

**INTELLIGENT VEHICLE HIGHWAY
SYSTEMS AND HOV FACILITIES**

**Current IVHS/HOV
Projects**

**Moderator: Katherine F. Turnbull
Texas Transportation Institute
The Texas A&M University System**

**Recorder: Jeff Lindley
Federal Highway Administration**

**Helen Gault
Ottawa Carlton Regional
Transit Commission**

Ms. Gault provided an overview of the automatic vehicle location (AVL) system in operation in Ottawa. She presented a brief review of the major elements of the Ottawa transitway system, a history of the development of the AVL system, the major components and use of the system, and plans for future expansion and enhancement of the system. Ms. Gault covered the following points relating to the Ottawa AVL system.

- The basic philosophy used in the development of the AVL system was to keep the system simple, avoid duplication, avoid the need for complex on-bus equipment, and avoid information overload.
- The system was designed to integrate the AVL system into the existing computer assisted service control and monitoring system. Major elements of the existing system include the radio communications network, bus to operator run assignments, call prioritization, schedule information displays, and data management.

- Currently, a demonstration project is being conducted focusing on one heavily traveled route. Buses on this route are equipped with AMTECH Automatic Vehicle Identification (AVI) transponders. The transponders are read by detectors located at strategic points along the route. Finding good locations for the detectors, which must be located over the area the buses will pass under, has been a challenge. The objective of the demonstration is to determine the accuracy and reliability of the equipment, as well as the operation and maintenance costs.
- Key elements of the demonstration focus on information management, including the provision of real-time bus schedule information to the public through information displays, telephone information service updates, and select-call communication. In the future, the system will also be tied to signal preemption capabilities.
- Further expansion of the AVL system to other routes and eventually the full system is anticipated.

**Steve Albert
Metropolitan Transit Authority
of Harris County**

Mr. Albert provided a summary of the Houston HOV lane system and the IVHS-related activities in the Houston area. He noted that a number of demonstration projects are either being initiated or are in the planning stages. Many of these are being developed through the joint efforts of Houston Metro, the Texas State Department of Highways and Public Transportation, the Texas Transportation Institute, and local jurisdictions. Mr. Albert noted the following projects as representative of many

of efforts currently underway in the Houston area.

- A demonstration is currently underway focusing on the use of cellular telephones to measure travel times in selected corridors. A limited demonstration has been conducted by having drivers in these corridors call in travel times at selected points using cellular telephones. This system will be expanded in the fall to include some 200 drivers. The resulting travel time and real-time traffic information will be used in a variety of ways by a variety of groups. These include commercial vehicle operators, traffic reports, transit systems, and other demonstration projects. In 1992, it is anticipated that the cellular telephones will be replaced by transponders and AVI tags.
- As noted in the white paper presentation, the Houston *Smart Commuter* IVHS Demonstration Project is being developed focusing on the use of IVHS technologies to encourage greater utilization of high-occupancy commute modes. This will be accomplished by providing current traffic and transit information to individuals in their home and work place through a variety of advanced technologies. The real-time traffic information provided from the cellular telephone and transponder demonstration will be used in this project.
- Limited testing of automatic vehicle location (AVL) technology has been conducted and further testing is planned.
- The use of kiosk displays for transit and traffic information is being tested at a major suburban office complex.
- A very preliminary look is being given to the potential of using IVHS technology

on the HOV lanes for vehicle identification, authorization, and peak-period use. In addition, the use of IVHS on arterial streets has been discussed as a future consideration.

Mark Haselkorn
University of Washington

Dr. Haselkorn presented an overview of the real-time interactive traveler information system being developed at the University of Washington. A prototype of the system, called Traffic Reporter, is currently operational for the 15 mile I-5 corridor north of Seattle. Using a videotape showing the actual information screen, Dr. Haselkorn highlighted the following key elements and functions of the system.

- Traffic Reporter is a PC-based graphical, interactive, traveler information system. The goal of the system is to influence commuter behavior and decision making by providing current and useful traffic information.
- Traffic information is collected through detectors embedded in the pavement of the freeway lanes. A microprocessor gathers the detector data for one second and transmits it to a central processor. A mainframe computer at the Traffic Management Center receives this information and produces a one-minute summary that is transmitted to a personal computer. The data are converted into estimated travel speeds and times and displayed in graphical form. Four colors are used to denote different operating speeds.
- The user can also access other data screens that can zoom into a specific location or provide mean speed rates at selected locations.

- The information can also be utilized by traffic managers and engineers. The system will allow better management of the facilities by providing current information and allow detailed analysis to be conducted on historical data.

Current plans are to upgrade, improve, and expand the system. This includes expanding the area covered by the system, providing information on the freeway and HOV lanes separately, developing a touch screen feature for use in public kiosks, and expanding the capabilities to link into home computers. In addition, researchers are working on developing the ability to predict future traffic conditions based on current conditions and historical data.

**Chris Hill
Castle Rock Consultants**

Mr. Hill provided a summary of the use of IVHS technologies in transit and ridesharing. He noted that there are a number of current applications in use and the potential exists to expand the use of IVHS technologies to greatly enhance both transit and ridesharing activities. The following current and future applications were highlighted by Mr. Hill.

- Use of IVHS technologies in pre-trip planning services. This could include the use of telephones, teletext, and personal computers.
- Enhancing transit service information systems to include real-time or next trip bus arrival, departure, and schedule information.
- Improving the efficiency of transit vehicles through signal retiming and signal preemption.

- Using AVI, AVL, or other technologies to enhance the operation of special environments, such as HOV lanes, parking lots, toll facilities, and ramp metering.
- Improve HOV enforcement capabilities through the use of automatic vehicle classification systems and video systems.
- Improve the management of rideshare systems and ridematching capabilities.
- Utilize automatic vehicle monitoring systems to provide real-time information on the location, schedule, loading, condition of buses in operation, and to alert dispatchers to any emergencies.

**Vision for HOV-Related
IVHS Programs**

**Moderator: Katherine F. Turnbull
Texas Transportation Institute
The Texas A&M University System**

**Recorder: Jeff Lindley
Federal Highway Administration**

**Steven Levine
Texas State Department of
Highways and Public
Transportation**

Mr. Levine presented an overview of the approach being taken in the Houston metropolitan area to the utilization of IVHS technologies. He noted that a variety of IVHS related projects are being pursued by different agencies in Houston. However, these activities are being coordinated through a number of multi-agency groups and projects. Mr. Levine highlighted the following IVHS projects and activities currently underway or planned for the Houston area.

- The Houston Intelligent Transportation System (HITS) represents the overall concept for the coordinated development of IVHS technology in the Houston area. The goal of HITS is to improve the mobility of people and goods and to reduce the environmental impacts of the transportation system through an accelerated and innovative program utilizing advanced technologies.
- A computerized traffic management system is under development for the freeways, HOV lanes, and frontage roads. The system is being jointly developed and implemented by the Department and Houston METRO.
- A major element is providing information to the traveling public through a variety of methods. These include newspapers, information banks or kiosks, radio stations and highway traffic advisories, information at truck stops, and changeable message signs.
- A demonstration using cellular telephones to provide current traffic information is currently underway in targeted corridors. This demonstration will be expanded to utilize transponders to record the travel time information in 1992. The information obtained will be provided to a variety of users.
- The Houston *Smart Commuter* IVHS Demonstration project is being developed to test the use of advanced technologies to encourage greater utilization of high-occupancy commute modes.

Ted Chira-Chavala
University of California, Berkeley

Dr. Chira-Chavala discussed an UMTA funded project being conducted at the

University of California, Berkeley, which is examining the application of advanced technologies to HOV systems. He provided an overview of the medium and long-term technologies that are being examined and the benefits and potential applications associated with these. The following points were highlighted in his presentation.

- Mid-term technologies are considered realistic over the next 3 to 5 years. Most of these technologies are optional, can be used in mixed traffic, do not include vehicle to vehicle communication, and maintain driver control of the vehicle. Anticipated benefits include reductions in travel times, frequency and severity of accidents, and vehicle emissions. They also provide a transition to the longer term automated technology. Candidate technologies being examined include roadway electrification, dynamic route guidance, AVI, and lateral and longitudinal control.
- Long term technologies are considered realistic within a 10 to 12 year time frame. These technologies will allow for significant increases in capacity. HOV lanes represent ideal test facilities for many of these technologies. In addition to the benefits noted previously, the use of these technologies should greatly increase the capacity of the transportation system.

Richard Braun
Center for Transportation Studies
University of Minnesota

Mr. Braun provided an overview of many of the IVHS activities in Minnesota and on a national basis. He noted the wealth of opportunities to combine IVHS technologies and HOV facilities. He suggested that individuals involved in the

HOV area should actively promote the use of IVHS technologies to improve the operation and management of HOV facilities.

Mr. Braun noted the enthusiasm at the federal level for the IVHS program. FHWA, UMTA, and a number of other groups are actively involved in a number of projects and more demonstration programs are expected to be initiated over the next year. IVHS America, which held its first Annual meeting in March, is also actively supporting the development of a national IVHS program. There is interest and enthusiasm for IVHS on many levels. The March meeting drew over 500 people.

Mr. Braun suggests the need for one source for all the traffic and transit information that will be available through IVHS technologies. He stressed that the credibility of the IVHS and associated programs will depend largely on the accuracy of this information. Ensuring that the information provided is accurate and timely will be critical to the success of these programs.

Mr. Braun reviewed the Autoscope system, which was developed by a professor at the University of Minnesota. Autoscope is a video image processing system that can be used to provide information on traffic levels, travel speeds, and incidents. The first large scale test of the system will be in the I-394 corridor.

Mr. Braun noted the importance of addressing legal, institutional, and human factor issues related to the development of many IVHS projects. Many of these same concerns relate to HOV facilities. He also stressed the real opportunity to fold transit into IVHS, especially as it relates to giving transit an advantage. This is an area where the creative application of IVHS technology

could provide numerous benefits. These applications also provide the opportunity to provide the early winners that the IVHS program needs.

**Dennis Ingham
Washington State Department
of Transportation**

Mr. Ingham provided an overview of the approach being taken in Washington State to implementing IVHS and HOV technologies. He also discussed the overall vision for the development of these programs. Mr. Ingham noted the following points as central to the approach and vision for IVHS and HOV technologies in Washington State.

- It is important to identify a long-term vision and then implement this vision through incremental short- and mid-term activities.
- The programs and projects in Washington State all share a common theme focusing on communication. This includes the data collection elements, the central processing functions, and transmitting this information to drivers, commercial vehicles, traffic management centers, and others.
- A wide variety of technical choices and approaches exist and should be utilized. These include telecommuting, dynamic bus routing, real-time traffic and transit schedule information, dynamic rideshare matching, providing travel time savings to HOVs, and allowing SOVs access to HOV facilities for a fee. All of these approaches can improve the management and operations of the transportation system and enhance the environment.
- A better understanding of the needs of commuters is necessary to ensure that the

programs and technologies are matched to the desires of the customers. A number of options must be provided to individuals so they can select the ones which best meet their needs.

status of programs, projects, and innovative technique.

Ron Fisher
Urban Mass Transportation
Administration

Mr. Fisher summarized the major points of the Advanced Public Transportation System (APTS) program, which represents UMTA's component of the IVHS program. The program is designed to focus transit IVHS applications and coordinate with the activities of IVHS America, FHWA and other groups. One of the IVHS America Committees will deal specifically with transit.

He supported the comments of previous speakers who suggested that IVHS can be used to give transit an advantage in congested transportation corridors. Mr. Fisher further suggested that transportation professionals should think creatively to identify ways IVHS technologies can be used to improve transit management and operation. Mr. Fisher identified the following opportunities for improving transit.

- There is a vast amount of information becoming available on all aspects of the transportation system. Providing this information to commuters along with information on travel options can result in more educated consumers.
- A variety of IVHS technologies can be used to better manage HOV facilities and test different innovations.
- Since technologies evolve so quickly, there is a need to continually monitor the