Office of Operations R&D

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*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 provide 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*, and Volume III: *Guidelines for Applying Traffic Microsimulation Modeling Software*.

Adaptive Control Systems (ACS)

Three ACS software packages were developed in collaboration with the private sector to automatically generate new signal timing plans to respond to traffic flow changes in real-time. Prototype algorithms were evaluated in Tucson, AZ, and Seattle, WA. Development of an ACS "Lite" architecture, a reduced-scale version of ACS that will support the needs of smaller and rural communities, is also underway.

Advanced Transportation Controller and the Controller Interface Device (CID)

This project developed the next generation of traffic control hardware (Model 2070) that will support multiple advanced transportation applications. In coordination with the American Association of State Highway and Transportation Officials, the National Electrical Manufacturing Association, and the Institute for Transportation Engineers, specifications for advanced transportation controllers, cabinets, and application program interfaces were completed in FY 2000. The CID was also developed to enhance optimization of new signal timing/phasing onsite and is being delivered through the private sector.

Traffic Estimation and Prediction System (TrEPS)

The 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 was completed in March 2000. Field experiments are underway, and TrEPS products will be available soon.

Strategic Work Zone Analysis Tools (SWAT)

The SWAT program is developing a suite of four tools to facilitate the analysis of work zone strategies to reduce delay to the motorist, 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 them to customize the software for local needs.

Traffic Software Integrated System (TSIS)

TSIS is a collection of software tools that allow traffic engineers to simulate and evaluate the impacts of a wide range of operational improvements to a network of freeways and surface streets through output measures and animation. An enhanced version of TSIS (version 5.1), with a graphical input editor, is available.

Next Generation Traffic Simulation (NGSIM)

Work on developing new microscopic traffic simulation modeling technologies began in FY 2000. This included a broad “Request for Information” and stakeholder forums to discuss both technical and nontechnical issues with developing these new technologies. As a result, FHWA is taking a new role in simulation development as a market facilitator to stimulate the commercial market in an environment of public-private coordination. NGSIM algorithm work is underway.

Traffic Management Tools—Handbooks

Work to update a series of handbooks covering traffic detectors, traffic signal control systems, and freeway management is underway. These handbooks will help traffic managers and practitioners use equipment and other technologies for efficient operation of traffic corridors and networks.

Focusing on Weather, Security, and Lifesaving Technologies

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 could minimize the negative weather-related impacts on traffic operations. The objectives of this study were to identify how weather events impact traffic operations, assess the sensitivity of weather-related traffic parameters in the CORridor SIMulation (CORSIM) traffic microsimulation model, develop guidelines for using the CORSIM model to account for the impacts of adverse weather conditions on traffic operations, and identify gaps and recommend future research related to CORSIM's ability to model weather events.

Cooperative Intersection Collision Avoidance Systems (CICAS) Initiative

The Cooperative Intersection Collision Avoidance Systems (CICAS) initiative is one of nine intelligent transportation systems (ITS) initiatives recently launched by the U.S. Department of Transportation's (USDOT) ITS Management Council. In partnership with automotive manufacturers and State and local DOTs, the CICAS initiative will attempt to determine the optimal combination of infrastructure and in-vehicle systems needed to address the full range of intersection crash problems. The CICAS initiative will integrate two types of intersection collision avoidance systems—infrastructure-only and vehicle-based. Infrastructure-only systems use roadside sensors and processors to warn drivers of intersection hazards by sending critical information via signals or signage along a roadway. Vehicle-based systems warn drivers using sensors and processors housed within the vehicle. Infrastructure-vehicle cooperative systems, which comprise the bulk of the CICAS future research, unify the two types of systems to give drivers the best possible information to help avoid a collision. The initiative will culminate in a series of coordinated field operational tests, which will lead to an improved understanding by highway users of the CICAS initiative's safety benefits. If these tests prove successful, the next phase would be to support the deployment of these systems at our Nation's most hazardous 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.

Road Weather Management Program

This effort will develop a functional prototype winter-weather Maintenance Decision Support System (MDSS) to improve information systems and provide tools to help maintenance managers make better highway operations decisions. Using the MDSS, these managers will be able to operate and maintain the highway system better and with greater efficiency under adverse weather conditions. A prototype MDSS has been released to the private sector for further development.

Developing and Implementing a Reliable Nationwide Differential Global Positioning System (NDGPS)

Base Stations for NDGPS

This project is converting signal stations transferred from the U.S. Department of Defense into base stations for the 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, or automated collision notification systems. Seventy percent of the Nation is currently covered by NDGPS that provides 1- to 3-meter accuracy.

High-Accuracy NDGPS

Two NDGPS stations are being instrumented and tested to explore the potential for even higher accuracies in the range of 10 to 20 centimeters.

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