A5009: Committee on Intelligent Transportation Systems
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Intelligent Transportation Systems

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A greatly expanded version of this paper is being published as a separate Transportation Research Circular on the status and future prospects of intelligent transportation systems (ITSs). It features separate reports on nearly a dozen subareas related to ITS.

YOU'VE COME A LONG WAY, ITS

In the 1980s, a small group of transportation professionals recognized the impact that the computing and communications revolutions of the Information Age could have on surface transportation. The idea of ITS—originally intelligent vehicle-highway systems—was born.

ITS harnesses new technology to improve the safety, efficiency, and convenience of surface transportation, both for people and for goods. A glance at the state of transportation today—roads equipped with electronic tolling and variable message signs, passenger vehicles with navigation products and emergency notification systems, commercial vehicles equipped for nonstop weighing and cross-border credentials checking, transit vehicles containing location and communications systems, infrastructure to automatically track and support the better management of traffic flow—confirms that ITS is gaining widespread acceptance within the transportation community and by the general public.

At one level, ITS has been made possible by overall technological trends of the late 20th century, including ever-less-expensive and increasingly widespread computing power and communications technology. This new technology has enabled ITS products and services to become more sophisticated, reliable, and affordable over a relatively short period of time. However, an exploration of the evolution of ITS makes it clear that technology is only half the story. The success of ITS has also required careful attention to institutional and social concerns and to finding new ways of doing business. Notable among these is the focus in ITS on public-private cooperation, the linchpin of ITS since its inception.

The U.S. Department of Transportation (DOT) recognized the promise of ITS to enhance mobility and safety and to reduce fuel consumption and emissions without the formerly exclusive reliance on an expanding physical infrastructure. DOT has provided support for research and development, architecture and standards development, and field tests and model deployments. This public support has occurred alongside and in cooperation with private-sector efforts to create and market viable ITS products and services.

The creation of ITS America, a nonprofit industry association, has been instrumental in generating the momentum to identify, catalyze, develop, and implement ITS solutions. Besides serving as a focal point for the new ITS industry, ITS America is a utilized federal

advisory committee to DOT, helping foster the connection between public and private partners in the ongoing development of ITS.

The Transportation Equity Act for the 21st Century (TEA-21), passed by Congress in 1998, provides strong incentives to mainstream ITS into the transportation milieu. In this sense, TEA-21 is a testament to the fact that ITS has come of age.

The mainstreaming of ITS is also evident in the private sector, the critical engine of technological innovation in the market. Advances in wireless communications are widening the national and global information infrastructure, giving individuals seamless access to information anywhere, any time. ITS is taking advantage of these technological developments, including the explosive growth of the Internet. Automotive manufacturers are coming to view telematics—the wireless provision of ITS information, convenience, and safety services—as an important complement to their relationship with their customers. Many new products are being marketed not as ITS applications per se, but as enhancements to the mobile individual's ability to use the information superhighway.

Building ITS is a multidisciplinary, multifaceted undertaking. Some of these areas, such as advanced traveler information systems (ATIS), advanced public transportation systems (APTS), and advanced transportation management systems (ATMS) are applications oriented. Others, such as advanced vehicle control and safety systems (AVCSS), are more specifically technology oriented. Still others deal with the crosscutting issues that confront ITS, including safety and human factors, institutional issues, and legal issues. It should be noted that institutional, legal, and social issues represent some of the thorniest, as well as some of the most potentially productive, areas of ITS concern. New areas of ITS interest continue to arise as well, such as the application of ITS technology to rail-highway grade crossings. Given the range of ITS stakeholders and the divergence of interests they represent, setting directions and providing products and services that are responsive to these interests and concerns remain major challenges.

AND THERE'S STILL A LONG WAY TO GO!

For years, government and industry have been raising public awareness and acceptance of ITS. Today, with more products available than ever before, ITS is becoming a common feature of surface transportation. As product development and diffusion continue, ITS applications are becoming part of the basic fabric of transportation, not separate considerations.

However, many obstacles must be overcome before the long-run viability of ITS can be assumed. The benefits and operation of ITS products must be clear to consumers, and their costs must be justified against a wide array of competing automotive and consumer electronic products available on the market. Similarly, roadway-based ITS applications must provide clear advantages over other possible improvements to the transportation infrastructure. Reliability, ease of use, and affordability are all crucial ingredients to the future success of the industry. Some of the most difficult issues will continue to surround the allocation of scarce public and private dollars, legitimate differing viewpoints on the role and consequences of transportation, and the difficulty of effectively merging steel and asphalt with integrated circuits and wireless communications.

ITS also remains a rich area for both fundamental and applied research. Except at the most superficial levels, we really do not understand how traffic behaves over time; how to get multiple in-vehicle safety systems (e.g., collision avoidance and stability control) to

effectively cooperate in an emergency; how to gather, organize, and present information to drivers, passengers, and pedestrians in a way that informs without causing confusion or distraction; how to determine the best way to get particular people and goods from here to there (or even what “best” fundamentally means); how to optimize the overall throughput of the transportation system within practical cost and social constraints; and so on and on.

With continuing focus from industry and government, over the next decades we can reasonably look forward to a surface transportation system that ITS has helped to become well integrated into all parts of personal and commercial life, one that is safer and more reliable, more pleasant and less stressful, and increasingly cost-effective.

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