle, and the second "bus" refers to the device that enables electronic networking.)

Evaluated Societal Benefits of Independent and Integrated ITS

The DOT report *Review of ITS Benefits: Emerging Successes* and other documents -- such as *Benefits Assessment of Advanced Public Transportation Systems* and *Assessment of Intelligent Transportation*

Systems/Commercial Vehicle Operations User Services: ITS/CVO Qualitative Benefit/Cost Analysis and *Preliminary Assessment of Crash Avoidance Systems Benefits* -- show how ITS technologies can positively affect transportation efficiency, productivity, safety, and user satisfaction. Research on the public benefits of ITS establishes a compelling national interest in launching the ITS infrastructure. The infrastructure will allow us to accomplish both the vision and mission of ISTEA and engender a wide new array of private-sector goods and services in much the same way as the Internet has.

Proposed Solutions to Remove Nontechnical Barriers to Implementing and Mainstreaming ITS

DOT initiated a major investigation into the institutional and legal issues associated with intergovernmental cooperation, public-private partnership, intellectual property rights, procurement, privacy, user acceptance, staffing and education, socioeconomic issues, and environmental issues. The results are documented in the 1994 report to Congress *Nontechnical Constraints and Barriers to the Implementation of Intelligent Transportation Systems* and in the 1996 update of that report.

Created New Models of Public-Private Partnerships

Because successful development and deployment of ITS will rely on the efforts of both the public and private sectors, the department has tried to involve the private sector in all facets of the program from research to testing to deployment initiatives. For example, the National Highway Traffic Safety Administration (NHTSA) has nine cooperative agreements with industry to develop and test crash-avoidance systems. In addition, the goals and activities of the AHS program are being realized through a cost-shared cooperative agreement with the National AHS Consortium (NAHSC), which consists of close to 100 public and private stakeholders, including automobile manufacturers, suppliers, universities, and state governments.

Set National Goals to Encourage Widespread ITS Deployment

DOT has established a national goal to build the ITS infrastructure by 2005. Three specific "systems" of infrastructure have been defined to date: the metropolitan intelligent transportation infrastructure, Commercial Vehicles Information Systems and Networks (CVISN), and the infrastructure associated with rural applications. This national goal has helped create a positive environment within federal, state, and local governments and has inspired confidence among private-sector developers. The department is monitoring progress on achieving this goal in 75 metropolitan areas and is making plans to monitor deployment of CVISN.

Launched a Model Deployment Initiative to Demonstrate the Benefits of ITS Infrastructure

In 1996, the department created the model deployment initiative to showcase the benefits and cost-effectiveness of ITS services integrated along the lines defined by the National ITS Architecture. By 1999, four sites -- the New York City tri-state area, Phoenix, Seattle, and San Antonio -- will showcase the benefits of the metropolitan ITS infrastructure. In the same time frame, eight states will demonstrate CVISN -- California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, and, in a joint project, Oregon and Washington.

Developed Plans to Meet Educational and Human Resource Needs

The transition to electronic management of surface transportation represents the same transition the Federal Aviation Administration (FAA) underwent as it moved from using a civil engineering staff to oversee the construction of airports to managing the air system more effectively, which required a very different set of technical skills. ITS applications use information, communication, and navigation technologies that are unfamiliar to surface transportation professionals. The ITS concept also emphasizes system management, operations, and performance measurement, instead of construction and maintenance and often requires unprecedented cooperation within and between the public and private sectors. The department's national strategic plan and five-year program for building professional capacity address the need to retool the skills of the nation's professionals in the transit, highway, and CVO fields.

What Have We Learned?

The program has demonstrated that the ITS concept, even at this early stage, is technically viable, highly cost-effective, and increasingly accepted as an essential component of a modern surface transportation system. To realize the full long-term potential of ITS, however, an information and communication infrastructure is necessary to ensure that ITS services are integrated, intermodal, and interoperable. In addition, research performed by NHTSA and the Federal Highway Administration has demonstrated the potential for major breakthroughs in accident reduction and built the foundation for future human-centered smart vehicles. The major findings of the National ITS Program are documented in the 1996 report *Key Findings From the Intelligent Transportation Systems (ITS) Program: What Have We Learned?* The following paragraphs outline the major lessons learned thus far in the ITS Program.

ITS Delivers Significant Public Benefits

DOT's research and testing activities have demonstrated that ITS services can meet a wide range of community needs -- enhancing capacity and improving efficiency, safety, and quality of life.

Enhancing Efficiency and Use of Existing Capacity

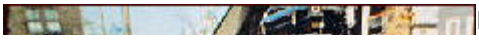
DOT estimates that deploying the intelligent transportation infrastructure in 50 of our largest metropolitan areas will reduce the need for new roads and save taxpayers 35 percent of required investment in urban highways. Better management of transportation systems is central to achieving the efficiency envisioned by ISTEA; however, managing any part of the system -- transit, highways, or streets -- more efficiently is nearly impossible unless system managers have access to information such as the locations of traffic incidents. And information does little good if there is no means to respond and make adjustments to the system or communicate with travelers. ITS field tests and deployments have shown that strategic application of information and control systems can significantly improve efficiency for system managers:

- ITS infrastructure in 75 of the largest metropolitan areas is estimated to have a benefit-cost ratio of 8.8 to 1.
- Freeway management systems allow existing physical infrastructure to handle 8-percent to 22-percent more traffic at 16-percent to 62-percent greater speeds compared to congested conditions.
- Incident management programs have reduced incident-related congestion and delays by 50 percent to 60 percent.
- Electronic toll collection has increased throughput by 200 percent to 300 percent compared with traditional attended lanes.
- Automated traffic signal systems have shown the capability to decrease travel times by 14 percent, reduce delay by 37 percent, and increase travel speeds by 22 percent.

Preventing Accidents and Saving Lives

Today, ITS technologies are making it easier for emergency response teams to locate incidents and reach victims quickly, dramatically improving the chances of survival. Freeway management systems, such as ramp meters that help smooth traffic flow, have reduced accidents by 15 percent to 20 percent. New information technology for commercial vehicles is allowing more efficient and accurate safety inspections, increasing access to safety information for inspectors, and automating hazardous material incident response systems. NHTSA estimates that 1.2 million crashes -- 17 percent of the annual nationwide total of 6.4 million -- could be prevented if all vehicles were equipped with three ITS crash-avoidance countermeasures currently under development: rear-end crash warning systems, roadway-departure warning systems, and lane-change/merge crash-avoidance systems. This reduction in collisions corresponds to a $26 billion annual savings in crash-related economic costs.

Reducing the Cost of Government Operations and Services



ITS/CVO technologies will allow drivers to submit

credentials electronically, reducing paperwork for both motor carriers and public agency regulators. Other technologies enable automated roadside safety inspections and electronic pre-clearance for safe and legal carriers.

In an October 1995 report, *High-Tech Highways: Intelligent Transportation Systems and Policy*, the Congressional Budget Office states, "ITS research may enable highway and transit authorities to provide better service at lower cost, possibly reducing the need for public subsidies." In an environment of limited budgets and cuts in public-sector subsidies, the components of ITS infrastructure can dramatically reduce the costs of transit management, toll collecting, and truck safety inspections:

- Advanced public transportation management systems in 265 actual or planned deployments are estimated to save transit operators from $3.8 billion to $7.4 billion in operating costs (in 1996 dollars) over the next decade, without diminishing quality of service.

- In Oklahoma, operating costs dropped from $176,000 to $16,000 per year per toll booth when booths were equipped with electronic debit systems -- a cost reduction of 90 percent.

- Commercial vehicle administration programs have reduced compliance-related labor costs (obtaining licenses, permits, registrations, and credentials and reporting fuel-tax payments) by 9 percent to 18 percent through the use of advanced information technology.

Enhancing Quality of Life

Because ITS technology can enhance capacity using the existing physical infrastructure, it can lessen disruptions -- caused by new construction -- to wetlands, parks, open spaces, and neighborhoods. Also, ITS and its supporting infrastructure can increase mobility, giving people more information and greater control over their transportation choices. In greater Boston, for example, a majority of travelers change their routes, times of travel, or modes when they are given up-to-date information through advanced information services. National focus group research indicates high interest among all income groups in travel products that provide personal security and safety services, location assistance, advanced traffic notification, and alternative route advisories. Equally important as the nation's baby boomers grow older, in-vehicle safety and information technology could enhance the capabilities of older drivers.

ITS Infrastructure Is Ready for Deployment

ITS products and services are not technologies of the future. They are already being applied to solve problems for state and local transportation managers, enforcement officials, and other transportation service providers; improve the efficiency of commercial shippers and carriers; and provide travelers with better information to improve the quality and safety of their trips.

Although market and user acceptance of individual components of intelligent transportation infrastructure are growing, local ITS deployment is narrowly focused and disconnected. For the most part, transportation officials and managers are reinforcing the fragmentation of today's transportation systems and infrastructure instead of using the technology as a bridge to a new era of intermodalism as ISTEA intended. Although individual ITS products and services produce specific benefits, integrated ITS infrastructure is expected to deliver multiple and synergistic benefits and provide more options for both system managers and travelers. The risk of continuing the current pattern of local deployment is electronic "hardening" of the fragmentation that will take decades and billions of dollars to overcome.

To close the gap between the great potential of integrated ITS solutions and the current state of fragmented ITS deployment, DOT has developed a four-pronged strategy for encouraging the public sector to build integrated ITS infrastructure.

Showcasing the Benefits of ITS Infrastructure

The more exposure individuals have to useful products and services, the more likely they are to accept,

purchase, and use them. The 1996 model deployment initiative, which will demonstrate intelligent transportation infrastructure at approximately 12 locations across the nation, aims to raise the awareness of the benefits of integrated ITS services and encourage public-sector officials to build supporting infrastructure.

Creating Funding Incentives

ITS deployment is gaining momentum under existing surface transportation programs, but not consistently, optimally, or systematically. Temporary funding incentives are necessary to intervene in the current deployment process to foster integration and national interoperability. The power of small incentives was shown dramatically in the model deployment initiative solicitation. The solicitation catalyzed institutional collaboration, even among sites that were not selected. Many of these sites are proceeding with their ITS deployment plans without direct DOT funding.

Establishing Standards

Public-sector officials are hesitant to buy new ITS products that might become obsolete under future standards. Private firms are reluctant to invest in technology that may not meet future performance requirements. The relationship between standards and ITS infrastructure deployment is like the old riddle: Which came first -- the chicken or the egg? We will have difficulty integrating ITS without standards, yet setting standards will be difficult without strong demand for integrated ITS services. The establishment of standards goes hand-in-hand with deployment incentives as priorities in DOT's ITS Program and must be supported by the reauthorization of ISTEA.

Building Professional Capacity

Just as the interstate construction program required new skills in road-building and civil engineering, ITS development requires skills in system integration, electronics, and communications. Because professionals with these skills currently do not exist in sufficient numbers to support the effective delivery of ITS, carrying out DOT's five-year program for building professional capacity is crucial to establishing the infrastructure to realize the ISTEA vision.

We Must Invest in the Next Generation of ITS -- Particularly Smart Vehicles

The long-range potential of ITS cannot be fulfilled without smart vehicles -- automobiles, buses, and commercial fleets -- that combine collision-avoidance capability, route guidance, and other in-vehicle ITS services in a safe, human-centered, integrated system. This may involve stand-alone smart systems, as well as those that communicate with the infrastructure.

Research to develop and enhance this vehicle technology must be carried out in collaboration with the industry that will potentially manufacture it. The risk of not making this investment is threefold. First, the car of the future will largely be a "mobile computer." The economic block -- Europe, Japan, or the United States -- that develops the operating systems of this mobile computer will control the industry for a decade or longer. In addition, without accelerated developmental research, current evidence suggests that smart vehicles will be very late (perhaps decades) in arriving on the market, if ever. This represents a potential loss of millions of lives and billions of dollars in accident-related costs. Finally, individually developed systems without proper human-centered integration could actually degrade safety.

Many of the fruits of today's ITS deployments are being harvested from research and development initiated in the 1970s. Continued research and development is needed to provide the technological foundation for the solutions to tomorrow's problems.

What's Next? A Reauthorization Agenda for ITS

ISTEA launched a National ITS Program that has amassed a formidable record of achievements. The reauthorization of ISTEA in the form of the National Economic Crossroads and Transportation Efficiency Act (NEXTEA) has the opportunity to realize the benefits of that research and extend the horizon of accomplishment. Although DOT envisions a reduced federal role, virtually all constituents agree that it must still provide critical research and technical assistance to state and local agencies, particularly in the area of ITS. The principal goals of the next phase of the ITS Program are to launch the deployment of an

integrated ITS infrastructure, develop the standards and professional capacity to sustain it, and extend our research horizons, particularly in the area of integrated safety and navigational features of the intelligent vehicle.

Research and Technology

Continued funding is required to maintain the momentum of the ITS Program's near- and long-term research and technology agenda. As provided by the initial authorization, the department would continue to pursue both high-priority and high-risk initiatives, such as collision-avoidance systems, automated highway systems, advanced rural transportation concepts, the next generation of advanced travel management, and commercial vehicle operations The research agenda would also support the development of standards and the execution of the five-year program for building professional capacity, as well as field operational tests and evaluations.

Incentives to Accelerate ITS Deployment

Based on numerous focus groups and "listening sessions," two options have emerged for accelerating the deployment of ITS infrastructure. One option would provide small incentive awards to metropolitan areas, primarily to support the cost of system integration, after the demonstration of institutional willingness to adopt and finance an integrated system. A second option would create a more traditional program that directly apportions ITS deployment funds to state and local agencies. These funds would support both hardware procurement and system integration. Funding eligibility under either option would be contingent on conformance with the National ITS Architecture and supporting standards and protocols.

Mainstream Deployment Provisions

Existing federal highway, transit, and motor carrier investment program policies and regulations have been refined over many decades, but they have not accounted for improved system management or ITS. The successor to ISTEA must make explicit the eligibility of ITS deployment for mainstream federal surface transportation funding. It should also pave the way for expansion of the capital planning process to include operational planning, as well as ITS operations and maintenance. NEXTEA should also reconcile disparities between highway and transit programs regarding the eligibility of ITS operating costs. The National Highway System Designation Act, for example, allowed most highway funds to be used for ITS operations, yet corresponding provisions are lacking in the transit programs. In addition, the next surface transportation authorization must sanction innovative procurement and financing approaches, including public-private partnerships.

Conclusion

> *"This telephone has too many shortcomings to be seriously considered as a means of communications. The device is inherently of no value to us."* -- Western Union internal memo, 1876

More than 40 years ago, the federal government conceived a plan to build the interstate highway system, the nation's most ambitious public works project. As in 1956, DOT is again serving as an agent to transform this nation's surface transportation system -- this time with the intelligent transportation infrastructure, which will serve as the foundation for managing the many individual systems as one seamless system. DOT does not propose to do this alone, but instead to encourage public-sector agencies, with appropriate private-sector support, to build this new infrastructure for the 21st century. This new infrastructure will apply information technology to meet local needs within a framework that enables a national, interoperable system -- a system that will open up business opportunities much as the interstate highway system did four decades ago.

A historic opportunity is at hand for Congress to dramatically improve the future of surface transportation. Although the full potential of ITS has yet to be realized, enough has been learned in the past five years to verify the wisdom of forging ahead, nurturing the National ITS Program and allowing it to fulfill ISTEA's promise of a safer, more efficient, and less costly intermodal transportation system.

Guiding Principles of the ITS Program

The multifaceted ITS Program compelled the Department of Transportation to reexamine its traditional way of doing business. In May 1994, the department established the ITS Joint Program Office to manage the program. This action resulted in unprecedented interagency cooperation involving most of the department's modal administrations -- the Federal Highway Administration, the National Highway Traffic Safety Administration, the Federal Transit Administration, the Federal Railroad Administration, and the Research and Special Programs Administration. The ITS Program is guided by four key principles:

- Support research and development of ITS technology to solve problems of surface transportation congestion, safety, efficiency, and mobility and to improve quality of life.
- Ensure that newly developed ITS technologies and services are safe and cost-effective.
- Promote and support the development of an interoperable and integrated system that reduces risks and costs to users, as well as to the public- and private-sector providers of ITS products and services.
- Identify and emphasize private-sector involvement in all aspects of the program.

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