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BENEFITS OF INTELLIGENT TRANSPORTATION SYSTEMS (ITS)



Introduction

ITS technologies advance transportation safety and mobility and enhance American productivity by integrating advanced communications technologies into transportation infrastructure and into vehicles. ITS encompasses a broad range of wireless and traditional communications-based information and electronic technologies.

A Growing Problem

While America's transportation system remains one of the Nation's greatest achievements and the life blood of the U.S. economy, the system continues to have serious challenges:

- **Safety:** In 2011, there were 5.3 million crashes and 2.22 million injuries. The number of fatalities dropped by 1.9 percent but still accounted for 32,367 deaths, according to the National Highway Transportation Safety Administration (NHTSA).
- **Mobility:** In 2010, the cost of congestion in urban areas was \$101 billion, according to the Texas Transportation Institute. U.S. highway users waste 4.8 billion hours a year stuck in traffic—nearly one full work week (or vacation week) for every urban traveler.
- **Environment:** The total amount of wasted fuel topped 1.9 billion gallons in 2010, according to the Texas Transportation Institute, equivalent to about 2 months of flow in the Alaska Pipeline.

ITS Overview and Benefits

The ITS Joint Program Office (JPO), within the U.S. Department of Transportation's (USDOT's) Research and Innovative Technology Administration, is responsible for conducting research on behalf of the USDOT and all major modes to advance transportation safety, mobility, and environmental sustainability through electronic and information technology applications, known as ITS. ITS applications focus on both the infrastructure and vehicle, as well as integrated applications between the two, to enable the creation of an intelligent transportation system.

The USDOT's ITS Program supports the overall advancement of ITS through investments in major research initiatives, exploratory studies, and a deployment support program. Increasingly, Federal investments target opportunities or major initiatives that have the potential for significant payoff in improving safety, mobility,

Benefit Trends

Electronic Toll Collection (ETC): Annual benefits grew by around 40 percent between 2000 and 2004, but they have declined substantially since. High estimates for ETC's nationwide mobility benefits were over \$1 billion per year, at 2007 deployment levels (2009 dollars).

Ramp Meter (RM): RM technologies had high annual mobility benefit estimates of over \$287 million. Annual benefits have remained fairly constant over time.

Red Light Camera (RLC): Annual benefits doubled every 2 years between 2000 and 2004, but have since declined by nearly 25 percent. At 2007 deployment levels (2009 dollars), RLCs had high annual safety benefit estimates of over \$1 billion.

Traffic Signal Coordination (TSC): Annual benefits grew at a fairly steady pace of about \$70 million per year between 1997 and 2004, but have remained relatively constant in the years since. TSC technologies had high annual mobility benefit estimates of over \$276.5 million, at 2007 deployment levels (2009 dollars).

Transit Signal Priority (TSP): After more than doubling between 2000 and 2004, annual benefits grew by a more modest 11 percent between 2004 and 2007. At 2007 deployment levels (2009 dollars), TSP technologies had high annual mobility benefit estimates of over \$149.9 million.

Traveler Information Systems (Dynamic Message Signs): Annual benefits grew by roughly \$100 million per year until 2003; growth has been far more modest since. At 2007 deployment levels (2009 dollars), these technologies had high annual mobility benefit estimates of over \$543.1 million.



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and productivity. Some of the most prominent ITS technologies already deployed across the country include electronic toll collection, ramp meters, red light cameras, traffic signal coordination, transit signal priority, and traveler information systems. Among these technologies, ITS deployment appears to have the most broad-based benefit in the area of improved mobility (i.e., in the form of travel-time reduction), according to the USDOT's *ITS Technology Adoption and Observed Market Trends from ITS Deployment Tracking* report. Examples cited in the report include:

- **Electronic Toll Collection (ETC):** ETC supports the collection of payment at toll plazas using automated systems that increase the operational efficiency and convenience of toll collection. Systems typically consist of vehicle-mounted transponders identified by electronic readers located in dedicated or mixed-use lanes at toll plazas. ETC has the potential to significantly increase mobility on the nation's transportation system.
- **Ramp Meter (RM):** Traffic signals on freeway ramp meters alternate between red and green signals to control the flow of vehicles entering the freeway. Metering rates can be altered based on freeway traffic conditions.
- **Red Light Camera (RLC):** According to the USDOT Federal Highway Administration's *Priority, Market-Ready Technologies and Innovations*, RLCs detect a motor vehicle that passes over sensors in the pavement after a traffic signal has turned red. The sensors connect to computers in high-speed cameras, which take two photographs of the violation. Typically, the first photo is taken of the front of the vehicle when it enters the intersection, and the second photo is taken of the rear of the vehicle when the vehicle is in the intersection. Law enforcement officials review the photograph, and a citation is mailed to the registered owner of the vehicle.
- **Traffic Signal Coordination (TSC):** According to the USDOT's *Traffic Signal Timing Manual*, TSC provides the ability to synchronize multiple intersections to enhance the operation of one or more directional movements in a system. Some examples include arterial streets, downtown networks, and closely spaced intersections such as diamond interchanges.

- **Transit Signal Priority (TSP):** TSP gives special treatment to transit vehicles at signalized intersections. TSP systems use sensors to detect approaching transit vehicles and alter signal timings to improve transit performance. For example, some systems extend the duration of green signals for public transportation vehicles when necessary. Because transit vehicles can hold many people, giving priority to transit can potentially increase the person throughput of an intersection.
- **Traveler Information Systems (TIS):** According to the USDOT ITS JPO's *Developing Traveler Information Systems Using the National ITS Architecture*, effective TIS are multimodal and support many categories of drivers and travelers. Traveler information applications use a variety of technologies, including Internet websites, telephone hotlines, and television and radio, to allow users to make informed decisions regarding trip departures, routes, and mode of travel.

Conclusion

Many benefits exist for further deployment and continued development of ITS technologies. With the ITS Program, the USDOT strives to make the most of ITS technologies that already exist and where possible integrate these advancements into vehicles and, infrastructure. The purpose of transportation systems technology is to process and share information that can prevent potential crashes, keep traffic moving, and decrease the negative environmental impacts of the transportation sector on society.

The ultimate benefits of a transformed transportation system—one that is fully connected; information-rich; and able to address safety, mobility, and environmental impacts—are wide-ranging and powerful. They will be felt by every one of us, delivering greater livability to our communities and to our daily lives.

The U.S. Government's Role

The USDOT's Research and Innovative Technology Administration's ITS Joint Program Office fosters the development and future deployment of these connected vehicle technologies. But connected vehicle research involves all agencies within the USDOT including NHTSA, the Federal Highway Administration, the Federal Motor Carrier Safety Administration, the Federal Transit Administration, and the Federal Railroad Administration. The USDOT and its public and private partners are working to address the technical, safety, and policy challenges and are helping to create the standards and the wireless architecture that will be the backbone of the system. Connected vehicle research will leverage the potentially transformative capabilities of wireless technology to make surface transportation safer, smarter, and greener. If successful, connected vehicles will ultimately enhance the mobility and quality of life of all Americans, while helping to reduce the environmental impact of surface transportation.

For more information about this initiative, please contact:

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