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Primer on Intelligent Vehicle Highway Systems

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**PRIMER ON
INTELLIGENT VEHICLE HIGHWAY SYSTEMS**

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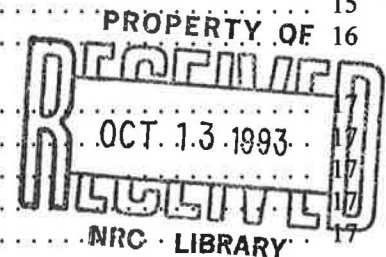
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INTRODUCTION

The purpose of the Primer is to provide a source of basic information on IVHS terminology, technologies, and activities. The Primer was prepared at the direction and with the support of the Transportation Research Board's Committee on Intelligent Vehicle Highway Systems (A5009).

The main objective of this Primer is to provide a useful source of basic information to those new to the field of IVHS, and a reference tool to those already involved in IVHS. Even those deeply involved in the IVHS industry find it difficult to keep up with all the emerging technologies and new projects.

The essays that form the first half of this Primer describe particularly prominent and timely topics in IVHS. The objective of these essays is to provide a basic foundation of information on IVHS. Although the focus is on U.S. IVHS, there are sections describing the state of IVHS in Canada, Europe, and Japan. There are brief descriptions of major U.S. operational field tests, and information on the roles of various U.S. standards-setting organizations and federal agencies involved in IVHS.

The second half of the Primer is an IVHS glossary. This section should prove useful to those wishing to become more familiar with IVHS terms, activities, and

organizations, as well as to those who merely need to find the meaning of an unfamiliar term or acronym.

The principal author of the Primer is Valerie Shuman of SEI Technology Group, which provided the resources for Primer development. The Primer was developed in cooperation with IVHS AMERICA. Principal editorial support was provided by Richard Weiland, SEI Technology Group, and Robert Parsons, Parsons Technology Associates. Additional editorial support came from Wally Albers of Albers Systems, Clay Collier, Susan Scott and Russell Shields of SEI, Steven Shladover of PATH, and Professor Joseph Sussman of MIT. The authors and editors express their thanks to Daniel Brand, Charles River Associates, Chair of the TRB Committee on IVHS, and to James Scott of the TRB staff for their assistance in publishing this Primer. Thanks are also due to all those who provided suggestions and responded to requests for information.

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PART ONE: ARTICLES AND ESSAYS

INTELLIGENT VEHICLE HIGHWAY SYSTEMS (IVHS)

IVHS is the application of advanced information processing and communications, sensing, and control technologies to surface transportation. The objective of IVHS is to promote more efficient use of the existing highway and transportation network, increase safety and mobility, and decrease the environmental costs of travel.

The dilemma facing the American traveling public is that while demands for mobility continue to increase, the available capacity of the roadway system is about exhausted in many areas. Except for fine tuning and relatively modest additions, the road system can not be expanded in many areas. The only means left for increasing available travel capacity is to use the available capacity more effectively: Redirect traffic to avoid congestion, provide assistance to drivers and other travelers on planning and following optimal routes, increase the reliability of and access to public transportation, and refocus safety efforts on accident avoidance rather than merely minimizing the consequences of accidents.

By general agreement, IVHS has been subdivided into six interlocking system areas, three focused on technology and three on applications:

Technology oriented:

- Advanced Traffic Management Systems (ATMS)
- Advanced Traveler Information Systems (ATIS)
- Advanced Vehicle Control Systems (AVCS)

Applications oriented:

- Advanced Public Transportation Systems (APTS)
- Commercial Vehicle Operations (CVO)
- Advanced Rural Transportation Systems (ARTS)

Advanced Traffic Management Systems (ATMS)

ATMS addresses technologies to monitor, control, and manage traffic on streets and highways. ATMS technologies include:

- Traffic control centers in major metropolitan areas to gather and report traffic information, and to control traffic movement to enhance mobility and reduce congestion through ramp, signal, and lane management, vehicle route diversion, etc.

- Changeable message signs which provide current information on traffic conditions to highway users, and suggest alternate routes
- Priority control systems to provide safe travel for emergency vehicles when needed
- Programmable, directional traffic signal control systems
- Automated dispatch of tow, service, and emergency vehicles to accident sites

IVHS AMERICA (qv) includes a technical committee on ATMS to coordinate the research, development, evaluation, deployment, operations and maintenance of ATMS technology and serve as a forum for the consideration of issues related to ATMS. (Chairman: Eugene Ofstead, Minnesota DOT, 612/296-1344, fax: 612/296-6135)

Advanced Traveler Information Systems (ATIS)

ATIS addresses technologies to assist travelers with planning, perception, analysis, and decision-making to improve the convenience and efficiency of travel. In the automobile, ATIS technologies include:

- On-board displays of maps and roadway signs (in-vehicle signing)
- On-board navigation and route guidance systems
- Systems to interpret digital traffic information broadcasts
- On-board traffic hazard warning systems (e.g., icy road warnings)

Outside the vehicle, ATIS technologies include:

- Trip planning services
- Public transit route and schedule information available online at home or office

IVHS AMERICA includes a technical committee on ATIS to address the acquisition, analysis, communication, presentation, and use of information to assist the surface traveler. (Chairman: James Rillings, General Motors, 313/986-2990, fax: 313/986-3003)

Advanced Vehicle Control Systems (AVCS)

AVCS addresses technologies to enhance the control of vehicles by facilitating and augmenting driver performance and, ultimately, relieving the driver of some tasks, through electronic, mechanical, and communications devices in the vehicle and in the roadway. AVCS technologies include:

- Adaptive cruise control (which slows a cruise-controlled vehicle if it gets too close to a preceding vehicle)
- Vision enhancement systems (which aid driver visibility in the dark or in adverse weather)
- Lane departure warning systems (which help drivers avoid run-off-the-road crashes)
- Automatic collision avoidance system (automatic braking upon obstacle detection)
- Automated highway systems (automatically controlling vehicles in special highway lanes to increase highway capacity and safety)

IVHS AMERICA includes a technical committee on AVCS to promote and communicate a vision of AVCS to society, develop and carry out a strategic plan for the research, development, testing, demonstration and deployment of that vision; and provide a forum for the promotion, discussion and analysis of issues relevant to AVCS. (Chairman: Steven Shladover, University of California, 510/231-9537, fax: 510/231-9565)

Advanced Public Transportation Systems (APTS)

APTS addresses applications of IVHS technologies to enhance the effectiveness, availability, attractiveness, and economics of public transportation. APTS strives to improve performance of the Public Transportation system at the unit level (vehicle and operator) and at the system level (overall coordination of facilities, provision of better information to users). APTS technologies include:

- Fleet monitoring and dispatch management
- Onboard displays for operators and passengers
- Real-time displays at bus stops
- Intelligent fare collection (e.g., using smart cards)
- Ride share and HOV information systems

IVHS AMERICA includes a technical committee on APTS to enhance and promote use of public transportation services through IVHS technologies, to increase the availability of accurate and timely information to travelers, and to improve the management and control of public transportation operations. (Chairman: Michael Bolton, Ann Arbor (Michigan) Transit District, 313/973-6500, fax: 313/973-6338)

Commercial Vehicle Operations (CVO)

CVO addresses applications of IVHS technologies to commercial roadway vehicles (trucks, commercial fleets, intercity buses). Many CVO technologies, especially for interstate trucking, relate to the automated, no-stop-needed handling of the routine administrative tasks that have traditionally required stops and waiting in long lines: toll collection, road use calculation, permit acquisition, vehicle weighing, etc. Such automation can save time, reduce air pollution (most/worst emissions are produced during acceleration and deceleration), and increase the reliability of record keeping and fee collection. CVO technologies include:

- Automatic vehicle identification (AVI)
- Weigh in motion (WIM)
- Automatic vehicle classification (AVC)
- Electronic placarding/bill of lading
- Automatic vehicle location (AVL)
- Two-way communications (TWC), between fleet operator and vehicles
- Automatic clearance sensing (ACS)

IVHS AMERICA includes a technical committee on CVO which is working to identify, coordinate, and monitor all IVHS activities related to commercial

vehicle operations; and identify, prioritize, and make recommendations to appropriate parties on needed research, operational test activities, and the development of uniform standards. (Chairman: Michael Walton, University of Texas, 512/471-1414, fax: 512/471-0592)

Advanced Rural Transportation Systems (ARTS)

ARTS addresses applications of IVHS technologies to rural needs, such as vehicle location, emergency signaling, and traveler information. The issues involved in implementing IVHS in rural areas are significantly different than in urban areas, even when services are similar. Rural conditions include low population density, fewer roads, low amount of congestion, sparse or unconventional street addresses, etc. Different technologies and/or communications techniques are needed in rural IVHS to deal with those conditions. Safety is a major issue in ARTS; over half of all accidents occur on rural roads. ARTS technologies include:

- Route guidance
- Two-way communications
- Automatic vehicle location (AVL)
- Automatic emergency signaling
- Incident detection
- Roadway edge detection

IVHS AMERICA includes a technical committee on ARTS which is working to coordinate work on rural issues. (Chairman: Don Kelly, Kentucky Transportation Cabinet, 502/564-4786, fax: 502/564-5238)

INTELLIGENT VEHICLE HIGHWAY SOCIETY OF AMERICA (IVHS AMERICA)

IVHS AMERICA is a public/private partnership encompassing all levels of government, the private sector, professional associations, and the universities, in a joint effort to define and advance a national IVHS program for more efficient, safer, and environmentally sound road transport through research, development, testing, and implementation of advanced technology. IVHS AMERICA's role is to define IVHS goals for North America, facilitate IVHS coordination across jurisdictional and sector boundaries, identify and oversee the development of relevant standards, and provide reliable information on IVHS to the general public.

IVHS AMERICA was proposed at a May 1990 National IVHS Leadership Conference sponsored by the Highway Users Federation and the U.S. Department of Transportation. IVHS AMERICA was incorporated in the District of Columbia on August 15, 1990 as a not-for-profit educational/scientific organization under Section 501(c)(3) of the Internal Revenue Code.

IVHS AMERICA is a utilized Federal Advisory Committee to the United States Department of Transportation under the Federal Advisory Committee Act. Part of IVHS AMERICA's mission is to support U.S. DOT efforts to define and advance IVHS, including defining a U.S. Strategic Plan for IVHS, establishing research priorities, coordinating standards and protocols, etc.

IVHS AMERICA is financed by membership dues, conference proceeds, U.S. DOT funding, grants, and service fees. Membership is open to companies, professional associations, government agencies at all levels, universities, public and private foreign organizations, unaffiliated individuals, and other parties with an interest in IVHS.

IVHS AMERICA is headed by a Board of Directors and a Coordinating Council. Committees of the Board and Coordinating Council include: ATIS, ATMS, APTS, AVCS, CVO, ARTS; Benefits, Evaluations & Costs; Institutional Issues; Legal Issues; Safety and Human Factors; Standards & Protocols; International Liaison; and System Architecture. Subcommittees of the Coordinating Council include Planning and Clearinghouse & Publications.

IVHS AMERICA operates an Information Clearinghouse for information interchange on IVHS activities, meetings, standards, legislation, and publications.

Through April 1994, the officers and management are:

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Director of Standards and Protocols:

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SYSTEM ARCHITECTURE

A System Architecture is a master plan — a structural outline — within whose dimensions a variety of actual, real-world systems can be implemented. It describes how components interact to achieve total system goals. Ideally, a system architecture provides a modular design which allows the system to grow and change over time, to include new components, and to accommodate new technologies.

The IVHS community recognizes that differences in traffic density, population, demographics, terrain, weather, and political priorities from one part of the continent to another mean that IVHS implementations are not all going to be identical. Mechanisms for gathering and distributing traffic information, identifying vehicles for electronic toll and traffic management, determining and responding to emergency situations, etc., will clearly not be the same everywhere.

At the same time, there is a strong need for compatibility and interoperability across areas so that:

- In-vehicle systems (e.g., navigation systems) can function consistently regardless of locale.
- Enforcement, permitting, and compliance systems can serve the widest possible community without requiring vehicles (particularly commercial vehicles) to carry multiple redundant systems.

To this end, the IVHS community has begun a strong initiative to develop an embracing IVHS system architecture. Such an architecture will identify the abstract components of the overall IVHS system and, equally important, the critical interfaces among components. Given appropriate definitions for the functional capabilities of the components and the characteristics of the interfaces, a variety of compatible IVHS implementations can be created. Regardless of the underlying technology, so long as the components correspond functionally to the architectural definition, and interface conventions are observed, the System will be able to operate consistently and economically.

IVHS AMERICA includes a Committee on System Architecture. The committee serves as a focal point for the coordination and discussion of system architecture activities sponsored by government agencies and private sector organizations.

At the urging of the IVHS AMERICA Committee on System Architecture, the Federal Highway

Administration has begun the process to define the IVHS System Architecture.

The FHWA issued a Request for Information, for which responses were due in late Summer 1992. Following analysis of the responses, FHWA issued a Request for Proposals (RFP) in Spring 1993 inviting teams of public, private, and academic organizations to propose projects through which a first order System Architecture is defined.

FHWA will select several such teams to develop competing initial architectures. Following evaluation of the initial architectures, two teams, possibly mixed-and-matched from the original teams, will be selected to take the draft architectures to a more developed second stage. Following further evaluation and refinement, the eventual result will be a final IVHS System Architecture which is accepted by consensus of a broad cross-section of the IVHS and user community. FHWA has already begun to establish the mechanisms through which the consensus will be achieved.

Info: Ron Heft, JPL, 202/426-9336, fax: 202/426-9355.

ELECTRONIC TOLL AND TRAFFIC MANAGEMENT

Electronic toll and traffic management (ETTM) is the application of computer and communications technology to electronic toll collection (ETC) and the management of traffic flow.

ETC enables the collection of fees from drivers without requiring the vehicle to stop at toll booths. It also allows for more sophisticated billing systems; vehicles can be charged according to the time of day they travel, how far they travel, or how much they use congested traffic facilities. Distance-based toll collection can be open or closed. In an open system, vehicles pay at toll booths along the route. In a closed system, vehicles pay when they leave the tollway, based on total travel distance.

There are two types of ETC:

- Identified
- Anonymous

Identified

Identified ETC identifies the vehicle as it goes by and typically debits an established toll account. There are three types of **automatic vehicle identification (AVI)** which can be used for this purpose:

- Passive
- Active
- Semi-active

Passive. Passive AVI provides one-way communication from the vehicle to the roadside, and is technologically the simplest of the three approaches. Special electronic tags associated with a toll account are affixed to the vehicle. Road-side readers with radio antennas beam radio waves at the tags which reflect and modify these signals to identify the vehicles. This reflection is known as **backscatter**. The readers check the identification with a central computer, validate the information and the toll account, and send the information to a central computer for accounting.

Microwaves and inductive loop systems may also be used in this manner, as well as for active and semi-active AVI.

Active. Active AVI involves two-way, real-time communication between the vehicle and the roadside using in-vehicle transponders instead of electronic tags. The transponders are powered by the vehicle itself. A signal from the roadside reader triggers the transponder to transmit its identifying information.

For ETC, systems debit a prepaid account stored in the transponder. This makes account information accessible to the driver at all times. The transponder memory reduces the need for centralized accounting.

Semi-active. Semi-active AVI is also usually two-way communication. It differs from active AVI in that the in-vehicle transponders use an internal battery and transmit only when triggered by the roadside. This eliminates the reliability problem of the active system, as the transponders have their own power source and are thus not vulnerable to vehicle failure.

Anonymous

In anonymous ETC, the driver secures a "smart" card or an equivalent form of electronic legal tender. Funds are installed directly. On the highway, a roadside reader debits the card as the vehicle goes by. This system eliminates some of the privacy concerns which surround ETC because the driver and the vehicle are never individually identified.

Future ETTM Systems

In the full-fledged ETTM systems of the future, traffic management may be fully integrated with ETC systems. Both systems could use the same communications and field equipment, and where they do not, information collected from one system could be used to verify the other. Transponders could be used to report traffic conditions, which would allow traffic management agencies to redirect traffic flow around congested areas, clearing incidents and bottlenecks quickly, and to vary traffic signals according to demand. Real-time congestion pricing, in which user fees are raised or lowered as traffic conditions change, would also be possible.

VEHICLE NAVIGATION

Vehicle Navigation is the use of on-board systems, sometimes in combination with a centralized infrastructure outside of the vehicle (e.g., traffic management centers), to assist drivers in getting to their destinations. Two prominent types of Vehicle Navigation Systems are:

- Map Display Systems
- Route Guidance Systems

Map Display Systems

Map Display Systems provide a computer-screen display of a street map, typically with vehicle location highlighted on the map. (See below for a discussion of how vehicle location is determined.) As the vehicle travels, the map shifts to keep the vehicle on the screen. Maps may appear "north-up," in which vehicle heading does not affect the orientation of the map. Maps may also appear "heading-up," meaning that the top of the map corresponds to the direction the vehicle is facing. Some map display systems communicate with an information center, which provides information on congestion and delays, which are then highlighted on the map display.

Original equipment map display systems have been offered by a number of Japanese automotive manufacturers for their domestic market. In the U.S. and Europe, aftermarket map display systems have been marketed by Etak and Bosch. Map Display Systems were a main focus of the Pathfinder Project, and were one component of the TravTek and ADVANCE operational tests (qv).

Route Guidance Systems

Route Guidance Systems allow the driver to specify a destination. The system then calculates an optimal route from the vehicle's current location to the desired location and presents directions to the driver, typically in the form of a simple graphic display or computer voice, or both. There are two prominent types of Route Guidance Systems: Infrastructure-Centered and Autonomous. Dual mode systems combining features of both are also being considered.

Infrastructure-Centered Route Guidance Systems have been prototyped by Siemens in Europe (ALI-SCOUT, EURO-SCOUT) and the U.S. (Fast-Trac). In these systems, vehicle identity and a destination are transmitted to a central facility. The central facility then calculates the route and transmits it back to the vehicle. This arrangement typically uses roadside infrared beacons for transmission. Vehicle position is determined primarily by proximity to a beacon, although dead reckoning capabilities are sometimes also present. In this arrangement, the vehicle has relatively little computing/database responsibility. However, service is limited to areas where beacons are installed, the infrastructure is relatively expensive, and system only works when the infrastructure is operational.

Autonomous Route Guidance Systems have been prototyped in Europe and the U.S. by Philips Electronics (CARIN), Zexel Corporation (NavMate), General Motors (TravTek), and Motorola, Inc. (ADVANCE). In these systems, the onboard system includes a database and computer processing technology to allow the vehicle to determine its own route and track its own progress along the route. Centrally assembled digital traffic information can be transmitted to the vehicles to permit real-time adjustments to calculated routes. In this arrangement, more technology must be present in the car. However, the system will work throughout the entire area covered by the on-board map, the infrastructure is relatively simple, and most routing operations do not depend on the infrastructure at all.

Dual-Mode Systems, now in the preliminary planning stage, combine features of infrastructure-based and autonomous Route Guidance Systems. In city centers and other densely populated and congested areas, infrastructure-based mode is used to combine route guidance capabilities with real-time traffic management. Essentially every signalized intersection in the central area will have beacons. Outside the central area, autonomous mode goes into effect, providing wide area route guidance capabilities without large scale infrastructure costs.

Vehicle Positioning

All navigation systems use some type of technology to determine vehicle position. Some navigation systems use several technologies in combination.

- Signals transmitted by the vehicle can be triangulated from ground stations, with the determined location transmitted back to the vehicle or to a fleet management system.
- The vehicle can use signals from multiple satellites (e.g., GPS) to triangulate itself. This is subject to error from echoes, obstacles, insufficient satellite coverage, and deliberate error introduced into satellite information by the government for national security reasons ("selective availability").
- The vehicle can use dead reckoning, in which sensors (e.g., wheel rotation counters, odometer, compass, gyroscopes, accelerometers) provide information on the direction and distance of vehicle travel relative to a known starting position. This process can be greatly enhanced by map matching, in which software compares the vehicle's sensor-derived path against a digital street map. The software corrects for inaccuracies in dead reckoning by assuming that the vehicle stays on the roadway and turns only in places where the map indicates that such turns are possible.
- Roadside beacons can provide current location to a vehicle as it passes. Between beacons, dead reckoning can be used.

Map Databases

A fundamental requirement for navigation and route guidance systems is a comprehensive digital street map database. Such maps must have the geographical coverage, accuracy, and detail to support such applications as: address location, route determination, route guidance, map displays, etc. This implies highly accurate geometric representation of the roadways (typical maximum tolerance: 10-15 meters), inclusion of address ranges, street names, directionality, turn restrictions, highway ramp configurations, etc.

These databases may also include demographic and political data, business listings ("electronic yellow pages"), and other information keyed to the underlying roadway geometry.

In the U.S., pioneering digital street map databases were produced by the U.S. Census Bureau to support the 1980 census (DIME files) and 1990 census (TIGER files). Many commercial street map databases use DIME and TIGER files as their base, often augmented by the printed maps available from the U.S. Geological Survey (USGS) and other data. Other street map databases are built starting from original source materials (aerial photographs and base maps).

In the U.S., the SAE Map Database Standards Committee is working to develop a truth-in-labeling standard for digital street map databases, including standardization of terms, metrics, and tests to permit the measurement, evaluation, and comparison of completeness and content level. **Info:** Russell Shields, Navigation Technologies, 408/737-3200, fax: 408/736-3734.

The IVHS community has also begun to work to develop a transportation/IVHS profile for the U.S. Spatial Data Transfer Standard, a Federal Information Processing Standard for spatial data exchange. **Info:** Daniel Toohey, IVHS AMERICA, 202/973-7872, fax: 202/296-5408.

In Canada, the Department of Energy, Mines and Resources is building a National Topographic Database (NTDB) which includes a digital road network for GIS applications involving road transport and vehicle positioning and navigation. The NTDB provides complete digital topographic coverage of Canada at the 1:250,000 scale and most of southern Canada and selected northern areas at the 1:50,000 scale.

In Japan, the Japan Digital Road Map Association (JDRMA) has purview over the development of street map databases. Maps at the 1:50,000 scale are currently available, with annual updates. JDRMA has also mapped half of Japan at the 1:25,000 scale and will have maps at that scale available for the entire country in five years. Other companies have built upon these databases to create their own more detailed versions. JDRMA has published the National Digital Road Data Base Standard for Japan.

In Europe, digital mapping efforts are being undertaken by public/private partnerships under the DRIVE program. The European Digital Road Map (EDRM) project has drafted a European mapping standard, the Geographical Data File (GDF) Specification.

U.S. OPERATIONAL FIELD TESTS

Many U.S. field tests have been sponsored by the government and private industry in the past few years. A complete listing of projects supported by the U.S. Department of Transportation is available from the FHWA. A small sampling of these includes:

- ADVANCE
- Advantage I-75
- Crescent Demonstration Project (HELP)
- Fast-Trac
- Guidestar
- INFORM
- Pathfinder
- Smart Bus/Smart Vehicle
- SMART Corridor
- Smart Traveler
- TRANSCOM
- TravTek

Additional projects are listed in the glossary section.

ADVANCE

ADVANCE is a Chicago-area demonstration of ATIS and ATMS sponsored by the FHWA, Illinois DOT, Motorola, and the Illinois Universities Transportation Research Consortium (IUTRC). The objective is to evaluate the performance of a large-scale dynamic route guidance system, the Mobile Navigation Assistant (MNA). The program seeks to relieve traffic congestion by using:

- Alternative approaches for driver information systems
- Dynamic traffic information acquisition
- Incident detection, analysis and forecasting

Operation in the northwest suburbs of Chicago will begin in early 1994. Several thousand private vehicles will be equipped with Motorola's in-vehicle route guidance system. ADVANCE includes a variety of demonstrations and experiments with a focus on arterial traffic. Business listings, point of interest, and traffic information will also be available. The equipped vehicles will act as traffic probes, reporting congestion information on an exception basis. Loop detectors,

video systems, and other traffic surveillance systems will also provide traffic information.

Advantage I-75

Advantage I-75 is a public-private partnership project along the Interstate 75 corridor, running from Florida to upstate Michigan, with an extension into Canada. Its objectives are to reduce congestion, increase efficiency, and enhance safety. Its initial project is an AVI application to facilitate motor carrier operations. Advantage I-75 features off-the-shelf technology and decentralized control, with each state retaining its constitutional and statutory authority relative to motor carriers and their operations. The preliminary design phase is complete.

Crescent Demonstration Project

Crescent is a demonstration project of the Heavy Vehicle Electronic License Plate (HELP) program. Participants include the states of Alaska, Arizona, California, Idaho, Iowa, Minnesota, Nevada, Oregon, Pennsylvania, Virginia, Washington, New Mexico, Texas, the Port Authority of New York/New Jersey, the FHWA, Transport Canada, and Castle Rock Consultants. The demonstration is being operated along Interstate 10 from the New Mexico/Texas state line, west through New Mexico, Arizona, and California, then north from Los Angeles along Interstate 5 through California, Oregon, and Washington, and into British Columbia. Technologies being evaluated include:

- Weigh In Motion (WIM)
- Automatic Vehicle Identification (AVI)
- Automatic Vehicle Classification (AVC)
- Automatic toll collection
- Speed and elapsed travel time monitoring
- Commercial license checking

Information will be processed at a central computer and then used by both government and the trucking industry for regulatory, weight enforcement, and fleet management purposes. Crescent will include approximately 40 equipped sites and currently has about 2000 equipped vehicles in operation. The goal is to have a system in which a truck can drive through the

entire network without having to stop at any weigh stations or ports of entry. The project is currently in its third phase; sites and trucks have been equipped and operational testing is underway.

Fast-Trac

Fast-Trac (Faster and Safer Travel – Traffic Routing and Advanced Controls) is a five-year ATMS and ATIS demonstration project taking place in Oakland County, Michigan. The goal is to demonstrate the effectiveness of an integrated ATIS/ATMS system in improving mobility, reducing energy consumption, enhancing air quality, and reducing traffic accidents. The program will also evaluate and demonstrate requirements for the deployment of IVHS systems. Participants include the Road Commission for Oakland County, Siemens, FHWA, General Motors, Ford, Chrysler, Rockwell, The University of Michigan, and Michigan State University. The integrated IVHS system to be demonstrated consists of an ATMS system using the SCATS traffic management system developed in Australia and the Autoscope™ video image processing system. The system will also include an ATIS system using the Siemens Ali-Scout technology for infrastructure-based real-time route guidance. The first phase of the traffic operations center was completed in spring 1993. Twenty-eight intersections are currently under SCATS control, and Ali-Scout testing has begun.

Guidestar

Guidestar is an IVHS program of the University of Minnesota Center for Transportation Studies and the Minnesota DOT. It was created to respond to congestion and safety problems by optimizing travel in existing freeway corridors. It is a cooperative effort that brings together a number of ongoing operational ATMS/ATIS efforts with other IVHS projects and technologies throughout the state, such as the Minnesota Administrative Truck Center, a "one-stop" center that combines permit and other regulatory offices previously scattered over the Minneapolis/St. Paul area. Guidestar includes:

- Machine-vision research (Autoscope™)
- A regional traffic communications network
- Weigh In Motion (WIM) research.

Currently, the Twin Cities Freeway Management System is operational and Autoscope™ is being installed on I-394. Autoscope™ is being used to monitor traffic flow and spot congestion and incidents via computer

analysis of TV pictures of the roadway. The Genesis and Travlink projects are to provide traveler information. ACTS and Roadstar I are among Guidestar's other projects.

INFORM

INFORM is a computerized traffic management and information system (ATMS/ATIS) operated by the New York State DOT. INFORM is designed to reduce travel time along the 40 mile central corridor of Long Island, in Queens, Nassau and Suffolk counties. The system gathers traffic information using citizens band radio monitors, closed-circuit TV (CCTV), and roadway sensors in the Long Island Expressway, Northern State Parkway/Grand Central Parkway, Jericho Turnpike and adjacent cross streets and parallel arterial streets. INFORM communicates traffic information to motorists through variable message signs (VMS), commercial radio broadcasts, and color-coded maps. INFORM also adjusts traffic signals and entrance ramp metering signals in response to current traffic patterns. INFORM is currently operational.

Pathfinder

Pathfinder was a \$2.4 million field test of in-vehicle urban freeway navigation and information systems sponsored by Caltrans, FHWA, and General Motors aimed at improving traffic flow. The project was completed in June 1992.

Pathfinder was divided into three stages. Stage One began in June 1990. Testing took place on the Smart Corridor, a 13 mile stretch of the Santa Monica Freeway between Los Angeles and Santa Monica. Twenty-five Oldsmobile Delta 88s were equipped with Travelpilot, a navigation system manufactured by Robert Bosch GmbH under license from Etak. The cars received real-time information on accidents, congestion, highway construction and alternate routes through a computerized map display or digital voice in the vehicle. A Traffic Operations Center (TOC) managed the communications, detecting traffic density and vehicle speeds (via detectors and by using the Pathfinder vehicles as probes) and transmitting congestion information to equipped vehicles.

Stage Two involved the use of hired drivers to travel between various origin and destination points to obtain data on differences in travel time with and without the equipment in operation. The drivers' choice of display mode, route selection, and diversion choices were also evaluated.

In Stage Three, local commercial drivers used Pathfinder vehicles for regular business trips. The final stage was much like Stage One, in that destinations were chosen by the driver. A report on the project has been issued.

Smart Bus/Smart Vehicle

Smart Vehicle includes a series of operational tests which use different technologies to improve the efficiency and attractiveness of public transportation. Five FTA-sponsored Smart Vehicle Programs are currently underway:

- (Ann Arbor) - Includes an on-board bus system capable of traffic signal preemption, a central control system, and a Smart Card fare collection/parking pass system.
- (Portland) - Integrated fixed-route transit and contract taxi service information is provided to travelers and operators.
- (Denver-RTD) - AVL technology provides bus location information to transit dispatchers. Uses GPS, and will be expanded to include a transit information system with kiosks.
- (Baltimore-MTA) - AVL technology provides bus location information to the public. Uses LORAN-C and radio, and will be expanded to include GPS.
- (Chicago-CTA) - Preliminary studies have been done for an operational test of AVL, computer-assisted dispatch and control system, real-time passenger information signs, and traffic signal preemption for public buses.

SMART Corridor

The SMART Corridor is a \$48 million joint demonstration project sponsored by FHWA, Caltrans, the Los Angeles Metropolitan Transportation Authority, the Los Angeles DOT, and the Los Angeles Police Department. Objectives include:

- Congestion relief
- Accident reduction
- Reduced fuel consumption
- Improved air quality

Changeable message signs (CMS), highway advisory radio (HAR), kiosks, teletext, and ramp metering will be tested along 13 miles of the Santa Monica Freeway. Improved emergency response and coordinated

interagency traffic management via voice communication and electronic data sharing will also be tested. Included Pathfinder operational testing. Full implementation is scheduled for 1993.

Smart Traveler

Smart Traveler includes a series of operational tests which examine ways to make reliable real-time information on ridesharing and public transit easily available. Four FTA-sponsored Smart Traveler Programs are currently underway:

- (Bellevue, Washington) - Phase one advised private auto drivers of rideshare possibilities using a prototype commuter information system and mobile communications. Phase two will test a prototype computer-based, interactive commuter information center.
- (California) - Test of the California Advanced Public Transportation Systems (CAPTS) program. Audiotex and videotex will be used for interactive ATIS services, including carpool matching. Five sites have been identified for testing.
- (Houston) - A real-time traffic and transit information system will be developed and evaluated. The operational test is in development.
- (Minneapolis/St. Paul) - "TravLink" automatic vehicle location and traveler information will be tested. Smart Cards will also be investigated.

TRANSCOM

TRANSCOM is an consortium of 14 transportation and public safety agencies in the New York and New Jersey area with funding from FHWA. TRANSCOM functions as an information clearinghouse for incident and construction information. Its three core projects are:

- Construction coordination — to avoid interagency scheduling conflicts
- Incident management planning — to coordinate interagency response to incidents
- Operations Information Center (OIC) — to collect and disseminate real-time traffic information to member agencies, who then pass it on to travelers via highway advisory radio and changeable message signs.

TRANSCOM has initiated a cooperative effort to equip approximately 1,000 commercial vehicles with transponders. Specific technologies will include:

- Highway Advisory Radio (HAR)
- Remote video surveillance
- Computer networking system
- AVI system for electronic toll collection
- Geographic Information System (GIS) for data management

The test will evaluate the use of transponder data to determine real-time traffic information such as speed, travel time, and the occurrence of incidents.

TRANSCOM is also involved in the EZ-Pass effort (an electronic toll collection system). TRANSCOM is funding a marketing study of the system, to explore its viability for advanced traffic management applications.

TravTek

TravTek was a three year joint effort of the American Automobile Association (AAA), FHWA, Florida DOT, General Motors, and the City of Orlando. It conducted ATIS experiments with the objective of evaluating user acceptance and technical performance. TravTek employed ATIS technologies to maximize consumer use of traffic and service information. One hundred vehicles were equipped with a route guidance system and an in-vehicle TravTek device that provided real-time information on traffic congestion, as well as information on local events, hotels/motels, restaurants, attractions, and other points of interest.

The system included a TMC (Traffic Management Center) which received information from a TIN (Traffic Information Network) and a TISC (TravTek Information Service Center). AAA counselors at the TISC provided assistance to TravTek drivers, answering questions, providing driving directions outside the automated coverage area, dispatching emergency road service, and other travel-related services. The TISC was also linked directly to the Traffic Information Center to ascertain current vehicle location and provide daily Special Event and Road Restriction information to the Traffic Center for broadcast to the vehicles. Avis was the fleet rental agent during the one year TravTek demonstration, which ended in March 1993. Analysis of project results is ongoing.

U.S. DOT ADMINISTRATIONS INVOLVED IN IVHS

Federal Highway Administration (FHWA):

Oversees the development and management of the national roadway system. Publishes a monthly update on IVHS research. **Info:** George Schoene, FHWA, 202/366-2197, fax: 202/366-2249.

Federal Transit Administration (FTA):

Oversees technological developments relevant to transit applications and the definition of appropriate IVHS operational test and evaluation plans. Provides capital assistance to local mass transit, planning research and technical assistance. Formerly Urban Mass Transportation Administration (UMTA). **Info:** Sean Ricketson, FTA, 202/366-6678, fax: 202/366-3765.

National Highway Traffic Safety Administration (NHTSA):

Has a five part program aimed at incident prevention through safety research, testing and evaluation of products. **Info:** August Burgett, NHTSA, 202/366-5662, 202/366-7237, or William Leasure, 202/366-5662.

Research and Special Programs Administration (RSPA):

Involved in institutional and policy-making aspects of IVHS. Operates Volpe National Transportation Systems Center. **Info:** Gary T. Ritter, RSPA, 617/494-2716, fax: 617/494-3062.

U.S. ORGANIZATIONS INVOLVED IN IVHS

American Association of State Highway and Transportation Officials (AASHTO):

Constituted solely of state DOTs. **Info:** Frank B. Francois, Executive Director, 202/624-5800, fax: 202/624-5806.

American Society of Civil Engineers (ASCE):

Interested in the advancement of the individual civil engineer and of the science and profession of civil engineering through education. Involved in the development of consensus standards. Publishes journals, newspapers, and magazines. Sponsors bi-annual conferences on the applications of advanced technologies in transportation operations. **Info:** John Griffin, 212/705-7495, or 800/548-2723.

American Society of Mechanical Engineers (ASME):

Professional society and standards-making body. Co-sponsor of the annual American Control Conference. **Info:** Vera Mills, 201/882-1167, fax: 201/882-1717.

American Society for Testing and Materials (ASTM):

Involved in the development of consensus standards for materials, products, systems and services. Includes volunteer members from all levels of the transportation profession in 132 technical committees. Also sponsors technical programs and publications. Committee E-17 on Pavement Management Technologies focuses on IVHS issues. **Info:** Daniel Smith, E-17 Staff Manager, 215/299-5400, fax: 215/977-9679.

American Trucking Associations Foundation (ATA Foundation):

Umbrella trade association for the trucking industry. Sponsors safety programs, publications, the Trucking Research Institute (TRI), and an information center. **Info:** Douglas Anderson, Technical Director of Management Information Systems, 703/838-1721, fax: 703/836-6070.

Highway Users Federation for Safety and Mobility (HUFSA):

Washington-based coalition of 400 corporate and association members (plus approximately 2,000 individual members) with affiliated groups in each state and 14 regional offices. Main goal is to serve

the common interests of business and industry in advancing highway transportation safety and efficiency. Was instrumental in the formation of IVHS AMERICA. **Info:** Lester Lamm, President, 202/857-1200, fax: 202/857-1220.

International Bridge, Tunnel, and Turnpike Association (IBTTA):

Non-profit trade association of the worldwide toll industry. Interested in toll facility organization, and better highway transportation. Membership is open to all interested individuals or organizations. Includes 22 countries. Involved in ETTM efforts. Publishes ETTM Forum and Tollways. **Info:** Neil D. Schuster, Executive Director, 202/659-4620, fax: 202/659-0500.

Institute of Electrical and Electronics Engineers (IEEE):

Professional society and standards-making body composed of 38 individual societies, including the Computer Society and the Vehicular Technology Society. Includes an IVHS Standards Coordinating Committee. **Info:** John May, 508/887-5237, fax: 508/887-8716, or Service Center, 908/981-0060.

Institute of Transportation Engineers (ITE):

An international scientific and educational association of approximately 10,000 transportation professionals in 70 countries. Sponsors annual conferences. **Info:** Thomas Brahms, Executive Director, 202/554-8050, fax: 202/863-5486.

Intelligent Vehicle Highway Society of America (IVHS AMERICA):

See IVHS AMERICA article. **Info:** James Costantino, Executive Director, 202/857-1202, fax: 202/296-5408.

Society of Automotive Engineers (SAE):

Technical society aimed at developing, collecting, and disseminating knowledge about mobility technologies worldwide. Involved in the development of consensus standards for automotive applications. Includes an IVHS Division. Sponsors annual conferences. **Info:** Arlan Stehney, 412/772-7157, fax: 412/776-0002.

Transportation Research Board (TRB):

Part of the National Research Council, National Academy of Sciences. Purpose is to bring scientific and technical information to bear on transportation problems by encouraging and conducting research, and disseminating information. Includes committees on IVHS and Communications. **Info:** James Scott, 800/424-9818, fax: 202/334-2003.

UNIVERSITY PROGRAMS

Illinois Universities Transportation Research

Consortium:

(IUTRC). Non-profit organization owned by the University of Illinois at Chicago, University of Illinois at Urbana-Champaign, the Illinois Institute of Technology and Northwestern University. Involved in the ADVANCE program. **Info:** David Boyce, University of Illinois/Chicago, 312/996-4820, fax: 312/413-0006.

Massachusetts Institute of Technology:

Has undertaken IVHS research projects on benefits, technology assessment, northeastern states pilot projects, congestion analysis and driver information systems, GIS for driver information, GIS for transit agencies, smart traffic signals, safety and human factors, and synthetic speech for real-time route guidance. **Info:** Moshe Ben-Akiva, Director, IVHS Research Program, 617/253-5324, fax: 617/253-0082.

New Jersey Institute of Technology:

Offers graduate degrees in transportation. Research activities are coordinated by the Center for Transportation Studies and Research (CTSR). Current projects include Intelligent Transportation Systems (ITS), feasibility of an innovative ridesharing system, Urban Goods Movement (UGM), intermodal freight operations, and integrated distribution systems. Also interested in ATIS research. **Info:** Louis Pignataro, Program Director, 201/596-3355.

Texas A&M University:

Operates the Texas Transportation Institute (TTI) which sponsors an IVHS research program whose primary emphasis is on ATMS, AVCS, and CVO. Projects are underway which address the use of commuters as traffic probes, route selection guidance, computer terminals which provide current traffic information, a Smart Commuter program which promotes the use of mass transit by providing access to real-time traffic information, a low cost piezoelectric film-based WIM system, a prototype for automated research control through Binocular Autonomous Research Team (BART, a test vehicle), design of TMS networks, traffic control system

software, and the assessment of available options for information channels. Receives support from the Texas State Highway Department. **Info:** G. Sadler Bridges, Deputy Director, Texas Transportation Institute, 409/845-5814, fax: 409/845-9356.

University of California:

Conducts a statewide, multi-campus program of academic research for Caltrans in ATMS and ATIS (called ATMIS in California), AVCS, systems integration and institutional barriers. This program of IVHS research and development is called PATH (Partners for Advanced Transit and Highways). Ongoing work at five campuses, with private companies, and coordination with national laboratories. Emphasis on lateral and longitudinal control, field tests, and resolution of institutional issues. Maintains an active program on clean propulsion technology. **Info:** Donald Orne, Director, 510/231-9541, fax: 510/231-9565.

University of Michigan:

Coined the term IVHS in 1988. Sponsors an IVHS program which includes Education, Basic Research, Applied Research and Program Planning/Development and emphasizes ATIS, ATMS, CVO, and AVCS. Current research includes a four part project on Diversion Advice and Recommendation (Anticipatory Route Guidance, System Architecture, Human Factors and Safety Issues, and Wide-Area Sensors); driver response experiments with MDOT, the impact of in-vehicle displays on driver performance; future market timing and potential; public/private sector cooperation, and increasing public awareness. Operates the Transportation Research Institute (UMTRI). **Info:** Steven Underwood, 313/963-2999, fax: 313/763-1674, and Robert Ervin, 313/936-1066.

University of Minnesota:

Invented and patented Autoscope™. Conducting research on various ATMS and ATIS computer components such as estimation of real-time origin/destination data, traffic flow simulation, incident detection and management, and other traffic control strategies; driver reaction to in-vehicle

devices; and an effort to link the ATIS and ATMS functions to a common real-time database. Participating in Guidestar. **Info:** Richard Braun, Director, Center for Transportation Studies, 612/626-1077, fax: 612/625-6381.

Virginia Polytechnic Institute and State University:

Operates the Center for Transportation Research (CTR). Current research centers around the Smart Road test-bed, a fully instrumented intelligent highway. Technologies for development on the test-bed include fiber optic sensing, interactive satellite/sensors, in-vehicle audio and video safety advisory, all-weather/night vision, and automated navigation. On-going and completed research areas include rural ATIS, truck safety, AVL and GPS for mass transit, adaptive cruise control, incident detection strategies, real-time diversion techniques for urban areas, human factors, evaluation of communications technologies and the development of a driver status/performance monitor. **Info:** Antoine Hobeika, Director, 703/232-7740, fax: 703/231-5214, or Mary Laurent, Information Officer, 703/231-9918, fax: 703/231-5214.

CANADIAN PROGRAMS

Canadian IVHS activities are carried out by both public and private organizations. The IVHS Roundtable of the Transportation Association of Canada acts as a monitor for these activities. Canada is also a participant in several North American operational field tests, including the Heavy Vehicle Electronic License Plate (HELP) Program, Advantage I-75, and the Wide Area Vehicle Monitoring (WAVM) Project. Current Canadian programs include:

- AVION (Vehicle Monitoring Automation)
- COMPASS
- IVHS Roundtable
- MTIPS (Municipal Traffic Information Production System)
- TravelGuide

Additional projects are listed in the glossary section.

AVION

AVION is an Ontario CVO project that is being implemented in connection with the Advantage I-75 program and the border crossings project at the Ontario/Michigan border. The project will use IVHS technologies such as automatic vehicle identification, smart card transponder, weigh-in-motion, and electronic document processing to monitor and verify truck movements and compliance with regulations on Highway 401 between Detroit and Montreal.

COMPASS

COMPASS is a real-time freeway traffic management system in Toronto focused on incident detection and response. CCTV and in-pavement sensors monitor traffic and relay the information to a central facility. This facility notifies the appropriate personnel of incidents and transmits information about traffic conditions to changeable message signs (CMS). This program is sponsored by the Ministry of Transportation Ontario (MTO), and has been operational along the Queen Elizabeth Way for several years. The next major installations will be in Toronto and Ottawa.

IVHS Roundtable

IVHS Roundtable is an ad hoc organization for the coordination of IVHS development in Canada which seeks to broaden IVHS interests throughout Canada and encourage active Canadian involvement through strategic planning and partnership. IVHS Roundtable provides a forum for new developments rather than acting as a funding organization. Members include the Transportation Association of Canada (TAC), representatives from the federal, Ontario, and Quebec governments, the National Research Council, and the Canadian Urban Transit Association. IVHS Roundtable publishes the IVHS Roundtable bulletin. It was reorganized as a TAC standing committee in May 1992, and has recently opened its membership to industry.

MTIPS (Municipal Traffic Information Production System)

MTIPS is a real-time traffic information system which is planned to cover the entire metropolitan Toronto area. Participants include the Ministry of Transportation Ontario (MTO), the Metropolitan Toronto Traffic Control Center, and the Toronto Transit Commission. MTIPS's first stage was a demonstration project tested in 1992. The goal of this project was to show MTIPS's ability to collect real-time travel information and process it into a transmittable data stream for a four square mile area of metropolitan Toronto. Information from the city's Automatic Vehicle Location and Control (AVLC) system, which tracks city buses; Toronto Traffic Commission (TTC); Communication Information System (CIS); COMPASS; and a network of microwave sensors, loop detectors, video monitors and computerized traffic signals, was collected and processed at a central location. Historical traffic patterns, real-time incidents such as accidents and static incidents such as construction were also included. The resultant information will be used for both traffic management and route planning in applications such as TravelGuide. A fully operational data fusion system is planned within five years, to be operated by private/public partnerships. A suburban demonstration project is also planned.

TravelGuide

TravelGuide is a palm-top portable traveler information and static route guidance system that will allow travelers to receive traffic, modal choice, and other travel information in their homes or automobiles. The system will include:

- Map database
- Ancillary software for route guidance, transit schedules, yellow pages, and other types of information
- RF receiver for link travel time and other real-time information
- Voice synthesis for step-by-step route planning and guidance

TravelGuide will be integrated with ATMS systems (which include SCOOT) to increase traffic flow and travel efficiency. MTIPS will provide the dynamic traffic information necessary for route planning, which will be integrated with a traffic model to provide travel time predictions. Voice messages will help travelers select optimal routes. TravelGuide has a demonstration project planned to be tested within the next two years, with a complete system operational within the next five years.

EUROPEAN PROGRAMS

In Europe, government and industry work together to fund research and development of IVHS services (IVHS is called Road Transport Informatics (RTI) or Transport Telematics Applications (TTA) in Europe). European IVHS standards activities are being addressed by Technical Committee 278 of CEN, the European Standards Organization. Current European IVHS programs include:

- EUREKA
- PROMETHEUS
- DRIVE and Drive II

EUREKA

EUREKA is a 19-country program designed to stimulate cooperative research and development between industries and governments in Europe. A major goal of the program is to improve European industrial competitiveness. Project participants must provide their own funds, find financial partners, or seek financing from private sources or their own governments. All projects must include firms from at least two countries. EUREKA efforts include ATIS, CARMINAT, DEMETER, ERTIS, EUROPOLIS, GENEGIS, PROMETHEUS, ROADACOM, and TELEATLAS. (Many of these projects are described briefly in the glossary.)

PROMETHEUS

PROMETHEUS (Programme for European Traffic with Highest Efficiency and Unprecedented Safety) is a primarily private sector initiative aimed at developing a uniform European traffic system incorporating IVHS technology with a vehicular focus. The system is designed to be a European-wide traffic management and control system using three major levels of information transfer or communication:

- Active Driver Support (Intelligent driver aids onboard the vehicle)
- Cooperative Driving (Communication networks between vehicles)
- Traffic and Fleet Management (Communication and information systems that link vehicles and

roadside facilities which provide information and monitor traffic)

PROMETHEUS is an 8 year project of EUREKA. PROMETHEUS funds development work to the point of commercial viability. Firms are then free to design new products in competition with each other. General objectives are to:

- Improve traffic safety
- Enhance vehicle operating efficiency
- Reduce the adverse environmental effects of automobile travel
- Reduce European traffic fatalities by 50% by the year 2000.

A central PROMETHEUS concept is that of the "intelligent co-pilot," an integrated set of vehicular systems linked by communication networks to the infrastructure and other vehicles to aid and enhance the capability of the driver for safer and more efficient road traffic. Research and development is divided into seven subprograms:

- Pro-Car, devoted to enhancing or supplementing the senses of the driver
- Pro-Net, inter-vehicle communications
- Pro-Road, communication between vehicle and roadside infrastructure
- Pro-Chip, development of microelectronics for information and control systems
- Pro-Art, clarifying the requirements for artificial intelligence
- Pro-Com, defining the structures, standards, and architecture of communications systems
- Pro-Gen, analyzing traffic scenarios

The results of this research will be used in Common European Demonstrators (CEDs) that include vision enhancement, proper vehicle operation, collision avoidance, autonomous and infrastructure-supported route guidance, public information services, and commercial fleet management.

DRIVE and Drive II

DRIVE is a European Community (EC) program of collaborative research and development. Its objective is to find ways to alleviate road transportation problems through the application of advanced information and telecommunications technology with a focus on infrastructure. Stated goals are to:

- Improve road safety
- Promote transport efficiency
- Reduce environmental pollution.

Current focus is on the transmission of information between vehicles and the road, and the development of standardized technology for the EC. Participants include representatives from the public sector, motor vehicle and supplier industries, and highway users.

A workplan was drawn up by the EC's Research and Development Framework Program in 1988, and DRIVE began awarding contracts for 60 projects in January 1989. It had a total committed funding level of approximately \$140 million over three years, divided evenly between the public and private sectors. It supported pre-competitive research and development to determine how best to exploit emerging information technologies that affect road transport. Research projects involve the participation of at least two independent partners not from the same country, and at least one must be an industrial concern.

DRIVE has coordinated 72 projects, including CAR-GOES, CIDER, CORRIDORS, DACAR, DG XIII, DNT, EDRM, FLEET, IMAURO, IMPACT, IRTE, PAMELA, PANDORA, RIMES, SECFO, SIRIUS, SMART, SOCRATES, TARDIS, and VIC. (Many of these projects are described briefly in the glossary.) DRIVE ended in 1991.

A second phase, Drive II, is focusing on field trials involving local and regional transportation agencies throughout Europe and began in January 1992. The program is divided into seven Areas of Operations Interest:

- Demand Management
- Travel and Traffic Information
- Integrated Urban Traffic Management
- Integrated Inter-Urban Traffic Management
- Driver Assistance and Cooperative Driving
- Freight and Fleet Management
- Public Transport

Each of the 56 Drive II projects is associated with one or more of these areas. A major part of the program is

POLIS, which originated in a separate political initiative. Some 20 POLIS cities are grouped together in five major projects: GAUDI, QUARTET, SCOPE, LLAMD, and CITIES. There are also several cross-cutting projects, such as CORD. Drive II projects also include ATT, ASTRA, ATT-ALERT, EDRM, ET-NET, GEMINI, INVAID, IRTE, INTERCHANGE, PLEIADES, PRIMAVERA, PROMISE, PROMPT, RDS ALERT, and VIGIL. (Many of these projects are described briefly in the glossary.)

JAPANESE PROGRAMS

The Japanese IVHS program is quite extensive and involves close cooperation between industry and government. An ATMS/ATIS infrastructure has been installed in much of the country, and automakers have been offering navigation systems since 1987. Several government agencies have played a key role in the development and testing of IVHS systems, including the Ministry of Construction, the Ministry of Posts and Telecommunications, the Ministry of International Trade and Industry (MITI), the Ministry of Transport, and the National Police Agency (NPA). Japanese IVHS programs include:

- Japan Digital Road Map Association (JDRMA)
- Comprehensive Automobile Control System (CACS)
- Advanced Mobile Traffic Information and Communication Systems (AMTICS)
- Road-Automotive Communication System (RACS)
- Vehicle Information Communication System (VICS)
- Advanced Road Traffic System (ARTS)
- Urban Traffic Control System (UTCS)
- Super Smart Vehicle System (SSVS)
- Personal Vehicle System (PVS)
- Advanced Traffic Information Service (ATIS)

Japan Digital Road Map Association (JDRMA)

JDRMA operates under the auspices of the Ministry of Construction and is made up of automotive makers, mapping and surveying companies, and electronics and communications firms. Its role is to standardize map formats and aid in digitizing major roads and highways. JDRMA has published the National Digital Road Data Base Standard. Attributes specify administrative category, access type, physical class, traffic volume classification, and traffic regulations for each road, as well as certain major landmarks. Files are provided to JDRMA members on magnetic tape for adaptation or enhancement for their own applications and will be used to support the VICS program (qv).

Comprehensive Automobile Control System (CACS)

CACS was a 6 year, \$52 million project guided by the Ministry of International Trade and Industry (MITI). The project established that vehicle-road information systems with dynamic route guidance yielded significant benefits. CACS was completed in the 1970s and led to RACS and AMTICS (qv).

Advanced Mobile Traffic Information and Communications Systems (AMTICS)

AMTICS is a Japanese traffic control system that transmits traffic congestion information from a traffic control center to in-vehicle video display terminals via a cellular-like teleterminal network. In-vehicle navigation and dynamic route guidance are AMTICS's main functions, with map-matching and beacons used for positioning. The system uses an in-vehicle CD-ROM database to display road maps and local traffic regulations. It is sponsored by the National Police Agency (NPA), the Ministry of Posts and Telecommunications, the Japan Traffic Management and Technology Association and 59 private companies.

AMTICS was originally managed by the National Police Agency, but is now combined with RACS as VICS under the direction of the Ministry of Posts and Telecommunications.

Road-Automotive Communication System (RACS)

RACS is an experimental ATMS effort consisting of roadside communication beacons, in-vehicle units, and a systems center. RACS formerly collected and disseminated information between roadside beacons and vehicles, but is now restricted to one-way communications. The RACS navigational component uses dead reckoning along with vehicle location and radio communication services such as fax and traffic data. The program was originally managed by the Ministry of Construction (MOC), which also managed NeGHTS, a spinoff communications program. RACS is now combined with AMTICS as VICS under the Ministry of Posts and Telecommunications.

Vehicle Information Communication System (VICS)

VICS is a combination of RACS and AMTICS overseen by the Ministry of Posts and Telecommunications. The program involves ATIS technology for providing real-time congestion information and combining it with route guidance systems to help drivers avoid congestion and thus aid in reducing accident rates. VICS' objective is to arrive at a common architecture and associated protocols and operational practices for infrastructure to support in-vehicle systems. **Info:** Hiroshi Inose, +81-3-3592-5492, fax: +81-3-3592-5494.

Advanced Road Traffic System (ARTS)

ARTS is an infrastructure-oriented ATIS program aimed at increasing the effectiveness of vehicle-to-roadside communications with a special emphasis on relieving poor visibility conditions. The program builds on technology developed in RACS, and is sponsored by the Ministry of Construction. Prospective elements include:

- Automatic Toll Collection
- Road Surface Detection Systems
- Road Alignment Information Systems
- Surrounding Object Detection Systems - meant to decrease single car accidents during poor visibility
- Vehicle Headway Control Systems - involves vehicle-to-vehicle communication via buried roadside cable and automatic control of vehicle operations
- Traffic FlowGuide/Control System - allows drivers to select optimal routes and reduces congestion

Experiments are currently underway on guide lighting systems for surrounding object detection, buried roadside cable (LCX), and vehicle headway control systems.

Urban Traffic Control System (UTCS)

UTCS was developed by the National Police Agency (NPA) to improve the function and performance of traffic control systems. There are four functional areas:

- Integrated Traffic Control System (ITCS) - Includes traffic signal control, improved transmission of information to drivers, automatic toll collection.
- Advanced Mobile Information System (AMIS) - Includes two-way communication between vehicle and roadside, route guidance

- Mobile Operation Control System (MOCS) - Includes automated vehicle tracking and vehicle dispatch
- Public Transportation Priority System (PTPS) - Includes traffic signal control for priority of public vehicles, and in-vehicle transportation information.

Current plans are to install UTCS in several key areas first and then expand it to cover the entire country.

Super Smart Vehicle System (SSVS)

SSVS, coordinated by the Ministry of International Trade and Industry (MITI), is a research program focused on advanced vehicle control systems for dealing with traffic problems 20-30 years in the future. Work is currently underway on machine vision for vehicles, vehicle-to-vehicle communications, accident recognition and avoidance, and other direct aids for vehicle operation. System candidates to be explored include:

- Cooperative Driving Systems - involves vehicle-to-vehicle communication
- Control-Configured Vehicle System with Ultra-Little Vehicles
- Active Driver Assistance Systems
- Detection of Road Surface Conditions
- Automatic Park and Ride
- Intelligent Intersection Systems
- Bird's-Eye View Systems - transmit aerial views of intersections to the driver

Personal Vehicle System (PVS)

PVS was an AVCS project which was carried out by Nissan from 1988-1990 and supervised by the Ministry of International Trade and Industry (MITI). A van was equipped for autonomous steering and braking based on stereo imaging, laser range-finding, and ultrasonic sensing. A "fuzzy logic" controller was used to simulate a human driver who could learn and thus gradually improve. Speeds of up to 37 mph were eventually achieved, but rain-covered and shadowed surfaces, as well as night-time conditions, caused serious problems in the imaging system.

Advanced Traffic Information Service (ATIS)

ATIS is a real-time traveler information system operated by the ATIS Corporation, which includes the Tokyo

Metropolitan Government in partnership with private companies. The program is scheduled to start in July 1993. Graphic traffic information will be provided for the Tokyo metropolitan area experimentally for two years, and then commercially. Both current (e.g. congestion and accidents) and statistical (e.g., recent traffic tendencies and traffic status forecasts) information will be disseminated via telephone lines, co-axial cable, and the mobile telephone network. Subscribers will be able to access the service from home, office, vehicle, and various public places such as gas stations and restaurants. A similar project is being planned in Osaka.

PART TWO: GLOSSARY

GLOSSARY

AAMA:

See American Automobile Manufacturers Association.

AAR:

Association of American Railroads. **Info:** 202/639-2217.

AASHTO:

(American Association of State Highway and Transportation Officials). See U.S. Organizations article. **Info:** Frank B. Francois, Executive Director, 202/624-5800, fax: 202/624-5806. See also: SHRP.

ACS:

See Automatic Clearance Sensing.

ACTS:

Guidestar (qv) project. Centralized integration of traffic control of freeways and urban streets to allow multiple highway jurisdictions to coordinate ramp meters and street signals. Will provide traffic responsive signal control to accommodate traffic surges during peak periods.

ADIS:

(Advanced Driver Information Systems). Previous name for Advanced Traveler Information Systems (qv).

ADVANCE:

(Advanced Driver and Vehicle Advisory Navigation Concept). See U.S. Operational Field Tests article. **Info:** Joseph Ligas, ADVANCE Project Office, 708/705-4800, fax: 708/705-4803.

Advanced Fleet Management System (AFMS):

Canadian term for CVO. Includes AVL, AVI and WIM.

Advanced Public Transportation Systems (APTS):

1. Technology aimed at improving public transportation. See IVHS article. See also: CAPTS, FTA, Mobility Manager, MTO, PRIMAVERA, Smart Traveler, Smart Vehicle, Translink, TRIPS.
2. Committee of IVHS AMERICA. **Info:** Michael Bolton, Chairman, 313/973-6500, fax: 313/973-6338.
3. FTA program to focus R&D and funding efforts on IVHS technologies composed of four main

areas: vehicle operations and communication, high occupancy vehicles, customer interface, and market development. Presently sponsoring Mobility Manager, Smart Vehicle and Smart Traveler programs.

Advanced Rural Transportation Systems (ARTS):

1. Technology aimed at improving rural transportation. See IVHS article. See also: TravelAid.
2. An IVHS AMERICA committee. **Info:** Don Kelly, Chairman, Kentucky Transportation Cabinet, 502/564-4786, fax: 502/564-5238.

Advanced Systems Integration and Implementation:

(ASII). Caltrans department researching new systems concepts and architecture, CVO, and institutional and implementation issues. **Info:** Wesley Lum, 916/445-1668.

Advanced Traffic Management Systems (ATMS):

1. An array of institutional, human, hardware, and software components designed to monitor, control, and manage traffic on streets and highways. See IVHS article. See also: ADVANCE, ALI, ALI-SCOUT, AMTICS, ATMIS, ATSAC, CAPTS, CARAT, COMPASS, FAME, Fast-Trac, Guidestar, INFORM, MAGIC, PEGASUS, PIARC, RACS, RIMES, SCOPE, SIRIUS, TRANSCOM, TravelGuide, UTCS, VICS.

2. An IVHS AMERICA committee. **Info:** Eugene Ofstead, Chairman, 612/296-1344, fax: 612/296-6135.

Advanced Transport Telematics (ATT):

Official name of the Drive II program (qv).

Advanced Transportation Management & Information Systems:

(ATMIS). Caltrans department involved in ATIS and ATMS. **Info:** Patrick Conroy, 916/445-4179, fax: 916/323-8977.

Advanced Traveler Information Systems (ATIS):

1. Technologies which assist travelers with planning, perception, analysis, and decision-making. See also: ADVANCE, AHAR, ARTS (Japan), ATMS, ARTS, CAPTS, CARAT, DATIS, ET-NET, Fast-Trac, Gemini, Genesis, Guidestar, HAR, IMSIS, INFORM, IRANS, IVSAWS, LPHAR, OTIS,

Pathfinder, PIARC, PROMISE, QUARTET, SAGACE, SCANDI, Smart Commuter, Smart Traveler, SOCRATES, SSVS, TeleMap, TrafficMaster, TRANSCOM, TravelAid, TravelGuide, TravLink, TravelMatch Express, Travtek, TRIPS, UTCS, VICS. See IVHS article.

2. An IVHS AMERICA committee. **Info:** James Rillings, Chairman, 313/986-2990, fax: 313/986-3003.

3. An \$8.5 million, five year project to provide pre-trip information on traffic conditions. Part of EUREKA. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906.

4. A Japanese traffic information service. See Japanese Programs article. **Info:** Hiroyuki Okamoto, Japan Traffic Management Association, +81-3-3260-3621, fax: +81-3-3260-3696.

Advanced Vehicle Control Systems (AVCS):

1. Vehicle and/or roadway-based electromechanical, electronic, and communications devices that enhance the control of vehicles by facilitating and augmenting driver performance. Will ultimately relieve the driver of most tasks on designated, instrumented roadways. See IVHS article. See also: AHS, AVASD, CAPTS, PIARC, Roadstar I, SSVS, VIC, VORAD.

2. An IVHS AMERICA committee. **Info:** Steven E. Shladover, Chairman, 510/231-9537, fax: 510/231-9565.

Advanced Vehicle & Automated Systems Development:

(AVASD). Caltrans division involved in AVCS, Advanced Vehicle Development (AVD), and Automated Systems Development (ASD). Also working on Advanced Highway Maintenance Technology (AHMT) (qv). **Info:** Roy Bushey, Caltrans, 916/227-7130.

Advanced Vehicle and Highway Technologies:

(AVHT). Former task force of the Transportation Research Board. Now the IVHS Committee (A5009). **Info:** Daniel Brand, Chairman, 617/266-0500, fax: 617/266-0698.

ADVANTAGE I-75:

IVHS operational field test operating along Interstate 75. See U.S. Operational Field Tests article. **Info:** Don Hartman, University of Kentucky, 606/257-4521, fax: 606/257-1815. See also: HELP and Crescent.

AFMS:

See Advanced Fleet Management Systems.

AHAR:

See Automatic Highway Advisory Radio.

AHMT:

(Advanced Highway Maintenance Technology). Caltrans/UC Davis program to increase safety reliability and efficiency in highway maintenance. **Info:** Roy Bushey, Caltrans, 916/227-7130.

AHS:

See Automated Highway System.

ALI:

(Autofahrer Leit- und Informationssystem). The first successful integration of advanced traffic management systems (ATMS) and individual guidance systems. Proposed in 1970 by W. Kumm (RWTH Aachen) and tested by Blaupunkt-Werke GmbH. Testing was sponsored by the West German government. See also: ALI-SCOUT.

ALI-SCOUT:

A route-guidance system that uses infrared beacons to transfer navigation information from the roadside to on-board displays in appropriately equipped vehicles. Developed in Germany by Bosch/Blaupunkt and Siemens. Earlier versions (ALI, qv) were tested along a 60 mile stretch of the German autobahn. A more advanced system has been tested in Munich and West Berlin as part of the LISB project. Known as EURO-SCOUT in its European commercial applications. Second generation ALI-SCOUT includes traffic management, electronic toll collection (ETC), and driver information. To be implemented in German cities in 1993. See also: LISB.

American Association of State Highway and Transportation Officials:

(AASHTO). See U.S. Organizations article. See also: SHRP. **Info:** Frank B. Francois, Executive Director, 202/624-5800, 202/624-5806.

American Automobile Manufacturers Association:

(AAMA). Formerly the Motor Vehicle Manufacturers Association (MVMA). **Info:** Ronald Wasko, Manager, IVHS, 313/872-4311, fax: 313/872-5400.

American National Standards Institute:

(ANSI). Umbrella organization for U.S.-based consensus standards setting. U.S. representative on the International Standards Organization. **Info:** 212/642-4900.

American Society of Civil Engineers:

(ASCE). See U.S. Organizations article. **Info:** John Griffin, 212/705-7495, or 800/548-2723.

American Society for Testing and Materials:

(ASTM). See U.S. Organizations article. **Info:** Daniel Smith, E-17 Staff Manager, 215/299-5400, fax: 215/977-9679.

American Trucking Associations Foundation:

(ATA Foundation). See U.S. Organizations article. **Info:** Douglas Anderson, Technical Director of Management Information Systems, 703/838-1721, fax: 703/836-6070.

AMTICS:

(Advanced Mobile Traffic Information and Communication Systems). A Japanese traffic control system. See Japanese Programs article.

ANSI:

See American National Standards Institute.

APTS:

See Advanced Public Transportation Systems.

ARI:

(Autofahrer Rundfunk Information). A German traffic information broadcasting system whose transmissions are received through car radios after drivers are alerted to turn the radio to a specific frequency. Analogous to American AHAR system. See also: ARIAM.

ARIAM:

Advanced version of ARI (qv).

ARTS:

1. (Advanced Rural Transportation Systems). See IVHS article. See also: TravelAid.
2. (Advanced Road Traffic Systems). Japanese ATIS program. See Japanese Programs article.

ASCE:

See American Society of Civil Engineers.

ASII:

See Advanced Systems Integration and Implementation.

ASTM:

See American Society for Testing and Materials.

ASTRA:

(Integrated System of Assistance Services for Travel and Traffic). Drive II project taking place in Denmark. Objective is to investigate the feasibility of an interactive integrated system of assistance service for travel and traffic. **Info:** S. Krug, +49-241-502-056, fax: +49-241-531-622.

ATA Foundation:

See American Trucking Associations Foundation.

ATC:

See Automatic Toll Collection.

ATIS:

See Advanced Traveler Information Systems.

ATLAS:

Early Renault advanced vehicle electronics project.

ATMIS:

See Advanced Transportation Management and Information Systems.

ATMS:

See Advanced Traffic Management Systems.

ATSAC:

(Automated Traffic Surveillance And Control). A Los Angeles DOT traffic management (ATMS) project. Involves Closed Circuit TV (CCTV), variable intersection control, and real-time surveillance and evaluation. First phase installed in 1984. **Info:** Anson Nordby, ATSAC, 213/485-4271, fax: 213/237-0960.

ATT:

See Advanced Transport Telematics.

ATT-ALERT:

(Advanced Transport Telematics - Advice and Problem Location for European Road Traffic). Drive II project. Builds on DRIVE I's RDS ALERT to continue the standardization and enhancement of the current RDS-TMC protocol, as well as developing a suite of compatible protocols for other bearers such as digital audio broadcasting and radiopaging. **Info:** Peter Davies, +44-602-430-830, fax: +44-602-430-823.

Autoguide:

A planned, but largely unimplemented British route guidance system that uses infrared transceivers to

transmit information between roadside beacons and on-board displays in appropriately equipped vehicles.

Automated Highway System (AHS):

1. Operation of fully automated vehicles on specially instrumented freeway lanes, separated from manually controlled vehicles.
2. Project to demonstrate this technology on a test track by 1997, as mandated by the Intermodal Surface Transportation Efficiency Act (ISTEA, qv).

Automatic Clearance Sensing:

(ACS). Used in CVO to help large vehicles negotiate low/limited-clearance objects such as bridges and viaducts.

Automatic Highway Advisory Radio:

(AHAR). U.S. traffic information broadcasting system whose transmissions are received through car radios which automatically interrupt other radio reception and tune to the correct station. Analogous to European ARI system. See also: ARI, HAR, LPHAR, DIRECT.

Automatic Toll Collection:

(ATC). Alternate name for Electronic Toll Collection (ETC). See ETTM article.

Automatic Vehicle Classification:

(AVC). Used in CVO to identify vehicles by type in order to reduce the necessity for record-keeping by drivers and speed interstate travel.

Automatic Vehicle Identification:

(AVI). A system which combines an on-board tag or transponder with roadside receiver for the automated identification of vehicles. Used for electronic toll collection (ETC), stolen vehicle recovery, etc. See ETTM article. See also: Advantage I-75, HELP, PAYD, Q-FREE, RFID, TRANSCOM, VRC, WAVM, WIM.

Automatic Vehicle Location System:

(AVLS). Computerized system which tracks the current location of fleet vehicles, to assist dispatching, etc. See also: AVL-2000, DART, Smart Vehicle, Teletrac, TravLink, UTCs, WAVM.

Automatic Vehicle Location and Control System:

(AVLCS). Enhanced form of AVLS used to track vehicle location and to automatically report schedule deviations to a central dispatcher. Can also be used to

calculate link travel times for an ATIS. See also: MTIPS in Canadian IVHS Programs article.

Autoscope™:

A product patented by the University of Minnesota which uses a video camera and computer software to analyze roadway images and extract traffic flow information. Now being tested on Interstate 394 under a \$1.4 million grant from the FHWA and Minnesota Department of Transportation. Expected to become the centerpiece of a traffic communication network for monitoring 300 miles of freeways and major arterials in the Minneapolis/St. Paul area by 1995. See also: Fast-Trac, Guidestar.

AUTOSTRADE:

Italian administrator of highways.

AUTOSTRADE Highway and Telematic Network:

Italian national highway surveillance network. Constructed by Marconi and ABL, Inc. Its main objectives are improving internal communications of the AUTOSTRADE (qv) organization and providing better service and security to drivers.

AVASD:

See Advanced Vehicle & Automated Systems Development.

AVC:

See Automatic Vehicle Classification.

AVCS:

See Advanced Vehicle Control Systems.

AVHT:

See Advanced Vehicle and Highway Technologies.

AVI:

See Automatic Vehicle Identification.

AVION:

Canadian CVO project. See Canadian IVHS Programs article. **Info:** Arjan Chandan, Transport Canada, 613/991-6035, fax: 613/991-6045.

AVL-2000:

University of Calgary research effort. Uses digital maps in in-vehicle, real-time automatic vehicle location systems (AVLS). Includes work on automatic fleet and vehicle monitoring, travel support systems, and navigation systems. **Info:** Arjan

Chandan, Transport Canada, 613/991-6035, fax: 613/991-6045.

AVLS:

See Automatic Vehicle Location System.

AVLCS:

See Automatic Vehicle Location and Control System.

BART:

1. (Bay Area Rapid Transit). See also: Translink.
2. (Binocular Autonomous Research Team). See Texas A&M University in University Programs article.

Beacons:

Short-range roadside transceivers for communicating between vehicles and the traffic management infrastructure. Common transmission technologies include microwave and infrared.

Boston SmartTraveler:

Project will test public acceptance and potential traffic impacts of a telephone-based audiotext information service, assess the information obtained from various data collection methods, and gauge the market for privatization of the information service. Participants include FHWA, Massachusetts Highway Department, SmartRoute Systems, and the American Trucking Association. See also: Smart Traveler in U.S. Operational Field Tests article. **Info:** Jonathan McDade, FHWA, 518/472-4253.

Broadcast Subcarrier:

An additional FM, AM, or TV signal (or two) included in regular commercial broadcasts for transmission of data or background music. May be used for IVHS applications such as driver information. Currently the subject of experiments by the FHWA aimed at developing a high-speed, low-cost broadcast data link for distributing traffic data to vehicles. Formerly called SCA. **Info:** Frank Mammano, FHWA, 703/285-2405.

CACS:

(Comprehensive Automobile Control System). See Japanese Programs article.

CAD:

1. Computer-Aided Dispatching. See also: DART, CVO.
2. Computer-Aided Design.

California Advanced Public Transportation Systems:

(CAPTS). Encompasses ATIS, ATMS, AVCS and Fleet Management and Control Systems for the improvement of transit, paratransit, and ride-sharing. Funded by FTA and Caltrans. Currently being tested under the Bellevue Smart Traveler program. See U.S. Operational Field Tests article. **Info:** Robert Ratcliff, Research Manager, 916/323-2644, 916/323-8977, or Ron Boenau, FTA Headquarters, TTS-32, 202/366-0195.

California Polytechnic State University:

Involved in INRAD. **Info:** Shirlee Cribb, Cal Poly Transportation Research Group, 805/756-5062.

Caltrans:

California Department of Transportation. Has departments for Advanced Transportation Management and Information Systems (ATMIS), Advanced Vehicles and Automated Systems Development (AVASD), and Advanced Systems Integration and Implementation (ASII). See also: AHMT, CAPTS, INRAD, PATH, Pathfinder, TRIPS. **Info:** John West, 916/227-7003, fax: 916/227-7075.

Canadian Urban Transit Association:

(CUTA). Involved in the IVHS Roundtable (qv).

CAPTS:

See California Advanced Public Transportation Systems.

CAR-GOES:

DRIVE I project investigating links between dynamic route guidance and traffic control.

CARAT:

See Congestion Avoidance and Reduction for Automobiles and Trucks.

CARIN:

(Car Information and Navigation System). Autonomous route guidance system developed by Philips Electronics. Uses spoken directions and a visual pictogram display. Includes dead-reckoning and map matched dead reckoning. See also: SOCRATES.

CARMINAT:

(CARin MINerve ATlas). A four year research project to develop in-vehicle electronic navigation and communications systems. Combines Philip's CARIN automobile navigation project with the automobile information system concepts of Sagem's MINERVE project and Renault's ATLAS project. Goal is to facilitate an electronic car monitoring and navigation system by integrating information received via RDS (Radio Data System) with information stored on CD-ROM and data from various vehicle sensors. CARMINAT is part of EUREKA. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906. See also: CARIN, SAGACE.

CCATS:

(Camera and Computer Aided Traffic Sensor). Commercial video image analysis system launched in 1988 in Belgium by Devlonics Control NV. Also being used and evaluated in Spain, Italy, Luxembourg, UK, Germany, France and the U.S. **Info:** Jo Versanel, +32-56-235311, fax: +32-56-202183.

CCIR:

(International Radio Consultive Committee). Part of the International Telecommunications Union, an agency of the United Nations. Sets standards for large scale allocations of radio channels. See also: WARC.

CCTV:

(Closed Circuit TV). See also: ATSAC, COMPASS, IMPACTS, MAGIC.

CD-CRAFT:

(CD and CRT Applied Format). Software standard for in-vehicle information and application programs stored on CD-ROM. Developed by Toyota, Nissan, Nippondenso and Sumitomo Electric.

CEI

(Commission Electrotechnique Internationale). International Electrotechnical Commission (qv).

CEN:

(Comité Européen de Normalisation). Committee for European Standards, an arm of the EC. Goal is to eliminate differences in European national standards to eliminate technical barriers to trade. Includes a technical committee (TC 278) devoted to IVHS/RTI issues. **Info:** +32-2-519-6811, fax: +32-2-519-6819.

CENELEC:

(Comité Européen de Normalisation Electrotechnique). Committee for European Electrotechnical Standards. European standards body for electrical systems and telecommunications. **Info:** +32-2-519-6871, fax: +32-2-519-6919.

CERCO:

Consortium of European cartographic organizations.

Changeable Message Sign:

(CMS). Sign which is restricted to a set library of messages. Used in ATIS and ATMS. See also: COMPASS, GEMINI, INFORM, MAGIC, SCANDI, SMART Corridor, TravelAid, VMS.

CIDER:

(Communication Infrastructure for Drive on European Roads). A DRIVE program with the objective of recommending the optimum communication infrastructure. Concluded that DRIVE should not have a dedicated communication infrastructure, but instead employ a mixture of public and private networks. Created the Drive Normalized Transmission (DNT) protocol. **Info:** N.D.C. Wall, British Telecom Research Labs, +44-473-644524, fax: +44-473-637573.

CITIES:

(Cooperation for Integrated Traffic Management and Information Exchange Systems). One of five POLIS/Drive II projects. Involves Paris, Brussels, and Gothenberg (Sweden). Focused on traffic and travel information, data exchange, and route guidance. **Info:** F. Vanderborght, +32-2-219-7280 ext. 417, fax: +32-2-223-0937.

CMS:

1. See Changeable Message Sign.
2. See Congestion Management System.

Commercial Vehicle Operations (CVO):

1. The application of IVHS technology to commercial vehicles. See IVHS article. See also: Advantage I-75, ASII, ACS, AVC, AVLS, Crescent, DART, EUROPOLIS, FLEET, Guidestar, HELP, MTO, ROADACOM, RoadKIT, VRC.
2. An IVHS AMERICA committee. **Info:** C. Michael Walton, Chairman, 512/471-1414, fax: 512/471-0592.

COMPASS:

Canadian ATMS system focused on incident detection and management. See Canadian IVHS Programs article. **Info:** Ministry of Transportation Ontario, 416/235-4371 or 800/268-0637.

Congestion Avoidance and Reduction for Automobiles and Trucks:

(CARAT). ATIS/ATMS system to be implemented in Charlotte, NC. Will include a subscription-based advanced traveler information system (ATIS) that will provide incident location and response as well as consumer information to its users, and an advanced traffic management center (ATMS). Will rely on visual monitoring and in-pavement sensors to detect incidents and congestion. Information will be broadcast by radio to system users. Currently in the design phase. **Info:** Ed Hauser, NC DOT, 919/733-7384.

Congestion Management System:

(CMS). ISTEA requires the development of these systems by state and local agencies. FHWA is planning a project to develop prototype CMS to facilitate this process. **Info:** Wayne Berman, FHWA, 202/366-4069.

CORD:

(Coordination of Research and Development). Coordinates issues among the various Drive II projects. Run by ERTICO as part of Drive II. Successor to SECFO. **Info:** Frederico Filipi, +32-2-538-0262, fax: +32-2-538-0273.

CORRIDORS:

(Cooperation on Regional Road Informatics Demonstrations on Real Sites). DRIVE program which assists inter-urban consortia in dealing with inter-urban initiatives. Acts as a complement to POLIS (qv).

Corridors:

Roadways identified as highly congested and therefore a focus of federal research and funding. See also: Corridors Program, DATIS, INFORM, ISTEA, Smart Corridor, Smart Commuter, TRANSCOM, TravelAid.

Corridors Program:

Research and development project provided for under the Intermodal Surface Transportation Efficiency Act (ISTEA, qv) of 1991 to address the relief of particularly congested highway systems.

Crescent:

Program testing heavy commercial vehicles equipped with transponders in an integrated systems environment. See U.S. Operational Field Tests article. **Info:** Janet W. Brooks, WHM Transportation Engineering Consultants, 512/473-8343, fax: 512/473-8237.

CUTA:

See Canadian Urban Transit Association.

CVO:

See Commercial Vehicle Operations.

DAB:

See Direct Audio Broadcasting.

DACAR:

(Data Acquisition and Communication techniques and their Assessment for Road transport). A project of DRIVE. A pan-European consortium of 11 companies from five countries aimed at research and development in the field of advanced data communication and acquisition technologies for RTI.

Dallas Area Rapid Transit:

(DART). Involved in a \$17 million fleet management application which uses GPS (Global Positioning Satellites, qv), AVL (Automatic Vehicle Location, qv), and CAD (Computer-Aided Dispatching, qv). **Info:** Paul Ledwitz, 214/658-6663.

Dallas North Tollway:

(DNT). An ETTM system operated by the Texas Turnpike Authority on 18 miles of Dallas tollway. System has been in operation since 1989.

DAR:

Digital Audio Radio.

DART:

1. See Dallas Area Rapid Transit.
2. Diversion Advice Recommendation Technology. Term used to identify the common focus of ADVANCE, TravTek, and Fast-Trac on dynamic route guidance to assist in diversion after the detection of an incident.
3. INRETS (qv) project dealing with traffic regulation and video image processing.

DATIS:

(Dulles Area Travel Information System). Dulles International Airport Corridor project. Testing

techniques for collecting and disseminating traffic information, including highway accidents, transit service delays, and parking availability at selected sites. Information will be provided at home, office, and malls. Participants include FHWA, Virginia DOT, Dulles Area Transportation Association (DATA), Metro Traffic Control, and the Town of Herndon. **Info:** Stacy Marlbert, Public Affairs Office, 703/934-7350.

Dead Reckoning:

See Vehicle Positioning in Vehicle Navigation article.

DEMETER:

(Digital Electronic Mapping of European Territory). EUREKA project started by Bosch and Philips in 1986 to create a standard European digital road map at 1:10,000 scale. Resulted in the development of GDF, a proposed standard for the acquisition and representation of highly detailed digital map data required for navigation systems. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906.

DG XIII:

Directorate-General 13 of the European Commission. Covers Telecommunications, Information Industries, and Innovation. Managed DRIVE I and II.

Differential correction:

A technique for overcoming GPS selective availability. A GPS receiver is placed at a precisely identified control location. The difference between the indicated GPS position and the actual position is calculated. Correction information is then broadcast for other GPS systems to use in making position determinations. See also: GPS, Selective Availability, SPS.

Digital Line Graphs:

(DLG). Geographic computer plots produced by U.S. Geological Survey, available on CD-ROM. Includes data on political and administrative boundaries, water bodies, roads and trails, railroads, and points of interest. Drawn from 1:2,000,000 scale maps of the National Atlas of the U.S. Last updated in 1979.

DIME files:

(Dual Incidence Matrix Encoded files). Computer-based map files built by the U.S. Census Bureau to support the 1980 census. Based on 1978 material. See also: TIGER.

DIRECT:

See Driver Information Radio Experimenting with Communication Technology.

Direct Audio Broadcasting:

(DAB). Refers to several competing methods for transmitting digital audio. Similar to FM. Also used for transmission of high speed data. Testing and standards efforts are currently underway in the U.S.

DLG:

See Digital Line Graph.

DNT:

1. See Dallas North Tollway.
2. (Drive Normalized Transmission). A DRIVE communications protocol. Follows the Open Systems Interconnection (OSI) framework. Developed by CIDER (qv).

DRIVE:

(Dedicated Road Infrastructure for Vehicle Safety in Europe). A European Community program to find ways to alleviate road transportation problems through the application of advanced information and telecommunications technology. See European Programs article. See also: CAR-GOES, CIDER, CORRIDORS, DACAR, DG XIII, DNT, EDM, FLEET, IMAURO, IMPACT, IRTE, PAMELA, PANDORA, RIMES, SECFO, SIRIUS, SMART, SOCRATES, TARDIS, VIC. **Info:** DRIVE Central Office, +32-2-236-3449, fax: +32-2-236-2391.

Drive II:

Extensive European RTI research program, a continuation of DRIVE. Formal name is Advanced Transport Telematics. See European Programs article. See also: ATT, ASTRA, ATT-ALERT, CITIES, CORD, EDM, ET-NET, GAUDI, GEMINI, INVAID, IRTE, INTERCHANGE, LLAMD, POLIS, PLEIADES, PRIMAVERA, PROMISE, PROMPT, QUARTET, RDS ALERT, SCOPE, SECFO, VIGIL. **Info:** DRIVE Central Office, +32-2-236-3449, fax: +32-2-236-2391.

DriverGuide:

A route finding system produced by Navigation Technologies. Exists in PC, network, telephone (dial-in) and vending machine form. **Info:** John Stearns, President, Navigation Technologies, 408/737-3200, fax: 408/736-3734.

Driver Information Radio Experimenting with Communication Technology:

(DIRECT). U.S. operational field test sponsored by the FHWA, Michigan DOT, and several automobile and electronic component manufacturers. Will deploy four alternate low cost methods of communicating advisory information to motorists and evaluate impact on driver behavior, benefits and costs, and technical feasibility. Includes RDS, AHAR, LPHAR, HAR, and cellular telephone. Uses a Transportation Advisory Center (TAC) to process data and generate advisory messages. Will also evaluate traffic detectors and incident detection algorithms. **Info:** Robert Maki, Michigan DOT, 517/373-2326, fax: 517/373-2330 or Martin Monahan, FHWA, 708/206-3218, fax: 708/206-3207.

EDRM:

(European Digital Road Map Project). DRIVE project consortium which created the Geographic Data File (GDF) specification (qv). Includes Daimler Benz, Bosch Blaupunkt, Philips, Renault, SAGEM, TeleAtlas, and Intergraph. Continued in Drive II. **Info:** Hinrich Claussen, +49-5121-494-857, fax: +49-5121-492-538.

ELECTRANS:

(Electronic Highway Transportation Association of America). The name initially proposed for IVHS AMERICA.

Electro Multi Vision:

Toyota-Nippondenso information system. Displays vehicle and map information on an LCD screen. Uses GPS and CD-CRAFT technology.

Electronic Road Pricing (ERP):

Use of smart card technology or simple tags to charge motorists for road use based on demand, congestion, day and time, miles traveled, and other flexible criteria.

Electronic Toll and Traffic Management (ETTM):

1. See ETTM article. See also: AVI, DNT, ETC, EZ-Pass, GAUDI, IBTTA, Lincoln Tunnel Project, Mobility Manager, Oklahoma Turnpike System, PAMELA, PAYD, Pikepass, Q-Free, Smart Card, TRANSCOM, VRC.
2. Program to provide electronic toll collection equipment (ETC) to the New Jersey Toll Authorities. Developing a region-wide ETTM system compatible with a single tag. Participants include FHWA, NJ DOT, NJ Expressway Authority, NJ Turnpike

Authority. **Info:** Jonathan McDade, FHWA, 518/472-4253.

Electronic Toll Collection:

(ETC). See ETTM article. See also: ALI-SCOUT, ARTS (Japan), AVI, Crescent, ETTM, EZ-Pass, HELP, PAYD, Pikepass, Smart Card, Tolltag, TRANSCOM, VITA.

EMS:

1. Emergency Medical Service.
2. Emergency Management Systems.
3. Emergency Message Systems.

ENTERPRISE:

(Evaluating New Technologies for Roads Program Initiative in Safety and Efficiency). North American IVHS cooperative initiative to facilitate the rapid development and deployment of IVHS technologies. A consortium of public and private organizations with compatible IVHS goals which will identify and exploit opportunities for cooperative ventures. Participants include Arizona DOT, Arizona State University, Castle Rock Consultants, Colorado DOT, FHWA, Ford, Iowa DOT, Lockheed, Marconi Electronic Devices, Minnesota DOT, New York DOT, Nissan, Ministry of Transportation Ontario, and Transport Canada. **Info:** John Kiljan, Colorado DOT, 303/757-9508, fax: 757-9974.

ERP:

1. See Electronic Road Pricing
2. (European Radionavigation Plan). European Community group involved in a feasibility study on satellite navigation systems and Loran-C.

ERTICO:

(European Road Transport Telematics Implementation Coordination Organization). Market-oriented umbrella organization formed to guide and oversee IVHS/RTI research, development and deployment activities in Europe. Participants include Association des Constructeurs Européens d'Automobiles (ACEA), Alliance Internationale de Tourisme (AIT), Eurotunnel, Fiat, Ford of Europe, France-Telecom, PSA, POLIS, Renault, Rijkswaterstaat (Netherlands MOT), ROVER, SECAP, Swedish National Road Administration, Union Internationale des Transports Publics (UITP) and Volvo. **Info:** Ghassan Freij, +32-2-538-0262, fax: +32-2-538-0273.

ERTIS:

(European Road Transport Information Systems). A \$2.7 million, three year project to develop a common road information and communications system for motor carriers across Europe. Part of EUREKA. Has the objective of applying systems for automatically communicating motor freight information. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906.

ETC:

1. Electronic Toll Collection. Also known as automatic toll collection. See ETMM article. See also: ALI-SCOUT, AVI, ETMM, EZ-Pass, PAYD, Pikepass, Smart Card, Tolltag, VITA.

2. Employee Transportation Coordinator. Responsible for car and vanpool creation at a workplace.

ET-NET:

European traveler information network developed under the INTERCHANGE project of Drive II.

ETSI:

(Institut Européen des normes de télécommunication). European Telecommunications Standards Institute. Includes both public and private sectors. **Info:** +33-92-944-200.

ETMM:

See Electronic Toll and Traffic Management. (See article).

ETMM Group:

See Interagency Group.

EUREKA:

(European Research Coordination Agency). European program designed to stimulate cooperative research and development between industries and governments in Europe. See European Programs article. See also: ATIS, CARMINAT, DEMETER, ERTIS, EUROPOLIS, GENEGIS, PROMETHEUS, ROADACOM, TELE ATLAS. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906.

EUROPOLIS:

A \$150 million, seven year, Danish/French/Spanish/Italian research project to design automated road systems and develop technologies to automate driver functions. Part of EUREKA. Other objectives include environmental

control and fleet management. **Info:** EUREKA Secretariat, +32-2-217-0030, fax: +32-2-218-7906.

EURO-SCOUT:

Second generation infrastructure-based route guidance system, successor to ALI-SCOUT (qv).

EUTELTRACS:

European satellite-based messaging and positioning system. **Info:** Alcatel, +33-1-4652-4043.

EZ-Pass:

The electronic toll collection system to be used in the New York/New Jersey/ Pennsylvania area. See also: Interagency Group, TRANSCOM.

FAME:

See Freeway and Arterial Management Effort.

Fast-Trac:

See Faster and Safer Travel – Traffic Routing and Advanced Control.

Faster and Safer Travel – Traffic Routing and Advanced Control:

(Fast-Trac). Oakland County, Michigan field test of ATMS and ATIS. See U.S. Operational Field Tests article. **Info:** James Barbaresso, Road Commission of Oakland County, 313/645-2000, or Martin Monahan, FHWA, 708/206-3218, fax: 708/206-3207.

Federal Highway Administration:

(FHWA). See U.S. Department of Transportation Administrations article.

Federal Transit Administration:

(FTA). See U.S. Department of Transportation Administrations article.

FHWA:

(Federal Highway Administration). See U.S. Department of Transportation Administrations article.

FISITA:

Federation Internationale des Societes d'Ingenieurs des Techniques de l'Automobile. (International Federation of Automobile Engineering Societies). Interested in international databases and vehicle research systems. Sponsors international conferences. **Info:** Central Secretariat, +44-71-222-7899, fax: +44-71-222-4557.

FLEET:

(Freight and Logistics Efforts for European Traffic). DRIVE project investigating the potential of new information and communications technologies for use in establishing an integrated pan-European freight and fleet management system. Defining and assessing alternative system concepts. **Info:** M. Both, Dornier GmbH, +49-7541-209-246, fax: +49-7541-209-263.

Freeway and Arterial Management Effort:

(FAME). Includes the Incident Management and Integrated Systems project which will develop a framework for establishing and implementing an incident management system as well as demonstrate the benefits of an integrated system by designing and implementing a control system for Interstate-5 that automatically modifies arterial timings and ramp metering in response to freeway conditions. Sponsored by the Washington State DOT. Publishes an informational bulletin. **Info:** Peter Briglia, Washington DOT, 206/543-3331, fax: 206/685-0767.

FTA:

(Federal Transit Administration). See U.S. Department of Transportation Administrations article.

GAUDI:

(Generalized and Advanced Urban Debiting Innovation). One of five POLIS projects under Drive II. Involves Marseille, France; Barcelona, Spain; Dublin, Ireland; Trondheim, Norway; and Bologna, Italy. Focused on automatic toll and fare debiting, demand management, and smart cards. **Info:** J. Augusto, +34-3-415-9517, fax: +34-3-415-5236.

GDF:

(Geographic Data File). File specification for digital roadway and topological map databases produced by Philips and Bosch under DEMETER and now part of Drive II EDRM project. Includes specifications for data transfer and database acquisition and encoding. See also: DEMETER, EDRM, GDF.

GEMINI:

(Generation of Messages in the New Integrated Road Transport Environment). Drive II project. Objective is to develop an integrated driver information system based on RDS-TMC and variable message sign (VMS) networks. **Info:** Grant Klein, Castle Rock Consultants, +44-602-430-830, fax: +44-602-430-823.

GENEGIS:

(Generator for Geographical Information Systems). Objective is to develop a platform for the integration of spatial, economic and statistical data in geographic information systems (GIS). Part of EUREKA. Partners include European Geographic Technologies (EGT), Feblac Data Systems, Institut Géographique National, and SAGEM Navigation and Defense Division. **Info:** Jan Melein, project manager, +31-10-436-7100, fax: 31-10-436-7110.

Genesis:

A Guidestar (qv) project. A personal traveler information system that will provide real-time route specific vehicle and transit travel times. Traffic data will come from transit vehicles used as probes and conventional data sources. Participants include FHWA, Minnesota DOT, University of Minnesota Center for Transportation Studies, and Motorola. **Info:** Martin Monahan, FHWA, 708/206-3218, fax: 708/206-3207.

Geographic Information System:

(GIS). Computerized data management system designed to capture, store, retrieve, analyze, and report on geographic/demographic information. See also: TRANSCOM.

GEOSTAR:

A satellite system which was used for determining vehicle location. Pioneered satellite-based commercial truck tracking and communications services. Now defunct.

GIS:

See Geographic Information System.

Global Positioning System:

(GPS). U.S. government owned system of 24 Earth-orbiting satellites which transmit data to ground-based receivers. Provides extremely accurate latitude/longitude ground position in WGS-84 coordinates for the military called Precise Positioning Service (PPS). Deliberate error (selective availability, qv) is introduced into the civilian service (Standard Positioning Service or SPS) for defense purposes. RSPA is investigating IVHS GPS requirements to determine whether current GPS services are applicable. See also: DART, Electro-Multivision, GLONASS, Travtek. **Info:** Heywood Shirer, RSPA, DRT-20, 202/366-4355.

GLONASS:

Soviet satellite radionavigation system similar to Global Positioning System (GPS). May be integrated with GPS.

Golden Glades Interchange:

Program to install ATMS technologies at the Golden Glade Interchange on I-95 in Dade County, Florida. Will use CCTV and VMS for incident monitoring and motorist information. Participants include Florida DOT and the FHWA. Info: Patricia Harrison, FHWA, 404/347-4075.

GPS:

See Global Positioning System.

GSM:

(Groupe Speciale Mobile). European digital cellular telephony standard. See also: SOCRATES.

Guidestar:

An IVHS program of the University of Minnesota Center for Transportation Studies/Minnesota Department of Transportation. See U.S. Operational Field Tests article. Info: Richard Stehr, Mn/DOT, 612/297-3532, fax: 612/297-7328. See also: Genesis, TravLink, ACTS, and Roadstar I.

HAR:

See Highway Advisory Radio.

Heads Up Display:

(HUD). Display of instrument readings which appears (usually by reflection) on the inside of a vehicle's windshield. See also: Vehicle Navigation article.

Heavy Vehicle Electronic License Plate:

(HELP). A cooperative study and demonstration program which includes the Crescent demonstration project. Focus is on Automated Vehicle Identification, Weigh In Motion, Automatic Vehicle Classification, data communications networks, and systems integration. Became HELP Inc., a private corporation, in the fall of 1993. See Crescent Demonstration Project in U.S. IVHS Operational Field Tests article. Info: Ted Scott, ATA, 703/838-1789, fax: 703-838-1992.

HELP:

See Heavy Vehicle Electronic License Plate.

Highway Advisory Radio:

(HAR). U.S. traffic information broadcasting system whose transmissions are received through car radios after drivers are alerted to turn the radio to a specific frequency. See also: ARI, AHAR, DIRECT, LPHAR, MAGIC, SMART Corridor, TRANSCOM.

High Occupancy Vehicle:

(HOV). Bus, van, car with multiple riders. Usual context: HOV lane: roadway lane reserved for use by HOVs. See also: Smart Commuter, Smart Traveler, Smart Vehicle.

Highway Reauthorization Bill:

See Intermodal Surface Transportation Efficiency Act.

Highway Users Federation for Safety and Mobility:

(HUFSAM). See U.S. Organizations article.

HITS:

See Houston Intelligent System.

Houston Intelligent System:

(HITS). Project aimed at improving the mobility of people and goods and reducing the environmental impacts of the transportation systems through advanced technology. Includes Smart Commuter. Info: Darrel Puckett, 713/739-6093, fax: 713/739-4925.

HOV:

See High Occupancy Vehicle.

HUD:

See Heads Up Display.

HUFSAM:

(Highway Users Federation for Safety and Mobility). See U.S. Organizations article. Info: Lester Lamm, 202/857-1200, fax: 202/857-1220.

HVCO:

See CVO.

IAG:

See Interagency Group.

I-95 Corridor Coalition:

Voluntary association of 12 State DOTs (from Maine to Virginia), 11 independent transportation and toll authorities, and 3 Federal agencies. Will coordinate communications and operations along the Interstate 95

corridor to promote IVHS. **Info:** Michael Halladay, FHWA, 202/366-6503.

IBTTA:

(International Bridge, Tunnel, and Turnpike Association). See U.S. Organizations article.

ICVTAID:

DRIVE project dealing with the use of computer vision techniques for incident detection.

IEC:

(International Electrotechnical Commission). Sets international standards in the electrical and electronics industries. **Info:** +41-22-734-0150, fax: +41-22-733-3843.

IEEE:

(Institute of Electrical and Electronics Engineers). See U.S. Organizations article. **Info:** John May, 508/887-5237, fax: 508/887-8716, or Service Center, 908/981-0060.

Illinois Universities Transportation Research

Consortium:

(IUTRC). See ADVANCE in the U.S. Operational Field Test article. **Info:** David Boyce, University of Illinois/Chicago, 312/996-4820, fax: 312/413-0006.

IMAURO:

(Integrated Model for the Analysis of Urban Route Optimisation). DRIVE project dealing with urban traffic simulation.

IMPACT:

(Implementation Aspects Concerning Planning and Legislation). DRIVE project to propose international planning procedures for standardization and identify areas for changes in legislation to facilitate RTI.

IMPACTS:

A video imaging system for monitoring traffic conditions on highways as shown by CCTV cameras. Developed by the University College, London and being commercially marketed by Wootton Jeffreys Consultants.

IMSIS:

(In-vehicle Motorist Services Information Systems). One of the information subsystems used in ATIS. Being investigated in relation to CVO by FHWA. **Info:** Truman Mast, FHWA, 703/285-2404.

INF-FLUX:

A French vehicle guidance system which combines a commercial infrastructure-based route guidance system (LISB) with RDS communication of traffic data (RDS-TMC). Promoted by a consortium including Urban 2000 (a group made up of several government ministries and individual operators such as Compagnie Generale Des Eaux (CGE), CGA-HBS, Siemens, and the City of Paris. May be completely integrated with SIRIUS (qv) in the future. Tested in Berlin.

Info-mobility:

A Japanese term for IVHS.

INFORM:

(Information For Motorists). See U.S. Operational Field Tests article. **Info:** Jonathan McDade, 518/472-4253.

INMARSAT:

International Maritime Satellite Organization.

INRAD:

Caltrans-sponsored project to demonstrate the use of short range, two-way communications between vehicles and the roadway using inductive radio. **Info:** Walt Winter, Project Manager, 916/227-7024.

INRETS:

Institut Nationale des Recherches sur les Transports et Securité (France). (National Institute for Research in Transportation and Safety). Researching communications, video image processing, traffic control, human factors, environmental issues, and international cooperation. Involved in DART and LEN. Connected with CRESTA, DRIVE, LESCO, PROMETHEUS, the French Ministry of Transportation, and French industry. **Info:** +33-20-916-209, fax: +33-20-670-832.

Institute of Electrical and Electronics Engineers:

(IEEE). See U.S. Organizations article.

Institute of Transportation Engineers:

(ITE). See U.S. Organizations article.

Institute of Transportation Studies:

(ITS). Transportation R&D organization of the University of California. Faculty, staff, and graduate students conduct multi-disciplinary research. Operates PATH. **Info:** Adib Kanafani, 510/642-3685, fax: 510/642-1246.

Interagency Group:

(IAG). A consortium of transportation agencies from New York, New Jersey and Pennsylvania.. working to make the region's ETC systems compatible with a single tag (E-ZPass, qv). Participants include New Jersey Highway Authority, New Jersey Turnpike Authority, New York State Thruway Authority, Pennsylvania Turnpike Commission, Port Authority of New York & New Jersey, South Jersey Transportation Authority, and Triborough Bridge & Tunnel Authority. Also known as E-ZPass Interagency Group. **Info:** Terry Benczik, 212/432-5615.

Integrated Road Transport Environment:

(IRTE). Ultimate goal of the DRIVE and Drive II programs. See also: SOCRATES, TARDIS.

INTEGRATION:

Canadian traffic simulation and modeling program for AMS/ATIS applications. Developed at Queen's University. Used in TravTek, the Highway 401 and Gardiner Expressway freeway corridor evaluations, and by The University of Michigan. **Info:** Michael van Aerde, Queens University, 613/545-2122.

Intelligent Corridor Program:

Program to provide real-time information to travelers along the Interstate 95 corridor in Palm Beach, Broward, and Dade counties. Will eventually integrate elements of ATMS, ATIS, APTS, CVO, and AVCS. Participants include FHWA, Florida DOT, and JHK Associates. **Info:** Patricia Harrison, FHWA, 404/347-4075.

Intelligent Vehicle Highway Society of America:

(IVHS AMERICA). A nonprofit, public/private scientific and educational corporation which works to advance a national program for safer, more economical, energy efficient, and environmentally sound highway travel in the U.S. Utilized federal advisory committee to U.S. Department of Transportation. See IVHS AMERICA article. **Info:** James Costantino, Executive Director, 202/857-1202, fax: 202/296-5408.

Intelligent Vehicle Highway System Act:

See Intermodal Surface Transportation Efficiency Act.

IntelliTag™:

Radio Frequency Identification (RFID) system for electronic toll applications. Allows two-way information transfer. **Info:** Carla Morgan, Amtech, 214/733-6059, fax: 214/733-6699.

INTERCHANGE:

Drive II project. Objective is to develop a network for the real-time exchange of ATT information between national travel/traffic information centers. Network is to be called ET-NET. **Info:** Peter Davies, Castle Rock Consultants, +44-602-430-830, fax: +44-602-430-823.

International Standards Organization:

(ISO). An international standards umbrella organization. Includes a Technical Committee (TC 204) on Transport Information and Control Systems. **Info:** +41-22-734-1240.

Intermodal Surface Transportation Efficiency Act of 1991:

(ISTEA). Provides primary federal funding for highway and other surface transportation programs in the U.S. Contains the Intelligent Vehicle Highway Systems Act. Directs the establishment of a national IVHS program which is to include a strategic plan for IVHS in the U.S., implementation and evaluation of IVHS technologies, the development of standards and protocols, an information clearinghouse, the utilization of advisory committees (of which IVHS AMERICA is one) and the funding of IVHS research, development, and testing, in efforts such as the Corridors Program.

International Symposium on Automotive Technology and Automation:

(ISATA). Annual European meeting on IVHS and other automotive technology. **Info:** John Soliman, +44-81-681-3069, fax: +44-81-686-1490.

INTERNET:

Integrated traffic control system which will coordinate traffic signal operations along almost 40 miles of I-5, SR 99 and SR 522 in Washington state's King and Snohomish counties.

INVALID:

(Integration of computer Vision techniques for Automatic Incident Detection). Drive II research project testing vehicle monitoring systems. Will include a test of VIGIL (qv).

In-Vehicle Signing:

On-board display of roadside signs, usually by short-range transmission from the roadside to an in-vehicle system. Used to improve effectiveness for drivers with impaired vision or driving in bad weather.

IRANS:

(In-vehicle Routing and Navigation Systems). One of the information subsystems used in ATIS. Being investigated in relation to CVO by FHWA. **Info:** Truman Mast, FHWA, 703/285-2404.

IRTE:

See Integrated Road Transport Environment.

ISATA:

See International Symposium on Automotive Technology and Automation.

ISIS:

(In-vehicle Signing Information Systems). One of the information subsystems used in ATIS. Being investigated in relation to CVO by FHWA. **Info:** Truman Mast, FHWA, 703/285-2404.

ISO:

See International Standards Organization.

ISTEA:

See Intermodal Surface Transportation Efficiency Act.

ITE:

See Institute of Transportation Engineers, and U.S. Organizations article.

ITIS:

(International Traveler Information Interchange Standard). Also known as ITIIS. Compatible, non-proprietary communications protocol and standard under development by groups in the U.S. and Europe. Contributors include ENTERPRISE and ATT-ALERT.

ITS:

1. See Institute for Transportation Studies.
2. (Intelligent Transportation Systems). New Jersey and U.S. DOT program to develop methods for measuring effectiveness for specific applications and to assess the state of the art. Results to be used by TRANSCOM.

IUTRC:

See Illinois Universities Transportation Research Consortium.

IVHS AMERICA:

See Intelligent Vehicle Highway Society of America, and IVHS AMERICA article.

IVHS Act:

See Intermodal Surface Transportation Efficiency Act.

IVHS AMERICA Information Clearinghouse:

See IVHS AMERICA article. **Info:** Perry Carter, IVHS AMERICA, 202/973-7864, fax: 202/296-5408.

IVHS IDEA:

(Innovations Deserving Exploratory Analysis). Program for identifying and exploring new IVHS concepts proposed by individual researchers. Participants include FHWA and TRB. **Info:** Michael Freitas, FHWA, 703/285-2421.

IVHS Roundtable:

Ad hoc organization for the coordination of IVHS development in Canada. See Canadian Programs article. **Info:** IVHS Roundtable, 613/736-1350, fax: 613/736-1395.

IVSAWS:

(In-Vehicle Safety and Advisory Warning System). One of the information subsystems used in ATIS. Provides in-vehicle warnings for roadway hazards early enough that the driver can take appropriate action. Developed by Hughes and FHWA. **Info:** Peter Mills, FHWA, 703/285-2402.

Japan Digital Road Map Association:

(JDRMA). See Japanese Programs article. **Info:** Akira Onaka, +81-3-3222-7990, fax: +81-3-3222-7991.

JDRMA:

(Japan Digital Road Map Association). See Japanese Programs article.

JSAE:

Japanese Society of Automotive Engineers.

JSK Foundation:

(Japanese Association of Electronic Technology for Automotive Traffic and Driving). Formed to disseminate the information from the CACS project. Worked on the SSVS project. See Japanese Programs article.

LEO:

See Low Earth Orbit.

Liaison Council for IVHS/RTI Japan:

Formed by representative members of the IVHS community in Japan to carry out information

interchange smoothly inside and outside of Japan. Membership includes personnel from the Japan Traffic Management Technology Association, Highway Industry Development Organization, and the Association of Electronic Technology for Automobile Traffic and Driving (JSK Foundation). **Info:** Nobuwo Watanabe, Director General, +81-3-3501-5649, fax: +81-3-3501-5685.

Lincoln Tunnel Project:

An ETTM system operated by the Port Authority of New York and New Jersey. 2800 buses are equipped with tags.

LISB:

(Leit und Information System Berlin). A full-scale trial carried out in Berlin of the ALI-SCOUT dynamic route guidance system developed jointly by Siemens and Bosch. Funded by the German government and the Senate of Berlin. Has close ties with PROMETHEUS. **Info:** J. Sparmann, +49-30-82007-126, fax: +49-30-82007-151. See also: ALI-SCOUT, EURO-SCOUT.

LLAMD:

(London, Lyon, Amsterdam, Munich and Dublin). One of five POLIS projects of Drive II. Focused on traffic control and route guidance. **Info:** Ian Catling, +44-81-643-4451, fax: +44-81-643-4452.

LORAN-C:

Land-based radio navigation system operated by the U.S. Coast Guard as a public service. Nationwide coverage is provided by signals broadcast from radio towers.

Low Earth Orbit:

(LEO). Satellite system to provide positioning and two-way messaging services. Systems are being developed in the U.S. (Iridium) and Canada (ORBCOMM).

Low Powered Highway Advisory Radio (LPHAR):

Traffic information broadcasting system. Requires the traveler to manually tune in to a traffic message channel after being alerted by flashing roadside lights. See also: AHAR, DIRECT, HAR.

LPHAR:

See Low Powered Highway Advisory Radio.

MAGIC:

See Metropolitan Area Guidance, Information and Control.

Map Matching:

Technique to enhance and correct in-vehicle dead-reckoning. See Vehicle Navigation article.

MDTRS:

See Mobile Digital Trunked Radio Systems.

Memory Card:

A plug-in computer memory card containing prerecorded information. May function as mass storage for on-board navigation systems. Also called IC card and Flash Memory.

Metropolitan Area Guidance, Information and Control:

(MAGIC). New Jersey incident detection and traffic management system. Will use variable message signs (VMS), closed circuit television (CCTV), highway advisory radio (HAR), loop detection, and ramp metering to help relieve congestion in nine New Jersey counties. Will be coordinated with the TRANSCOM effort (qv). Operated by New Jersey DOT. **Info:** Jonathan McDade, FHWA, 518/472-4253.

Metropolitan Transportation Information Production System:

(MTIPS). See Canadian IVHS Programs article. **Info:** Lewis Strasberg, Ministry of Transportation Ontario, Transportation Technology and Energy Branch, 416/235-3452, fax: 416/235-4936.

MINERVE:

Part of CARMINAT (qv).

MITI:

Japanese Ministry of International Trade and Industry. **Info:** Hideaki Kumano, Director General, Machinery and Information Industries Bureau, +81-3-3501-1511.

MNA:

See Mobile Navigation Assistant.

Mobile Digital Trunked Radio Systems:

(MDTRS). Standard for pan-European public and private digital trunked mobile voice and data networks.

Mobile Navigation Assistant:

(MNA). An in-vehicle navigation system designed and built by Motorola that determines vehicle position, performs route planning based on current traffic information, and provides dynamic route guidance information to the driver. See ADVANCE project in U.S. Operational Field Tests article.

Mobility Manager:

FTA-sponsored APTS project testing an experimental information clearinghouse aimed at integrating and coordinating transportation services offered by multiple providers. Combines Smart Traveler and Smart Vehicle technology with the integration of communications and billing systems. Currently being tested in Norfolk, VA and Central Point, OR (Rogue Valley). Uses ETTM and computer based systems. **Info:** Helen Tann, FTA Headquarters, TTS-30, 202/366-0207, fax: 202/366-3765.

Mobility 2000:

A precursor of IVHS AMERICA. An informal assembly of individuals, government agencies, automotive companies, electronics suppliers, communications companies, consultants, large fleet operators, and universities which served to define and promote IVHS from 1988 until the founding of IVHS AMERICA in 1990.

MOC:

Japanese Ministry of Construction. **Info:** Hitoshi Yamaguchi, Director, Road Traffic Control Division, +81-3-3580-4311, fax: +81-3-3503-7588.

MOE:

(Measure of Effectiveness). Used to evaluate results of operational field tests.

MPT:

Japanese Ministry of Posts and Telecommunications. **Info:** Tatsuo Kito, Director, Land Mobile Communications Division, +81-3-3504-4871, fax: +81-3-3504-4048.

MTIPS:

(Metropolitan Transportation Information Production System). See Canadian IVHS Programs article. **Info:** Gabriel Heti, Manager, Ministry of Transportation Ontario, 416/235-3454, fax: 416/235-4936.

MTO:

(Ministry of Transportation Ontario). Involved in APTS and CVO programs as well as and AVION,

COMPASS, IVHS Roundtable, MTIPS, RTMS, TravelGuide. See Canadian IVHS Programs article. **Info:** Gabriel Heti, Ministry of Transportation Ontario, 416/235-3454, fax: 416/235-4936.

Multi AV:

Nissan-Sumitomo navigation system. Uses microwave beacon receivers for the transmission of static information. Applies RACS (qv) communications technology and protocols.

MVMA:

(Motor Vehicle Manufacturers Association). Former name of American Automobile Manufacturers Association (qv).

National Highway Traffic Safety Administration:

(NHTSA). See U.S. Department of Transportation Administrations article.

Navigable Database:

A digital streetmap database containing sufficient detail and scope to support driver and vehicle guidance applications (e.g., the generation by computer of a high quality driving route between two stated addresses). See Vehicle Navigation article.

Navigator:

The first commercially available self-contained map-matching navigation system. Introduced by Etak in 1985 in California. Used dead-reckoning in combination with stored digital maps and map-matching software to track vehicle location. See also: TravelPilot. **Info:** John Rehfeld, President, Etak, 415/328-3825, fax: 415/328-3148.

NavMate:

A prototype autonomous, in-vehicle route guidance system developed by Zexel Corporation. Includes route determination, vehicle positioning, and route guidance. **Info:** Robert Borcherts, Zexel, 313/553-9930, fax: 313/553-9931.

Navstar:

See Global Positioning System.

NeGHTS:

(Next Generation Highway Traffic Systems). Japanese program overseen by the Ministry of Construction (MOC). A spinoff of the RACS program. Opens the next round of infrastructure-related systems which provide for vehicle-highway communication technologies.

NHK:

(Japan Broadcasting Corporation). Analogous to the FCC and National Public Broadcasting in the U.S. Active in the development of communications and positioning systems.

NHTSA:

(National Highway Traffic Safety Administration). See U.S. Department of Transportation Administrations article. **Info:** August Burgett, 202/366-5662, fax: 202-366-7237, or William Leasure, 202/366-5662.

NPA:

(Japanese National Police Agency). **Info:** Mitsuhiro Koga, Director, Traffic Management Division, +81-3-3581-0141, fax: +81-3-3593-2395.

OEM:

(Original Equipment Manufacturer). In the IVHS context, a vehicle manufacturer.

OIC:

(Operation Information Center). See TRANSCOM in U.S. Operational Field Tests article.

Oklahoma Turnpike System:

ETTM system installed in January 1991 which uses dedicated lanes and covers all vehicle classifications. Allows users to continue at highway speeds with a 25% reduction in traffic accidents. Uses Pikepass (qv) to charge for miles driven. **Info:** 800/745-3727.

On-Line Travel Information System:

(OTIS). Microcomputer-based system which helps agents to respond to telephoned requests for travel information. Used by the New York City Transit Authority. Also displays a map of the area around the caller's origin or destination, faxes or mails itineraries, displays a description of the bus stop or train station, and reports service delays.

Open Systems Interconnection:

(OSI). A standard communications architecture, adopted by the International Standards Organization (ISO, qv) in 1983.

Ordnance Survey

British mapping agency, equivalent to USGS in the United States.

OS:

See Ordnance Survey

OSI:

See Open Systems Interconnection.

OTIS:

See On-Line Travel Information System.

PAMELA:

(Pricing and Monitoring Electronically of Automobiles). A DRIVE project which is investigating two-way microwave communications between vehicles and roadside equipment for automatic toll collection using smart cards.

PANDORA:

(Prototyping a Navigation Database of Road Network Attributes). A digital mapping project of DRIVE. One of two DRIVE projects underway to test the Geographic Data File (qv) specification. Objectives include integration of a comprehensive digital map for a 7000 sq km trial area between Birmingham and London using road network, geometry, and street name data from the Ordnance Survey, and traffic related attributes from the Automobile Association; and demonstrating the correctness of the integrated data in field trials using the CARIN and TravelPilot systems. Partners include Bosch, the UK Ordnance Survey, and Philips. **Info:** D. McCallum, Project Manager, +44-483-728051, fax: +44-483-755207.

PASS:

(Port-of-Entry Advanced Sorting System). Test of AVI, WIM, AVC and OBC integration for weighing, classifying, and directing selected heavy vehicles in advance of weigh stations and ports of entry. Legal trucks will be able to bypass both stopping points. Participants include FHWA, Oregon DOT, and the Motor Carrier Industry. **Info:** Ed Fischer, FHWA, 503/326-2071.

PATH:

(Partners for Advanced Transit and Highways; formerly Program on Advanced Technology for the Highway). Program of IVHS research and development operated by the Institute for Transportation Studies (ITS) of University of California/Berkeley in conjunction with the California Department of Transportation (Caltrans). Also includes the Universities of California Davis and Irvine, California Polytechnic State University, and University of Southern California. Operates CAPTS (qv). Research program includes ATMS, ATIS, APTS, CVO, human factors and safety, policy and planning, and ETC with a emphasis on clean

propulsion technology and AVCS. Includes an FHWA-sponsored project for the automated highway system (AHS). **Info:** Don Orne, PATH, 510/231-9541, fax: 510/231-9565.

Pathfinder:

See U.S. Operational Field Tests article. **Info:** Lewis Yee, 213/897-0253, fax: 213/897-3639.

PAYD:

(Pay As You Drive). Company formed to promote private introduction and operation of electronic toll collection (ETC) using prepaid tags for Automatic Vehicle Identification (AVI) under license from the Hong Kong Government.

PCS:

(Personal Communication Service). A next generation mobile telephone service which associates an individual with a universal telephone number.

PDA:

(Personal Data Assistant). Handheld ATIS device.

PEGASUS:

See People, Goods and Services Urban Systems.

People, Goods and Services Urban Systems:

(PEGASUS). A concept for incorporating demand-responsive traffic management with advanced traffic control developed by the Texas State Department of Highways and Public Transportation (SDHPT). Has been implemented by the SDHPT and FHWA as a traffic management system for freeways, frontage roads, arterials, and HOV lanes which is currently unnamed. Such systems have been partially installed in Houston, Fort Worth, El Paso, and San Antonio. **Info:** Al Kosik, Texas State Dept. of Highways and Public Transportation, 512/416-3260, fax: 512/416-3304.

Permanent International Association of Road

Congresses:

(PIARC). The oldest international association concerned with roads. Objective is to foster progress in the construction, maintenance, operation, and economic development of roads. Organizes a World Road Congress every four years. Has an IVHS working group interested in ATMS, ATIS, and AVCS. **Info:** Dennis Judycki, FHWA, 202/366-2149, fax: 202/366-2249.

PIARC:

See Permanent International Association of Road Congresses.

Pikepass:

Electronic Toll Collection (ETC, qv) card used in the Oklahoma Turnpike toll collection system.

Platooning:

Linking cars closely together in small groups for high-speed, high-density freeway travel under control of an Automatic Vehicle Control System (AVCS, qv).

PLEIADES:

(Paris London Corridor Evaluation of Integrated ATT and Drive Experimental Systems). Drive II project. Evaluating an integrated traffic management and traveler information system in France, London and Belgium. **Info:** David Jeffery, Wootton Jeffreys Consultants, +44-483-480-033, fax: +44-483-488-887.

POLIS:

(Promoting Operational Links with Integrated Services). An organization of European cities with an agreement to work together in developing RTI technologies to help with urban transport problems. Now organized under Drive II as an urban complement to CORRIDORS and administered by the cities involved. Divided into five projects: GAUDI, QUARTET, SCOPE, LLAMD, and CITIES (qv).

PPS:

See Precise Positioning Service.

Predictive Data Fusion:

Technique used in ATMS for combining traffic data from multiple sources into a single model of traffic behavior.

Precise Positioning Service:

(PPS). Military version of Global Positioning System (GPS) (qv).

PRIMAVERA:

(Priority Management for Vehicle Efficiency, Environment and Road Safety on Arterials). Drive II project. Objective is to identify and implement strategies for public transport priority using adaptive urban traffic control techniques. Participants include Peek Traffic Ltd., Institute of Transportation Studies at Leeds University, the cities of Leeds and Turin, and Mizar Ltd. **Info:** F. Montgomery, +44-532-335-339, fax: +44-532-335-334.

PROMETHEUS:

(Programme for European Traffic with Highest Efficiency and Unprecedented Safety). A primarily private sector initiative aimed at developing a uniform European traffic system incorporating IVHS technology. A project of EUREKA. See European Programs article. See also: EUREKA, INRETS, LISB, PROMISE, TELE ATLAS. **Info:** Hans-Peter Glathe, +49-7-11-17-22440, fax: +49-7-11-17-57748.

PROMISE:

(PROmetheus Mobile and portable Information Systems in Europe). Drive II project taking place in Sweden. Objective is to develop a multimodal traveler information system incorporating open architecture and mobile and portable terminals. Interested in standardization between DRIVE and PROMETHEUS. **Info:** Jan Hellaker, +46-31-772-4075, fax: +46-31-772-4086.

PROMPT:

Drive II project taking place in Sweden. Objective is to develop and evaluate methods of giving active priority to buses, trams and emergency vehicles in urban traffic control systems. **Info:** Peek Traffic AB, +46-8-726-2100, fax: +46-8-726-2068.

Proximity Beacons:

Short range emitters of radio, microwave, or infrared location-coded signals located at key intersections. Can also be used as a communication link for traffic and other local data.

QASPR:

(Qualcomm Automatic Satellite Position Reporting). Uses existing civilian communications satellites for vehicle tracking. Introduced by Qualcomm in February 1990. **Info:** 619/587-1121.

Q-Free:

Electronic Toll and Traffic Management (ETTM) system used in Norway which uses passive Automatic Vehicle Identification (AVI) tags and a camera system for enforcement.

Quad Sheets:

A series of maps produced by the U.S. Geological Survey (USGS) at scales of 1:24,000 and 1:62,000. Available to the general public. Cover the entire U.S.

QUARTET:

(Quadrilateral Advanced Research on Telematics for Environment and Transport). One of five POLIS/Drive II projects. Involves Stuttgart, Germany; Birmingham, England; Torino, Italy; and Athens, Greece. Focused on travel and traffic information and data exchange. **Info:** V. Mauro, +39-11-650-2424, fax: +39-11-657-432.

RACS:

(Road-Automotive Communication System). An experimental Japanese ATMS effort. Now integrated with AMTICS as VICS under the Ministry of Posts and Telecommunications. See Japanese Programs article.

Radio Frequency Identification:

(RFID). A type of electronic identification that uses radio frequency signals to read on-vehicle tags for Automatic Vehicle Identification and Classification (AVI and AVC) (qv).

Ramp metering:

Traffic-responsive regulation of vehicle entry to a highway, typically via sensor-controlled freeway ramp stoplights.

RBDS:

(Radio Broadcast Data System). A use of FM subcarrier radio for wide area transmission of digital information, program information, radio control, etc. Standardized in 1992 in the U.S. by the National Radio Standards Committee. Fully compatible with the European standard. See also: ATT-ALERT, DIRECT, GEMINI, INF-FLUX, RBDS-GPS, RDS, RDS ALERT, RDS-TMC, SAGACE, SCA.

RBDS-GPS:

(Radio Broadcast Data System-Differential GPS). Method for sending differential correction data for navigation signals (such as GPS). Complies with the RBDS (qv) standard. The National Association of Broadcasters and the Electronics Industrial Association are currently developing a working specification for RBDS-GPS.

RDS:

(Radio Data System). A use of FM subcarrier for wide area transmission of digital information, program information, radio control, etc. Standardized in 1984 by the European Broadcasting Union (EBU). One application is the Traffic Message Channel (TMC). See also: ATT-ALERT, DIRECT, GEMINI,

INF-FLUX, RBDS, RDS ALERT, RDS-TMC, SAGACE, SCA.

RDS ALERT:

DRIVE I project which developed the European pre-standard for the RDS-TMC. Drive II analog is ATT-ALERT (qv).

RDS-TMC:

(Radio Data System-Traffic Message Channel). See RDS.

Research and Special Programs Administration:

(RSPA). See U.S. Department of Transportation Administrations article. **Info:** Gary T. Ritter, 617/494-2716, fax: 617/494-3062.

RFID:

See Radio Frequency Identification.

Rijkswaterstaat:

Dutch Ministry of Transportation. **Info:** Hans van der Wal, +31-15-691-111, fax: +31-15-618-962.

RIMES:

(Road Information and Management Eurosystem). DRIVE I project aimed at studying and developing standards for construction of road databases for the use of administrations managing a road network. **Info:** Y. Loyaerts, Belcotec, +32-81-322-625, fax: +32-81-322-664.

Road KIT:

Mobile satellite communications and positioning service designed and developed by Ontario private sector participants — Telesat Mobile, Frederick Transport, and Thompson Transport — with 50% research and development funding from the Ontario government. Allows vehicle fleet dispatch centers to automatically track the position of each vehicle in a fleet, acquire data, and send/receive messages to/from individual vehicles. A result of the WAVM project. **Info:** Joe Tsai, Ministry of Transportation Ontario, 416/235-3453, fax: 416/235-4936.

ROADACOM:

(En Route Applied Data Communications). EUREKA project to create an integrated system for on-board electronic data collection and processing, and for bi-directional exchange of data between commercial vehicles and their home bases.

Roadstar I:

Guidestar (qv) feasibility test of a driverless tractor trailer.

Road Transport Informatics:

(RTI). A European term for IVHS.

Roadway Powered Electric Vehicle:

(RPEV). Project for the development and commercialization of automobile-sized electric vehicles. Participants include FHWA, Caltrans, LA DOT, LA Metropolitan Transportation Authority, New York State Thruway, GA DOT, Georgia Tech Research Institute, Ross Industries, Inc., Raytheon, GE, Arco Power Technology, and Arthur D. Little. Transmittal of electric energy from road to car has been accomplished, and second-stage testing is in progress. **Info:** Milton Heywood, FHWA, 202/366-2182, fax: 202/366-2249.

Route Builder:

A service implemented in 1990 by Guidestar (qv) in Minnesota which enables truckers to use phone and fax machines to obtain permits and computer-developed routings appropriate for their trucks' size, weight, etc., without stopping at a center. **Info:** Richard Stehr, Minnesota DOT, 612/297-3532, fax: 612/297-7328.

Route Guidance:

See Vehicle Navigation article. See also: ADVANCE, ALI, ALI-SCOUT, AMTICS, Autoguide, CACS, CAR-GOES, CARIN, CARMINAT, CITIES, DART, DEMETER, ERP, INF-FLUX, LISB, LLAMD, LORAN-C, Map-matching, Memory card, Multi-AV, Navigable database, Navigator, Navmate, PANDORA, Pathfinder, RACS, Smart Vehicle, SOCRATES, TARDIS, TravelMatch Express, VICS, UTCS.

RPEV:

See Roadway Powered Electric Vehicle.

RSPA:

(Research and Special Programs Administration). See U.S. Department of Transportation Administrations article.

RTI:

See Road Transport Informatics.

RTMS:

(Road Traffic Microwave Sensor). Canadian pole-mounted traffic sensor with multi-zone and multi-target capability for all-weather operation at intersections and for free-way surveillance. Intended to replace inductive loop detectors. Funded by the Ministry of Transportation Ontario (MTO) through EIS, a Canadian company. **Info:** Gabriel Heti, Ministry of Transportation Ontario, 416/235-3454, fax: 416/235-4936.

SAE:

Society of Automotive Engineers. See U.S. Organizations article. **Info:** Arlan Stehney, 412/772-7157, fax: 412/776-0002.

SAFE:

(San Diego Service Authority for Freeway Emergencies). Operates a system of solar powered cellular phones installed along San Diego freeways to facilitate incident reporting.

SAGACE:

An in-vehicle system providing traffic-related information such as parking availability, along with on-board vehicle diagnostics. Parking information is relayed by RDS. Developed by SAGEM for CARMINAT (qv).

San Francisco Bay Area Intermodal Traveler Information System Test:

See TravInfo.

SAP:

See Subsidiary Audio Program.

SCA:

1. (Subsidiary Carrier Authorizations). Term (though not technology) officially obsolete as of 1983 subcarrier deregulation. Now called Broadcast Subcarriers (qv).
2. Subsidiary Communications Allocation. Obsolete term as of 1984.
3. SubChannel Area. Obsolete term.

SCANDI:

See Surveillance, Control, and Driver Information System.

SCATS:

(Sydney Coordinated Adaptive Traffic System). Australian computer-based real-time traffic signal

control system. **Info:** +61-2-285-0285, fax: +61-2-267-6695.

SCOOT:

(Split, Cycle time and Offset, Optimization Technique). Traffic signal control system which allows dynamic signal response to traffic flow. Presently in use in several countries. **Info:** Peek Traffic, 904/562-2253, fax: 904/562-4126 or GEC Traffic, +44-81-207-7109, fax: +44-81-953-5262. See also: TravelGuide in Canadian IVHS Programs article.

SCOPE:

One of five POLIS projects of Drive II. Involves Southampton, UK; Cologne, Germany; and Piraeus, Greece. Focused on urban traffic control and traveler information systems. Emphasizing the use of public transit. **Info:** S. Rupprecht, +49-221-221-1855, fax: +49-221-221-1900.

SDTS:

See Spatial Data Transfer Standard.

SECFO:

(Systems Engineering and Consensus Formation Office). Part of DRIVE I. Coordinated issues among the DRIVE projects. Succeeded by CORD in Drive II.

Selective Availability:

A mechanism for deliberately introducing inaccuracy into GPS broadcasts for civilian applications, as a preventative of misuse by hostile foreign powers. Used on the Standard Positioning Service (SPS, qv) of GPS (qv).

SHRP:

See Strategic Highway Research Program.

SIRIUS:

1. (Système Intègre de Regulation et d'Information des Usagers). French ATMS system to integrate loop detectors and video cameras providing traffic data in the congested Paris area into a data communications network which will detect incidents, predict responses, etc.

2. (Sociopolitical Implications on RTI Implementation and Use Strategies). A DRIVE project on developing pollution advisory software for traffic controllers to support the assessment of environmental standards and reduce pollution. Also developing recommendations for introducing and

phasing RTI policies in different European environments.

SMART:

1. DRIVE project aimed at specification of the most promising application of smart cards (Integrated Circuit Card Systems).
2. See Smart Corridor.
3. (Suburban Mobility Authority for Regional Transportation). Detroit bus dispatching office.

Smart Bus:

1. Transit vehicle equipped with IVHS applications. See U.S. Operational Field Tests article. cf. Smart Vehicle. **Info:** Denis Symes, FTA, 202/366-0242, fax: 202/366-3765.
2. A software enhanced cable.

Smart Card:

Also known as Integrated Circuit Card Systems. Contains both memory and a microprocessor. Capable of receiving, storing, and processing information. Used for many non-IVHS applications, such as phone and gas debit cards. In the context of IVHS, used for electronic toll collection (ETC) and as debit cards for mass transit tickets. Allows distance-based rather than fixed rate fares. Used in the U.S. and Europe. See also: ETTM article, PAMELA, GAUDI, SMART.

Smart Commuter:

Demonstration project in Houston. Testing HOV and ATIS, especially ride-sharing, along the I-45 North and I-10 West corridors. Coordinated with Houston Intelligent System (HITS). Sponsored by the U.S. Department of Transportation.

SMART Corridor:

(Santa Monica Smart Streets Corridor Demonstration Project). See U.S. Operational Field Tests article. **Info:** Verej Janoyan, 213/485-8754, fax: 213/237-0960.

Smart DART:

Project to evaluate the use of smart cards for fare collection on the Wilmington, Delaware transit system. Participants include Delaware DOT, Delaware Transportation Authority, AT&T, Hughes Aircraft, General Motors, and JHK Associates. Funded by the U.S. Department of Transportation under the IVHS Operational Test Program.

Smart Intermodal

The integration of APTS technologies into traffic management to build a multimodal transportation system. Actions range from simply exchanging information between transit dispatch centers and traffic management centers to coordinating traffic signal systems with transit fleet operations.

Smart Traveler:

FTA-funded APTS projects taking place in Bellevue, CA, Houston, and St. Paul. Focus is on providing information more conveniently to transit users. Technology being tested includes Smart Cards, ATIS, and mobile communications for HOV and ride-sharing applications. Part of CAPTS. See U.S. Operational Tests article. **Info:** Ron Boenau, FTA, 202/366-0195, fax: 202/366-3765.

Smart Vehicle:

FTA-funded APTS projects taking place in Ann Arbor, Michigan; Chicago; Portland, Oregon; Denver; and Baltimore. Focus is on applying IVHS technologies directly to transit vehicles. Technology being tested includes AVL, automatic demand-responsive dispatching, HOV verification, and automatic guidance equipment. See U.S. Operational Tests article. **Info:** Denis Symes, FTA, 202/366-0242, fax: 202/366-3765.

SMR:

(Special Mobile Radio). In the 800-900 MHz band. Privately owned.

Society of Automotive Engineers:

(SAE). See U.S. Organizations article. **Info:** Arlan Stehney, 412/772-7157, fax: 412/776-0002.

SOCRATES:

(System of Cellular Radio for Traffic Efficiency and Safety). DRIVE project which is developing the techniques for using digital cellular telephony as a communications medium for transmitting traffic information within Europe's Integrated Road Transport Environment (IRTE). Includes the West Sweden Field Trial in 1991 (See also: TSWS). Major participants include Philips, Bosch, Ford, and British Telecom. Will supply CARIN and TravelPilot systems with traffic information. Continued in Drive II to maintain progress towards a pan-European traffic information and communications system. **Info:** Ian Catling, +44-81-643-4451, fax: +44-81-643-4452.

Spatial Data Transfer Standard:

(SDTS). U.S. federal database information interchange standard for geographic databases. Provides specifications for digital spatial data transfer, data transfer encoding, and definition of spatial features and attributes. Divided into subschemas called profiles.

Spread Spectrum:

Type of radio transmission. Signal is spread over excess bandwidth by means of a special code signal and received by synchronizing the data and receiver with the same code. Reduces interference and jamming, and allows multiple user communications. Originally developed by the military.

SPS:

See Standard Positioning Service.

SSVS:

(Super Smart Vehicle System). See Japanese IVHS Programs article.

Standard Positioning Service:

(SPS). Civilian version of Global Positioning System (qv).

Strategic Highway Research Program:

(SHRP). A research program on highway materials, pavement performance, structures, and operations funded by FHWA and AASHTO, and administered by TRB.

Subsidiary Audio Program:

(SAP). An additional signal found in TV broadcasts. Similar to Broadcast Subcarrier (qv). Proposed as a transmission medium for driver information.

Surveillance, Control, and Driver Information

System:

(SCANDI). A Michigan DOT program started in 1978 which now covers parts of four Detroit freeways. Surveillance from a traffic operations center is accomplished via video cameras and traffic detector loops. Variable message signs (VMS) provide drivers with delay/backup warnings, locations of accidents, suggested bypasses and alternative routes, parking availability, and other information as warranted. SCANDI operations began in 1991. Operations are managed from the Metropolitan Transportation Center, which is also used to monitor future IVHS projects. **Info:** Robert Maki, Michigan DOT, 517/373-2326, fax: 517/373-0167.

TAC:

1. (Transportation Association of Canada). Sponsors IVHS Roundtable. **Info:** 613/736-1350, fax: 613/736-1395.
2. Traffic Advisory Center.
3. (Transportation Advisory Center). Used in DIRECT (qv).
4. (Technical Advisory Committee). Used in ADVANCE (qv).

TAG:

(Technical Advisory Group). National group which formulates a country's position on standards issues before the International Standards Organization (qv) and establishes the national delegation to ISO technical committee meetings. Activities are coordinated by a TAG Administrator (qv).

TAG Administrator:

National organization (typically a standard setting or professional society) which coordinates TAG activities. IVHS America is TAG administrator for U.S. TAG to the ISO (qv) TC 204 committee.

TARDIS:

(Traffic and Roads-DRIVE Integrated Systems). A DRIVE project to establish common functional specifications for systems that are not wholly vehicle-based and that depend on communication between vehicles and roadside infrastructures. Includes investigating the possibility of combining communication for route guidance with that for automatic debiting. Also aims to specify the functional requirements of the IRTE (qv) in order to provide a common framework for technical developments. **Info:** Ian Catling, +44-81-643-4451, fax: +44-81-643-4452.

TELEATLAS:

Dutch/Belgian EUREKA project concerned with the development and electronic publishing of digital map data bases including geographic and economic as well as traffic related information. Coordinated with DRIVE and PROMETHEUS. **Info:** TELEATLAS International, +31-73-429-100, fax: +31-73-424-408.

TeleMap:

Traveler information system providing information via telephone and fax. Offered by Wayfinder Systems in cooperation with the American Auto Association. **Info:** Charles Savage, President, Wayfinder, 914/356-7200, fax: 914/356-7291.

Teletrac:

AVL system for emergency and corporate vehicle and stolen vehicle location. Communication is limited to location and status information. Being tested by Los Angeles Rapid Transit. See also: DART.

Test Site West Sweden:

(TSWS). Operated by the Swedish National Road Administration in Gothenberg, Sweden and vicinity. Its mission is to create a system environment for testing RTI in a realistic traffic context. Testing includes in-vehicle signing systems and automatic debiting. Used as primary test bed for SOCRATES (qv). **Info:** +46-31-772-4075, fax: +46-31-772-4086.

TIGER files:

(Topologically Integrated Geographic Encoding & Referencing files). Computer-based map files built for the Census Bureau to help support the 1990 census. Contains DIME (qv) file data augmented with information for new suburbs and small cities (as of 1987) that were not included in DIME files.

TISC:

(TravTek Information Service Center). See TravTek in U.S. Operational Field Tests article.

TMC:

1. Traffic Message Channel (radio). See RDS.
2. See Traffic Management Center.

TOC:

See Traffic Operations Center.

Tolltag:

Electronic toll collection (ETC) device used on the Dallas North Tollway.

Traffic Management Center:

(TMC). Used in TravTek (See U.S. Operational Field Tests article). Subject of an FHWA project to develop human factors handbooks and a TMC simulator to facilitate TMC development. **Info:** Nazemeh Sobhi, FHWA, 703/285-2907.

TrafficMaster:

A hand-held or dashboard-mounted information system device for drivers using Britain's M25 London Orbital Motorway and interconnecting motorways within a 35-mile radius of London. Issues congestion warnings detected by infrared speed sensors. Information is conveyed to the motorist in map display form. Developed and operated by General

Logistics PLC. Licensed under the United Kingdom's 1989 Road Traffic Act. TrafficMaster has been in operation since September 1990. Westinghouse may deploy the system in the U.S. **Info:** John Abboy, +44-582-450188, fax: +44-582-455277.

Traffic Operations Center:

(TOC). Used in Pathfinder (qv) to collect, analyze and disseminate dynamic traffic information for rapid incident detection and response. Other TOCs have been implemented in San Diego, Sacramento, San Bernadino, Orange County, and San Francisco.

Traffic Reporter:

Interactive ATIS system developed by the University of Washington. Provides travel time estimates and comparisons between HOV and general purpose lanes. Prototype will be tested in the Westlake Mall, downtown Seattle. **Info:** Mark Haselkorn, University of Washington, 206/543-2577, fax: 206/543-8858.

TRANSCOM:

(Transportation Operations Coordinating Committee). An ETTM (qv) project for managing a heavily traveled corridor between northern New Jersey and New York City. See U.S. Operational Field Tests article. **Info:** Matthew Edelman, TRANSCOM Project Manager, 201-963-4033, fax: 201/963-7488.

Translink:

Debit card that can be used on bus and rail in the Bay Area Rapid Transit System. Will be used for parking payment and fare payment on other modes, such as ferries. **Info:** Robert Hueng, 510/464-7784, fax: 510/464-7848.

Transport Canada:

Canadian Federal Ministry of Transportation. **Info:** Lewis Sabounghi, 514/283-0029, fax: 514/283-7158.

Transport Telematics Applications:

(TTA). Alternate European term for IVHS.

Transportation Association of Canada:

(TAC). **Info:** 613/736-1350, fax: 613/736-1395.

Transportation Research Board:

(TRB). Part of the National Academy of Science, National Research Council. Serves to stimulate, correlate, and make known the findings of transportation research. **Info:** TRB, 800/424-9818.

Transportation Resources Processing System:

(TRIPS). An audiotex/videotex-based ATIS in suburban California. Gives information on traffic delays and alternate routes, as well as public transportation. Being tested in California's Smart Traveler Program. Sponsored by Caltrans. **Info:** Patrick Conroy, 916/445-4179, fax: 916/323-8977.

Travel-Aid:

Traffic surveillance and roadway condition warning system for the Snoqualmie Pass in Washington state. Includes variable message signs (VMS) and in-vehicle displays. Focus is on safety in a rural corridor, rather than congestion reduction. Participants include Washington DOT, Farradyne Systems, Inc., Westinghouse, FHWA and NHTSA. Will involve up to 200 vehicles. Estimated cost is \$4.5 million. Also known as Washington State Portable ATIS. **Info:** Peter Briglia, Washington DOT, 206/543-3331, fax: 206/685-0767.

TravelGuide:

See Canadian IVHS Programs article. **Info:** Gabriel Heti, Ministry of Transportation Ontario, 416/235-3454, fax: 416/235-4936.

TravelMatch Express:

Prototype self-service traveler information terminal. Developed by the American Automobile Association (AAA). Includes information on hotels, restaurants, and tourist attractions. Provides point-to-point driving directions using technology from Navigation Technologies. Exists for telephone and fax as TeleMap. **Info:** Kent Taylor, AAA, 407/444-7713, fax: 407/444-7380.

TravelPilot:

An enhanced version of the Etak Navigator (qv) marketed by Bosch using CD-ROM for map storage. Used in PANDORA and Pathfinder. See also: SOCRATES.

TravInfo:

(San Francisco Bay Area Intermodal Traveler Information System Test). One of the projects funded under the FHWA's Field Operational Test program. Will evaluate a multi-modal, region-wide ATIS which collects, integrates and disseminates traffic and transit information. Participants include the California Metropolitan Transportation Commission (MTC), Caltrans, the California Highway Patrol, FHWA, FTA, PATH, and private companies. **Info:** Jeff Georgevich, MTC, 510/464-7820, fax: 510/464-7848.

TravLink:

A Guidestar (qv) project. Interrelated AVL and ATIS system to be used in the Twin Cities in Minnesota. Will allow pre-trip planning from home or office. Audiotex and videotex systems using real-time data will be tested. AVL will also be used to improve fleet management. Participants include FTA, FHWA, MnDOT, Twin Cities Metropolitan Council, Metropolitan Transit Commission, Regional Transit Board, US West, 3M/Rennix. **Info:** James Wright, Chair, Guidestar Transit Innovations Committee, 612/296-8567, fax: 612/296-6599.

TravTek:

See U.S. Operational Field Tests article. **Info:** Don Gordon, AAA, 407/444-8466, fax: 407/444-8416.

Travtek Information Service Center:

(TISC). See TravTek in U.S. Operational Field Tests article.

TRB:

See Transportation Research Board.

TRIPS:

See Transportation Resources Processing System.

TRRL:

(Transport and Road Research Laboratory). A UK organization for RTI research. **Info:** TRRL: +44-344-770-945, fax: +44-344-770-356.

TSWS:

See Test Site West Sweden.

TTA:

See Transport Telematics Applications.

TTA & IVHS World Congress:

Annual Congress for the presentation and discussion of IVHS concepts and deployment activities on an international level. Current participants include Europe, Australia, Japan and North America. First meeting is scheduled for Fall 1994.

TTI:

1. (Texas Transportation Institute). See University Programs article. **Info:** G. Sadler Bridges, Deputy Director, Texas Transportation Institute, 409/845-5814, fax: 409/845-9356.
2. (Technology Transfer Institute). Established as a private company in 1969 to develop international cooperation in the fields of science and technology.

Affiliated with the Japan Technology Transfer Association.

TWC:

See Two-Way Real-time Communication.

Two-Way Real-Time Communication:

(TWC). Used to transmit traffic information and guidance from the infrastructure to vehicles. Various methods are being considered, including RDS-TMC (qv), infrared beacons, and GSM cellular telephone systems. See also: SOCRATES and ALI-SCOUT.

ULIISE:

French version of EURO-SCOUT (qv).

UMTA:

(Urban Mass Transportation Administration). Former name of the Federal Transit Administration. See U.S. DOT Administrations article. **Info:** Sean Ricketson, 202/366-6678, fax: 202/366-3765.

UMTRI:

See University of Michigan Transportation Research Institute.

United States Geological Survey:

(USGS). National mapping agency. Provides coverage of the entire U.S. in both digital and paper maps. Operates Earth Science Information Centers. **Info:** Earth Science Center, 703/648-6045 or 800/USA-MAPS.

United States Council for Automotive Research:

(USCAR). Umbrella consortium formed by Chrysler, Ford, and GM to oversee the activities of existing research consortiums.

University of Michigan Transportation Research Institute:

(UMTRI). Conducts research on motor-vehicle injury and other transportation-related topics such as ATMS and ATIS. **Info:** Patricia Waller, Director, 313/936-1046, fax: 313/936-1081.

Urban Traffic Control System (UTCS):

1. System will be developed for traffic signal control. Projected completion date is August, 1996. Participants include FHWA, KLD Associates, and other contractors. **Info:** Henry Lieu, FHWA, 703/285-2410.

2. See Japanese IVHS Programs article.

USCAR:

See United States Council for Automotive Research.

USGS:

See United States Geological Survey.

UTCS:

See Urban Traffic Control System.

Variable Message Sign:

(VMS). Sign which allows variable input. Not restricted to a fixed library of messages. Used in ATMS and ATIS. See also: CMS, COMPASS, GEMINI, INFORM, MAGIC, SCANDI, TravelAid.

Vehicle On-board Radar:

(VORAD). Experimental low-powered radar unit to support collision avoidance. May be connected to a vehicle's cruise control as part of a platooning system or to maintain a safe driving interval when following a slower vehicle. Greyhound has purchased 2,500 units to equip its entire intercity bus fleet, the first large-scale commercialization of AVCS. See also: AVCS. **Info:** Paul Bonchard, 619/674-1200.

Vehicle/Roadside Communications:

(VRC). Used in ETSM, AVI, CVO and ATMS. Technologies include transponders, readers, cellular telephone, and beacons, among others.

VIC:

(Vehicle Inter-Communication). DRIVE project. Objective is to specify protocols for real-time vehicle-to-vehicle communication, with possible AVCS applications. **Info:** Mme. F. Lucazeau, +33-1-3481-4941, fax: +33-1-3481-482.

VICS:

(Vehicle Information Communication System). See Japanese Programs article. **Info:** Yasuhiko Kumagai, +81-3-3592-5492, fax: +81-3-3423-5680.

VIGIL:

An automatic incident and congestion detection system that uses video monitoring on selected sections of roadway to project traffic conditions over the entire roadway. Developed at the University of Valencia. To be tested as part of INVAID II in Drive II. **Info:** Sergio Guillen, +34-6-386-4565, fax: +34-6-386-4568.

VITA:

(Vehicle Identification and Transaction Aid)
European specifications for electronic toll collection (ETC).

VMS:

See Variable Message Sign.

VORAD:

See Vehicle On-board Radar.

VRC:

See Vehicle/Roadside Communications.

Washington State Portable ATIS:

See TravelAid.

WAVM:

See Wide Area Vehicle Monitoring and Road KIT.

WGS-84:

See World Geodetic System 1984.

WARC:

See World Administrative Radio Conference.

Wide Area Vehicle Monitoring:

(WAVM). An application of satellite communications and navigation technologies for automatic vehicle location (AVL), automatic vehicle identification (AVI) and two-way communications. Originated by Ministry of Transportation Ontario (MTO) and produced in cooperation with the private sector. Introduced commercially as Road KIT (qv). North America-wide satellite communication service should be provided by 1994-5.

WIM:

(Weigh In Motion). Technology for determining vehicle weight without requiring the vehicle to stop at a scale. Uses automatic vehicle identification (AVI) and technologies which measure the dynamic tire forces of a moving vehicle and estimate the corresponding tire loads of the static vehicle. See also: AVI, Crescent, Guidestar, HELP.

World Administrative Radio Conference:

(WARC). Sponsored by the International Telecommunications Union, an agency of the United Nations. Defines the activities permitted on the various radio channels. Involved with CCIR. See also: CCIR.

World Geodetic System 1984:

(WGS-84). Standard, widely accepted scheme for laying out longitude and latitude lines on the globe that attempts to compensate for the earth's irregularities of shape. Used by GPS (qv) systems.