TRB

# Products of SHRP 2 STRATEGIC HIGHWAY RESEARCH PROGRAM Reliability Research

*The second Strategic Highway Research Program (SHRP 2) focuses for a short time on a small number of large problems that confront transportation agencies: congestion, crashes, and the need to rebuild aging infrastructure. The mission is to strategically advance innovative ways to plan, renew, operate, and improve safety on the nation's highways. To achieve this, research focuses on four related areas, including driving behavior, highway capacity, travel time reliability, and rapid renewal methods.*

Travel time reliability is a relatively new, driver-focused way of looking at nonrecurring congestion. SHRP 2 Reliability research will result in a variety of products including performance measures, guidance on building reliability monitoring systems, an analysis tool for design treatments, a guide for improving the capability to manage and operate a highway system, messages and formats to communicate traveler information about reliability, training on incident management, and new ways of addressing nonrecurring congestion in planning and programming. Strategies to continually improve organizations to enhance reliability and to raise awareness among executive and political leadership are also addressed. Many of these products will prove cost-effective in helping states and local governments reduce traffic congestion and improve mobility.

| PRODUCT | IMPACT ON PRACTICE | STATUS OF RESEARCH PRODUCT |
|---|---|---|
| **Data and Analysis for Travel Time Reliability Performance**<br>Selecting effective strategies for operating and managing highway systems to improve travel time reliability and reduce congestion requires appropriate data types, measurement methods, and analysis tools. These products advance our ability to collect, measure, monitor, model, and analyze reliability data. | | |
| **Guide to Establish Monitoring Programs for Travel Time Reliability**<br>Practitioners guide<br>Methods for extracting the variability in travel time for segments and routes and for identifying how the variability is affected by such factors as incidents, weather, and work zones.<br>New techniques for reporting traffic detector data combined with sources of nonrecurring congestion | The guide can help transportation agencies develop systems (hardware, software, and strategies) to monitor travel time reliability and convey information to customers and other data users. Data from traffic monitoring systems is necessary to improve travel time reliability and mobility in general. | Research completes mid 2012. Report and practitioners guide available online in late 2012. (Project L02)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Measurement and Modeling Travel Time Reliability**<br>A method for portraying the distribution of travel times applicable to one or more time periods (e.g. peak and off-peak)<br>Recommendations for addressing travel time reliability in driver behavior studies | These "multi-modal" or "multi-state models are useful to depict travel time distributions obtained from traffic monitoring systems or to serve as predictive models for planning or other type of analysis. The modeling approach can be used to separate out different sources of non-recurring congestion that affects travel times. | Research completed. Report S2-L10-RR-01: *Feasibility of Using In-Vehicle Video Data to Explore How to Modify Driver Behavior That Causes Nonrecurring Congestion* is available online and in the TRB bookstore. (Project L10)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Urban Freeway Models for Operations Strategies**<br>Analytic procedures to determine effects of congestion mitigation strategies<br>Comprehensive dataset for future research<br>Recommended reliability metrics | This foundational research establishes the basis for predicting the effect of strategies to improve reliability. | Research completed. Report with data models and analysis of reliability improvements is in publication. Expected in print by mid 2012. (Project L03)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Guidelines for Incorporating Travel Time Reliability into Travel Models**<br>Explains how traffic operations and planning models can reflect factors that affect travel time reliability and generate reliability measures as an output | The research will provide guidance on the incorporation of reliability into simulation models (especially micro-and meso-) and demand models, as well as address the feedback between the two. There will be a new ability to reflect scenarios that contribute to reliability and to address the variability of travel times for trip trips between origins and destinations. | Research completes September 2012. (Project L04)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Economic Evaluation Models to Assess Improvements in Travel Time Reliability**<br>Syntheses on economic valuation of reliability<br>Findings on novel approach to valuing travel time reliability | A multi-pronged research approach will provide agencies with estimates of the economic value of improvements in travel time reliability to assess the effectiveness of strategies for reducing the variability. | Research projects in various stages of completion and publication (L05, L07, L11, L14, C04)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |

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| **Data and Analysis for Travel Time Reliability Performance** *(continued)* | | |
| **Communicating Traveler Information and Estimating its Value to Travelers**<br><br>Guide to effective traveler information<br><br>Utility functions to understand how travelers value and respond to reliability information | Translating reliability metrics into terms that travelers can use helps drivers adapt to traffic conditions. Traffic information providers can better understand how traffic patterns change as a result of travel information about reliability. The utility functions monetize reliability information and will help agencies prioritize traveler information as an operational strategy to improve reliability. | Research expected to be completed in fall 2012 (Project L14)<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Reliability in Planning, Programming, and Geometric Design**<br><br>Travel time reliability is not yet a mainstream focus of transportation planning, programming, or geometric design, but Reliability research is developing the means—including technical procedures—for state DOTs and metropolitan planning organizations to fully integrate mobility and reliability performance measures and strategies into the transportation planning and programming processes. | | |
| **Handbook for Incorporating Reliability Performance Measures into Transportation Planning and Programming**<br><br>Handbook describes how travel time reliability can be more systematically addressed in various types of planning and programming.<br><br>Technical Reference provides details on how to effectively address travel time reliability in performance-based decision making processes. | This practical guidance on integrating reliability into long-range plans, transportation improvement programs, program funding decisions, and setting priorities for projects opens new opportunities to improve travel time reliability. Reliability can be used with other performance measures in assessing how to allocate limited funding for operations, renewal and capacity improvements as well as understand key choices and tradeoffs. | Research expected to be complete in 2012. (Project L05)<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Reliability by Design**<br><br>Guide for assessing the effect of geometric design treatments on travel time reliability. Includes a detailed description of different geometric design treatments with both a direct and indirect effect on reliability. Spreadsheet analysis tool to assess the effectiveness of design treatments and their influence on reliability, delay and safety. Able to perform lifecycle benefit-cost analysis. | The guide will provide new technical knowledge to help determine the effect of various design features on reliability and other performance measures, safety, and lifecycle costs. Both the Guide and the analysis tool support project design submissions with quantitative estimates of how effective the proposed treatment will be in improving travel time reliability and other key considerations | Research completes in 2012. (Project L07)<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Reliability and the Highway Capacity Manual**<br><br>Computational procedures for predicting reliability on freeways and urban streets.<br><br>Draft chapters for the Highway Capacity Manual | Travel time reliability is increasingly recognized as a performance measure for mobility and now the Highway Capacity Manual can include methodologies that are sensitive to traffic management techniques and other operation/design measures for reducing nonrecurrent congestion. | Expected completion of research is November 2012 (Project L08)<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |

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| **Organizing Transportation Agencies to Improve Reliability**<br>Significant reduction of congestion related to nonrecurring events will require changes to the internal organization and business practices of transportation and public safety agencies. These products can help transportation agencies organize to improve travel time reliability. | | |
| **Guide to Integrating Business Processes to Improve Travel Time Reliability**<br>Guide to mapping traffic operations business processes<br>Case studies in reengineering highway operational areas<br>Self-assessment tool | These products provide methods and tools transportation agencies can use to reengineer their day-to-day business practices to improve traffic operations, address nonrecurring traffic congestion, and improve the reliability of travel times delivered to roadway system users. | Research completed. SHRP 2 Report S2-L01-RR-1: *Integrating Business Processes to Improve Travel Time Reliability* and Guide S2-L01-RR-2; *Guide to Integrating Business Processes to Improve Travel Time Reliability* are available online and through the TRB bookstore. (Project L01)<br>SHRP 2 contact:<br>David Plazak, dplazak@nas.edu |
| **Guide to Organizing Transportation Agencies to Advance Systems Operations and Management**<br>Institutional capability maturity model<br>Evaluation tool to assess agency capabilities in key areas<br>Templates for 'next step' action plans | Transportation agencies can evaluate their current organizational capability—within their agency and with others—to address congestion and then determine what steps to take in order to reach the next level of organizational effectiveness, and from there keep improving. | Research completes in spring 2012. Two research products are already available on line and in print: SHRP 2 Report S2-L06-RR-2: *Guide to Improving Capability for Systems Operations and Management;* SHRP 2 Report S2-L06-RR-1: Institutional Architectures to Improve Systems Operations and Management. The capability maturity model has been adapted for use of states and others and is available at: www.aashtosomguidance.org (Project L06)<br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Coordinated Training for Traffic Incident Responders and Managers**<br>Training curriculum with e-learning modules<br>Certification tool to standardize training programs<br>Train the trainers curriculum<br>Post-course assessment tool | Transportation and public safety agencies can use these training tools to strengthen current programs and deliver state-of-the-art training content for incident management. The training material integrates the roles of all responders, helps to establish priorities, and reinforces interagency cooperation. The materials provide a basis for a unified national practice on incident management training. | Research completed. Reports, Guidebook, and training products will be available online in early 2012. (Project L12)<br>SHRP 2 contact:<br>Gummada Murthy, gmurthy@nas.edu |
| **Reliability Knowledge Transfer System and Synthesis**<br>Web portal that creates a central information resource for system operations and management<br>Synthesis of current knowledge plus definitions, key messages, and sample communications materials<br>Workshop template and training materials for outreach to executive management | These products create a foundation for mainstreaming strategies to improve travel time reliability and they link knowledge to actions that transportation agencies can use to integrate travel time reliability into everyday practice. | Research completes February 2012. Report, first-stage web portal, synthesis, and training materials available online in late 2012. (Project L17)<br>SHRP 2 contact:<br>Gummada Murthy, gmurthy@nas.edu |
| **Regional Operations Forums**<br>Updated curriculum and training materials<br>Assessment and evaluation framework | The concept of regional forums expands on current learning opportunities to advance highway systems operations and management. The forums will develop and deliver training courses and executive management workshops that will help agencies mainstream strategies to mitigate congestion. | Research begins mid 2012. (Project L36)<br>SHRP 2 contact:<br>Gummada Murthy, gmurthy@nas.edu |

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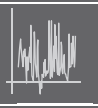
| **Preparing for the Future** | | |
| Not only does SHRP 2 research aim to provide major advances in how to plan for and manage congestion in the coming decades, but some of the research explicitly concerns the future. Also, some research aims to satisfy the needs of future researchers for data. | | |
| **Alternative Futures**<br><br>Sets out alternative future scenarios for the year 2035. Concepts of operations are presented and mapped to each alternative future. | Potentially valuable for mid- and long range planning concerning highway operations and managing travel time reliability. Addresses advances in technology and trends concerning demographics, the economy, energy and the environment. | Project Completed. Final Report, *Evaluating Alternative Operations Strategies to Improve Travel Time Reliability* (Project L11) is in publication review process.<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| **Capstone Reliability Data Archive**<br><br>Prototype data archiving plan and model with cloud-based deployment<br><br>Fully deployed archive populated with data from all SHRP 2 Reliability research projects | It is expected that practitioners and researchers will be able to access the complete archive of data from SHRP 2 Reliability research to support continued advances in reducing congestion and improving travel time reliability. | SHRP 2 Report S2-L13-RW-1: *Requirements and Feasibility of a System for Archiving and Disseminating Data from SHRP 2 Reliability and Related Studies* is online. (Project L13) Completion of the archive expected mid 2014. (Project L13A)<br><br>SHRP 2 contact:<br>William Hyman, whyman@nas.edu |
| *Innovations in transportation systems management and reliability begin with ideas that have the potential to significantly improve travel time reliability in the long term. To support this goal SHRP 2 sponsored a Reliability IDEA program, which funds early-stage proof-of-concept investigations. The following four projects were funded.* | | |
| **Origin-to-Destination Reliability Information on Google Maps**<br><br>Provides in various forms to drivers personalized pre-trip travel time information and en route updates based on real-time traffic, weather, work zone, and incident data. | This application aims to integrate information from various sources to develop travel time estimates that would help travelers be more likely to arrive on time. | Proof of concept phase complete. (Project L15A) Information about the effort is on the IDEA website: www.TRB.org/IDEA.<br><br>SHRP 2 contact:<br>Inam Jawed, ijawed@nas.edu |
| **Proximity Information Resources for Special Events**<br><br>Mobile proximity information system to provide event-specific information participants can use to respond to conditions affecting their mobility | This product aims to reduce delay related to events that may cause nonrecurring congestion. | Proof of concept expected to be completed by mid 2012 (Project L15B) Information about the effort is on the IDEA website: www.TRB.org/IDEA.<br><br>SHRP 2 contact:<br>Inam Jawed, ijawed@nas.edu |
| **Online Traffic Simulation Service for Highway Incident Management**<br><br>Web-based capabilities for traffic simulation, scenario editing, and maintenance<br><br>Automated simulation model<br><br>Suite of incident scenarios and response strategies | This system automatically builds a traffic simulation model daily from data collected each day. Operations planners can view historical data and recreate traffic behavior by simulating, editing, and testing "what-if" scenarios. | Proof of concept phase is due to be completed in late 2012 (Project 15C). Information about the effort is on the IDEA website: Results are reported on the IDEA website: www.TRB.org/IDEA. SHRP 2 contact: Inam Jawed, ijawed@nas.edu |
| **Urban Travel Reliability Analysis with Consumer GPS Data**<br><br>Methodological framework for travel reliability analysis in urban highway networks | This product aims to reduce delay related to events that may cause nonrecurring congestion. | Proof of concept phase is due to be completed in 2013. (Project L15D). Information about the effort is on the IDEA website: www.TRB.org/IDEA.<br><br>SHRP 2 contact:<br>Inam Jawed, ijawed@nas.edu |

# New Tools for Reliable Travel Times

| 7 Causes of Nonrecurring Congestion | | SHRP 2 Products |
|---|---|---|
|  | Incidents | Regional Operations Forums to help mainstream operations strategies. Executive workshops to convey the value of operations strategies to agency mission. Interagency Training for incident responders. |
|  | Weather | Guide and analysis tool for selecting design treatments that improve reliability. Part of a new method to address reliability in the Highway Capacity Manual. |
|  | Work Zones | Tools for travel time monitoring. Models for real -time congestion management. |
|  | Fluctuation in Demand | Performance Measures. Value of Reliability. Incorporating reliability into planning & programming. Economic evaluation model. |
|  | Special Events | Travel time monitoring. Organizational strategies to improve travel time reliability. Improving data for traveler information. |
|  | Traffic Control Devices | Reliability Monitoring Systems. Methods for estimating capacity of urban streets. |
|  | Inadequate Base Capacity | Guide for geometric designs that advance reliability. Analytical model for assessing effectiveness of strategies. Ways to incorporate reliability into planning & programming. |

SHRP 2
STRATEGIC HIGHWAY RESEARCH PROGRAM
*Accelerating solutions for highway safety, renewal, reliability, and capacity*

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