

Federal Highway Administration ■ TURNER-FAIRBANK HIGHWAY RESEARCH CENTER

Office of Operations R&D

The Office of Operations Research and Development (R&D) is making major contributions to help the Federal Highway Administration (FHWA) meet its mobility, safety, and security goals through completed or planned products and activities with the following strategies:

Implementing an Integrated Intelligent Transportation System (ITS) Infrastructure

Traffic Analysis Toolbox

The Traffic Analysis Toolbox is a set of documents that provides guidance on the role and use of traffic analysis tools in transportation analyses. “Traffic analysis tools” is a collective term used to describe a variety of software-based analytical procedures and methodologies that support different aspects of traffic and transportation analyses. These include methodologies such as sketch-planning, travel demand modeling, traffic signal optimization, and traffic simulation. Documents currently in the toolbox include *Volume I: Traffic Analysis Tools Primer*, *Volume II: Decision Support Methodology for Selecting Traffic Analysis Tools*, *Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*, and *Volume IV: CORSIM Application Guidelines*.

Adaptive Control Systems

FHWA in collaboration with the private sector has developed three Adaptive Control Systems (ACS) software packages to automatically generate new signal timing plans to respond to traffic flow changes in real time. Prototype algorithms were evaluated in Reston, VA; Tucson, AZ; and Seattle, WA. The software prototypes showed positive results, and the deployment of the ACS packages is underway.

ACS Lite

FHWA in conjunction with manufacturers of traffic control and signal equipment have developed and field tested the ACS Lite software. ACS Lite is a low-cost control software designed as an original or a retrofit for closed-loop systems. The field tests show that the software, responding to changing traffic conditions, improves system performance while reducing user costs. FHWA, in partnership with Econolite, PEEK, Eagle, and McCain, developed and tested the software in systems manufactured by these vendors and arranged for the software to be available from these manufacturers.

A second phase to improve control logic, user interfaces, data archiving, and database development is underway. FHWA will perform laboratory testing of these enhancements prior to release to the four participating entities.

Traffic Estimation and Prediction System

The Traffic Estimation and Prediction System (TrEPS) software will provide the predictive information needed for proactive traffic control and traveler information. TrEPS will facilitate and enhance planning analysis, operational evaluation, and real-time advanced transportation systems operation. Laboratory evaluation of the TrEPS prototypes is complete, and the planning version of the software is available from the University of Florida's McTrans Center. The State of Texas will test the real-time version of the software in Harris County, TX, in the near future.

Strategic Work Zone Analysis Tools

FHWA under the Strategic Work Zone Analysis Tools (SWAT) program is developing a suite of four tools to facilitate the analysis of work zone strategies to reduce delay to motorists, identify viable mitigation strategies, consider the costs of various options, and provide guidance on establishing work zone performance-based contracting specifications. The first software tool, QuickZone, is a spreadsheet package available to analyze the traffic impacts of work zones. QuickZone also features partnerships with up to eight jurisdictions, allowing customization of the software for local needs. The software is available from the University of Florida's McTrans Center. The planned work for this program includes an economic analysis package that will permit a decision maker to include motorists' costs in the overall decision process. The visualization tool will permit the designers to “drive” the work zone, and TrEPs linkage will quantify the traffic diversion due to congestion from work zones.

Traffic Management Tools—Handbooks

Researchers are working to update a series of handbooks covering traffic detectors, traffic signal control systems, and freeway management. These handbooks will help traffic managers and practitioners use equipment and other technologies for efficient operation of traffic corridors and networks. The revised *Traffic Detector Handbook, Third Edition*, is available.

Integrated Corridor Management

The greatest concentration of highway congestion is often along critical transportation corridors that link residential areas with business centers, sports arenas, and shopping areas. The U.S. Department of Transportation (USDOT) has launched the Integrated Corridor Management (ICM) Initiative to optimize all transportation corridor networks through proactive, integrated, and multimodal management and operation among all corridor transportation agencies. With ICM, transportation professionals manage the transportation corridor as a multimodal system rather

than taking the more traditional approach of managing individual assets.

The implementation of ICM is a natural evolution of current Intelligent Transportation Systems (ITS) deployment and transportation operations practices. USDOT is conducting targeted research in the areas of ICM systems integrations and ICM modeling and simulation tools development. Both public and private entities are refining the existing transportation modeling and simulation tools for analysis of ICM applications. These tools will enable transportation decision makers and operators to optimize multimodal corridor operations in real time and to assess the impacts and benefits of individual corridor strategies and approaches prior to implementation.

Exploratory Advanced Research Program

The FHWA Exploratory Advanced Research (EAR) Program is a new initiative to explore research topic areas that could result in revolutionary improvements to our Nation's surface transportation system. FHWA and its partners are exploring a combination of project-based work, scanning and convening efforts, and in-house research which will result in advancements in traffic control, vehicle control, and the further integration and automation of vehicle and roadway components.

Developing and Implementing Technologies Focusing on Weather, Security, and Lifesaving

Weather-Related Impacts on Traffic Operations Study

Adverse weather conditions can dramatically impact the operation and quality of traffic flow. With the advent of advanced traffic management systems, there is an opportunity to develop traffic management strategies that can minimize the negative weather-related impacts on traffic operations. The primary objective of this study is to identify how weather events impact traffic operations. Efforts are underway also to incorporate the TrEPS

algorithm into weather-related strategies to assess the adverse impacts, diversions, and other weather-related phenomena.

Cooperative Intersection Collision Avoidance Systems Initiative

The Cooperative Intersection Collision Avoidance Systems (CICAS) is a major USDOT intelligent transportation systems (ITS) initiative. In partnership with automotive manufacturers, State and local transportation departments, and universities, CICAS will develop intersection safety countermeasures to reduce crashes caused by red light and stop sign violations. The countermeasures will be "cooperative" in that they will take advantage of wireless communications between the vehicle and roadside, enabled by vehicle infrastructure integration (VII) technologies. FHWA will develop the CICAS countermeasures followed by lab testing prior to a decision to conduct field operational tests. If these tests are successful, the goal is to support deployment of these systems at our Nation's intersections and within the U.S. vehicle fleet.

ITS Applications for Communications

This work provides program support and assistance for developing standards and analyzing the application of Dedicated Short-Range Communication (DSRC) on the 5.9 GHz frequency band to support transportation safety and mobility initiatives. This effort includes possible uses of DSRC to support vehicle-to-infrastructure communications to enable enhanced intersection collision avoidance systems and other cooperative safety and mobility services.

Clear Roads Pooled Fund Research Program

The Clear Roads pooled fund research program, currently made up of 13 State transportation departments, has initiated a national winter safety campaign to reduce crashes and fatalities on our Nation's highways. With the tremendous support and assistance from volunteer public information officers in many snow-belt states, Clear Roads has developed a theme and outreach

materials slated for distribution to interested States. The Clear Roads Technical Oversight Committee is hoping that, "Ice and Snow, Take it Slow!" will become as familiar and influential to our drivers as the "Give 'em a brake" campaign used during summer construction.

Developing and Implementing a Reliable Nationwide Differential Global Positioning System

Base Stations for the Nationwide Differential Global Positioning System

This project is converting signal stations transferred from the U.S. Department of Defense to the USDOT into base stations for the Nationwide Differential Global Positioning System (NDGPS). It provides additional coverage and increased position location accuracy for vehicle-based and stationary NDGPS receivers. NDGPS is an important enabling technology that provides accurate location information for ITS applications such as transit fleet management, in-vehicle navigation, and automated collision notification systems. Ninety-seven percent of the Nation is covered by single coverage, and 67 percent by dual coverage that provides 1- to 3-meter accuracy.

FHWA will serve as a lead agency (as defined by 40 CFR Part 1 508.16) for all National Environmental Policy Act (NEPA) matters regarding the implementation of the NDGPS service. FHWA implementing regulations (23 CFR 771) for environmental impact analysis and procedural compliance with NEPA will be used. FHWA will prepare NEPA documents for the proposed NDGPS service, as well as follow-on site-specific analyses and documentation that may be required for future implementation of the NDGPS service.

High Accuracy NDGPS

FHWA is instrumenting and testing three NDGPS stations to explore the potential for even higher accuracies in the range of 100 millimeters horizontal or better.

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