

HAZARDOUS MATERIALS COOPERATIVE RESEARCH PROGRAM

Current and Completed Projects

Winter 2012

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Hazardous Materials Cooperative Research Program

Status

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) authorized a pilot cooperative research program focused on hazardous materials transportation. The Hazardous Materials Cooperative Research Program (HMCRP) is sponsored by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) and managed by the National Academies, acting through its Transportation Research Board (TRB). A contract to begin work on the HMCRP pilot was executed between PHMSA and the National Academies and became effective on September 1, 2006. SAFETEA-LU expired on September 30, 2009. However, subsequent continuing resolutions authorized funding to June 30, 2012 (i.e., all of FYs 2010 and 2011 and the first 9 months of FY 2012). On July 6, 2012, the President signed the Moving Ahead for Progress in the 21st Century Act or MAP-21. The legislation extended the terms of the previous Continuing Resolutions for FY 2012, thereby adding funds for the last 3 months of FY 2012. However, there are no authorizations for funding in FYs 2013 and 2014—the two FYs covered by MAP-21. TRB will complete all existing projects and then close down the program.

Current and Completed Projects

HM-01. Hazardous Materials Commodity Flow Data and Analysis

Objective: To produce an updated, user-friendly guidebook for conducting hazardous materials commodity flow surveys to support local risk assessment, emergency response preparedness, and resource allocation and to support analyses across jurisdictional boundaries. This guidebook is targeted at transportation planning and operations staff at the local and regional levels, as well as local and regional personnel involved in hazardous materials training and emergency response. All modes of transportation, all classes and divisions of hazardous materials, and the effects of seasonality on hazardous materials movements are discussed.

Research Agency: Texas A&M University

Contract Amount: \$300,000

Status: Published as *HMCRP Report 3: Guidebook for Conducting Local Hazardous Materials Commodity Flow Studies*. The guide is also available electronically at

http://www.trb.org/Main/Blurbs/Guidebook_for_Conducting_Local_Hazardous_Materials_165775.aspx.

The contractor's final report and appendices (unedited by TRB) are available electronically at

http://onlinepubs.trb.org/onlinepubs/hmcrp/docs/HM01_FR.pdf.

HM-02. Hazardous Materials Transportation Incident Data for Root Cause Analysis

Objective: To (1) develop a set of practical recommendations for methods to improve the availability and quality of hazardous materials transportation incident data, (2) identify gaps and redundancies in reporting requirements, and (3) provide an estimate of the under-reporting of serious incidents. The scope of this research included all transportation modes covered by 49 CFR Parts 100-180.

Research Agency: Battelle

Contract Amount: \$300,000

Status: Published as *HMCRP Report 1: Hazardous Materials Transportation Incident Data for Root Cause Analysis*. The report is also available electronically at <http://www.trb.org/Publications/Blurbs/162769.aspx>.

HM-03. A Guide for Assessing Emergency Response Needs and Capabilities for Hazardous Materials Releases

Objective: To develop a guide for conducting assessments of emergency response needs and capabilities for hazardous materials releases. The guide addresses four elements: (1) conducting state, regional, and local hazardous material emergency response needs assessments; (2) developing, maintaining, and sharing capability assessments; (3) aligning assessed needs with various levels of capability; and (4) identifying shortfalls where additional/different capabilities are warranted. The guide includes recommended methods for monitoring and recording changes in response capability over time, in order to avoid a static snapshot. In cases where there are gaps in existing techniques or necessary data for the needs or capability assessments, this research identifies research needs to address them.

Research Agency: Battelle

Contract Amount: \$350,000

Status: Published as *HMCRP Report 5: A Guide for Assessing Community Emergency Response Needs and Capabilities for Hazardous Materials Releases*. The guide is also available electronically at <http://www.trb.org/Main/Blurbs/165201.aspx>.

HM-04. Emerging Technologies Applicable to Hazardous Materials Transportation Safety and Security

Objective: To (1) develop a list of near-term (less than 5 years) and longer-term (5–10 years) technologies that are candidates for use in enhancing the safety and security of hazardous materials transportation, as applied by shippers, carriers, emergency responders, or government regulatory and enforcement agencies; (2) identify emerging technologies that hold the greatest promise of being introduced during these near- and longer-term spans; and (3) identify potential impediments to and opportunities for their development, deployment, and maintenance (e.g., technical, economic, legal, and institutional). This research reviews generic technologies and does not evaluate specific name-brand products.

Research Agency: Battelle

Contract Amount: \$350,000

Status: Published as *HMCRP Report 4: Emerging Technologies Applicable to Hazardous Materials Transportation Safety and Security*. The report is also available electronically at <http://www.trb.org/Main/Blurbs/165470.aspx>.

HM-05. Evaluation of the Use of Electronic Shipping Papers for Hazardous Materials Shipments

Objective: To develop a roadmap for the use of electronic shipping papers as an alternative to the current paper-based hazardous materials communication system. The roadmap addresses the electronic transfer of safety, operational, regulatory compliance, and emergency response data and documentation, for and amongst all transport modes.

Research Agency: Battelle

Contract Amount: \$300,000

Status: Published as *HMCRP Report 8: Evaluation of the Use of Electronic Shipping Papers for Hazardous Materials Shipments*. The report is also available electronically at <http://www.trb.org/Publications/Blurbs/167507.aspx>.

HM-06. Soil and Groundwater Impacts of Chemical Mixture Releases from Hazardous Materials Transportation Incidents

Objective: To develop a quantitative system or model that will allow carriers, shippers, and regulators to assess, compare, and classify the environmental hazards to soil and groundwater posed by materials in transport. Specifically, this research (1) conducted a review of state-of-the-art approaches to defining and modeling environmental hazards to soil and groundwater; (2) described the applicability and barriers to these approaches for use in transportation environmental impact assessments; (3) identified the key parameters for different chemical groups needed to determine the environmental hazards posed to soil and groundwater; (4) developed a quantitative methodology to calculate an environmental hazard index (screen) that provides an accurate estimation of hazard level to soil and groundwater; and (5) described and discussed data needed to support use of the model.

Research Agency: HSA

Contract Amount: \$400,000

Status: Published as *HMCRP Report 2: Assessing Soil and Groundwater Impacts of Chemical Mixture Releases from Hazardous Materials Transportation Incidents*. The report is also available electronically at <http://www.trb.org/Main/Blurbs/164709.aspx>.

HM-07. Accident Performance Data of Bulk Packages Used for Hazardous Materials Transportation

Objective: To (1) recommend methodologies for collecting and analyzing performance data for U.S. DOT-specified hazardous materials bulk packages (i.e., portable tanks and cargo tank motor vehicles) and (2) identify and evaluate institutional barriers to data collection and recommendations for overcoming these barriers. These data and their analysis will be used by decisionmakers to develop conditional probabilities of release and of amounts released in transport accidents by road and rail. Performance data include, but are not limited to, data related to various equipment designs (including materials of construction, thickness of the shell and head, and fittings design and protection on bulk packages) and circumstances of the accident when available (including location of damage, amount of material released, hole size, etc.).

Research Agency: ESI

Contract Amount: \$400,000

Status: Completed. In publication process.

HM-08. Consolidated Security Credential for Persons Who Transport Hazardous Materials

Objective: To identify options for achieving the objective of a single, universally recognized credential that establishes (1) identity; (2) eligibility to access secure areas; and (3) eligibility to obtain or hold transportation-related licenses, credentials and other government certifications required of persons who transport hazardous materials by all modes in the United States.

Research Agency: Virginia Polytechnic Institute

Contract Amount: \$250,000

Status: Published as *HMCRP Report 6: Feasibility of a Consolidated Security Credential for Persons Who Transport Hazardous Materials*. The report is also available electronically at <http://www.trb.org/Publications/Blurbs/165828.aspx>.

HM-09. Technical Assessment of Dry Ice Limits on Aircraft

Objective: To develop a decision tool(s) to assist passenger and cargo-only aircraft operators in determining the maximum quantity of dry ice that can be safely carried as cargo.

Research Agency: Battelle Memorial Institute

Contract Amount: \$250,000

Status: The final report was submitted by the contractor in September 2012. Publication is expected by January 2013.

HM-10. Current Hazardous Materials Transportation Research and Future Needs

Objective: To review and compile current and proposed hazardous materials transportation research and prioritize future research needs for HMCRP.

Research Agency: Visual Risk Technologies

Contract Amount: \$100,000

Status: Published as *HMCRP Web-Only Document 1: Current Hazardous Materials Transportation Research and Future Needs*. This report is available electronically at <http://www.trb.org/main/blurbs/168234.aspx>.

HM-11. Improving Local Community Recovery from Disastrous Hazardous Materials Transportation Incidents

Objective: To develop a compendium of best practices that can be used by local communities to plan for recovery from disastrous hazardous materials transportation incidents. Recovery is defined as both short- and long-term efforts to rebuild and revitalize affected communities. Recovery planning must provide for a near-seamless transition from emergency response activities to recovery operations to de-briefing lessons learned, including, but not limited to, restoration of interrupted utility services, reestablishment of transportation routes, the provision of food and shelter to displaced persons, environmental restoration, business continuity, and economic rebuilding.

Research Agency: ABSG

Contract Amount: \$200,000

Status: Published as *HMCRP Report 9: A Compendium of Best Practices and Lessons Learned for Improving Local Community Recovery from Disastrous Hazardous Materials Transportation Incidents*.

HM-12. Hazardous Materials Transportation Risk Assessment: State of the Practice

Objective: To (1) identify existing tools, methodologies, approaches, and key sources of data for assessing hazardous materials transportation risks in the public and private sectors; (2) characterize the capabilities and limitations of each; (3) identify where there are significant gaps and needs in the available tools and approaches; and (4) recommend paths forward. Transportation risks of particular concern relate to acute releases of significant quantities of hazardous materials for all modes of transportation.

Research Agency: Visual Risk Technologies, LLC

Contract Amount: \$200,000

Status: Completed; publication pending.

HM-13. Role of Human Factors in Preventing Cargo Tank Truck Rollovers

Objective: To (1) identify and analyze the root causes of the major driver factors contributing to cargo tank truck rollovers and (2) determine best safety, management, and communication practices that can be used to minimize or eliminate driver errors in cargo tank truck operations.

Research Agency: Battelle

Contract Amount: \$200,000

Status: Published as *HMCRP Report 7: Role of Human Factors in Preventing Cargo Tank Truck Rollovers*. The report is also available electronically at <http://www.trb.org/main/blurbs/167519.aspx>.

HM-14. Test Procedures and Classification Criteria for Release of Toxic Gases from Water-Reactive Materials

Objective: To identify test procedures and classification criteria for water-reactive materials (WRMs) that take account of the potential release of toxic gases during transport.

Research Agency: ScienceSmith Consulting, Inc.

Contract Amount: \$299,800

Status: Phase I underway.

HM-15. A Guide for Communicating Emergency Response Information for Natural Gas and Hazardous Liquids Pipelines

Objective: To develop a guide for natural gas and hazardous liquid pipeline operators and emergency responders that (1) includes the appropriate emergency response content that should be provided to emergency responders; (2) recommends effective means of disseminating this guidance by pipeline operators to recipient emergency response organizations and by those emergency response organizations to sub-units; and (3) recommends strategies for implementing and exercising the emergency response plan.

Research Agency: City College of New York

Contract Amount: \$250,000

Status: Project underway.

HM-16. Model Post-Secondary Education Curricula for the Transportation of Hazardous Materials

Objective: To develop model post-secondary education curricula that address the knowledge, skills, and abilities needed by the public sector (e.g., regulators, inspectors) and private sector (e.g., shippers, receivers) for the safe and efficient transportation of hazardous materials.

Research Agency: 3 Sigma Consultants

Contract Amount: \$200,000

Status: Project underway.

HM-17. Evaluating the Effectiveness of Hazmat Transportation Training

Objective: To develop a guide that describes methodologies, metrics, and best practices used to evaluate the effectiveness of training programs and instructional methods (including preparation and delivery) used to impart hazardous materials (hazmat) transportation safety and security regulatory requirements to public- and private-sector hazmat employees.

Research Agency: Project Performance Corporation
Contract Amount: \$200,000
Status: Project underway.

Publications of the Hazardous Materials Cooperative Research Program

Reports

No.	Proj. No.	Title, Pages, Publication Year
1	HM-02	Hazardous Materials Transportation Incident Data for Root Cause Analysis, 124 p. (2009)
2	HM-06	Assessing Soil and Groundwater Impacts of Chemical Mixture Releases from Hazardous Materials Transportation Incidents (& CD 90), 64 p. (2010)
3	HM-01	Guidebook for Conducting Local Hazardous Materials Commodity Flow Studies, 188 p. (2011)
4	HM-04	Emerging Technologies Applicable to Hazardous Materials Transportation Safety and Security, 132 p. (2011)
5	HM-03	A Guide for Assessing Community Emergency Response Needs and Capabilities for Hazardous Materials Releases (& CD 92), 120 p. (2011)
6	HM-08	Feasibility of a Consolidated Security Credential for Persons Who Transport Hazardous Materials, 84 p. (2011)
7	HM-13	Role of Human Factors in Preventing Cargo Tank Truck Rollovers, 70 p. (2012)
8	HM-05	Evaluation of the Use of Electronic Shipping Papers for Hazardous Materials Shipments, 106 p. (2012)
9	HM-11	A Compendium of Best Practices and Lessons Learned for Improving Local Community Recovery from Disastrous Hazardous Materials Transportation Incidents, 198 p. (2012)

Web-Only Documents

No.	Proj. No.	Title, Pages, Publication Year
1	HM-10	Current Hazardous Materials Transportation Research and Future Needs, 120 p. (2012)

CDs

No.	Proj. No.	Title, Publication Year
90	HM-06	Chemical Mixture Tool for HMCRP Report 2 (& Rep. 2) (2010)
92	HM-03	Worksheets for Assessing Community Emergency Response Needs for HMCRP Report 5 (& Rep. 5) (2011)

Note

Publications in parentheses with an ampersand (&) are companion publications.

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