U.S. Department
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**Research and
Innovative Technology
Administration**

TO: **Jack Pervenstein, Technical Advisor for National Institute of Technology and Standards**

FROM: **Curtis J. Tompkins, Acting Associate Administrator for Research, Development, and Technology**

SUBJECT: **U.S. DOT's Technology Transfer (T2) Report for FY2010**

Every year, the Department of Commerce (DOC) submits a Federal Laboratory T2 Fiscal Year Summary Report to the President and the Congress in accordance with 15 USC Sec 3710(g)(2) summarizing the implementation of technology transfer authorities established by the Technology Transfer Commercialization Act of 2000 (P.L. 106-404) and similar legislation. This report summarizes U.S. DOT's information for DOC's Fiscal Year 2010 Summary Report.

Please submit questions pertaining to this report to Santiago Navarro at santiago.navarro@dot.gov or 202-366-0849.

Attachment

cc:
Department of Commerce
National Institute of Technology and Standards

U.S. Department of Transportation

Technology Transfer – FY 2010

Research and Innovative Technology Administration's Office of Research, Development, and Technology

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Introduction

The U.S. Department of Transportation (DOT) is the federal steward of the nation's transportation system. DOT consists of multiple modal Operating Administrations, which carry out mission-related Research, Development and Technology (RD&T) programs in support of the DOT strategic goals: Safety, Livable Communities, State of Good Repair, Economic Competitiveness, and Environmental Sustainability. In 2004, the Research and Innovative Technology Administration (RITA) was charged by its enabling legislation[1] with coordination of DOT-wide RD&T and technology transfer activities.

Technology Transfer activities are executed by the following DOT laboratories: Federal Aviation Administration's (FAA) William J. Hughes Technical Center (Atlantic City, NJ), Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center (McLean, VA), and Research and Innovative Technology Administration's (RITA) John A. Volpe National Transportation Systems Center (Volpe Center, Cambridge, MA). Representative technology transfer successes in 2010 include the following:

1. FAA's Federal laboratory: William J. Hughes Technical Center

The FAA's Federal laboratory is the William J. Hughes Technical Center located at the Atlantic City International Airport, New Jersey. The Technical Center is one of world's leading aviation engineering, research, development and testing facilities, and serves as the national scientific test bed for the FAA.

The FAA Technology Transfer Program at the laboratory provides an opportunity for government, academia, State and local governments, and industry to access our advanced technologies, state-of-the-art facilities, and the expertise of our highly skilled scientists and engineers. This access benefits the FAA and the collaborating party to develop products and technologies that can play an active role in maintaining our world leadership in aviation.

Many CRADAs and other agreements have been established between the FAA and its partners, which are examples of the synergistic benefits of FAA's Technology Transfer Program.

- Boeing Corporation established the National Airport Pavement Test Machine at the William J. Hughes Technical Center.
- Engineered Arresting Systems Corporation developed a soft ground arrestor system using light weight cellular concrete to safely stop aircraft from going beyond the runway end. This technology has been deployed at many airports to date and has been successful at saving lives with little damage to the aircraft.
- Insitu, Inc. is to establish a regulatory-based Safety Management System approach for studying technical issues of Unmanned Aircraft Systems integration into the National Airspace System.

[1] P.L 108-426, November 30, 2004 (118 STAT. 2423).

2. FHWA working with State DOTs on Pavement Rehabilitation: CA4PRS Get In, Get Out, Stay Out

As state transportation agencies balance the need to rehabilitate and reconstruct existing highways with the goals of reducing congestion and improving safety, accelerated construction is more important than ever. A new software tool, Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS), assists agencies in accelerating construction. The software was developed under an FHWA pooled fund study by the Institute of Transportation Studies at the University of California, Berkeley. The states of California, Minnesota, Texas, and Washington participated in the study. Through the pooled fund study, these states now have access to the CA4PRS and its technical support.

CA4PRS can be used to identify optimal highway rehabilitation strategies that balance the construction schedule with projected inconvenience to drivers and transportation agency costs. The program's scheduling module estimates project duration, while its traffic module quantifies the impact of work zone lane closures on the traveling public. The cost module estimates total project cost (including construction, traffic handling, and supporting costs).

States that have used CA4PRS successfully to date include California, Utah, and Washington State. The California Department of Transportation (Caltrans) used it in the design stage of a project on I-15 in Ontario to select the most efficient rehabilitation strategy for the roadway. Caltrans' use of the software on a previous project on I-15 in Devore resulted in a 25 percent reduction in construction and traffic control costs, for a total savings of $6 million, as well as saving $2 million in road user costs. "A key benefit of using CA4PRS is that it allows us to get in and get out faster, reducing both the length of construction projects and traffic congestion," said Michael Samadian of Caltrans. http://www.fhwa.dot.gov/research/deployment/ca4prs.cfm

3. Setting Aggressive New Fuel Economy and Greenhouse Gas Emissions Standards

The National Highway Traffic Safety Administration (NHTSA), working with the Environmental Protection Agency (EPA), has finalized Corporate Average Fuel Economy (CAFE) standards as part of a new harmonized national program designed to reduce fuel consumption and greenhouse gas emissions. The standards will apply to the new light-vehicle fleet from 2012 through 2016.

NHTSA estimates that the new CAFE standards will result in benefits totaling more than $180 billion over the lifetime of the more fuel-efficient fleet, including:

- Cost savings to consumers, from reducing future fuel needs by 61 billion gallons;
- Prevention of 654.7 MMT of CO_2 emissions.

NHTSA expects that, by any measure, total benefits of the new standards will far outweigh total costs.

RITA's Volpe Center supports NHTSA in CAFE rulemaking, in part through managing the CAFE Compliance and Effects model, also known as the Volpe model. For more information, visit:

- Standards for Model Years 2012-2016: EPANHTSA Joint Final Rule (PDF, 188 KB).
- Related December 2009 *Volpe Highlights article*, Joint Rule Proposed for New Fuel Economy Standards.
  (Sponsored by NHTSA)

4. Award-Winning Expansion of Air Traffic Control in the Gulf of Mexico

FAA's Automatic Dependent Surveillance-Broadcast (ADS-B) team, which includes RITA/Volpe Center staff, was recognized by FAA Administrator J. Randolph Babbitt and the Helicopter Association International (HAI) for successfully expanding air traffic control (ATC) services in the Gulf of Mexico region. ADS-B is one of the major programs that will enable NextGen, the ongoing, wide-ranging transformation of the National Airspace System.

The team has been working to ensure that aircraft over the Gulf can take advantage of the full array of ATC services available from Houston Air Route Traffic Control Center. RITA's Volpe Center was instrumental in the selection of, negotiation for and deployment on petroleum exploration and production platforms. With ADS-B radio stations, VHF communications transmitters and receivers, and an array of weather sensors located on these platforms, significantly reduced aircraft separations will be achieved.

Early in 2010, Administrator Babbitt traveled to Texas to announce that Houston air traffic controllers are beginning to use ADS-B in the Gulf of Mexico and to recognize FAA and Volpe Center staff for successfully attaining the initial operating capability target date for ADS-B service in the area. Matthew Maki of the Volpe Center's Communication, Navigation, and Surveillance (CNS) and Traffic Management Systems COI participated in the awards ceremony.

At HAI's annual conference, the Volpe Center team accepted the *Salute to Excellence* group award, which recognized the Volpe Center support for this effort, and Mr. Maki received an individual award for Meritorious Service in recognition and appreciation of outstanding service to the international helicopter community. *(Sponsored by FAA)*

5. ITS Deployment Analysis System (IDAS)

The Problem: Transportation planners use software models to get answers to key questions about the future, such as: "What benefits can I expect if I make this particular investment?", "Will those benefits outweigh the costs?", and "Which scenario would give me the most value for my money: doing a lot, doing only a little, or doing nothing?" Most models, however, forecast using average conditions, such as a typical weekday with good weather and no traffic incidents, and ignore the extreme cases, such as a holiday weekend with a severe snowstorm and multiple crashes on the freeway. Intelligent Transportation Systems (ITS) and other operational improvements excel at tackling those extreme conditions, making the bad traffic days more like the average. The tools that many transportation planners use to determine benefits and costs often miss the benefits offered by ITS and improved operations.

The Opportunity: ITS Deployment Analysis System (IDAS) (http://idas.camsys.com/) was developed to address this need. IDAS estimates the benefits and costs of over 60 different types of ITS technologies and operational improvements, either working individually or in combination with each other. IDAS operates as a post-processor to travel demand models. In other words, transportation planners take the outputs of their travel demand models and input them into IDAS. IDAS then outputs the benefits and costs of ITS and operational improvements under all types of conditions, from typical to extreme. The benefits estimated include reduced travel time, reduced delay, reduced crashes, reduced costs, increased throughput, and increased travel time reliability. U.S. DOT sponsored the development, maintenance and support of IDAS, which is available for purchase for $795 through the McTrans Center for Microcomputers in Education (http://mctrans.ce.ufl.edu/).

The Results: IDAS has been used successfully in dozens of studies nationwide, including analysis of both ITS and operational improvements, as well as more traditional capacity and freight improvements. Nathan Masek of the Mid-Region Council of Governments in Albuquerque, NM used IDAS to evaluate the costs and benefits of individual ITS projects, and the results were surprising: a benefit-to-cost ratio of 10:1 for large projects, compared with 2:1 or 3:1 for smaller projects. He said that IDAS "provided us a clear, comparative mechanism to evaluate benefits of projects that aren't necessarily apparent or considered in the normal project programming and prioritization process."

6. Next Generation Simulation (NGSIM)

The Problem: Operation of roadways is growing more and more complex. Today's transportation professionals are faced with evaluating many diverse and comprehensive solutions to address congested transportation facilities. Instead of simply deciding how many lanes to design for a new freeway or how long the turn bays should be at a traffic signal, practitioners are now required to analyze such complex strategies as ramp metering, adaptive traffic signal control, complicated weaving patterns, multimodal corridor management plans and congestion pricing. Traffic simulation analysis tools can help evaluate these complex solutions by modeling real-world transportation networks on a system-wide scale that is difficult with more traditional methods. It is critical these traffic simulation tools be accurate and trustworthy, so that they can be used to make sound investment decisions.

The Opportunity: U.S. DOT began the Next Generation Simulation (NGSIM) (ngsim.fhwa.dot.gov) program in a new role of market facilitator that manages public resources in a focused way. The goal is to influence and stimulate the commercial modeling market by fostering an environment of public-private coordination. This new role has resulted in a unique public-private partnership between the U.S. DOT, transportation consulting companies, university researchers and commercial simulation software developers. U.S. DOT is not developing software, but instead is fostering conditions under which the software is developed by private vendors. The government's role is one where a core of open behavioral algorithms has been developed, along with supporting documentation and validation data sets that describe the movement and interaction of multimodal travelers and vehicles within the roadway system.

Four core algorithms (freeway lane selection, cooperative/forced freeway merging, arterial lane selection, and oversaturated freeway flow) and four data sets (I-80 in Emeryville, CA; U.S. 101 and Lankersham Boulevard in Universal City, CA; and Peachtree Street in Atlanta, GA) have been developed under NGSIM.

The Results: Commercial software developers are showing great interest in NGSIM. PTV (www.vissim.us), Traffic Simulation Systems (www.tss-bcn.com) and Quadstone (www.paramics-online.com), developers of the traffic simulation models VISSIM, AIMSUN and Paramics, respectively, have incorporated the freeway selection algorithm into their products on a test basis and validated the algorithm, meaning that the results of the simulation can be trusted as an accurate forecast. Over the coming year, responsibility for continued development, maintenance and support of NGSIM will be transferred from the government to an Open Source community. In an Open Source community, software is distributed to a community's members, with membership open to all interested individuals, many of whom contribute to the development, maintenance and support of that software. NGSIM's many developers and users applaud NGSIM's transition to an Open Source environment and see it as key to making the software even more useful. Nagui Rouphail, director of the Institute for Transportation Research and Education at North Carolina State University, says that NGSIM "represents a model public-private partnership that has yielded demonstrable benefits for both the public and private sectors."

7. Compliance, Safety, Accountability (CSA) for large trucks and buses: a new direction to help save lives

The Federal Motor Carrier Safety Administration's (FMCSA) Compliance, Safety, Accountability (CSA) Program is a novel way to carry out its safety mission of reducing large truck and bus crashes, injuries, and fatalities on our nation's highways. It enables the Agency and its State Partners to better target high risk motor carriers for early intervention, and to assess the safety performance of a much larger segment of the motor carrier industry. RITA's Volpe Center developed the entire CSA Program, which consists of two technology elements: the Safety Measurement System (SMS), and the CSA Interventions. SMS organizes violation and crash data associated with a given motor carrier into seven behavioral areas, called Behavior Analysis and Safety Improvement Categories (BASICs): Unsafe Driving, Fatigued Driving (Hours-of-Service), Driver Fitness, Controlled Substances/Alcohol, Vehicle Maintenance, Cargo-Related, and a Crash Indicator. SMS then generates "Alerts" for motor carriers whose violations in a given behavioral area, or crashes, indicate that they should be candidates for CSA Intervention. Every month, the CSA SMS evaluates centrally collected data describing violations of the Federal Motor Carrier Safety Regulations and commercial motor vehicle crashes, in order to: assess the relative safety performance of regulated truck and bus companies (motor carriers); determine the specific safety problems exhibited by a motor carrier; monitor whether safety problems are improving or getting worse; and identify candidates for interventions. *(Sponsored by FMCSA)*

The CSA Intervention tools can reach more carriers to improve unsafe behaviors early on: they range from warning letters for carriers with emerging problems to Onsite Comprehensive Investigations for carriers with recurring safety problems, and enable officials to move beyond fact-finding and simple verification of problem areas to a deeper exploration of why the violations occurred and how they can be corrected in order to save lives on the road.

Table 1 DOT Technology Transfer summary on: CRADAs, inventions, patents, and other

Table	Description	*Fiscal Year*				
		2006	2007	2008	2009	2010
A	**Collaborative Relationships for Research and Development**					
	• CRADAs, total active in the FY	59	36	23	22	22
	- New, executed in the FY	6	7	6	7	0
	▪ Traditional CRADAs, total active in the FY	59	36	23	0	0
	▪ Non Traditional CRADAs, total active in FY	0	0	0	0	0
	▪ Other collaborative R&D relationships	0	0	0	2	2
B	**Invention Disclosure and Patenting**					
	• New inventions disclosed in the FY	3	2	3	3	1
	• Patent applications filed in the FY	3	2	0	1	1
	• Patents issued in the FY	0	3	2	1	1
C	**Profile of Active Licenses**					
	• All licenses, number total active in the FY	5	5	5	2	3
	▫ New, executed in the FY	0	0	0	0	0
	▪ Invention licenses, total active in the FY	5	1	5	3	3
	▫ New, executed in the FY	4	0	0	0	0
	▪ Other IP licenses, total active in the FY	0	0	0	0	0
D	**Characteristics of licensing bearing Income**					
	• All income bearing licenses, number	4	4	4	3	3
	▫ Exclusive	3	2	1	3	3
E	**Income from Licensing (thousands)**					
	• Total income, all licenses active in FY	$22	$34	$18	$44	$17
	▪ Invention licenses	$22	$34	$18	$44	$17
	▪ Other IP licenses, total active in the FY	$0	$0	$0	$0	$0
	• Total Earned Royalty Income, (ERI)	$22	$34	$9	$34	$3