USDOT Federal Railroad Administration’s Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention: Volume II—Appendices

Office of Research and Development
Washington, D.C. 20590

Safety of Highway-Railroad Grade Crossings
On July 14-16, 2009 the Volpe Center hosted the United States Department of Transportation (US DOT) Federal Railroad Administration’s (FRA) Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention (workshop). The primary purpose of this workshop was to bring together nationally and internationally recognized subject matter experts to collaborate, identify and prioritize specific research needs to facilitate the reduction of highway-rail grade crossing and trespass incidents and fatalities for incorporation into the strategic vision of FRA, other US DOT modes and their stakeholders. There were approximately 90 participants, including support staff, over the two-and-a-half day workshop, representing the Federal, State, and local governments, as well as railroads, transit agencies, labor unions, academia, non-profit organizations, and consultants.

The Research Needs Workshop was organized into six research needs areas and four cross-cutting areas by the steering committee's recommendation. The research needs areas were: Grade Crossing Modernization, Traffic Patterns, New Technology Opportunities, Regulation and Enforcement, Education and Public Awareness and Institutional Issues. The four cross-cutting areas were Human Factors, Transit-Oriented Communities, Data Requirements and Efforts Related to High Speed Rail. This document provides the supporting and ancillary information to the Proceedings report (in Volume I) including presentations and all generated research needs.
## METRIC/ENGLISH CONVERSION FACTORS

### ENGLISH TO METRIC

#### LENGTH (APPROXIMATE)
- 1 inch (in) = 2.5 centimeters (cm)
- 1 foot (ft) = 30 centimeters (cm)
- 1 yard (yd) = 0.9 meter (m)
- 1 mile (mi) = 1.6 kilometers (km)

#### METRIC TO ENGLISH
- 1 millimeter (mm) = 0.04 inch (in)
- 1 centimeter (cm) = 0.4 inch (in)
- 1 meter (m) = 3.3 feet (ft)
- 1 kilometer (km) = 0.6 mile (mi)

#### AREA (APPROXIMATE)
- 1 square inch (sq in, in²) = 6.5 square centimeters (cm²)
- 1 square foot (sq ft, ft²) = 0.09 square meter (m²)
- 1 square yard (sq yd, yd²) = 0.8 square meter (m²)
- 1 square mile (sq mi, mi²) = 2.6 square kilometers (km²)
- 1 acre = 0.4 hectare (he)

#### MASS - WEIGHT (APPROXIMATE)
- 1 ounce (oz) = 28 grams (gm)
- 1 pound (lb) = 0.45 kilogram (kg)
- 1 short ton = 2,000 pounds (lb)
- 1 tonne (t) = 1,000 kilograms (kg)

#### VOLUME (APPROXIMATE)
- 1 teaspoon (tsp) = 5 milliliters (ml)
- 1 tablespoon (tbsp) = 15 milliliters (ml)
- 1 fluid ounce (fl oz) = 30 milliliters (ml)
- 1 cup (c) = 0.24 liter (l)
- 1 pint (pt) = 0.47 liter (l)
- 1 quart (qt) = 0.96 liter (l)
- 1 gallon (gal) = 3.8 liters (l)
- 1 cubic foot (cu ft, ft³) = 0.03 cubic meter (m³)
- 1 cubic yard (cu yd, yd³) = 0.76 cubic meter (m³)

### METRIC TO ENGLISH

#### LENGTH (APPROXIMATE)
- 1 square centimeter (cm²) = 0.16 square inch (sq in, in²)
- 1 square meter (m²) = 1.2 square yards (sq yd, yd²)
- 1 square kilometer (km²) = 0.4 square mile (sq mi, mi²)
- 10,000 square meters (m²) = 1 hectare (ha) = 2.5 acres

#### AREA (APPROXIMATE)
- 1 gram (gm) = 0.036 ounce (oz)
- 1 kilogram (kg) = 2.2 pounds (lb)
- 1 tonne (t) = 1,000 kilograms (kg)
- 1.1 short tons

#### MASS - WEIGHT (APPROXIMATE)
- 1 milliliter (ml) = 0.03 fluid ounce (fl oz)
- 1 liter (l) = 2.1 pints (pt)
- 1 liter (l) = 1.06 quarts (qt)
- 1 liter (l) = 0.26 gallon (gal)

#### VOLUME (APPROXIMATE)
- 1 cubic meter (m³) = 36 cubic feet (cu ft, ft³)
- 1 cubic meter (m³) = 1.3 cubic yards (cu yd, yd³)

#### TEMPERATURE (EXACT)

\[
\frac{[x - 32](5/9)}{\text{°F}} = \frac{y}{\text{°C}}
\]

\[
\frac{(9/5)y + 32}{\text{°C}} = \frac{x}{\text{°F}}
\]

### QUICK INCH - CENTIMETER LENGTH CONVERSION

<table>
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<th>Inches</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centimeters</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSION

| °F | -40° | -22° | -4° | 14° | 32° | 50° | 68° | 86° | 104° | 122° | 140° | 158° | 176° | 194° | 212° |
|----|-------|------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| °C | -40°  | -20° | -10° | 0°  | 10° | 20° | 30° | 40° | 50°  | 60°  | 70°  | 80°  | 90°  | 100° |

For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50
SD Catalog No. C13 10286

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Cambridge, MA  02142  
Email: bgrtrainman1@aol.com  
Phone: (617) 494-2302

Guan Xu  
Highway Engineer  
Federal Highway Administration/Office of Safety  
1200 New Jersey Ave. SE  
Washington,, DC  20590  
Email: guan.xu@dot.gov  
Phone: (202) 366-5892

Sesto Vespa  
Chief - Technology Applications  
Transport Canada - Transportation Development Centre  
Tower C, Place de Ville  
330 Sparks Street, Floor 26  
Ottawa, ON  K1A 0N5  
Email: sesto.vespa@tc.gc.ca  
Phone: 514 283-0059

Michelle Yeh  
Engineering Psychologist  
John A. Volpe National Transportation Systems Center  
55 Broadway, RVT-81  
Cambridge, MA  02142  
Email: Michelle.Yeh@dot.gov  
Phone: (617) 494-3459
Appendix B. Agenda, Correspondence, and Forms

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Agenda
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Speaker Letter
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**Agenda**

FRA’s Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention

John A. Volpe National Transportation Systems Center
July 14-16, 2009 ● Cambridge, Massachusetts

**JULY 14, 2009**

8:00 AM  **REGISTRATION AND CONTINENTAL BREAKFAST—AUDITORIUM LOBBY (BUILDING 2)**
U.S. Department of Transportation
Research and Innovative Technology Administration’s
John A. Volpe National Transportation Systems Center (Volpe Center)

8:30 AM  **WELCOME**
Robert Dorer, Director of Physical Infrastructure Systems Center of Innovation
Volpe Center
Richard R. John, Acting Director, Director Emeritus
Volpe Center

8:45 AM  **OPENING REMARKS**
- David Matsuda, Acting Assistant Secretary for Transportation Policy
  U.S. Department of Transportation
- Jo Strang, Associate Administrator for Railroad Safety and Chief Safety Officer
  Federal Railroad Administration
- Dr. Magdy El-Sibaie, Director, Office of Research and Development
  Federal Railroad Administration

9:30 AM  **GENERAL SESSION PRESENTATION**
*Level Crossing Needs: Thoughts from Overseas*
  Aidan E. C. Nelson, Co-Director
  Community Safety Partnerships, Ltd. (United Kingdom)

9:50 AM  **WORKSHOP PARTICULARS**
John McGuiggin, PE, PMP
Chief, Systems Engineering and Safety Division
Volpe Center

10:00 AM  **HUMAN FACTORS: A RESEARCH NEEDS CROSS-CUTTING AREA**
*Applying a Sociotechnical Framework for Improving Safety at Highway-Railroad Grade Crossings*
Jordan Multer, Ph.D., Manager, Rail Human Factors Program
Volpe Center

10:30 AM  **Break**

10:45 AM  **GRADE CROSSING MODERNIZATION**  
**TEAM LEADER: BRIAN GILLERAN, FEDERAL RAILROAD ADMINISTRATION**

This research needs area will focus on the identification and evaluation of conventional and enhanced systems at or near highway-rail grade crossings. The research in this area lays a foundation for the development of innovative technologies, methodologies, and countermeasures with a potential high return for R&D.

**Speakers:**
**Accessibility Issues at Highway-Rail Grade Crossings**  
David Peterson, Senior Manager, Industry and Public Projects  
Union Pacific Railroad

**Education and Analysis—Highway-Rail Grade Crossings in the Modern World**  
Paul O’Brien, Rail Service General Manager  
Utah Transit Authority

11:30 AM  **TRAFFIC PATTERNS**  
**TEAM LEADER: ANYA A. CARROLL, VOLPE CENTER**

This research needs area will focus on creating a better understanding of the highway traffic pattern and its impact on highway-rail grade crossing safety and railroad infrastructure. The research in this area will support the need to plan and implement efficient rail corridors and highway/pedestrian geometric features to reduce delays and congestion, thereby increasing throughput of the railroad and highway networks.

**Speakers:**
**Roundabouts at or Near Highway-Rail Grade Crossings**  
Mark Morrison, Grade Crossing Safety Engineer  
Wisconsin Department of Transportation

**The Massachusetts Bay Transportation Authority: Lessons Learned**  
Gerard J. Ruggiero, WSO-CS, Deputy Director of Safety  
Massachusetts Bay Transportation Authority

Lorraine M. Pacocha, Senior Project Coordinator  
Massachusetts Bay Transportation Authority
12:15 PM  **LUNCH (ON YOUR OWN)**

1:30 PM  **NEW TECHNOLOGY OPPORTUNITIES**  
**TEAM LEADER: RICK CAMPBELL, CAMPBELL TECHNOLOGY CORPORATION**

This research needs area targets various innovative technologies and technology transfer opportunities to test for applicability (and implementation if deemed a valuable tool) within the rail infrastructure. The research in this area will allow for the development and/or assessment of techniques or technologies that reduce incidents along the railroad rights-of-way, as well as to enhance congestion mitigation of the rail’s infrastructure.

**Speakers:**
- **Queue-Cutter Signals at Highway-Rail Grade Crossings**  
  Brent Ogden, Vice President  
  AECOM

- **Effectiveness of LED Signs at Passive Crossings**  
  John Shurson, Assistant Director of Public Projects  
  Burlington Northern Santa Fe Railway Company

- **Warrants for Pedestrian Treatments at Highway-Rail Grade Crossings**  
  Dan Guerrero, Director of Communications and Signals  
  Metrolink Los Angeles

2:15 PM  **REGULATION AND ENFORCEMENT**  
**TEAM LEADER: DEBORAH M. FREUND, FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION**

This research needs area targets a review and analysis of current regulations, policies, and programs to enhance safety along the railroad rights-of-way. The research in this area will facilitate standardization of regulation and enforcement efforts nationwide, which has the potential to reduce the number of violation and incident rates.

**Speakers:**
- **Commercial Driver’s License Program**  
  Robert (Bob) Redmond, Senior Transportation Specialist  
  Federal Motor Carrier Safety Administration

- **Enforcement Issues at Highway-Rail Grade Crossings**
LTC. Ralph D. Mitchell, Jr., Patrol Commander
Louisiana State Police

Safety and Enforcement: A Local and Regional Perspective
Jack C. Hanagriff, Senior Police Officer
Houston Police Department
Neighborhood Protection Corps

3:15 PM  Break

3:30 PM  Education and Public Awareness
Team Leaders: Helen Sramek, Operation Lifesaver, Inc. (USA)
Daniel Di Tota, Operation Lifesaver (Canada)

This research needs area targets the outreach aspect of highway-rail grade crossing safety and trespass prevention.

Speakers:
New Outreach Technologies: Florida Operation Lifesaver's Perspective
Annette Lapkowski, Rail Operations Administrator
Florida Department of Transportation

Public Education and Enforcement Research Study (PEERS)
Suzanne M. Horton, Operations Research Analyst
Volpe Center

Operation Lifesaver Data Collection – Power of the Internet
Daniel Di Tota, National Director
Operation Lifesaver, Canada

4:30 PM  Institutional Issues
Team Leader: Steve Laffey, Illinois Commerce Commission

This research area will focus on the successes and challenges related to planning and implementing programs at the industry, local, state, and national levels. The research will provide agencies/organizations with decision-making concepts and methodologies to embrace and implement as a means to update and/or advance safety programs in a comprehensive and cost-effective manner.

Speakers:
John Shurson, Assistant Director of Public Projects
Burlington Northern Santa Fe Railway Company

Karen M. Marshall, Program Development Director
American Association of Suicidology

Ronald E. Ries, Staff Director
Highway-Rail Grade Crossing and Trespasser Prevention Division
Federal Railroad Administration

5:30 PM  **ANNOUNCEMENTS AND ADJOURNMENT FOR THE DAY**

6:30–8:30 PM  **RECEPTION—CAMBRIDGE MARRIOTT HOTEL, SALONS I AND II**

**JULY 15, 2009**

8:30 AM  **CONTINENTAL BREAKFAST–AUDITORIUM LOBBY (BUILDING 2)**

9:00 AM  **WELCOME**
Organization of Working Groups and “Rules of Engagement”
Marco P. daSilva, Team Leader
Volpe Center

Introduction of Research Needs Workshop Team Leaders and Facilitators
Debra (Dee) Chappell, Grade Crossing Team Liaison
Volpe Center

<table>
<thead>
<tr>
<th>Grade Crossing Modernization (Green Team)</th>
<th>Regulation and Enforcement (Yellow Team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader: Brian Gilleran</td>
<td>Team Leader: Deborah M. Freund</td>
</tr>
<tr>
<td>Facilitator: Rachel Winkeller</td>
<td>Facilitator: Cassandra Allwell</td>
</tr>
<tr>
<td>Team Assistant: Steve Peck/Erica Squillacioti</td>
<td>Team Assistant: Adrian Hellman</td>
</tr>
<tr>
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<td>Location: Room 120 (Building 2)</td>
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<thead>
<tr>
<th>Traffic Patterns (Purple Team)</th>
<th>Education and Public Awareness (Red Team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader: Anya A. Carroll</td>
<td>Team Leader: Helen Sramek/Daniel Di Tota</td>
</tr>
<tr>
<td>Facilitator: Jeff Bryan</td>
<td>Facilitator: Rachael Barolsky</td>
</tr>
<tr>
<td>Team Assistant: Patrick Bien-Aime</td>
<td>Team Assistant: Tashi Ngamdung</td>
</tr>
<tr>
<td>Location: Room 143 (Building 2)–Learning Center</td>
<td>Location: Reserved Dining Room 4 (Building 1, Second Floor)</td>
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<thead>
<tr>
<th>New Technology Opportunities (Orange Team)</th>
<th>Institutional Issues (Blue Team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader: Rick Campbell</td>
<td>Team Leader: Steve Laffey</td>
</tr>
<tr>
<td>Facilitator: Aaron Jette</td>
<td>Facilitator: David Damm-Luhr</td>
</tr>
<tr>
<td>Team Assistant: Debra Chappell/Dan Kubacyzk</td>
<td>Team Assistant: Marco P. daSilva</td>
</tr>
<tr>
<td>Location: Room 519 (Building 1)</td>
<td>Location: Reserved Dining Room 4 (Building 1)</td>
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9:00 AM  **WORKING GROUPS BREAKOUT**

12:00 PM  **LUNCH**
**BOX LUNCH INCLUDED IN THE COST OF REGISTRATION**

1:00 PM  **WORKING GROUPS RESUME**

5:00 PM  **ADJOURNMENT FOR THE DAY**
July 16, 2009

8:00 AM CONTINENTAL BREAKFAST–AUDITORIUM LOBBY (BLG. 2)

8:30 AM WELCOME AND WORKING GROUP TOP FIVE SUMMARIES
Facilitator: Marco P. daSilva

- Grade Crossing Modernization – Brian Gilleran
- Traffic Patterns – Anya A. Carroll
- New Technology Opportunities – Rick Campbell
- Regulation and Enforcement – Deborah M. Freund
- Education and Public Awareness – Helen Sramek and Daniel Di Tota
- Institutional Issues – Steve Laffey

9:45 AM BREAK

10:00 AM RESEARCH NEEDS DISCUSSION AND PRIORITIZATION
Facilitator: Anya A. Carroll, National Expert, Multimodal Surface Transportation Physical Infrastructure Systems Center of Innovation Volpe Center

11:00 AM FINAL THOUGHTS
Len W. Allen, Program Manager and Workshop Steering Committee Chair Federal Railroad Administration

11:15 AM LUNCH (ON YOUR OWN)

12:30 PM OPTIONAL TOUR (PRE-REGISTRATION REQUIRED)
Massachusetts Bay Transportation Authority (MBTA) Silver Line Control Room and Transitway Tour

3:30 PM CONCLUSION OF WORKSHOP
Dear <Name>:

The Third Research Needs Workshop on *Highway-Rail Grade Crossing Safety and Trespasser Prevention*, sponsored by the Federal Railroad Administration (FRA) and coordinated and hosted by the John A. Volpe National Transportation Systems Center, will be held Monday, June 15th through Wednesday, June 17th in Cambridge, MA. The primary objective of this workshop is to identify specific high priority research needs related to technology, human factors, methodology, and education that will lead to a reduction of highway-rail grade crossing and trespasser injuries and fatalities.

You are nominated to participate on the workshop steering committee due to your level of expertise in this area. The role of the steering committee is to: recommend topic areas, identify speakers and delegates, refine the agenda, and participate in the workshop. Six members of the steering committee will also lead working groups during the workshop. In order to minimize the impact of the steering committee activities on your schedule, we plan to have two teleconference calls, one on February 3rd and the other sometime in April. Follow-up action items will be handled by e-mail. The workshop draft agenda is enclosed for your review.

Please notify Debra Chappell as to whether or not you accept this steering committee nomination as soon as possible at (202) 366-0236 or debra.chappell@dot.gov.

Sincerely,

Dr. Magdy El-Sibaie  
Director, Office of Research and Development

Enclosure
You have been nominated to participate at the Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention, which will be held July 14-16 at the USDOT Research Innovation and Technology Administration’s John A. Volpe National Transportation Systems Center (Volpe Center) in Cambridge, MA. The Research Needs Workshop (RNW) is sponsored by the USDOT Federal Railroad Administration, and coordinated and hosted by the Volpe Center. The primary purpose of the RNW is to bring together subject matter experts to collaborate, identify and prioritize specific research needs related to technology, human factors, methodology, and education to facilitate the reduction of highway-rail grade crossing and trespass incidents and fatalities for incorporation into the USDOT Federal Railroad Administration’s, other USDOT modes and stakeholders strategic vision.

You were recommended by <Name> of the <Organization> as an excellent speaker on <topic area> at highway-rail grade crossings and/or along the railroad’s rights-of-way. The agenda and additional RNW information can be found online at

http://www.macrosysrt.com/conference/FRA3rdresearch/default.html

The RNW will take place over two and one half days, starting on Tuesday, July 14 and ending midday on Thursday, July 16. The first day will be dedicated to reviewing the current status of research with three presentations each and/or panel discussion on the following topic areas:

- Grade Crossing Modernization
- Traffic Patterns
- New Technology Opportunities
The second day will be used to identify previously established research needs that have been completed, and generate additional research needs. The third and final day will be used to review selected research needs by topic area and a tour of the Massachusetts Bay Transportation Authority’s (MBTA) Silver Line Control Center and Transit Way (space for the tour is limited).

We have secured rooms at the Cambridge Marriott Hotel at the RNW rate of $189. To reserve your room, contact the hotel directly (617) 494-6600, and indicate that you are part of the DOT FRA Meeting. Discounted rate deadline is Monday, July 3. The number of discounted rooms is limited. It is recommended that you reserve your room as soon as possible to avoid missing out on the discount. The RNW registration fee for speakers has been waived. I will be in contact with you to gather logistical information necessary for the Workshop.

Please let me know as to whether or not you accept this speaking nomination as soon as possible with a suspense date of two weeks from the date of this letter of invitation. Thank you very much for your consideration of this important activity.

Sincerely,

Debra M. Chappell
Research Needs Workshop
Conference Coordinator

Attachment

cc: File
Dear <Name>,

You have been nominated to participate at the Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention, which will be held July 14-16 at the USDOT Research Innovation and Technology Administration’s John A. Volpe National Transportation Systems Center (Volpe Center) in Cambridge, MA. The Workshop is sponsored by the USDOT Federal Railroad Administration, and coordinated and hosted by the Volpe Center. The primary purpose of the workshop is to bring together subject matter experts to collaborate, identify and prioritize specific research needs related to technology, human factors, methodology, and education to facilitate the reduction of highway-rail grade crossing and trespass incidents and fatalities for incorporation into the USDOT Federal Railroad Administration’s, other USDOT modes and stakeholders strategic vision.

Your nomination was received by the Research Needs Workshop Steering Committee, and is based on your expertise and leadership on highway-rail grade crossing safety and trespass prevention. Details of the workshop, including registration, are located online at:

http://www.macrosysrt.com/conference/FRA3rdresearch/default.html
Research Needs Workshop Invitation Code: FRAVOLPE

The Workshop length will take place over two and one half days, starting on Tuesday, July 14 and ending midday on Thursday, July 16. The first day will be dedicated to reviewing the current status of research with three presentations each and/or panel discussion on the following topic areas:

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Please let me know no later than June 22 as to whether or not you accept this nomination. I can be reached at debra.chappell@dot.gov or (202) 366-0236. Thank you very much for your consideration of this important activity.

Sincerely,

Debra M. Chappell
Research Needs Workshop
Conference Coordinator

Attachment

cc: File
# Breakout Working Group Assignments

## Grade Crossing Modernization Working Group

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brian Gilleran (Team Leader)</td>
<td>FRA</td>
</tr>
<tr>
<td>Rachel Winkeller (Facilitator)</td>
<td>Volpe Center</td>
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<tr>
<td>Steve Peck (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Erica Squillacioti (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Leonard Allen</td>
<td>FRA</td>
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<tr>
<td>William Barringer</td>
<td>Norfolk Southern Corporation</td>
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<tr>
<td>Ed Boni</td>
<td>Interactive elements Incorporated</td>
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<tr>
<td>Mark Ciurej</td>
<td>Brotherhood of Railroad Signalmen</td>
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<tr>
<td>Jessica Franklin</td>
<td>Texas Transportation Institute</td>
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<tr>
<td>Frank Frey</td>
<td>Massachusetts Department of Public Utilities</td>
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<tr>
<td>Paul O’Brien</td>
<td>Utah Transit Authority</td>
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<tr>
<td>Ed O’Connor</td>
<td>Massachusetts Operation Lifesaver</td>
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<tr>
<td>David Peterson</td>
<td>Union Pacific Railroad</td>
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<td>Phillip Poichuck</td>
<td>Transport Canada</td>
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<tr>
<td>Scott Windley</td>
<td>U.S. Access Board</td>
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<tr>
<td>Paul Worley</td>
<td>North Carolina Department of Transportation</td>
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## Traffic Patterns Working Group

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Anya Carroll (Team Leader)</td>
<td>Volpe Center</td>
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<tr>
<td>Jeff Bryan (Facilitator)</td>
<td>Volpe Center</td>
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<tr>
<td>Patrick Bien-Aime (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Jim Krieger</td>
<td>Canadian Pacific</td>
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<tr>
<td>Carolyn Cook</td>
<td>FRA</td>
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<tr>
<td>Shou-Ren Hu</td>
<td>National Cheng Kung University, Taiwan</td>
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<tr>
<td>Chip Frazier</td>
<td>HDR, Inc.</td>
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<tr>
<td>Oi Kei Ng</td>
<td>University of Waterloo, Canada</td>
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<tr>
<td>John Mitchell</td>
<td>Massachusetts Bay Commuter Rail</td>
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<td>Brann Greager</td>
<td>Jacobs Consulting</td>
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<td>Daniel LaFontaine</td>
<td>Transport Canada</td>
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<tr>
<td>Mark Morrison</td>
<td>Wisconsin DOT</td>
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<tr>
<td>Lisandra Garay-Vega</td>
<td>Volpe Center</td>
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### New Technology Opportunities Working Group

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Rick Campbell (Team Leader)</td>
<td>Campbell Technology Corporation</td>
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<tr>
<td>Aaron Jette (Facilitator)</td>
<td>Volpe Center</td>
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<tr>
<td>Debra Chappell (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Dan Kubaczyk (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Paul Chapat</td>
<td>Brotherhood of Locomotive Engineers and Trainmen</td>
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<tr>
<td>Andy Davis</td>
<td>Quixote Transportation Safety</td>
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<tr>
<td>Bill Grizard</td>
<td>APTA</td>
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<td>Dan Guerrero</td>
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<td>Bob Hoffman</td>
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<tr>
<td>Vijay Kohli</td>
<td>Fulcrum Corporation</td>
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<td>Brent Ogden</td>
<td>AECOM</td>
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<td>Dick Pew</td>
<td>BBN Technologies</td>
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<tr>
<td>Tom Potter</td>
<td>Reno A&amp;E</td>
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<td>John Sharkey</td>
<td>Campbell Technology Corporation</td>
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<td>Sesto Vespa</td>
<td>Transport Canada</td>
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<tr>
<td>Michelle Yeh</td>
<td>Volpe Center</td>
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### Regulations and Enforcement Working Group

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Deborah Freund (Team Leader)</td>
<td>Federal Motor Carrier Safety Administration (FMCSA)</td>
</tr>
<tr>
<td>Suzanne Sloan (Facilitator)</td>
<td>Volpe Center</td>
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<td>Adrian Hellman (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Richard Brown</td>
<td>TRANSPO Industries</td>
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<td>Lou Frangella</td>
<td>FRA</td>
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<td>Jack Hanagriff</td>
<td>Houston Police Department</td>
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<td>Dr. Thomas Raslear</td>
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<td>Robert Redmond</td>
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<tr>
<td>Gerald Ruggiero</td>
<td>Massachusetts Bay Transportation Authority (MBTA)</td>
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<tr>
<td>James Sottile</td>
<td>PVB Consulting Group</td>
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<tr>
<td>Guan Xu</td>
<td>FHWA</td>
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### Education and Public Awareness Working Group

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Helen Sramek (Team Leader)</td>
<td>Operation Lifesaver (OLI)</td>
</tr>
<tr>
<td>Daniel Di Tota (Team Leader)</td>
<td>OL Canada</td>
</tr>
<tr>
<td>Rachael Barolsky (Facilitator)</td>
<td>Volpe Center</td>
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<tr>
<td>Tashi Ngamdung (Team Assistant)</td>
<td>Volpe Center</td>
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<tr>
<td>Tarah Harkins</td>
<td>CSX Transportation</td>
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<tr>
<td>Annette Lapkowski</td>
<td>Florida Department of Transportation</td>
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<td>Cliff Strayton</td>
<td>CSX Transportation</td>
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<tr>
<td>Alvin Richardson, Sr.</td>
<td>Amtrak</td>
</tr>
<tr>
<td>Suzanne Horton</td>
<td>Volpe Center</td>
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<tr>
<td>Hadar Rosenhand</td>
<td>Volpe Center</td>
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<tr>
<td>Richard Towle</td>
<td>FRA</td>
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<tr>
<td>Lorraine Pacocha</td>
<td>MBTA</td>
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### Institutional Issues Working Group

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Steven Laffey (Team Leader)</td>
<td>Illinois Commerce Commission</td>
</tr>
<tr>
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<td>Volpe Center</td>
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<tr>
<td>Marco daSilva (Team Assistant)</td>
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<tr>
<td>William Browder</td>
<td>Association of American Railroads</td>
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<tr>
<td>Ian Lake</td>
<td>Railway Safety Commission (Ireland)</td>
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<td>FRA</td>
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<td>Joy Schaad</td>
<td>Chicago Metropolitan Agency for Planning</td>
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<tr>
<td>John Shurson</td>
<td>Burlington Northern Santa Fe Railway Corporation</td>
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Sample Research Need Form

Research Needs Project Template: Instruction Sheet

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
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</table>
| 1. Research Needs Area                       | Enter the name of one of the six Research Needs Areas:  
  • Grade Crossing Modernization (GCM)        
  • Traffic Patterns (TP)                     
  • New Technology Opportunities (NTO)        
  • Regulations and Enforcement (RE)          
  • Education and Public Awareness (EPA)       
  • Institutional Issues (II)                 |
| 2. Research Topic Area / Number              | Enter the Abbreviation of the Research Needs Area and the sequential order of the proposed projects in this Research Needs Area (e.g., TP-1, TP-2, etc.). Abbreviations are located under the Research Needs Area above. |
| 3. Title                                     | Enter the name of the proposed project                                                                                                                                                                |
| 4. Project Statement                         | Provide a brief description of the following:  
  • The issue(s)/challenge(s) to be addressed  
  • The purpose of the project                
  • The expected outcome(s)                   |
| 5. Cross-Cutting Areas                        | Mark an X if this project will specifically address a cross-cutting area (or areas):  
  • Human factors                            
  • Transit-oriented communities              
  • Data requirements                         
  • Efforts related to high Speed Rail        |
| 6. Relationship to Current Research          | Indicate whether this is a new project or a follow-on to previous research.                                                                                                                              |
| 7. Potential Benefit(s) of Identified Research Need Area | Briefly describe the positive tangible and non-tangible (but beneficial) outcomes that are expected to result from such a project. If possible, indicate whether it would be a short- or long-term benefit (short term = 5 years or less; long term > 5 years) and who would be the benefactors. |
| 8. Research Need Urgency                     | Mark an X to indicate the level of criticality of the need for this research project, e.g., high-priority, medium priority (strong consideration), or low priority (closely monitored for future action). |
| 9. Cost of Research                          | Mark an X to indicate the total estimated cost to conduct the research.                                                                                                                                    |
| 10. Potential Organization(s) to Conduct Research | Provide the specific name(s) or organization type(s) that should conduct the research. For example:  
  Specific name: FRA, AREMA, AAR, Volpe Center, OLI, et. al.  
  Categories: Highway agencies, industry, railroads, international collaboration, academia, consultants, unions, non-union organizations, et. al. |
<table>
<thead>
<tr>
<th>11. Ease of Implementation</th>
<th>Mark an X to indicate the anticipated level of difficulty to implement the results of the research. If medium or difficult, please explain what the key implementation issues are.</th>
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<tr>
<td>12. Other Comments</td>
<td>Provide any supplemental information that could provide insight on items of interest or concern related to this project. <em>Example: potential to combine with other Research Needs Areas.</em></td>
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<tr>
<td>Question</td>
<td>Response</td>
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<td>1. Research Needs Area</td>
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<td>5. Cross-Cutting Areas</td>
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<td>Please mark an X next to the applicable area(s)</td>
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<td>__ High Speed Rail</td>
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<td>__ Supplemental (list organization &amp; title of current research)</td>
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<td>7. Potential Benefit(s) of Identified Research Need Area</td>
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<td>9. Cost of Research</td>
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<td>If medium or difficult, list key implementation issues</td>
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<td>__ Easy, __ Medium, __ Difficult</td>
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<td>Issues:</td>
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<td>12. Other Comments</td>
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Prioritization of Projects from the
Third Research Needs Workshop on Highway-Rail Grade Crossing and
Trespass Prevention (RNW)

Instructions

Please email to debra.chappell@dot.gov by COB August 19, 2009

Dear RNW Attendees:

Thank you for your attendance and input at the RNW. As discussed during Anya A. Carroll’s presentation and discussion on July 16, 2009 the effort to prioritize the Top 33 projects would be completed via an electronic document. This document provides you the opportunity to review the top five or six projects developed during the July 15, 2009 breakout sessions, and to assist you with establishing your thoughts on research needs for highway-rail grade crossing safety and trespass prevention.

The next page contains the form to be used to prioritize the projects developed at the RNW. As you select projects, please place a number next to each title in order of need. If you feel that a certain project has the highest priority, then place a “1” next to the project title. Please place a “2” to the project with the second highest priority, and so forth for all 33 projects.

It is important to note that this effort is to prioritize the 33 projects as a whole, and not by research need area. For example, John Doe may mark TP-3 with a “1” for the highest priority research need and II-3 with a “2” for the second highest priority need, and so forth.

The one-page project write-ups are also enclosed for your reference.

Please email your choices to Debra (Dee) Chappell no later than Friday, August 14 at debra.chappell@dot.gov. If you have any questions, please email or call Dee at (202) 366-0236.

Thank you for your assistance.

Sincerely,

Debra (Dee) Chappell
RNW Coordinator
## Ballot

**TOP 33 PROJECTS**

DEVELOPED AT THE FRA’s THIRD RESEARCH NEEDS WORKSHOP ON HIGHWAY-RAIL GRADE CROSSING AND TRESPASS PREVENTION

<table>
<thead>
<tr>
<th>Rank</th>
<th>Project Number*</th>
<th>Title</th>
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<tbody>
<tr>
<td></td>
<td>EPA-1</td>
<td>Evaluation of Social Media Outreach</td>
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<td>EPA-2</td>
<td>Evaluation of Existing Education and Outreach Strategies</td>
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<td></td>
<td>EPA-3</td>
<td>Crossing Consolidation Education</td>
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<td></td>
<td>EPA-4</td>
<td>Evaluate Effectiveness and Potential Motorist &amp; Pedestrian Signage and Treatments</td>
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<td>EPA-5</td>
<td>Evaluate the Effectiveness of Mobile Warning Devices When Approaching Grade Crossings</td>
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<td></td>
<td>GCM-1</td>
<td>Warning Device Minimum Requirement for 80-110 MPH Trains</td>
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<td></td>
<td>GCM-2</td>
<td>Flangeway Gap Solutions</td>
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<td></td>
<td>GCM-3</td>
<td>Global Positioning Satellite (GPS)/Positive Train Control (PTC) Constant Warning Time</td>
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<td>GCM-4</td>
<td>Second Train Warning Devices for Pedestrian Crossings</td>
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<td></td>
<td>GCM-5</td>
<td>Personal Detection Device for Railroad Workers</td>
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<td></td>
<td>II-1</td>
<td>Establishment of a Railroad/Transit Data Clearinghouse</td>
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<td>II-2</td>
<td>Cost/Benefit analysis of Grade Crossing Improvements</td>
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<td>II-3</td>
<td>Synthesis to Evaluate How, When, and Where Human Perception Negatively Impacts Rail Safety</td>
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<td>II-4</td>
<td>Institutionalize Evaluation as a Key component of Project/Program (countermeasure) Design and Implementation</td>
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<td>II-5</td>
<td>Improved Effectiveness of Stakeholder Interaction</td>
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<td>II-6</td>
<td>Identify Opportunities to Make Legislation and Regulations Across Jurisdictions Compatible, Meaningful and Up-to-Date</td>
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<td>NTO-1</td>
<td>Alternative Sensors and Warning Systems for Vital Applications</td>
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<td>NTO-2</td>
<td>Pedestrian, Non-Motorized and Limited Mobility Treatments</td>
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<td>NTO-3</td>
<td>On-Track Vehicle Detection</td>
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<td>NTO-4</td>
<td>Effectiveness of LED Enhanced Grade Crossing Traffic Signs</td>
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<td>NTO-5</td>
<td>Minimum Traffic Control Devices for High-speed Train (HST, formerly known as HSR) HRGC</td>
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<td>NTO-6</td>
<td>Enhanced Commercial Systems to Improve HRGC Safety</td>
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<td>RE-1</td>
<td>Data Needs for Proactive Enforcement</td>
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<td>RE-2</td>
<td>Collecting and Analyzing Trespass Data</td>
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<td>RE-3</td>
<td>Photo Enforcement at HRGXs</td>
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<td>RE-4</td>
<td>Regulations and Signage: No-Train-Horn Xings</td>
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<td>RE-5</td>
<td>National Campaign for Targeted Seasonal Enforcement Programs</td>
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<td>TP-1</td>
<td>Application of Warning Devices/Treatments at High Speed Rail Corridors</td>
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<td>TP-2</td>
<td>Highway Traffic Signal Pre-emption at Highway-Rail Grade Crossings</td>
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<td>TP-3</td>
<td>Effectiveness of Gates for Pedestrians</td>
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<td>TP-4</td>
<td>Signage at Roundabouts</td>
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<td></td>
<td>TP-5</td>
<td>Driver Decision Making At Complex Crossings</td>
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<tr>
<td></td>
<td>TP-6</td>
<td>Review and Improvement of Hazard Indices and Accident Prediction Formulae</td>
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*In some cases, the project number shown may not reflect the project numbers from the ones generated during the breakout session on July 15.

**Key:**
- EPA – Education and Public Awareness
- NTO – New Technology Opportunities
- GCM – Grade Crossing Modernization
- RE – Regulations and Enforcement
- II – Institutional Issues
- TP – Traffic Patterns
Evaluation Form

Cambridge, MA – July 14-16, 2009

Evaluation

Workshop Evaluation: Please take a moment to complete this evaluation and leave it at the Workshop registration desk. Your responses will be valuable in planning future Workshops. Please use the back of the page as needed for your comments. Thank you.

Which of the following best describes the industry you belong to?
- Federal State or Local agency
- Transit agency
- Designated Employer Representative
- Management
- Consultant
- Union Rep
- Association or organizations representing the railroad community
- Academic or University research
- Education and Public Awareness
- Other ____________

Please rate your satisfaction level for the following.

<table>
<thead>
<tr>
<th>Category</th>
<th>Extremely</th>
<th>Very</th>
<th>Somewhat</th>
<th>Not at all</th>
<th>Comments</th>
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<td>Workshop presentations</td>
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<td>Workshop session structure</td>
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<td>Courtesy and helpfulness of workshop staff</td>
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<td>Conference location and facilities</td>
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<td>Overall quality of the Workshop</td>
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</table>

Did the Workshop meet your expectations?  [ ] YES  [ ] NO
Comments:

What kinds of topics would you like to see included at future Workshops?

What did you like most about this Workshop?

What did you like least about this Workshop?
Appendix C. Day One Presentations
OPENING REMARKS

- Dr. Magdy El-Sibaie, Director, Office of Research and Development, Federal Railroad Administration

**Crossing Demographics: Highway-Rail Grade Crossings (2008)**

- Total number of crossings: 224,798
  - Public: 137,659
  - Private: 85,175
  - Pedestrian: 1,963
- Total number of crossings closed between 2007-2008: 4,312
  - Public: 1,899
  - Private: 2,413
  - Total closed since 1990: 70,004

Some key lessons learned

Successful Safety Initiatives
- Freight Car Reflectorization
- Locomotive Alerting Lights
- Commercial Driver Safety Initiatives
- Operation Lifesaver

Safety Initiatives with Challenges
- Driver behavior
- Pedestrian warning devices
- Intelligent grade crossings
- Low cost active warning devices

Goals for the Highway-Rail Grade Crossing and Trespass Prevention Research Program

- Reduction of injuries and fatalities
- Tools for grade crossing safety assessment and inventory
- Effective education and outreach efforts
- Rationale for effective rulemaking
- Improvements along vital rail corridors (including HSR)

Key Strategies as we move forward
- Aging infrastructure and equipment
- Providing cost-effective railroad safety and security
- Efficient and environmentally compatible use of energy resources
- Ensuring investments are made to enable network capacity to meet future demands
- Implementing effective policies and regulations

Thank You!

Dr. Magdy El-Sibaie
Director
Office of Research and Development
Federal Railroad Administration
GENERAL SESSION PRESENTATION

Level Crossing Needs: Thoughts from Overseas
Aidan E. C. Nelson, Co-Director
Community Safety Partnerships, Ltd. (United Kingdom)
A roads perspective

- Profile of this issue will remain low as the numbers killed on the roads is so high.
- Level crossing risks may be shared between the interfering modes but they are predominantly a railway risk.
- In the 4.5 years since a train occupant died in a level crossing accident, 14,000 have died on the roads.

Key issues

- Attitude and role of highway authorities.
- Attitude and role of planning authorities.
- Partnership approaches.
- Engineering, education, enforcement.
- Costs of level crossings/new technology.
- Proportionate & properly targeted recommendations.
- International collaboration.

Schizophrenic attitudes

- I'm invincible when behind the wheel of my car.
- A train driver ran a red light: disgusting.
- A car driver ran a red light: we all do it, don't we?
- 3,000 killed on the roads: minor news.
- One passenger killed in a train accident: front page news for days.
- Why should I vote? I can look out for myself.
- You should make it so I can't do anything stupid.

Physiology

- Looming: Large objects - difficult to judge distance away.
- Frontal view.
- Rear view.
Pedestrians
- Mask on train whistle: walker doesn’t make it
- Headphones off, train whistle: warming heard
- Child crying, pushchair stuck in railway gap: mother struggles, pushchair stuck; train can’t stop
- Child crying, pushchair stuck in railway gap: child gut: mother & child safely off the crossing
- That’s our train light at red & alarma sounding: ran across but second train coming.......

Down on the farm
- Stop, get out, open the near side gate
- Cross, open the far side gate and return
- Get in the vehicle, drive across
- Get out, walk across to close the gate
- Back across, close the gate, get in drive off
- I’m soaked, it’s pity going to be a couple of minutes before I come back, I’ll leave the gates open
- The postman will be along soon, I’ll leave the gates open for him, save him getting wet too

Large animals
- Unspeakable in pursuit of the uncatchable fox across the railway: hounds follow; huntmen can’t stop
- Train hits horse: train derailed.......

30 July 1984: a cow on the line was struck near Cheltenham; that led to thirteen deaths on the train
- Many lessons learned
- 5 October 1990: a train was delayed near Wrexham after hitting a bullock that had strayed onto the line the same day as the Paddington tragedy
- Who remembers the lessons from this disaster?

Upgrade brings a new risk
- An accident, we must upgrade the crossing
- Why not add some miniature warning lights?
- We have warning lights, we don’t need gates
- Oh I didn’t see the lights, I didn’t know there was a train at this time of day, I’m so sorry.......
- Are we surprised? Crossings with lights and no barriers have a disproportionate concentration of risk
- A better answer, a set of crossing gates?
**Cars**
- Late for work, red lights flashing: I can beat them
- Train wins this time
- School run: flashing yellow light means speed up, not prepare to stop
- Kids, I told you to keep quiet...

**Motorcyclists**
- Traffic moving slowly: exit not clear: Come on, Move! I'm stopped on the level crossing. Move!!
- Come on! Why are they slowing down? Dodgy old-git! Nothing coming: safe to overtake; barriers down! Can't stop: need to zig-zag; one motorcyclist heavenward bound?

**Buses and coaches**
- A bus crossed as the barriers were being lowered, damaging the barriers in the process
- A witness said that the lights and alarms were working correctly
- Competent or not? The driver? The bus company? Both?
- School bus driver chose to ignore the fact that the level crossing was closed to road traffic

**Commercial vehicles over-represented**
- I do this journey every day
- It really is difficult to get this thing moving again
Hazards

- Weather
- Time of day
- Sightings
- Vegetation
- Built environment
- Expectation
- No train at this time of day
- The train's a long way off
- I've got time
- Parallel road and rail, sharp crossings, curved approaches, bad signage

Cost effective measures

- Keep on learning lessons from accident investigation
- Look for transferable lessons wherever they might be found
- Objective means of determining priorities
- Look for measures which influence and change behaviour
- Evaluation of efficacy

Rip off and replicate

- A host of traffic calming measures exist

Other issues common to all

- Suicide – there are measures that work, Germany for example
- Second train coming, not just pedestrians at stations
- Long traverse over railway
- Case for photo enforcement
- Follow the GPS

Contact details

Aidan McKeon
Community Safety Partnership Ltd
92 Box 493, York, YO2 8XJ
01904 460 439
+44 7939 540260
sdramelon@comsafepartners.com
www.2iminfo.org
WORKSHOP PARTICULARS
John McGuiggin, PE, PMP
Chief, Systems Engineering and Safety Division, Volpe Center

Workshop Particulars

John P. McGuiggin, PE, PMP
Chief, Systems Engineering and Safety Division
Research and Innovative Technology Administration
Volpe National Transportation Systems Center

Welcome!

Purpose

To provide FRA, other USDOT agencies and their stakeholders with the status of current and future research needs in the areas of highway-rail grade crossing safety and trespass prevention.

Primary Objective

To identify and prioritize specific research needs related to technology, human factors, methodology, and education to facilitate the reduction of highway-rail grade crossing and trespass collisions and fatalities.

Research Needs Areas

- Grade Crossing Modernization
- Traffic Patterns
- New Technology Opportunities
- Regulations and Enforcement
- Education and Public Awareness
- Institutional Issues

Workshop Cross-cutting Areas

- Human factors
- Transit-oriented communities
- Data requirements
- Efforts related to high-speed rail

Workshop Activity Summary

July 14: Review of the current status and/or panel discussion of research within each Research Needs Area
Workshop Webinar is being streamed through the Internet

July 16: Breakout sessions to discuss identifying previously established research needs and additional research needs.

July 18: Review and discussion of selected research needs by topic area
A tour of the Massachusetts Bay Transportation Authority’s (MBTA) Silver Line Control Center and Transit Way pre-registrants only.
Questions/Special Needs?

Please let any of the Volpe Highway-Rail Grade Crossing and Trespass Prevention Team know.

Thank You!
HUMAN FACTORS: A RESEARCH NEEDS CROSS-CUTTING AREA

Applying a Sociotechnical Framework for Improving Safety at Highway-Railroad Grade Crossings

Jordan Multer, Ph.D., Manager, Rail Human Factors Program, Volpe Center

Applying a Sociotechnical Framework for Improving Safety at Highway-Railroad Grade Crossings

Jordan Multer and Michelle Yeh
Research and Innovative Technology Administration
Volpe National Transportation Systems Center

One view of the Sociotechnical Model

Environmental Context
Organizational/Management Infrastructure
Personnel Subsystem
Technical/Engineering System
Traffic Control Devices
Crossing Characteristics
Trains
Driving Skill
Driving Style
Identifying/Crossing for Improvements
Interconnecting Infrastructure
Signaling
Intelligent Transportation Systems (ITS)
Regulations
Public Education
Enforcement

Fox River Grove Grade Crossing Accident (October, 1995)

- School bus stopped for a red light at a traffic intersection 45 feet from the crossing
- Rear of the bus extended on the tracks, three feet into the path of a commuter train

Results of NTSB Investigation
- Primary cause: Bus driver stopped the bus on the railroad tracks
- Several other contributing factors were identified

Contributing Factors: Technical/Engineering Subsystem

- Failure to detect visual and auditory cues at the grade crossing
  - Flashing lights and gates at crossing
  - Sound of the train horn

Contributing Factors: Personnel Subsystem & Organizational/Management Infrastructure

- Driver training
  - Substitute driver on the day of the accident was not familiar with the route
  - She was also not aware of the bus's position with respect to the railroad tracks
  - School district did not have a process for identifying and sharing information about potential hazards along the route
  - Drivers expected to report hazards on a pre-trip inspection form, but no enforcement
Contributing Factors: Organizational/Management Infrastructure

• Lack of coordination between highway and railroad agencies regarding timing of highway and railroad signals
  - Highway signals presented a green light only 2-3 seconds before impact
  - Maintenance complaints noted lack of synchronization between crossing warning lights and traffic signals
  - Inadequate timing failed to prevent vehicles from stopping on the tracks at the intersection

Contributing Factors: Environmental Context

• State failed to take adequate measures to prevent vehicles from queuing onto the railroad tracks when stopped at the traffic intersection
  - Storage space was insufficient to accommodate large vehicles
  - Short turning area was the result of IDOT's widening the roadway
  - IDOT used 30 feet of property belonging to the railroad
  - Railroad had expressed their safety concerns but IDOT completed their project as planned

Implications of a Sociotechnical model for Grade Crossing Research

• Value of the sociotechnical model
  - Broadens our vocabulary and way of thinking about the grade crossing problem
  - Organizational issues need our attention
  - Boundaries between components are as important as the components themselves

• Some gaps in current research:
  - Overcome institutional barriers & historical logics: Railroad vs. Highway
  - Warning design: yield sign vs. crossbuck, flashing light vs. traffic light
  - Acceptable waiting time
  - Uniform standards (e.g., MUTCD) vs. standards that vary by state
  - Shared ownership of the intersection — who pays
  - Void lacks information about organizational conflicts (e.g., accident databases)

Commuter Crossings: An Idea Representative of the Sociotechnical Framework

• Identification of risk factors involving trains, motorists, and pedestrians at commuter crossings
  - High exposure for all stakeholders: motorists, pedestrians, trains
  - Many densely packed grade crossings (in space and time)
  - Affects grade crossing and trespassing incidents
  - Behavior at nearby intersections can influence the crossing as well as the converse
Accessibility Issues at Highway-Rail Grade Crossings
David Peterson, Senior Manager, Industry and Public Projects
Union Pacific Railroad

Federal Guidelines & Regulations

- Draft Guidelines for Accessible Public Rights of Way
  - Released in November 2005
  - Truncated Domes
    - Must be placed 6-16' from centerline tracks
    - 24" Depth
  - Flangeway Gap
    - 2.5' Passenger Operations only
    - 5' Freight Operations
  - Sidewalks
    - Min. width should be 4' on reconstructed facilities.
    - Maximum surface discontinuities is 0.5"

Federal Guidelines and Regulations (cont.)

- FHWA's ADA Standards for Transportation Facilities
  - Effective November 29, 2006
  - Walking Surfaces (including sidewalks)
    - Maximum slope 1:20
    - RR tracks can be super-elevated 6.6' = 1:10 slope
  - Truncated Domes
    - Must be of contrasting color to walking surface
    - Must have 24" depth
  - Flangeway Gaps
    - 2.5' Max

FRA Quiet Zone Rules

- 49 CFR Parts 222 & 229
  - Current update dated August 17, 2006
  - Does not require the routine sounding of horns at pedestrian grade crossings
  - If within a proposed Quiet Zone the must be evaluated by a diagnostic team.
  - Advance Warning Signs and No Train Horn Sign must be installed.

Flangeway Gap Issue

- No filler material exist that will withstand normal train volumes or speed.
- Railroads typically do not provide flangeway filler for timber or flange rail crossings.
- Wheel wear and tolerance limits set by international interchange rules.
- Flangeway gaps less than 3" result in wheel impacts to gage panels.
What is Desired for a Flangeway Gap?

No Gap at All!

Wood Plank Crossing

Concrete Panel Crossings
(Old Style Lagfree)

Rubber Crossings

Skewed Crossings

- Should there be a guidance on intersecting angle?
- Flangeway gap issues are compounded at skewed crossings.

Truncated Domes

- Need to be at least 2" in depth across the full width of the pathway.
- Contrasting color with paving surface.
- Should be at least 12" from centerline of track. Ideally opposite the crossing warning device.
- Ownership and maintenance needs to be defined.
Truncated Domes

Quiet Zones
- Should rules be modified pertaining to public pathway crossings?
  - Standard be the sounding of the train horn at all pedestrian pathway crossings not in a quiet zone.
  - Require an audible bell at all quiet zone crossings.
  - Require truncated domes at all quiet zone crossings.

Possible Research Needs?
- Find material that would close the flangeway gap that is durable and will work on mainlines.
- Investigate issues related to skewed pathway and sidewalk crossings and issue design guidelines that might be incorporated in the AASHTO’s Green Book and the Railroad-Highway Grade Crossing Handbook.
- Investigate if Quiet Zone rules should be modified to address pedestrian ADA issues.

Questions?
- John Johnson
  - 703-884-9987
  - jjohnson@np.com
Education and Analysis—Highway-Rail Grade Crossings in the Modern World
Paul O’Brien, Rail Service General Manager
Utah Transit Authority

Education and Analysis; Grade Crossings in the Modern World
FRA Research Workshop
Grade Crossing Modernization

Best Solution – Grade Separation

Highway Rail Grade Crossing Flashing Lights
Go Faster?

Modernizing Grade Crossings
Upgrading Technology
Design Modifications
New/Improved Treatments

Changes in the way LED Technology is used?

Quad Gates
Loops vs. Timers for Exit Gates
Modernizing Colors

- To the Next Trains' Arrival
- To Train Crossing with Gate Down
- To Second Trains' Arrival

Treatments for Multi-Track Crossings
Use of “Second Train Coming” Warning
Special Treatment for Gates with Multiple Tracks

High Speed Rail
Do High Speed Crossings Need Special Treatment?
Is a High Speed Train Safer than a Low Speed Train?
Special Treatments to warn High Speed Trains are Present?

Pedestrians and Other Non-Motorists
How do we design a grade crossing for the non-motorist?
How do we design for increased numbers of Pedestrians and mode Types?

Pedestrian Gates
How effective are Pedestrian Gates?
Are Pedestrian Gates a good return on Investment?
What types or designs work and what doesn’t work?
Pedestrian Treatments

Walk/Don’t Walk

Pedestrian Treatments

Automatic Gates Tied into Crossing Gates

Passive Pedestrian Treatments

Z-Crossing treatments
Modified Z-Crossing treatments
Signage – Type, size, color, style, location

Changes in MUTCD

Vertical White Stripe
Time to Implement changes to MUTCD and at crossing locations
Other Changes?

How can we protect the right of way from accidental access by motorist at crossings?
Conclusions

Technology, Design, and Treatments?

What is worth researching?

Now is the Time and Place to Modernize Grade Crossings!
**Roundabouts at or Near Highway-Rail Grade Crossings**

Mark Morrison, Grade Crossing Safety Engineer
Wisconsin Department of Transportation

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**Roundabouts Near Railroad Crossings**

Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention

Mark Morrison, mark.morrison@dot.wi.gov
WisDOT Grade Crossing Safety Engineer

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**Introduction**

- Here to discuss roundabouts near at-grade crossings, mainly signing issues today.
- Emerging, some at roundabouts become more the norm in highway construction.
- Nationally, Wisconsin is near the top in roundabouts to be constructed.
- Our planners/designers are directed to explore roundabouts whenever traffic signals are warranted or are proposed to be installed.

---

**WHY ROUNDABOUTS?**

- Not traffic circles like in the movies but modern roundabouts (Yield on Entry).
- Roundabouts have more throughput than conventional signalized intersections (more traffic volume).
- Reduce the amount of crashes.
- Typically change the type of crashes from right angle to side swipes.
- Reduce the severity of crashes.
- Lower operational costs. (Electricity, signal Eng.)
- Can have lower real estate impacts, especially on the approaches.

---

**Signing**

Currently no roundabout signs in the MUTCD equivalent to the W10-2, 3 & 4 signs for intersections

![Roundabout Signs](image)

**Signing**

MUTCD ROUNDABOUT ADVANCE WARNING SIGN

![Roundabout Advance Sign](image)

---

**PROPOSED OPTIONAL ROUNDABOUT ADVANCE WARNING SIGN**

![Proposed Roundabout Sign](image)

---

65
Signing

ROUNDABOUT ADVANCE GUIDANCE SIGN

- At First FHWA Gave Positive Reaction
- Sign wasn’t Non-Conforming since it combined to already approved symbols:
  1. Roundabout Symbol
  2. Crossing Symbol

WisDOT Explored Options Using Plaques

WisDOT Developed a Proposed Sign

WisDOT sent letter to FHWA for an official interpretation.
FHWA’s MUTCD Team responded with 3 concerns:

1. Study for experimentation since drivers might not understand the sign
2. Operational concerns: why is a roundabout so close to a crossing?
Signing

3. Design of sign is crowded, circle too small. Use the “standard W10-3” within the circle just before the exit or a W10-1 at the departure from the circle with a distance plaque if space permits, and only in situations where the devices at the crossing cannot be seen from within the circulatory roadway.”

What Started this Signing Discussion?

- Project on Allouez Ave. (USH 141) in the Green Bay area.
- Proposed roundabout to replace an existing signalized intersection.
- Roundabout was determined to handle the intersection traffic better and safer at this location.
- Railroad crossing impacts were actually positive compared to the existing.

Signing

1. Study for experimentation since drivers might not understand the sign.
   - WisDOT feels this is a national issue and should be taken up as such.
   - It was presented to the NCHRP technical committee for Parts 6 & 10 in January and they agree.
   - Utilizing the existing symbols as we’ve proposed is probably the best but research is needed.

2. Operational concerns, why is a roundabout so close to a crossing?
   - Common reaction to the issue but they already exist, aren’t going away and issues are coming.

How could the impacts be positive?

- Storage distance from the “intersection” to the crossing was slightly increased as part of the project.
- Right turn movements moved significantly further from the crossing.
- Signalized intersection would have moved the intersection closer to the crossing due to additional turn lanes. A roundabout’s approach lanes don’t have to line up with the departure side.

How could the impacts be positive?

- Vehicles facing a YIELD sign at a roundabout have better opportunities to clear the track zone than those facing a red traffic signal without pre-emption or a side road stop sign.
  - This alone makes the crossing safer than the previous configuration.
- Passive crossing with limited number of trains per month isn’t conducive to pre-emption.
  - Rusty rail, pre-emption not assured.
  - Decreased highway operations/safety the 99.9% of the time trains aren’t operating at/near the crossing.
Plan Overview of the Roundabout

Signing Research Needs
- Need to develop a new sign (or series of signs) to address when roundabouts are in close proximity to grade crossings.
- OR, need to develop guidance on how to apply the existing signs to roundabouts.
  - Would most likely need changes to the MUTCD.

Other Roundabout Research
- This issue isn’t going away so research needs to be done on more than just signing. There are other issues around this emerging trend.
  - Traffic signals at roundabouts for pre-emption
    (How do we signalize a roundabout?)
    - What signal indications? (red/yellow/green or red/yellow or blank ones or lane use control signals?)
    (For each lane or each movement?)
    - Signals dwell in flashing yellow or dark?
    - How to allow non-conflicting moves?
  - One track vs. multiple track issues. (Clear out queues before a second train.)
The Massachusetts Bay Transportation Authority: Lessons Learned
Gerard J. Ruggiero, WSO-CSS, Deputy Director of Safety, Safety Department
Lorraine M. Pacocha, Senior Project Coordinator, Design and Construction Department
Massachusetts Bay Transportation Authority

Highway-Rail Grade Crossing Safety
Traffic Patterns

Four Quadrant Gates
Wales Street, Abington, MA
- Corridor Analysis
- Design Methodology
- Video Study
- Findings
- Recommendations

Four Quadrant Gates
Greenbush Project
- Commercial/Front Streets - Braintree, MA
- East Street – Weymouth, MA
- South Street – Hingham, MA
- Hersey Street – Hingham, MA
- Pleasant Street – Cohasset, MA

Median Barriers
Laurel Street, Bridgewater, MA
- Video Study
- Findings
- Recommendations

Median Barriers
Everett Avenue, Chelsea, MA
- Video Study
- Traffic Issues
- Installation of Quick Kurb Medians
- Pedestrian/Bicycle Issues
- High School – Operation Lifesaver
- Changing Conditions

Median Barriers
Everett Avenue, Chelsea, MA
- Changing Conditions

Original Configuration
New Entrance
Result
Grade Crossing Re-Design
- South Weymouth
- Hamilton, Rt. 1A at Walnut Street

Post Accident Changes (CAP)
- Beverly, MA at West Street
- Revere, MA at Oak Island Road

Post Accident Changes (CAP)
- Revere, MA at Oak Island Road

Traffic Studies
- High Street, West Medford
- Holmes Street, Halifax

Quiet Zones
- FRA Calculator

Any Questions?
Queue-Cutter Signals at Highway-Rail Grade Crossings
Brent Ogden, Vice President
AECOM

Queue Cutters and Pre Signals
Examples and Research Questions

Federal Railroad Administration
Third Research Needs Workshop
Volpe Transportation Center, Cambridge MA (July 2009)
Prepared by
Brent D. Ogden, AECOM

Clear Storage Distance
Key Definition

Pre Signal
Mary/Elwyn/UPRR, Sunnyvale, CA

Clear Storage = 20 ft, Stop Bar Offset = 15 ft

Pre Signal
Mary/Elwyn/UPRR, Sunnyvale, CA

Stop Bar Offset = 75 ft, Distance to Head = 25 ft

Pre Signal
Typical Cycle (No Train)

Video #1

Pre Signal
Typical Cycle (with Lagging Left Service)

Video #2
Queue Cutter
Bullock/Vicinity/UPRR, Los Angeles, CA

Video #5

Queue Cutter
Typical Activation at End of Red Phase

Queue Cutter
Non Compliance Event

Video #6

Queue Cutter
Heavy Vehicle Event

Video #7

Queue Cutter
Lane Distribution Event

Video #8

Differentiators

- Fee Signal
  - Applicable to Locations with Limited Clear Storage Distance
  - Interconnected with Downstream Intersection Signal
  - Cycles Continuously

- Queue Cutter
  - Applicable to Locations with Substantial Clear Storage Distance
  - Not Interconnected with Downstream Intersection Signal
  - Cycles Intermittently
Guidance and/or Requirements

- Pre Signal
  - Passive DO NOT STOP ON TRACKS sign
  - NO TURN ON RED sign
  - Queue Cutter timer shall be long enough to allow the (design) vehicle to move through the intersection, or to clear the rails if there is sufficient clear storage distance.
  - May use programmed visibility beacons

- Queue Cutter
  - Active DO NOT STOP ON TRACKS sign or Traffic signal

Research Needs – Device Selection

- Pre Signal
  - What is the minimum Clear Storage Distance?* *
  - What site conditions may limit applicability?* *

- Queue Cutter
  - What is the minimum
    Clear Storage Distance?*
  - Is there a maximum effective Clear Storage Distance?*
  - What site conditions may limit applicability

Research Needs – Compliance

- Pre Signal
  - Excessive Tones
    - Hearing Right Turn on Red
    - Lantern Condition (especially at Busways)
  - What are the countermeasures?*
  - What alternative treatments are available?

- Queue Cutter
  - Excessive Tones
    - Frequent gliding due to recurrent queuing
    - Visual clutter
  - What are the countermeasures?*
  - What alternative treatments are available?

Research Needs – Design

- Pre Signal
  - Placement of heads upstream vs downstream from crossing
    - Use of programmed visibility beacons or barriers
    - Minimum stop bar offset to signal heads
    - When is green extension required?

- Queue Cutter
  - Placement of detection loops
  - Minimum red time
  - Minimum green time
  - Does visibility of downstream intersection signal matter?
Effectiveness of LED Signs at Passive Crossings
John Shurson, Assistant Director of Public Projects
Burlington Northern Santa Fe Railway Company

BNSF Railway

New Technologies Research Needs Workshop

John Shurson Assistant Director Public Projects

Vitruv Research Center Cambridge, Massachusetts

LED Lights on Passive Signs at Private at-grade Crossings

Existing BNSF Standard for Signage at Private at-grade Crossings

- BNSF adopted a Standard for signage at private at-grade crossings
- Other Class I railroad followed suit and developed similar standard signage at private at-grade crossings
- BNSF is initializing pilot project to install enhanced signage that would provide a greater level of visibility at locations that have less than ideal sight distances that are commercial, industrial or park access crossings.

LED Lights on Passive Signs at Private at-grade Crossings

TAPCO Solar Powered Blinker Signs

LED Lights on Passive Signs at Private at-grade Crossings

Additional BNSF Standard for “Blinker” Signage at Private at-grade Crossings

New Technologies

LED Lights on Passive Signs at Private at-grade Crossings

- Target pilot installation project at using existing BNSF Standard for Signage at Private at-grade Crossings
- Supplement BNSF Standards by adding “Blinker” LED Signage at Private at-grade Crossings
- “Blinker” Signs at Public at-grade crossings?
LED Lights on Passive Signs at Private at-grade Crossings

Upcoming issues:

- Standardization in railroad industry
- Crossing selection
- Activation of LED lights
- 24 hours – 7 days
- Timed
- Train activation
- Adoption at public crossings
Warrants for Pedestrian Treatments at Highway-Rail Grade Crossings
Dan Guerrero, Director of Communications and Signals
Metrolink Los Angeles

PEDESTRIAN TREATMENTS
Dan C. Guerrero, Manager C&S Engineering, Metrolink
New Technology Workshop
July 14, 2009

Agency Background
- Initial service to Santa Clarita, Pomona and Moorpark in 1992
- Currently operate over 386 route miles (not including other railroads)
- 311 at-grade crossings (public, pedestrian, private, station crossings)
- Average weekday riders – 43,397 (an increase by a factor of 2.5 in the past two decades)

California Vehicle Code
VC § 22451. Stop: Railroad or Rail Transit Grade Crossing
(b) No driver or pedestrian shall proceed through, around, or under any railroad or rail transit crossing gate while the gate is closed.

Riverside Accident
"The crossing gates blocked the roadway—but not the sidewalk—and the warning lights and bells sounded as Samuel attempted to cross..."

Former NTSB Chairman James Hall said "the best, most immediate way to prevent accidents such as Wednesday's is to block pedestrian traffic."
Grade Crossing Manual

TECHNICAL ADVISORY GROUP (TAG)

- Purpose: Provide input on the draft document by a group with varying expertise in design, construction and operation of grade crossings.
- SCRRA (Civil Engineering, C.S., Rail Corridor Crossings, Safety, Legal, Risk Management)
- Civil Consultants: AECOM, JLP, Rail Prof. LAN
- Signal Consultant: XorRail, FIRE
- LACMTA
- CPUC
- City of Los Angeles

Committee Goals

- Establish Defined Design Procedures
- Proper field diagnostics
- Develop the engineering flow and approval process
- Establish Defined Design Procedures
- SCRRA Standard Configuration
- Define proper applications of technology
- Provide clear direction on the applications of technology
- Provide direction that can be used in a variety of cases

ENHANCE HIGHWAY-RAIL GRADE CROSSING AND PEDESTRIAN PATHWAY SAFETY

Why Pedestrian Standards?

- Provide consistency in the application of standards for highway-rail grade crossing safety within the SCRRA/Metrolink 5 County system
- Reference for municipalities on the SCRRA system when improving crossings
- Standards tool for upcoming capital programs in Riverside (PVL), Los Angeles (Sealed Corridor) and Orange County (Service Expansion and Crossing Program)

Manual Content

PEDESTRIAN CONSIDERATIONS

- Pedestrian grade separations
- Ten-minute walk rule (proximity to schools, hospitals or high density locations)
- ADA issues
- Refuge areas
- Warming devices – type and configuration
- Channelization
- Number of Tracks

Manual Content (Cont.)

PEDESTRIAN CONSIDERATIONS

- Pedestrian treatments work well with proper channelization and signs.
- Sidewalk area on either side of tracks and/or through track area.
- Pavement striping continued across the track portion of roadway is good visual and effective.
- Important to add extra pedestrian treatments near stations— people run to catch trains.
- All crossings unique and need diagnostic reviews
RECOMMENDATION

- Research and develop appropriate warrants to ensure industry-wide consistency in determining need and applicability of pedestrian treatments.
SCRRRA Highway-Rail Grade Crossing
Recommended Design Practices and
Standards Manual

- Can be accessed by going to:
  [www.metrolinktrains.com](http://www.metrolinktrains.com), click on "About Us" (pull down menu) "Public Projects" and "Grade Crossing Section" (on right side).
### Regulation and Enforcement

**Team Leader: Deborah M. Freund, Federal Motor Carrier Safety Administration**

#### 2006 Public Xing Statistics

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#### 2007 Public Xing Statistics

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### In Sum...

- The changes from 2004 to 2008 are striking:
  - 36% drop in collisions
  - 54% drop in fatalities
  - 13% drop in injuries
- From 2007 to 2008, 28% drop in collisions, 55% drop in fatalities, but one more injury
- Granted, some of this may be due to lessened truck and train traffic from economic downturn
- VMT and vehicle registration figures will be available this fall to compute rate-based outcomes
Commercial Driver’s License Program
Robert (Bob) Redmond, Senior Transportation Specialist
Federal Motor Carrier Safety Administration

Commercial Driver’s License Program
and Highway-Rail Grade Crossing Enforcement
FRA’s Third Research Needs Workshop on Highway-Rail Grade Crossing Safety and Trespass Prevention
July 14-16, 2009


- To prevent commercial vehicle drivers from concealing unsafe driving records by carrying licenses from more than one state.
- To ensure that all commercial vehicle drivers demonstrate the minimum levels of knowledge and skills needed to safely operate commercial motor vehicles before being licensed.

Goals of the Commercial Motor Vehicle Safety Act of 1986 (Cont.)

- To subject commercial motor vehicle drivers to new, uniform sanctions for certain unsafe driving practices.

Prior to the Commercial Motor Vehicle Safety Act of 1986

- States had wide variations in:
  - Testing and licensing standards
  - Disciplinary actions for violating traffic control laws.
- Drivers had multiple licenses

Commercial Motor Vehicle CDL - Class A

Gross Combination Weight Rating (GCWR) of 26,001 or more pounds inclusive of a towed unit(s) with a GVWR of more than 10,000 pounds.

Commercial Motor Vehicle CDL - Class B

- Gross vehicle weight rating (GVWR) of 26,001 pounds or more;
- Any such vehicle towing a vehicle(s) of 10,000 pounds or less GVWR.
Commercial Motor Vehicle CDL – Class C
- Any single vehicle or combination of vehicles, that meets neither the definition of Class A or Class B;
- Is designed to transport 16 or more passengers, including the driver; or
- Is transporting hazardous materials required to be placarded or select agents or toxins.

Enforcement of CDL requirements is a joint effort involving:
- Federal regulations and oversight
- State testing and licensing
- State and local law enforcement
- Judicial system

Disqualifying Offenses
- Major Offenses
- Serious Traffic Violations
- Violations of Out Of Service Orders
- Railroad Grade Crossing Violations

Background
- Regulation mandated by section 403 of the ICC Termination Act of 1995
- Final rule effective on October 4, 1999
- Reduce number of CMV/train collisions at grade crossings involving injuries and fatalities

Railroad-Highway Grade Crossing Violations
[49 CFR § 383.51(d)]
For drivers who are not required to always stop:
- Failing to slow down and check that the tracks are clear of an approaching train;
- Failing to stop before reaching the crossing, if the tracks are not clear.

Railroad-Highway Grade Crossing Violations (cont.)
For drivers who are always required to stop:
- Failing to stop before driving onto crossing.
Railroad-Highway Grade Crossing Violations (cont.)

For all drivers:
- Failing to have sufficient space to drive completely through the crossing without stopping;
- Failing to obey traffic control device or instructions of enforcement official at crossing;
- Failing to negotiate a crossing due to insufficient undercarriage clearance.

Disqualification for Railroad-Highway Grade Crossing Violations

- 1st Conviction = 60 days
- 2nd Conviction = 120 days
- 3rd or Subsequent Conviction = 1 year
- Violations must occur within a 3 year period.

Civil Penalties for Railroad-Highway Grade Crossing Violations

Employer: Civil penalty of not more than $10,000 must be assessed against an employer who knowingly allows, permits, requires or authorizes driver to operate a CMV in violation of Federal, State or local laws or regulations pertaining to railroad-highway grade crossings.

[49 CFR 383.37(d) and 383.53(d)]

Questions
Enforcement Issues at Highway-Rail Grade Crossings
LTC. Ralph D. Mitchell, Jr., Patrol Commander
Louisiana State Police

USDOT FRA’s Research Needs Workshop on Highway-Rail Grade Crossing and Trespass Prevention
July 14, 2009
Cambridge, MA

Different approaches
- The problem of human error can be viewed in 2 ways:
  1. The person approach
  2. The systems approach
- Each has its model of error causation, and each model gives rise to different philosophies of error management.
Person approach, basis

- The long-standing and widespread tradition of person approach focuses on unsafe acts - errors and statutory violations of people in the transportation system: DRIVERS and PEDESTRIANS.

Person approach, philosophy

- This approach views these unsafe acts as arising primarily from atypical mental processes such as forgetfulness, inattention, poor motivation, carelessness, negligence, and recklessness.
- People are viewed as free agents capable of choosing between safe and unsafe mode of behavior.
- If something goes wrong, a person must be responsible.

Person approach: countermeasures to errors

- The associated countermeasures are directed mainly at reducing unwanted variability in human behavior.
- Posters and campaigns that appeal to people’s fear, disciplinary measures, threat of litigation, retraining, naming, blaming, and shaming.

Uniformity of Laws

- Uniform traffic laws and enforcement practices contribute to safety.
- To ensure that activities are conducted in an orderly manner, traffic laws and their enforcement are uniform within a single traffic jurisdiction.
- In Louisiana, there are specific laws related to traffic operations and safety, including rules for driving, pedestrian behaviors, and equipment requirements.
- Enforcement of these laws by law enforcement officers is crucial to maintaining uniform and consistent traffic conditions.
person approach, why?

- Blaming individuals is emotionally more satisfying than targeting institutions.
- Uncoupling of person’s unsafe acts from any institutional responsibility is in the interests of managers.
- Person approach is also legally more convenient.

Person approach: shortcomings

- Although some unsafe acts rise to a level above the general publics standard behavior, many do not.
Person approach: shortcomings

- Effective risk management depends crucially on establishing a reporting culture. Without a detailed analysis of mishaps, incidents, near misses and “free lessons”, we have no way of uncovering recurrent error traps.
- Reliable Data
- Compstat/Trafficstat Process

2 important feature of human error tend to be overlooked:
- It is often the best people who make the worst mistakes; error is not the monopoly of an unfortunate few.
- Far from being random, mishaps tend to fall into recurrent patterns. The same set of circumstances can provoke similar errors, regardless of the people involved.

Person Approach: Shortcomings

- The pursuit of greater safety is seriously impeded by an approach that does not seek out and remove the error-provoking properties within the system.
- Quiet Zones

Systems Approach
Systems Approach

* Humans are fallible and errors are to be expected, even in the best society.
* Errors are seen as consequences rather than causes, having their origins not so much in the perversity of human nature as in “upstream” systemic factors.

System Approach: Countermeasures to Errors

* Although we cannot change the human conditions, we can change the conditions under which human operate.
* When an adverse event occurs, the important issue is not who blundered, but how and why the defenses failed.

The Swiss cheese model of system accident

* Defenses, barriers, and safeguards occupy a key position in the system approach.
* Some are engineered (highway, motor vehicle, warnings).
* Others rely on people (training, skill, experience).
* And others depend on procedures and laws.

This approach leads to proactive rather than reactive risk management.
Active failures are like mosquitoes; they can be swatted one by one, but they still keep coming. The best remedies are to create more effective defenses and to drain the swamps in which they breed. The swamps, in this case, are the ever-present latent conditions.

Error management

Error management has 2 components:
1. Limiting the incidence of dangerous errors (this will never be wholly effective).
   - Photo Enforcement
2. Creating systems that are better able to tolerate the occurrence of errors and contain their damaging effects.

Followers of the person approach direct most of their management resources to trying to make individuals less fallible or wayward.

Followers of the system approach strive for a comprehensive management program aimed at several targets: the person, the highway, the environment, the vehicle, and the process.

“I never notice what has been done; I only see what remains to be done.”
Madame Curie
Safety and Enforcement: A Local and Regional Perspective
Jack C. Hanagriff, Senior Police Officer
Houston Police Department
Neighborhood Protection Corps

**Connecting with Law Enforcement**

Jack C. Hanagriff, Police Officer
Houston Police Department
Federal Railroad Administration Law Enforcement Liaison

**Improve Communication**
- Translate Incident Data
- Incorporate City, County, State Names
- Utilize closest Street Name and Block Number
- Average Times and Days of Incident

**Trespassing Incidents**

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</tr>
<tr>
<td>2</td>
<td>Palestine</td>
<td>235:58</td>
<td>Trespasser</td>
</tr>
<tr>
<td>3</td>
<td>Palestine</td>
<td>204:56</td>
<td>Trespasser</td>
</tr>
<tr>
<td>4</td>
<td>Palestine</td>
<td>201:25</td>
<td>Trespasser</td>
</tr>
</tbody>
</table>
Legislature to enact Standardized Trespassing Laws

<table>
<thead>
<tr>
<th>Texas Criminal Code</th>
<th>Texas Transportation Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criminal Trespassing</strong></td>
<td></td>
</tr>
<tr>
<td>- Requires prior warning or sign</td>
<td></td>
</tr>
<tr>
<td>- Mandates Arrest</td>
<td></td>
</tr>
<tr>
<td>- Involves Fingerprinting of subject</td>
<td></td>
</tr>
<tr>
<td>- Involves drafting report</td>
<td></td>
</tr>
<tr>
<td>- Involves filing charges</td>
<td></td>
</tr>
<tr>
<td>- Time Consuming</td>
<td></td>
</tr>
<tr>
<td><strong>Interfering with Railroad Property</strong></td>
<td></td>
</tr>
<tr>
<td>- Arrest not Mandatory</td>
<td></td>
</tr>
<tr>
<td>- Issuance of Citation</td>
<td></td>
</tr>
<tr>
<td>- Place Property Owner and Phone number of Contact</td>
<td></td>
</tr>
</tbody>
</table>

Grade Crossing Enforcement

**What?**

**Where?**

**When?**

**How?**

Directed Enforcement

- FEA and Railroads deliver data to Law Enforcement
- Railroad establish a mechanism on specific RR Crossing
- Railroad informs Law Enforcement on train operation related to RR crossing
- Law Enforcement Monitors RR Crossing
EDUCATION AND PUBLIC AWARENESS
TEAM LEADERS: HELEN SRAMEK, OPERATION LIFESAVER, INC. (USA)
DANIEL DI TOTA, OPERATION LIFESAVER (CANADA)
New Outreach Technologies: Florida Operation Lifesaver’s Perspective
Annette Lapkowski, Rail Operations Administrator
Florida Department of Transportation

What we do now
- Free safety presentations by trained volunteers
- Key focus groups include:
  - Law Enforcement
  - Professional Drivers
  - School Bus Drivers
  - Elder Drivers
  - Drivers Ed (Novice Drivers)
- VIDE
- Volunteers distribute material at:
  - Local Events
  - Fairs
  - Law Enforcement Blitz

Florida OL – Statistics
- Number of Presenters – 80
- Total reached by presentations = 10,594
- Total reached at events = 23,025

Florida Demographics
- Total Population > 18M
- Total Visitors ~ 85M
- 23.1% of Floridians speak a language other than English at home (>4M)
  - Top Languages:
    - Spanish 71%
    - French Creole 6%
    - French 4%

The results
- Percentage of Floridians reached through presentations and events?
  - Less than 1/4 percent
- Percentage of tourists reached?
  - Unknown

How can we improve?
- Traditional Media
  - Billboards
  - Newspaper articles
  - Public Service Announcements
- New Media
  - Web advertising
  - Video sharing sites
  - Social Media
We are living in exponential times

- Number of internet devices
  - In 1984: 1,000
  - In 1992: 1,000,000
  - In 2006: 1,000,000,000

In March 2009,

- 14.3 billion U.S. searches were performed
- 64% on Google
- That is more than 290 million searches per day!

Children, ages 8 to 18 spend 6 1/2 hours daily in front of computer, television, and game screens

(more than any other activity in their lives except sleeping)

(Pew Internet Project, 2009 and Lenhart, 2009)

Facebook

- More than 200 million active users
- More than 100 million users log on to Facebook at least once each day
- More than 4 billion minutes are spent on Facebook each day (worldwide)
- Average user has 120 friends on the site

(Pew Internet Project, 2009 and Lenhart, 2009)

Facebook USA

- Number of users: > 91 million USA
- Demographics
  - 27% 12 to 17
  - 46% 18 to 34
  - 26% 35+
- The fastest growing demographic is those 35 years old and older

(Facebook, June 2009)
According to the Wall Street Journal...

- YouTube receives a billion videos per day
- In fact, every minute, ten hours of video is uploaded to YouTube

Your Marketing may be Dated?

- Millions of people no longer watch TV, and many that do skip the ads
- Print newspapers/magazines are dying
- Society influencers spend a majority of their time on the web
- Over 130 million Americans watch video on the Internet each month

Growth of customization & personalization

- Create fans around your mission
- They will spread your message for you through social media
- Build a culture
- Brand with dynamic people
- Keep it transparent

What’s the Florida plan?

- Keep the fans we have
- Encourage the use of new media
- Be fluid and adapt
- Create media that better appeals to younger audience
- Focus on our needs

Twitter

- Twitter the 3rd largest social network
- Allows its users to send and read other users' updates (known as 'tweets'), which are text-based posts of up to 140 characters
- Sample users = Jet Blue, IBM, BBC, Red Cross

- Number of users: > 21 million
- Number of monthly visitors: > 190 million

Twitter

- Demographics
  - 5% 12 to 17
  - 43% 18 to 34
  - 32% 35 to 49
  - 10% 50 +
Questions?

Annette Lapkoast, P.E.
Rail Operations Administrator
Operation Lifesaver State Coordinator
Florida Department of Transportation
866-414-6541
www.fdot.state.fl.us

http://www.fdot Mold.org/
Public Education and Enforcement Research Study (PEERS)
Suzanne M. Horton, Operations Research Analyst
Volpe Center

PEERS Project Overview
- 16-month video monitoring period
  - Pre-test case data collection period (2 months)
  - Test case data collection period (12 months)
  - Post-test case data collection period (2 months)
- Initiatives during test case period
  - Scheduled police information and enforcement blitzes
  - Community public awareness campaigns

Overall System Schematic

Violation Types
Type I Violation – Flashers active, gate is vertical

Violation Types
Type II Violation – Flashers active, gate in motion

PEERS Purpose and Goals
- The USDOT 2004 Secretary’s Action Plan on Highway-Rail Crossing Safety and Trespass Prevention identifies education and enforcement as key elements in reducing grade crossing incidents, injuries, and fatalities
- The Volpe Center was funded by FRA to conduct a Field Operational Test at highway-rail crossings to establish the effectiveness of education and enforcement programs
Violation Types

Type III Violation – Flashers active, gate fully deployed

Differences in Communities

<table>
<thead>
<tr>
<th></th>
<th>Arlington Heights, IL</th>
<th>Macomb, IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>76,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Trains per day</td>
<td>~76</td>
<td>~20</td>
</tr>
<tr>
<td>Train distribution</td>
<td>12 height 63 commuter</td>
<td>18 freight 1 Amtrak</td>
</tr>
<tr>
<td>Number of tracks</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Arlington Heights, IL

Arlington Heights Violations

The overall violation rate reduction (from the pre-test to post-test) was 30.02%

Arlington Heights Violations

<table>
<thead>
<tr>
<th>Violation Type</th>
<th>Pre-test</th>
<th>Test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>0.46</td>
<td>0.48</td>
<td>0.53</td>
</tr>
<tr>
<td>Type II</td>
<td>1.35</td>
<td>1.07</td>
<td>1.24</td>
</tr>
<tr>
<td>Type III</td>
<td>0.73</td>
<td>0.26</td>
<td>0.22</td>
</tr>
</tbody>
</table>

- Minimal increase in Type 1 violation rate
- Type 2 violation rate decreased by 29%
- Type 3 violation rate decreased by 72%

Macomb, IL
**Macomb Violations**

The overall violation rate increased from the pre-test to post-test period.

**Violation Rates by Violation Type for All Crossings**

<table>
<thead>
<tr>
<th>Violation</th>
<th>Pre-test</th>
<th>Test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>0.40</td>
<td>0.41</td>
<td>0.38</td>
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<tr>
<td>Type II</td>
<td>2.02</td>
<td>2.12</td>
<td>2.22</td>
</tr>
<tr>
<td>Type III</td>
<td>0.06</td>
<td>0.05</td>
<td>0.06</td>
</tr>
</tbody>
</table>

- Type 1 violation rate decreased by 10.1%
- Type 2 violation rate increased by 9.0%
- Type 3 violation rate was too small to be significant.

**Arlington Heights vs. Macomb**

**Population Demographics**

**Arlington Heights**

- Commuters – used the crossing daily and were exposed to safety initiatives on a regular basis.

**Macomb**

- Motorists – may drive over the crossing infrequently and not exposed to FEERS programs regularly.
- Students – every September approximately 25% of the student population in Macomb is new.

**Macomb PEERS Timeline**

- The population of Macomb fluctuates by time of year.
- Post-test data includes students who were not exposed to the PEERS programs.

**Population Demographics**

[Image of a street scene]
PEERS Program Implementation

Arlington Heights
- Police presence was major part of PEERS program
- Education and enforcement blitzes were conducted randomly but frequently throughout study

Macomb
- Primary activities included envelope stuffers, newsletters, posters, PSAs
- Activities reach a wide audience but do not specifically target crossing users

Education and Enforcement Blitzes

Gate Down Time

Arlington Heights
- Primarily commuter rail trains
- Crossing warning devices active for 2.1 minutes per train event

Macomb
- Primarily freight trains
- Crossing warning devices active for 3.7 minutes per train event

Conclusions

- The PEERS programs in Arlington Heights and Macomb had different effects on crossing-user behavior
- A variety of elements should be considered when constructing an education and enforcement program
- Best practices and guidance are next steps

Thank you
Suzanne M. Horton
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Volpe National Transportation Systems Center
Systems Engineering and Safety Division
(617) 564-1678
suzanne.horton@volpe.dot.gov
Operation Lifesaver Data Collection – Power of the Internet
Daniel Di Tota, National Director
Operation Lifesaver, Canada

Research Needs Workshop
June 26-27
Cambridge, MA
July 12, 2009

OL - Interactive Kiosks

OL - Interactive Kiosks

Computer Based Training
for Newly Licensed Drivers

www.train2drive.net
Institutional Issues
John Shurson, Assistant Director of Public Projects
Burlington Northern Santa Fe Railway Company

BNSF Railway

Institutional Issues
Research Needs Workshop

Institutional Issues

Perception of Grade Crossing Safety

- Does vehicular and trespassing issues at grade crossings take "back seat" to overall highway safety issues? If so, then industry experts need to address:
  - Limited Federal funds for grade crossing improvements
  - Limited State and local funds when using public works projects
  - Limited nationwide source for research, public education and creating uniform application of installation of safety improvements

Institutional Issues

Quiet Zones

- Does the creation of Quiet Zones improve safety at grade crossings?
- Are quiet zone projects adequately addressing pedestrians at grade crossings?
- Are quiet zone projects adequately addressing private and publically used private crossings within quiet zones?
- Should diagnostic field studies be conducted at all prospective quiet zone crossings?

Institutional Issues

Pedestrian safety and trespassing

- Are existing and new developments adjacent to rail corridors adequately addressing pedestrian safety?
- Should standards for fencing and channelization be developed at rail corridors?
- Should land zoning be developed in urban areas adjacent to rail corridors that provides for limited pedestrian traffic?
- Require grade separations and sealed rail corridors when schools, stores, parks and trails are proposed in urban areas

Institutional Issues

Grade crossing closures and consolidations

- Do grade crossing closures and consolidation improve grade crossing safety?
- Channelizing grade crossings to improved at-grade crossings and constructing grade separations reduces risk of train-vehicle incidences
- Promote education to public agencies that encourages crossing closures and "smart" development near grade crossings

Institutional Issues

Instituting new technology

- What are the obstructions to adopting new technology?
- Is there incentive for industry to development new technology?
- Can new technology be universally adopted by Regulatory Agencies and by private industry throughout the nation?
- Should video surveillance and enforcement be promoted?
Institutional Issues

Positive Train Control

- How does the rule making and implementation of positive train control effect grade crossing safety?
- Can PTC be used to improve grade crossing safety?
- Or will PTC take focus and resources away from grade crossing safety?

High Speed Rail

- Can standards for grade crossing safety at HSR corridors be used on existing rail corridors?
- When HSR is adjacent to existing rail, then opportunities for improvements such as grade separations and sealed corridors should be required.
Causal Analysis and Countermeasures to Prevent Rail Suicide
Karen M. Marshall, Program Development Director
American Association of Suicidology

Outline
- Project Objectives
- Early Findings
- Challenges in Rail Suicide Prevention
- Possible Prevention Strategies
- What We've Learned, What We Hope to Learn

Project Goals
- Establish prevalence
- Understand characteristics
- Develop countermeasures

Project Objectives: Scope of the Problem
- About 352 intentional deaths per year
- Most common in CA, IL, and NY
- Primarily middle-aged men
  - June, July, December

Project Objectives: Causal Analysis & Prevention
- Process
- Psychological Autopsies
- Some Early Findings

Research Process

CONTACT
Rail & Transit
Companies,
States,
Review media
**Challenges**
- Lack of a surveillance system
- Disparate data sources
- Confirmation by Medical Examiners/Coroners
- Widespread access to tracks
- Sensational, glamorized, romanticized coverage by media

**Potential Interventions**
- Barriers (living and others)
- Reduced speeds?
- Improved communication between station & train, crew-to-crew
- Media training
- Community education

**Signs, Signs ...**
- Several rail and transit organizations have installed signs
- Effective?
- Wording?
- With or without telephones?
- Dedicated lines?

**Since the Project Began ...**
- Proposed Rules Change on Reporting Suicide Incidents
- Federal Legislation Requires Railroad Plans for Mitigating Effect on Employees
- FTA Dropped Out

**What We’ve Learned**
- Clusters or “Hot Spots”
  – An American Phenomenon!
- Opportunities for Prevention
- The Power of Community

**What We Hope to Learn**
- Are signs effective?
- What interventions will work, in what combination?
- Can Communities and the Industry Partner to Stop Intentional Deaths?
- Will Unintentional Deaths be Positively Impacted as well?
- Can learnings be applied to other means?
**Data Needs and Other Issues**
Ronald E. Ries, Staff Director
Highway-Rail Grade Crossing and Trespasser Prevention Division
Federal Railroad Administration

---

**Data Needs and Other Issues**

Ron Ries
July 14, 2009
Cambridge, MA

---

**Data Is Necessary To:**
- Identify problem locations
- Identify causes of incidents and possible mitigations
- Determine effectiveness of interventions

---

**FRA Activities**

- NPRM on 49 CFR Part 225 – Reporting
- Revising inventory form
- Mandatory updating of Inventory

---

**NPRM on 49 CFR Part 225 – Reporting**

- Geo-locating trespassing casualties
- Gathering data on suicides
- Several new data elements on 57 reports
  - Passenger trains pulling/pushing
  - Stalled or stuck on crossing
  - Trapped on crossing by traffic
  - Blocked by gates
  - Roadway conditions
  - Locomotive video taken

---

**Inventory**

- Draft revision of inventory form is on web for review and comments
  - http://www.fra.dot.gov/us/content/801
- RSIA requires periodic updating by States and railroads

---

**Data Questions**

- Should vehicles collisions not involving a train at or near crossings be collected?
- What other data elements would be useful?
- Can other data sources be mined or accessed to provide additional data?
**Locomotive Video**
- More locomotives are being equipped with video cameras.
- How can they be used for data?
  - "Eye witness" to actual events of a collision
  - Identify hotspots – both crossing and trespassing
  - Quantify the results of mitigation efforts

**Intrusion Detection**
- Both at crossings and along rights-of-way
  - Provide notice of vehicles stalled/trapped on crossing
  - Virtual fence to detect trespassing
    - CA beaches
  - Research on whether this information should be provided to engineer
  - Impacts on train handling
  - Number of collisions that would be avoided

**High Speed Rail**
- How should crossings be treated as high speed passenger rail is implemented?
  - 80 mph to 110 mph
    - What is needed?
    - Impact on safety of train passengers and crew
    - How to quantify the benefits of the improvements?
  - Notification to train crew

**Ron Ries**
ronald.ries@dot.gov
(202) 493-6285
APPENDIX D. DAY TWO AND DAY THREE PRESENTATIONS
Organization of Working Groups and “Rules of Engagement”
Marco P. daSilva, Highway Rail Grade Crossing and Trespass Research Team Leader
Volpe Center

Working Group Particulars

Purpose for Working Groups

- Provide FRA and all the US DOT modes with a current status of research in the area of Highway-Rail Grade Crossing Safety and Trespass Prevention.
- Formulate an up-dated set of research needs created by Intermodal and stakeholder consensus.
- Prepare these research needs in a prioritized action item format, including appropriate modal agency designations.

Format for the Working Groups

9:00 AM Welcome and Working Group Particulars - Auditorium
9:30 AM Break out Sessions
- Team Leaders and Facilitators Orchestrate the Sessions
  - Review background materials
  - Brainstorm New Research Needs
  - Complete One Page Research Needs Form for each
12:00 PM Box Lunch
1:00 PM Break out Sessions
- Complete research needs form for each need
- Prioritize research needs by Highly Urgent and Other
5:00 PM Team Report Outs and Adjournment - Auditorium

Logistics for Working Groups

- Color Coded Working Groups
  - Grade Crossing Modernization (GCM) - Green
  - Traffic Patterns (TP) - Purple
  - New Technology Opportunities (NTO) - Orange
  - Regulation and Enforcement (RE) - Yellow
  - Education and Public Awareness (EPA) - Red
  - Institutional Issues (II) - Blue
- Group Member Roster and Room Assignment in Registration Package

Rules of Engagement

- Team Leaders and Facilitators Orchestrate the Groups
- Rules of Engagement
  - Respect
  - Logistics
  - Group Dynamics
  - Outcome

Rules of Engagement - Respect

- Turn off cell phones
- Minimize sidebar conversations
- Avoid digression
- Do not interrupt others
- War Story rule - 1-minute max.
Rules of Engagement - Logistics

- State name when speaking at first until group are familiar with each other
- Stick to facilitator’s agenda
- Honor time limits of agenda
- Please return promptly from breaks

Rules of Engagement – Group Dynamics

- Consensus decision making unless otherwise mentioned
- Listen and respect other’s viewpoint
- Diversity in opinion is valuable
- Be open-minded
- Be creative
- Don’t be defensive
- Set aside baggage you carried into the room
- Have fun

Rules of Engagement – Outcome

- Consider alternatives on the basis of public interest
- Don’t base discussions on current conventions, current standards
- Needs, perceptions, and potential more important than existing conventions
- Discuss possible research projects with different procedures, innovative technologies, new participants, changed responsibilities

Rules of Engagement – Outcome

- Prepare your Team Leader for the Summary Presentation for Thursday AM
- Prioritize Research Needs by High Urgency and Other categories
- Team Leader will provide Summary and Discuss Highly Urgent Research Needs from your working Group

Introduction of Team Leaders

Debra Chappell, FHWA – CIP
Tom Raslear, FRA – HF
Rhonda Crawley, FTA – STP
Brian Bowman, Auburn University – DGS
Gerri Hall, OLI – DPE
Jim Smailes, FRA – IT

Breakout of Working Groups

- Break
- Follow your Team Leader to designated room assignment
- Try to pair up with a “Federal Buddy”
- Security Level “Yellow”
- Good Luck on Your Deliberations
- Enjoy and Have Fun
Top Five Research Needs Summaries – Team Leader Day 3 Presentations

Top Five Project Summary: Grade Crossing Modernization

Team Leader - Brian Gilleran
Federal Railroad Administration
July 15, 2009

Top Five Research Needs Areas for Grade Crossing Modernization

- Warning Device Minimum Requirement for 80-110 MPH Trains
- Flangleway Gap Solutions
- GPS/PTC Constant Warning Time
- Second Train Warning Devices for Pedestrian Crossings
- Personal Detection Device for Railroad Workers

Project #1: Warning Device Minimum Requirement for 80-110 MPH Trains

- Description – Research and determine warning device requirements for high-speed corridors in the 80-110 mph range
- Rationale – Imminent deployment of HSR corridor calls for clear requirements for warning devices in this speed range
- Benefits – Uniform high standard of warning for road users at all HSR crossings nationwide
- Key Implementation Issues – Need to develop firm basis for warning device requirements

Project #2: Flangleway Gap Solutions

- Description – Flangleway gaps at grade crossings are a problem for wheelchair users
- Rationale – Need to develop an effective treatment for rail crossings so that road users may cross tracks without risk of entrapment
- Benefits – Safer and more uniform mobility for all road users
- Key Implementation Issues – Material used to fill the gap must be able to withstand the harsh railroad environment

Project #3: GPS/PTC Constant Warning Time (CWT)

- Description – Develop lower cost constant warning time system based on GPS and PTC
- Rationale – CWT is desirable, but not currently practicable at many crossings
- Benefits – Opportunity to make the benefits of CWT available at many more crossings
- Key Implementation Issues – Developed system must be compatible with existing population of crossing warning systems

Project #4: Second Train Warning Devices for Pedestrian Crossings

- Description – Develop universal active warning devices to let pedestrians know when a second train is approaching their location
- Rationale – Pedestrians need external cues to alert them to unseen potential danger
- Benefits – Reduction in pedestrian injuries and fatalities; better working environment for train crews
- Key Implementation Issues – Need to determine how best to communicate a complex message of second train location and direction
Project #5: Personal Detection Device for Railroad Workers

- **Description** – Develop a type of personal protection device using GPS/PTC technology that a railroad employee could wear to warn of approaching trains.
- **Rationale** – Need to enhance safety of workers at crossings and elsewhere on railroad.
- **Benefits** – Reduction in roadway worker injuries and fatalities; safer and more productive workplace.
- **Key Implementation Issues** – Any such device must be fail safe to be used in railroad industry.

Acknowledgements

- Leonard Allen, FRA
- William Barringer, Norfolk Southern Corp.
- Ed Boni, Interactive Elements Incorporated
- Mark Ciurej, Brotherhood of Railroad Signalmen
- Jessica Frankin, Texas Transportation Institute
- Frank Frey, Massachusetts DPU
- Dan Guerrero, SCRRA/Metrolink
- Paul O’Brien, Utah Transit Authority
- Ed O’Connor, Mass. Operation Lifesaver
- David Peterson, Union Pacific Railroad
- Phillip Poichick, Rail Safety, Transport Canada
- Scott Windley, US Access Board
- Paul Worley, NC Department of Transportation

Top Five Project Summary: Grade Crossing Modernization

Team Leader - Brian Gillianan
July 16, 2009

Top Six Project Summary: Traffic Patterns

Asya A. Carroll
Volpe Center
July 16, 2009

Top Six Research Needs Areas: Traffic Patterns

TP-10 - Application of Warning Devices/Treatments at High Speed Rail
 TP-7 - Highway Traffic Signal Pre-emption At Highway-Rail Grade Crossings
 TP-5 - Effectiveness of Gates for Pedestrians
 TP-9 - Signage At Rail Crossings
 TP-3 - Driver Decision Making At Complex Crossings
 TP-13 - Review And Improvement of Hazard Indices And Accident Prediction Formulas

TP-10 - Application of Warning Devices/Treatments at High Speed Rail

- **Description** – Determine adequate warning devices for High Speed Rail up to 110 MPH. Determine or evaluate whether or not existing types of warning devices are adequate for use on HS corners. Above 79 MPH, should different devices be required at speeds? Recommended treatments for pedestrian traffic at HSR crossings. Identify gateway crossing treatments for HSR crossings.
- **Rationale** – Covers three of the four Tier 1 warning issues High Speed Rail, Transit-Oriented Development, and Human Factors.
- **Benefits** – Standardizes treatments for more effective and efficient design. Reduces likelihood of incidents at HSR crossings.
- **Key Implementation Issues** – Blend scope of dealing with HSR between stakeholders FRA, AASHTO, FRA, TIR. High Cost: $1,000,000.
TP-2
Highway Traffic Signal Pre-emption At Highway-Rail Grade Crossing

- Description - Assess best practice nationally to determine proper application or use of traffic signal pre-emption at highway-rail grade crossing. Determine proper use of advanced pre-emption versus conventional pre-emption. Review equipment (hardware and software), particularly the traffic signal controller side to ensure these devices can adequately perform pre-emption as intended. Also assess best practice of field reviewing pre-emption. Research accident reports to identify "hot spots" (high incident areas) and factors relevant to pre-emption.
- Rationale - Covers three of the four cross-cutting issues High Speed Rail; Transit-Oriented Development and Data Requirements
- Benefit - Reduce incidents and more efficient traffic management
- Key Implementation Issues - High Cost > $500K; Difficult to implement.

TP-3
Signage at Roundabouts

- Description - Evaluate alternatives for advanced warning signs within or near the roundabout. Need to develop an advanced warning sign(s) for a roundabout located within 100 feet of the yield line at a roundabout. There is currently no recommended series of signs to the WID-4, 3, & 4 for crossings as close proximity to roundabouts. A sign also needs to be developed for situations where the rail line runs directly through a roundabout. Review body of existing literature in international examples. Gather information for development of roundabouts.
- Rationale - Covers two of the four cross-cutting issues High Speed Rail; Transit-Oriented Development and Human Factors.
- Benefit - National standard signage for MUTCD
- Key Implementation Issues - Medium Cost; Easy Implementation.

TP-22
Review And Improvement Of Fixed Distance And Accidental Prediction Formulas

- Description - New methods for evaluating the system safety performance of crossings are needed. The API calculation has become less valuable as the majority of crossings with high train and traffic volume have been signalized or grade-separated. The risk of a low-vol volume crossing is not fully captured in this current evaluation standard, and the API calculation may indicate crossings for upgrade that do not warrant signalization. A standardized evaluation method should be established for multiple agency use.
- Rationale - Covers two of the four cross-cutting issues Human Factors and Data Requirements
- Benefit - A holistic evaluation method will help state agencies to select crossings that most deserve improvements
- Key Implementation Issues - High Urgency; Medium ease of implementation.

TP-5
Effectiveness of Crosses for Pedestrians

- Description - Test the effectiveness of various gate treatments for pedestrians and passenger stations, commuter rail crossings in transit oriented development and freight rail crossings.
- Rationale - Covers three of the four cross-cutting issues High Speed Rail; Transit-Oriented Development and Human Factors.
- Benefit - National standard per design for pedestrian gates
- Key Implementation Issues - High Cost; Difficult to implement.

TP-3
Driver Decision Making at Complex Crossings

- Description - Close proximity between railtracks and complex interactions such as devoted and multiple approaches near RR. Drivers must divide attention and make decisions in a short period of time. Purpose: Better understanding of driver performance and information needed in order to provide means to reduce driver error. Expected outcomes: Input design process and safety analysis and enhancements.
- Rationale - This topic was in the RWM 2000 topics.
- Benefit - Reduce driver confusion and information overload. Reduce driver error and improve safety and mobility.
- Key Implementation Issues - Low Urgency; Medium ease of implementation.

Additional One-Page Research Need Statement Developed

<table>
<thead>
<tr>
<th>TP Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>TP1</td>
<td>Crash Reduction with reference to warning signs and Variable Message Signs</td>
</tr>
<tr>
<td>TP2</td>
<td>Driver Compliance with do not enter in Yard Signs</td>
</tr>
<tr>
<td>TP3</td>
<td>Driver Behavioral Correlative to High Time Traffic (Stimulating Questions)</td>
</tr>
<tr>
<td>TP4</td>
<td>Signal Control Information Sign or Certification (Long - What Was Made Use)</td>
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Six Top Five Projects Summary: New Technology Opportunities

Rick Campbell
Campbell Technology Corporation
July 16, 2009

Top Six Research Needs Areas for New Technology Opportunities

1. Alternative Sensors and Warning Systems for Vital Applications (NTO-1)
2. Pedestrian, Non-Motorized and Limited Mobility Treatments (NTO-2)
3. On-Track Vehicle Detection (NTO-3)
4. Effectiveness of LED Enhanced Grade Crossing Control Signs (NTO-4)
5. Minimum Traffic Control Devices for High-Speed Train (HST) HRGC (NTO-5)
6. Enhanced Commercial GPS Systems to Improve HRGC Safety (NTO-6)

Project #1: Alternative Sensors and Warning Systems for Vital Applications

- Description – To develop a vital non-traditional means for train detection and communication
- Rationale – Existing technology has significant limitations
- Benefits – Cost-effective means to provide additional warning time for preemption of adjacent signalized intersections and some warning devices (e.g., 4QG)
- Key Implementation Challenge(s) – Extensive knowledge of vital signal systems, train detection and communications

Project #2: Pedestrian, Non-Motorized and Limited Mobility Treatments

- Description – Identify and evaluate technology at active and passive HRGC
- Rationale – Need to develop standards for use of treatments for these conditions
- Benefits – Improve safety
- Key Implementation Issues – Increase in demand to meet transit/passenger and accessibility needs

Project #3: On-Track Vehicle Detection

- Description – Develop a system for on-track vehicles to activate HR warning devices
- Rationale – Numerous collisions between roadway users and on-track equipment
- Benefits – Safety for road users and railroad employees
- Key Implementation Issues – Necessary to activate one crossing at a time. Radio may not be an alternative due to communication congestion
Project #4: Effectiveness of LED Enhanced Grade Crossing Traffic Control Signs

- Description – Evaluation of effectiveness of LED enhanced signs at HRGC
- Rationale – Current signs compete for driver’s attention
- Benefits – Low cost means to increase safety
- Key Implementation Issues – Development of a national standard for use of the devices

Project #5: Minimum Traffic Control Devices for High-Speed Train (HST) HRGC

- Description – Development of a model to evaluate effectiveness of 4QG versus barrier gates on HST corridors
- Rationale – Determine if the use of barrier gates is a reliable, cost-effective measure instead of 4QG
- Benefit – Potential cost savings
- Key Implementation Issues – Data collection and analyses,

Project #6: Enhanced Commercial GPS Systems to Improve HRGC Safety

- Description – To incorporate HRGC data into commercial GPS systems
- Rationale – With the proliferation of GPS systems, HRGC data can likely be incorporated to increase user awareness of crossings
- Benefit – Increase safety, especially for commercial motor vehicles
- Key Implementation Issues – GPS manufacturer buy-in and regulations requiring use

Acknowledgements

- Facilitator – Aaron Jette, Volpe Center
- Staff Assistant – Dee, Volpe Center
- Andy Davis, Quixote Transportation Safety
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- Dan Kubaczyk, Volpe Center

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- Brent Ogden, AECOM
- Dick Pew, BBN Technologies
- Tom Potter, Reno A&E
- John Sharkey, Campbell Technology Corp.
- Sesto Vespa, Transport Canada
- Michelle Yeh, Volpe Center

Top Five Project Summary: Research Needs Area Name Here

Rick Campbell

July 16, 2009
Top Five Project Summary:
Regulations & Enforcement

Deborah M. (Debbie) Freund
Federal Motor Carrier Safety Administration
July 16, 2009

Top Five Research Needs Areas

- Project 1: Data Needs for Proactive Enforcement
- Project 2: Collecting and Analyzing Trespassing Data
- Project 3: Photo Enforcement at HRGXs
- Project 4: Regulations and Signage: No-Train-Horn Xings
- Project 5: National Campaign for Targeted Seasonal Enforcement Programs

Project #1: Data Needs for Proactive Enforcement

- Description – What data do stakeholders (including HRGx, researchers, local law enforcement and administrative officers) need to support proactive enforcement efforts? Can we automate many common data searches from FRA, RR, and highway databases?
- Rationale – We’re updating the Grade Crossing Inventory – great opportunity to help the end-users!
- Benefits – Increase efficiency of data analyses, improve ability to pinpoint hotspots and to target enforcement activities.
- Key Implementation Issues – Timing of Inventory update, different levels of challenges in gathering information from FRA, FHWA, States and RR; coordination of disparate databases (GS 38 and others).

Project #2: Collecting and Analyzing Trespassing Data

- Description – Upgrade existing trespassing data collection to include sufficient definitions of the term “trespasser,” provide effective guidelines to develop model law for nationwide application.
- Rationale – Need more consistent State and local regulations to better identify trespassing problem size and scope, and to develop consistent State and local regulations and enforcement mechanisms.
- Benefits – Improved knowledge of State and local trespassing situations, leading to improved prevention and mitigation.
- Key Implementation Issues – Incentives and disincentives for States; ownership, risk, and liability concerning ownership of ROW and data availability and data sharing.

Project #3: Evaluating Photo Enforcement at HRGXs

- Description – Assess potential benefits of photo enforcement to improve traffic safety, develop model laws, guidelines, and procedures to provide for standard and consistent application nationwide.
- Rationale – Potential benefits: improve traffic safety by deterring improper actions and documenting those that occur.
- Benefits – Verifiable data to document violations can provide a deterrent effect and promote sustained improvements in motorist behavior.
- Key Implementation Issues – Overcoming negative attitudes (SS generation over safety enhancement); privacy; initial and ongoing operational costs.

Project #4: Regulations and Signage: No-Train-Horn Xings

- Description – Modification of W10-1 sign to indicate no-train-horn crossing.
- Rationale – Provide notification to motorists unfamiliar with the particular crossing.
- Benefits – Enhanced motorist awareness of no-train-horn crossing – an “expected” audible warning may not be available.
- Key Implementation Issues – Development of sign, review by NUTC/D, rulemaking by FHWA to modify W10-1, posting of new sign.
Project #5: National Campaign for Targeted Seasonal Enforcement Programs

- Description – Develop targeted, seasonal, topical campaigns for HRGR and trespass prevention activities.
- Rationale – Many highway safety concerns (seat belts, drunk driving, child safety seats) have seasonal targeted outreach and enforcement programs – no similar program for HRGRx safety and trespass prevention activities.
- Benefits – Raise awareness of HRGRx and trespass prevention, increase officer awareness and precision of enforcement practices.
- Key Implementation Issues – Funding will be a challenge in time of limited resources.

Acknowledgements

- Richard Brown, Transpo Industries
- Lou Frangella, FRA Region 1
- Deborah M. Freund, PE, FMCSA Policy
- Officer Jack Hanagriiff, Houston Police Department
- Dan Lauzon, BLET
- Gita Melnik, Velpe Center
- LTC Ralph Mitchell, Louisiana State Police
- Dr. Thomas Raslear, FRA R&D
- Robert (Bob) Redmond, PE, FMCSA Enforcement
- Gerald Ruggiero, MBTA
- James Sotile, PVB Consulting Group
- Guan Xu, PE, FHWA Safety

Top Five Project Summary: Regulations & Enforcement

The Yellow Team
Debbie Freund, Team Leader
July 16, 2009

Top Five Project Summary: Education and Public Awareness

Helen Szamek – Operation Lifesaver USA
Daniel Di Toto – Operation Lifesaver Canada
July 10, 2009

Top Five Research Needs Areas for Education and Public Awareness

- Evaluation of Social Media Outreach
- Evaluation of Existing Education and Outreach Strategies
- Crossing Consolidation Education
- Evaluate effectiveness and potential motorist & pedestrian signage and treatments
- Evaluate the effectiveness of Mobile Warning Devices when approaching grade crossings

Project #1: Evaluation of Social Media Outreach

- Description – To identify, assess, and test the effectiveness of social media
- Rationale – Use of new media applications offers the opportunity to reach a broader audience with minimum resources.
- Benefits – Collection of data that has never before been utilized or captured, improve targeting of future educational efforts, better utilization of limited resources
- Key Implementation Issues – N/A
Project #2: Evaluation of Existing Education and Outreach Strategies
- Description – To quantify the role that education plays in preventing incidents on active rail lines
- Rationale – It is crucial to assess the impact and effectiveness of existing education and outreach strategies in changing public behavior
- Benefits – Identify effective current education methods to better target intended audience to reduce incidents on RR right-of-way
- Key Implementation Issues – Collection of data, and designing research study

Project #3: Crossing Consolidation Education
- Description – To determine effective methods to educate community leaders in this area
- Rationale – Many communities are unaware of the benefits of public/private partnerships regarding grade crossing consolidation and grade separation funding.
- Benefits – Increased community safety, forges better partnerships, long term safety benefits, and mutual benefit among cross-sectional groups (FRA, industry, community, DOT, law enforcement, etc.)
- Key Implementation Issues – N/A

Project #4: Evaluate effectiveness and potential motorist & pedestrian signage and treatments
- Description – Assess the effectiveness of existing and potential new driver and pedestrian signage/treatments on or around railroad tracks and station platforms
- Rationale – Current signage may be misunderstood or overlooked by motorist and pedestrian traffic
- Benefits – Further reductions in motorist and pedestrian grade crossing and trespass incidents, increased motorist and pedestrian awareness of public rail safety, and improved compliance to signs
- Key Implementation Issues – Design of new signage, changes in signage, MUTCD compliance

Project #5: Evaluate the effectiveness of Mobile Warning Devices when approaching grade crossings
- Description – Research the effectiveness of mobile warning devices as means to alert drivers and pedestrians within close proximity of active rail lines
- Rationale – Utilization of current technology (i.e. cell phones, GPS, PDAs, etc.) as mobile warning devices can offer additional alerts
- Benefits – Active warning alert, reduction in collisions at crossings, long term benefit to general public and industry
- Key Implementation Issues – Integration with existing equipment, and the challenge to using this technology includes driver distraction.

Acknowledgements
- Tarah Harkins, CSX Transportation
- Annette Lapkowski, Florida DOT
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- Suzanne Horton, DOT – Volpe
- Hadar Rosenhand, DOT – Volpe
- Richard Towle, FRA
- Lorraine Pacocha, MBTA

Top Five Project Summary: Education and Public Awareness

Helen Stamek and Daniel DiTota
July 16, 2009
Top Five Project Summary: Institutional Issues

Steve Laffey
Illinois Commerce Commission
July 18, 2008

Top Five Research Needs Areas for Institutional Issues

1. Establishment of a railroad/transit data clearinghouse
2. Cost/benefit analysis of grade crossing improvements
3. Synthesis to evaluate how, when, and where human perception negatively impacts rail safety
4. Institutionalize evaluation as key component of project/program (countermeasure) design and implementation
5a. Improved effectiveness of stakeholder interaction
5b. Identify opportunities to make legislation and regulations across jurisdictions compatible, meaningful and up to date

Project #1: Establishment of a railroad/transit data clearinghouse

- **Description** – Development of a framework/architecture for integrating existing databases.
- **Rationale** – Maximize distribution of information
- **Benefits** – To make better informed decisions
- **Key Implementation Issues** – none

Project #2: Cost/benefit analysis of grade crossing improvements

- **Description** – Developing examples of how to conduct cost/benefit analyses of Federally funded grade crossing improvements under the Section 130 Program.
- **Rationale** – Defend continued need for the Sec. 130 Program
- **Benefits** – Making more efficient use of Federal funds
- **Key Implementation Issues** – none

Project #3: Synthesis to evaluate human perception implications on rail safety

- **Description** – Evaluating human perception to positively modify behavior
- **Rationale** – Local authorities, media, and public misperception of rail dangers
- **Benefits** – Reducing collisions, injuries, fatalities
- **Key Implementation Issues** – none

Project #4: Institutionalization of evaluation as key component of projects

- **Description** – Build “evaluation” into the planning stage of a project
- **Rationale** – Building evaluation up front is most beneficial
- **Benefits** – Identify and Maximize potential benefit
- **Key Implementation Issues** – Adds cost in the short-term, resistance due to being potential culture change for some organizations
Project #5a: Improved effectiveness of stakeholder interaction

- Description – Role definition and best practices for communication and coordination among diverse stakeholders
- Rationale – Improving communication is always a good idea
- Benefits – Improved effectiveness of stakeholder interaction
- Key implementation issues – Diverse group of stakeholders with entrenched interests and well defined positions.

Project #5b: Identify opportunities to make legislation/regs across jurisdictions compatible, meaningful and up to date

- Description – Is the original legislation or regulation still relevant?
- Rationale – Harmonization
- Benefits – Streamlining of project implementation
- Key implementation issues – Legislative and regulatory inertia, long lead times and powerful coalitions needed

Acknowledgements

- William Browder, Association of American Railroads
- Ian Lake, Railway Safety Commission
- Jay Holman, Union Pacific
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- Ronald Roes, Federal Railroad Administration
- Joy Schaard, Chicago Metropolitan Agency for Planning
- John Shurson, BNSF Railway Company

Top Five Project Summary: Institutional Issues

Steve Laffey
July 16, 2009
Top 33 Research Needs Summary Presentation
Anya A. Carroll, National Expert, Multimodal Surface Transportation Physical Infrastructure Systems Center of Innovation, Volpe Center

Summary
All Top Research Needs

Top Needs
- GCM - Warning Device Minimum Requirement for 80-110 MPH Trains
- GCM - Flange-way Gap Solutions
- GCM - Sensed Train Warning Devices for Pedestrian Crossings
- GCM - Personal Detection Device for Railroad Workers
- TP - Application of Warning Devices/Treatments at High Speed Rail
- TP - Railway Traffic Signal Pre-emption At Highway-Rail Grade Crossings
- TP - Effectiveness of Signs for Pedestrians
- TP - Signage At Railroad Crossings
- TP - Speed Limit Enforcement At Crossing
- TP - Pedestrian, Non-Motorized and Limited Mobility Treatments
- NTO - Alternative Sensors and Warning Systems for Vital Applications
- NTO - Pedestrian, Non-Motorized and Limited Mobility Treatments
- NTO - On-Track Vehicle Detection
- NTO - Effectiveness of LED Enhanced Grade Crossing Traffic Control Signs
- NTO - Minimum Traffic Control Devices for High-Speed Train (HSY) HRGC
- NTO - Enhanced Commercial GPS Systems to Improve HRGC Safety

Synergies/Conglomerations of Top Needs
- GCM - Warning Device Minimum Requirement for 80-110 MPH Trains
- TP - Application of Warning Devices/Treatments at High Speed Rail
- NTO - Minimum Traffic Control Devices for High-Speed Train (HSY) HRGC
- GCM - GPS/PTC Constant Warning Time
- NTO - Enhanced Commercial GPS Systems to Improve HRGC Safety
- GCM - Second Train Warning Devices for Pedestrian Crossings
- NTO - Alternative Sensors and Warning Systems for Vital Applications
- NTO - Pedestrian, Non-Motorized and Limited Mobility Treatments
- NTO - Pedestrian, Non-Motorized and Limited Mobility Treatments
- NTO - On-Track Vehicle Detection
- NTO - Effectiveness of LED Enhanced Grade Crossing Traffic Control Signs
- NTO - Minimum Traffic Control Devices for High-Speed Train (HSY) HRGC
- NTO - Enhanced Commercial GPS Systems to Improve HRGC Safety

Discussion
All Top Research Needs

Prioritization
All Top Research Needs
THANK YOU ALL 😊

Anya A. Carroll
National Expert
Multimodal Surface Transportation Systems
Volpe Center
APPENDIX E. FINAL DAY DISCUSSIONS AND CLOSING REMARKS
U.S. DEPARTMENT OF TRANSPORTATION
RESEARCH AND INNOVATIVE TECHNOLOGY ADMINISTRATION
JOHN A. VOLPE NATIONAL TRANSPORTATION SYSTEMS CENTER

- - -

FEDERAL RAILROAD ADMINISTRATION'S
THIRD RESEARCH NEEDS WORKSHOP ON
HIGHWAY-RAIL GRADE CROSSING SAFETY
AND TRESPASS PREVENTION
---------------------------------------

DAY 3 OF THIRD RESEARCH NEEDS WORKSHOP
CAMBRIDGE, MASSACHUSETTS
JULY 16, 2009

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REPORTED BY: DONNA KIMMEL, CSR NO. 116293
FILE NO.: A306607

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Day 3 of THIRD RESEARCH NEEDS WORKSHOP held at the John A. Volpe National Transportation Systems Center Auditorium, 55 Broadway, Cambridge, Massachusetts, commencing at 8:41 a.m., Thursday, July 16, 2009, before Donna Kimmel, CSR No. 116293.
PRESENTERS

WELCOME AND WORKING GROUP TOP FIVE SUMMARIES

Welcomer: Debra Chappell
Facilitator: Marco P. daSilva

Grade Crossing Modernization -- Brian Gilleran
Traffic Patterns -- Anya A. Carroll
New Technology Opportunities -- Rick Campbell
Regulation and Enforcement -- Deborah M. Freund
Education and Public Awareness -- Helen Sramek and Daniel Di Tota
Institutional Issues: Steve Laffey

RESEARCH NEEDS DISCUSSION AND PRIORITIZATION

Facilitator: Anya A. Carroll, National Expert, Multimodal Surface Transportation Physical Infrastructure Systems Center of Innovation, Volpe Center

FINAL THOUGHTS

Len W. Allen, Program Manager and Workshop Steering Committee Chair, Federal Railroad Administration
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DAY 3 OF THIRD FEDERAL RAILROAD ADMINISTRATION’S
RESEARCH NEEDS ON HIGHWAY-RAIL GRADE CROSSING
SAFETY AND TRESPASS PREVENTION WORKSHOP

WELCOME AND WORKING GROUP TOP FIVE SUMMARIES

MS. CHAPPELL: Okay. We're going to get started now.
Good morning, everyone.

ATTENDEES: Good morning.

MS. CHAPPELL: This is our last day here. And I have to
tell you, contrary to common belief here, it has been an
absolute joy.
I've appreciated the fact that -- and humbled in the
fact that this whole thing could not be put together without a
team. And as you all have seen, when the folks that are teamed
stand forward together, everyone achieves more. The grade
crossing team, my team management staff here at the Volpe
Center: Mirna Gustave, Rich Gopen and Craig Austin who manages
Webinar, I'm just humbled; and I appreciate everything you've
done to make it successful. So to you, I thank you. This all
could not have been done without you.

And a special thank you goes to Len Allen from
Federal Railroad Administration, Program Manager for the Grade
Crossing and Trespass Research and Development Program. A
special thank you to Len for his support.

So with that, let's move on to our business here.
We're going to go ahead and get started.

First things first. I want to make sure everybody has a copy of the presentation today. If not, we'll make sure that we get one to you.

We will have evaluations for this workshop, and we'll be passing them out to you. Feel free to start with the evaluations at your leisure and to drop them off at the counter where Mirna stands, the orange counter. And if you get a chance and you enjoyed yourself, just let her know. This is what she does, and she does a fabulous job with everything.

The other thing is I'm doing quick lost and found here. I have a jump drive. I have -- I think it's a network card. And in reserve Item No. 4, a pad full of notes. So if any of this looks familiar, please let me know.

We also have outside a few copies of the Railway-Highway Grade Crossing Handbook, or Highway-Railroad Grade Crossing Handbook as some people refer to it. I ordered some of those from FHWA to have here, and they're ready to go. It's an extremely popular document everyone wants to hang onto. So please feel free to take the documents. They're right outside.

What we're going to do now is go into our summary of our break-out sessions. So to facilitate that will be our team leader, Marco daSilva; but before he arrives on the stage here, I just wanted to introduce to you Donna Kimmel. Donna Kimmel is a court reporter from depo.com. What we're doing is that
we're transcribing all of the information, all the comments here to make sure that we capture your comments, your thoughts because it's important that we incorporate this information into the proceedings of the Research Needs Workshop.

And with that, Erica and Dan will have the microphones. I'd ask you to please hold for the mike before you make comments or questions so that they can -- that Donna can hear you and it can be captured. So with that I will turn everything over to Marco. Thank you.

MR. daSILVA: Good morning, everyone.

ATTENDEES: Good morning.

MR. daSILVA: Nice to see that most of you actually stayed till the third day. I'd like to echo these comments about the Volpe staff. I'm most proud of our staff for putting this together and hanging on and doing a good job. So thank you again, guys.

And also for you for participating throughout the week, and especially yesterday putting your heads together, really coming up -- coming up with some really good -- good ideas.

So what we're going to do here today is first we're going to start with the top five research needs from each group, sort of a report out by the team leaders. And then after each report out, if you have any questions, raise your hand; and then when the mike gets to you, please ask them away.
So the first one will be the Grade Crossing Modernization Group led by Brian Gilleran. And this is the key area to focus on the identification evaluation of the conventionally enhanced systems at or near highway rail grade crossings.

So, Brian, if you want to come up.

ATTENDEES: (Applause.)

MR. daSILVA: We'll all give you a hand.

MR. GILLERAN: We'll wait.

Good morning, everyone. Thank you, Marco and Dee and everyone here at the Volpe Center.

The Top Five Project Summaries For Grade Crossing Modernization. Our top five consists of: a warning device minimum requirement for 80- to 110-mile-per-hour trains. The second one is flange-way gap solutions. No. 3 was GPS-/positive-train-control-based constant warning sign system. Second train warning devices for pedestrian crossings, and the development and implementation of a personal detection device for railroad workers.

The first one would be research and determine the warning device requirements for high-speed corridors where trains run in the 80- to 110-mile range, the rationale being that the imminent deployment of high-speed rail corridors calls for clear requirements for warning devices within the speed range.
Among the benefits would be uniform high standard of warning for road users at all high-speed rail crossings nationwide.

Among the key implementation issues, we identified the need to develop a firm basis for these standardized nationwide warning device requirements.

Priority No. 2, the development of a flange-way gap filler for use at grade crossings because, as we all know, currently the flange-way gap at the grade crossing is a problem for wheelchair and other nonmotorized users. The rationale being the need to develop an effective treatment for rail crossings so that any road users may cross the tracks at the intended crossing without the risk of entrapment. The benefit obviously would be safer and more uniform mobility for all classes of road users.

Among the key implementation issues we identified, the material used to fill the gap must be able to withstand the harsh railroad environment, both the wheel impacts and the UV and other environmental long-term impacts.

No. 3, the development of a constant warning time system based on GPS and positive train controlling works. The rationale, a constant-warning-time system obviously is desirable at a grade crossing; but with current technology and methodologies it's not practical at many crossings that could derive a benefit from constant warning.
And obviously the benefit would be the opportunity to make these benefits of constant warning time available at many more public crossings.

Among the key implementation issues we identified, that the developed system would have to be compatible with the existing population of crossing warning systems so that they all work together effectively.

No. 4, the development of a universal active warning device to let pedestrians know when a second train is approaching their location. The rationale being that pedestrians moving within station areas and at other crossings will need external cues to alert them to an unseen potential danger.

The benefits would be, among other things, a reduction in pedestrian injuries and fatalities while also creating a better working environment for the train crews.

Among key implementation issues we identified is the need to determine how best to communicate a complex message of second train location and second train direction of travel.

No. 5, the development of a type of personal protection device that would be based upon the GPS or positive-train-control technology inputs that a railroad employee could wear to warn them of approaching trains and also to advise control systems of that employee's location while they're
performing their work tasks.

The rationale for this would be to enhance the safety of workers at grade crossings and also a secondary benefit elsewhere on the railroad.

The benefits would be a reduction in roadway work injuries and fatalities while providing a safer and more productive workplace.

Among the key implementation issues we identified, any such device must operate in a fail-safe condition to be used in the railroad industry.

I'd like to make acknowledgements of all the people that worked on the working group with me. First of all, the Volpe staff that we were lucky enough to work with. Rachel, Steve and Erica did an outstanding job. We would not have the experience of success that we did without their hard work and patience and diligence.

On my team was Leonard Allen from FRA; William Barringer from Norfolk Southern; Ed Boni, Interactive Elements Incorporated; Mark Ciurej, Brotherhood of Railroad Signal; Jessica Franklin, TTI; Dan Guerrero, Metrolink; Paul O'Brien, Utah Transit Authority; Ed O'Connor, Massachusetts Operation Lifesaver; David Peterson from the Union Pacific Railroad; Phillip Poichuk from Rail Safety, Transport Canada; Scott Windley from U.S. Access Board; and Paul Worley from North Carolina Department of Transportation.
I personally could not possibly overstate my appreciation for the time, diligence and efforts of these transportation professionals in coming from far and wide. In a time when travel dollars are very scarce, these people put in the time, made the effort to do the work that produced our work products here today. So thanks to everybody involved.

And are we taking questions now, or are we waiting until everybody's made their presentation? How do we want to do this?

MS. CARROLL: Now.

MR. GILLERAN: Now? If there are any questions for the grade crossing modernization top five items, please let me know; and I will try as best I can to provide some measure of satisfaction.

Once. Twice. Seeing none, I will yield the floor.

Thanks very much. And again, thanks to everyone who's been involved.

ATTENDEES: (Applause.)

MR. daSILVA: Thank you, Brian.

Next one is traffic patterns. Focused on the creating a better understanding of highway traffic patterns, its impact on highway-rail grade crossings, safety and railroad infrastructure. The team leader was Anya Carroll.

MS. CARROLL: Good morning, everyone.

ATTENDEES: Good morning.
MS. CARROLL: Okay. Just a few anecdotal notes to share about our team. We had a dynamic --

MR. BROWDER: In one minute.

MS. CARROLL: Pardon me?

MR. BROWDER: Less than one minute.

MS. CARROLL: Oh, no war stories?

MR. BROWDER: No.

MS. CARROLL: We had a very dynamic, diverse team; and I'll share with you folks in a slide later on. We came up with something like 56 independent ideas that the group diligently put together and crafted 24 separate condensed ideas of which we came up with 16 one-pagers, and I'm going to show you six of them.

We did have a dot-malfunction; so when we did our ranking, we -- the team decided to include six rather than five priorities for your digestion. And our seventh one we had three projects that were tied for seventh place, so we're going to show you the top six today.

So our top six included, very similar to the grade crossing modernization team, the application of warning device treatment at high-speed rail corridors. Our next one, highway traffic signal preemption at highway-rail grade crossings.

The third priority was the effectiveness of gates for pedestrians. The third one was the signage at roundabouts.

The fourth one was guide decision making at complex crossings.
And out sixth one was the review and improvement of hazard indices and accident prediction formula.

Now, we decided -- the group as a whole decided to use the systems approach. So we looked at the user, the environment and the interaction thereof. So that's why we have so many diverse research needs. So those are the top six.

The application of high-speed -- warning devices at high speed, we had an interesting discussion on this one. And the group did decide to go for just the high-speed operations, although personally I feel that lower speeds should be included in this type of regime; but it's to determine the adequate warning devices for high-speed rail up to 110 miles an hour, determine or evaluate whether or not existing types of warning devices are adequate for use on high-speed rail corridors. Above 79 miles an hour should different devices be required and at what speeds? Recommend treatments for pedestrian traffic at high-speed rail crossings, identify pathway crossing treatments for high-speed rail as well.

Our rationale, actually, we had quite a number of discussions; but when I reviewed the one-pagers, this particular topic covers three of the four cross-cutting issues; and I think that's a good rationale for moving forward with this one.

And the benefits are you standardize the treatments for more effective and efficient design and to reduce the
likelyhood of incidents at high-speed rail crossings.

Key implementation issues, it's a broad scope in dealing with high-speed rail; and we have a large number of stakeholders that would be necessary to move forward with this one.

Highway traffic signal preemption at highway-rail grade crossings, we need to assess best practices nationally to determine proper application of use of traffic signal preemption at highway-rail grade crossings, determine proper use of advanced preemption versus simultaneous preemption, review the equipment, hardware and software, particularly on the traffic signal controller side to ensure those devices get adequately -- adequately perform preemption as intended.

Also assess best practices of field -- of the field reviewing preemption, research accident reports to identify hot spots and factors relevant to preemption.

Again, the rationale could be that these -- this area is -- cuts across three of the cross-cutting areas. The benefits are to reduce incidents and more -- and to create more efficient conflict management.

Some of the key implementation issues is it is a high cost to look at this area, and to implement it would be difficult -- would have some difficulty.

Signage at roundabouts. Well, you heard Mark Morrison's presentation two days ago. He was very passionate
in his presentation. We do need to address this up-and-coming environment within the highway-rail crossing intersection, and we need to evaluate alternatives for advanced warning signs within a close proximity to roundabouts.

We need to develop an advanced warning sign for a crossing located within a hundred feet of the yield line at the roundabout. There is currently no equivalent series of signs to the W10-2, -3 or -4 for crossings in close proximity to roundabouts. A sign also needs to be developed for situations where the rail line runs directly through roundabout.

We need to review the body of existing literature and international examples and gather information for development of warrants. Once again, this area covers three of the four cross-cutting areas: high-speed rail, transit-oriented development and human factors.

The benefits would be to provide a national standard for input to the manual on newborn traffic control devices. The implementation issues is a medium cost, but it's easy to implement.

The next one is driver decision-making at complex crossings. I did not get a chance to review the 2003 research needs workshop. I think this one actually is resonant from six years ago, but the group felt that it should move forward in a presentation to you as a priority. Close proximity between railroad tracks and complex intersections such as roundabouts.
and multiple access roads near railroad crossings, drivers must divide their attention and make decision in a short period of time. The purpose of the work would be to -- excuse me -- better understand driver performance and information needed in order to provide means to reduce driver error, and our expected outcome would be input to the design process and safety review and enhancements at grade crossings.

As I mentioned here, I'm quite sure that this was part of the research needs workshop in 2003, and also this would be a supplemental area of research. Transport Canada did some work on visual constituency looking at the grade-crossing signs and signals.

The benefits, would reduce driver confusion and information overload, would reduce driver error and improve safety and mobility.

Implementation issues, we ranked it as low urgency; but that's because it's a basic research premise. We need to understand what's happening in this area. And the implementation -- the ease of implementation would be medium.

Review and improvement of hazard indices and accident prediction formula. This was our last one that made the cut.

And for those of you practitioners in the audience, we realize that the last update to this formula and the indices was in 1987. So we need new methods for evaluating the systems safety performance of crossings. The ATI calculation has become less
available as the majority of the crossings with high train and high traffic volumes have been signalized or grade-separated. The risk of a low-volume crossing is not fully reflected in the current evaluation standard, and the API calculation may indicate crossings for upgrade that do not warrant signalization.

A standardized evaluation method should be established for multiple agency use. This covers two of the four cross-cutting areas, human factors and data requirements. And the benefits would be a holistic evaluation method, will help state agencies to select crossings that most deserve improvements. That was a very creative writing group. It's high urgency, and its ease of implementation is medium.

Just a quick snapshot of some of the other ones that we crafted, and eventually Volpe will release all of the one-page projects; but we looked at driver reaction to active advance warning signs, driver compliance to the do-not-stop-on-track signs, driver behavior at crossings with mixed train traffic. That was a question that Jo Strang had after hearing some of our presentations on the first day.

The impact of storage information signs on long combination vehicle use, which is of interest to FMCSA. Railroad signals through roundabouts, again, this was another area that has not been addressed.
Identify barriers to crossing consolidation implementation, Dr. Magdy El-Sibaie questioned why he could only close 4,000 crossings a year. Method for estimating traffic volumes at grade crossings where counts are not available. Review of current GIS methods and data for hot-spot analysis, this relates to Karen Marshall and her suicidology as well as some of the work that's being done in Transport Canada. Investigate safety performance of grade crossings using microsimulation, University of Waterloo under the auspices of Dr. Frank Saccomanno has done a lot of work in the area of risk and modeling; and that was an area we thought was worth pursuing. And best methods for linkage or sharing of crossing data, traffic data, collision data amongst all stakeholders. So I would like to acknowledge our team. Could my team please stand up? Jim Kreiger, Canadian Pacific; Carolyn Cook, FRA; Shou-Ren Hu from Taiwan, from the University of Cheng Kung; Chip Frazier, Oi Kei Ng from Waterloo; John Mitchell from MBCR; Brann Greager; Daniel LaFontaine from Transport Canada; Mark Morrison from WisDOT; and Lisandra Garay-Vega from the Volpe Center. Thank you very much.

ATTENDEES: (Applause.)

MS. CARROLL: I couldn't have done this without you.
Any questions? I'm going to have the team answer the questions.

ATTENDEE 1: What happened to No. 5, pedestrian gates?

MR. BROWDER: You've got two 9s and no 5.

ATTENDEE 2: You're not making an error. The slide just isn't there.

MS. CARROLL: The slide's just not there right now, I guess.

ATTENDEE 2: Oh, you repeated 9.

MS. CARROLL: Oh, sorry. We'll fix it.

MR. BROWDER: I'm here from the Government to help you.

MS. CARROLL: Thank you.

Okay. We've got two roving mikes, so --

MR. POICHUK: I want to express my happiness in seeing roundabouts making your cut of six, but I respectfully suggest that this goes a lot deeper than signage. Roundabouts are widely being seen as a replacement for intersections by the traffic operations community.

MS. CARROLL: Mr. Poichuk, could you please introduce yourself for our court reporter and tell her where you're from?

MR. POICHUK: Certainly. Phil Poichuk from Transport Canada.

Going back to roundabouts, they're widely being seen by the traffic operations community as a replacement for intersections that are about to be signalized, largely -- as we
heard at the presentations -- due to energy consumption and also cost. The U.S. has just come to their solution to having these stop-sign crossings that are proximate to grade crossings. They've been a thorn in the side of rail safety practitioners for years. And, in fact, I look at the MUTCD and the U.S. Warrant 9 as being a solution to that because, of course, it would force signalization so then you can interconnect.

The problem with roundabouts is you can't interconnect them, and you still have the right-of-way assignment at roundabouts that requires the exiting -- that the vehicles on the approach exiting from a crossing -- to yield. Not as bad as a stop; but, nonetheless, the fact that there's a right-of-way assignment against the person that may get hung up on a crossing -- it might be a truck, for example -- that's still a thorn in the side now. So it sort of regurgitates the whole problem again.

I would respectfully suggest that the research try and investigate the area of right-of-way assignments so that we can come up with some sort of a unified and consistent position from the rail safety community on that. Thank you.

MS. CARROLL: We actually -- the group came up with three separate research needs: one on highway signs, one on highway signals and one on railroad signals; but only one made the top cut.
Anybody else with a question?  

Thank you very much. Sorry for my human error.

ATTENDEES: (Applause.)

MR. daSILVA: Okay. Next we'll move on to new technology opportunities which really focus on innovative technologies and high transfer opportunities to test for probabilities within the rail infrastructure, and that was led by Rick Campbell.

MR. BROWDER: You ought to get a hand, too.

ATTENDEES: (Applause.)

MR. BROWDER: You're not that bad a guy.

MR. CAMPBELL: Thank you, Bill.

Greetings. I won't make everybody say, "Good morning," again. That gets to be redundant.

Well, as you can see, as a lot of times happens, we turned out to be the mavericks. We couldn't be happy with five research need statements as the top picks, so we actually kind of jointly put the sixth one together based on work that Helen and her work did regarding GPS. And it's interesting to note that, while we had some very parallel work that happened in that area, we also have some other parallel topics as well with some of the other groups on this group with devices for high-speed train applications, which it's interesting because there are obviously a lot of us in this group that are focused on similar needs and we chose to come at them from different directions in the work that we did.
But to review our top six choices, the first one, the top choice that we had, was alternative sensors and warning systems for vital applications. No. 2 was pedestrian nonmotorized and limited mobility treatments. No. 3 was on-track vehicle protection. No. 4, effectiveness of LED-enhanced grade crossing traffic control signs. No. 5, the minimum traffic control devices for high-speed train highway-rail grade crossings. And No. 6, enhanced commercial GPS systems to improve highway-rail grade crossing safety.

No. 1, the alternative sensors of warning systems for vital applications, this was interesting. It's actually intended to develop a viable, nontraditional -- and what we mean by "nontraditional" is nonrail-based means for train detection and communication. The rationale is that the existing technology, rail-based technology has significant limitations, a lot of them which come from the electrical application of the devices. And this is, again, an off-rail solution that has some significant benefits to reduce costs associated with warning devices and applications that require additional time such as traffic signal preemption and interconnection for connection of vehicles prior to train arrival and even for some other types of devices such as four-quadrant gates where we have to figure in additional time for the exit-gate clearance-time value.

And we believe that there is existing technology out
there that's capable of doing a lot of this, but we need some 
additional research to be able to extend and define exactly 
what that technology is capable of providing and then how we 
would integrate it into existing crossing warning systems. So 
the group felt this was our No. 1 choice because we see so much 
need now for additional warning time. And in so many cases the 
costs are extremely high, okay -- half a million dollars or 
more -- to provide added time on top of the cost of the warning 
system. So that was No. 1.

No. 2 dealt with pedestrian, nonmotorized and limited 
 mobility treatments; and the project, the research needs 
project is intended to identify and evaluate technology -- both 
existing and new -- at active and passive highway-rail grade 
crossings. And the rationale behind this is that we need to 
develop standards and potentially warrants for the use of 
treatments for these conditions.

Right now the industry essentially takes a shotgun 
approach to it that in many cases pedestrian, nonmotorized and 
limited mobility needs are not even addressed. You saw some 
pictures the day before yesterday about items such as sidewalks 
that stop at the railroad right-of-way line, surfaces that had 
not been properly treated, use or misplacement of truncated 
domes and in many cases the total absence of active warning 
devices for pedestrians.

And we believe that this entire area needs a global
look at it -- at, like I said, treatments old and new but also some standards for application and warrants to determine their use. We also have a fear that there will be a wholesale application of every potential device at every crossing, and in many cases they're not needed.

We need a reasonable method -- much like warranting for traffic signals -- to determine which devices are really necessary at a given location. Surfaces and approaches may be required at all locations, but we may not need pedestrian gates at all locations. So that's the intent of this, is to develop a workable tool that can be used to develop the standards for application of use.

Obviously the benefits of this particular research is improved safety for these crossing users; and the key implementation issue, as we see it, is that there's an ever-increasing demand right now to meet pedestrian needs at transit and passenger stations and also just generally accessibility needs, not only at stations but at all highway-rail grade crossings.

No. 3, on-track vehicle detection, an interesting project. We've learned that many railroads have had numerous collisions between on-track equipment -- high-rail-type vehicles, track machines, that sort of equipment -- and road users at highway-rail grade crossings; and in many cases the active warning systems do not operate because those vehicles...
were insulated. They don't shunt or short the rails together to activate the warning systems. And there have been limited attempts at a methodology that would provide for reliable activation of warning devices when this equipment approaches a crossing, and it's critical that when that equipment approaches a crossing it activates the crossing that they wish to traverse over but also not downstream crossings. So this project actually develops a system for on-track vehicles to activate the warning devices at crossings, and we believe that it will have a significant safety impact for road users and railroad employees because it will essentially eliminate these collisions by providing increased safety by activation of the active warning devices. There's some limitations and challenges to implementation of this because, as I mentioned earlier, the system needs to focus on specific crossings. It needs to address the potential for multiple track machines that may show up simultaneously and also needs to be capable of dealing with an on-track equipment such as a high-rail vehicle that may stop on the crossing, pick up the rail wheels and then drive off on the road surface. So there are a few challenges. We also recognize that radio, which has been used in the past, may not be the correct answer due to channel congestion. In many cases railroads have limited frequencies available and given -- especially in large metropolitan
areas -- the use of -- the repeated use of DTMF or touch tones on the radio frequency crossing after crossing could almost hinder voice traffic between trains and dispatchers. So another interesting segment for technology to be used for critical safety issue.

No. 4 is effectiveness of LED-enhanced grade crossing traffic control signs. We spent a lot of time discussing this particular item. And the research we're looking at is to evaluate the effectiveness of these LED-enhanced signs at highway-rail grade crossings.

The rationale is that the current signage right now competes for driver attention. In urban areas there are so many signs that the roadway users have to deal with and process, but also in rural applications this is a means to be able to attract driver attention where they tend to get lulled into a tunnel-vision-almost approach as a driver may become lulled into a stretch of roadway that's straight and level where they tend to almost get into a semi-tranquil state.

We believe that the benefits of this are that it's a low-cost means to increase safety, may in fact be one of the potential solutions to the elusive low-cost warning system. We believe that because we've always looked at low-cost warning systems as trying to be applications of lights and gates and similar devices; but, in fact, it may that we need a different type of traffic control device as our low-cost warning system.
A key implementation issue to deal with this is we need to develop a national standard for use of the devices. Right now these devices are gaining in popularity; and there are a lot of different viewpoints as to how they're applied, whether it's a 24/7 operation or train activated, approaching-vehicle activated, maybe only blink with the nighttime hours. So we need to develop a standard for application and use of these devices.

No. 5 dealt with some minimum traffic control devices for high-speed trains at highway-rail grade crossings. And we looked at whether in the global approach, a specific question, that has been addressed and discussed; and that's development of a model to evaluate the effectiveness of four-quadrant-gate warning systems versus the use of barrier gates on high-speed train corridors.

And the rationale is we need to determine if the use of barrier gates is a reliable, cost-effective measure to use in lieu of four-quadrant gates. In other words, is the additional expense of a full barrier warranted in terms of reduction of crashes and cost benefit.

The real benefit here is potential cost savings. As we see an increase in high speed trains, the increases in warning systems -- and we know because we step into a minimum four-quadrant-gate scenario -- do we need to go with full barrier protection and at what speed and what are the true
benefits of those types of devices. The real implementation issue here is data collection and analysis because, again, we're not trying to develop a technology, as such, but to develop a model to guide us in the proper application of technology.

And finally, No. 6, our joint project -- and I'm not going to steal all of Helen's thunder. I wouldn't do that to her. So she can talk about this, too -- but we both felt as we talked about -- we talked together yesterday after our sessions -- that there's some real applications for use of commercial GPS systems to improve highway-rail grade crossing safety.

And what the intent -- our intent was, was to incorporate highway-rail grade crossing data into commercial GPS systems. And especially with the fact that the Rail Safety Improvement Act has mandated the updating of the grade-crossing inventory, in a year we're going to have a lot of fresh data that could be supplied to be included in these types of devices. And we think that there are a number of different things that could be included like presence of crossings, whether they're grade-separated or not, active or passive devices. And in some cases for commercial vehicles we could even include data such as hump-crossing information, potentially frequency of trains to be expected so that a commercial vehicle may seek an alternate route due to one or
more limitations or uses of the crossing.

Of course, obviously the benefit is increased safety, especially for commercial motor vehicles.

And we saw this as a difficult-to-implement issue because it's going to require buy-in on the GPS system manufacturers. And those things have actually dropped significantly in price since their release. So they're real price-point systems. So we feel that we're going to have to work to get the manufacturers to buy in and really recognize what we perceive as a benefit but may not be perceived as a significant benefit by the manufacturers. So that covers our six statements.

Number of folks that we had, we had an interesting group that sat on New Technology. And we talked about in excess of 50 different items. We actually had four pages of items we discussed in our morning session. Actually, we whittled it down to 15 different research-needs statements.

And as you can see just from some of the characters involved that it was a lively discussion. Our facilitator was Aaron Jette with the Volpe Center, and Dan Kubaczyk from the Volpe Center who assisted Aaron.

We had the blessing of having our staff attendant as Dee Chappell. And between all of her running to support the entire conference and trying to type -- and last night as we worked on this her fingers had just about quit. So she typed...
three letters; and we'd edit, too. But she kept going, and
I don't know how she did it. And I really want to commend her
for the work that she has done on this particular program. So
a big hand for Dee, if you would.

ATTENDEES: (Applause.)

MR. BROWDER: There's another page there, I think.
There's another page there of suspects. You don't have it
marked?

MR. CAMPBELL: I know. I'm going to read through them.

MR. BROWDER: All right. You're going to read through
them?

MR. CAMPBELL: Yes, I am.

MR. BROWDER: Oh, okay.

MR. CAMPBELL: I think they deserve recognition for their
work.

So, people that sat on our committee: Andy Davis
with Quixote Transportation -- and we have one, actually,
that's missing from this particular list that -- again, one of
those oversights, but -- who provided a lot of insight and
commentary about what goes on around the world; and that's
Aidan Nelson with Community Safety Partnerships. And he
certainly gave us guidance on a lot of topics that he sees with
highway-rail grade crossing safety issues around the world;
Bill Grizard with APTA; Dan Guerrero with Metrolink was a big
help with pedestrian treatments and warning devices; Bob
Hoffman with CSX, we did some work on remote monitoring and abilities to use reliable remote monitoring to seek relief from some of the signal monitoring requirements in Part 234; Vijay Kohli, an input on databases and how we better use data. We also had John McGuiggin who sat in with us; and he didn't pull his hair out and run out screaming from the room, so I guess he followed where we were headed with some of our conversations. Brent Ogden helped us with traffic-signal applications, presignal speed cutters. Dick Pew, of course, was an asset to us in telling us that we need to get the human factors right before we build a product. And that kept us on track in a lot of areas to be able to get first things first. Tom Potter with Reno A&E helped with alternative detection. John Sharkey was there and kept us mindful of railroad simple circuitry and the fail-safe issues we have to deal with. Sesto was a tremendous help with Transport Canada. Oh, I'm sorry. I turned my page, not that page. I'm just up here going, "Give me that button."

So Sesto was a valuable assistant to us to keep us informed of parallel research that Transport Canada is involved with. And finally, Michelle Yeh with the Volpe Center was there and provided insight to us from a different -- some different perspectives of her view of where we approach the research needs.

So that concludes my report. I'll thank you for
listening to me, thank our team and all the people that traveled so far to not only spend the dollars associated with the travel on being here but also their valuable time. Thanks for supporting us.

ATTENDEES: (Applause.)

MR. daSILVA: There is a question, Rick, out in the front.

MR. SOTTILE: Rick, Jim Sottile, PVB Consulting.

MR. CAMPBELL: Yes, sir.

MR. SOTTILE: One-track vehicles that don't shunt, Northeast Corridor at the School Street, Connecticut, at one time they had a -- you know, vehicle detector loops. And when the nontending went -- theirs went over it, it put a train in emergency on an adjacent track. How would you get around that type of -- and the only fix they have is operating rule. So how would you -- what type of device would you envision that could be used for that purpose?

MR. CAMPBELL: Well, it seems to me that my recollection of that event was that when that, when that high-rail vehicle went over the vehicle detection system and the crossing was already active, what they realized was that the system needed to be designed in such a way that, once the crossing was closed and the gates were down, standard practice now in four-quadrant gate operation is that we ignore the vehicle detection system. And that was the solution to their problem.

Obviously, there's a lot more to it -- and, Jim,
I don't want to get into a lot of that here -- but we could do some gate-position monitoring. There are ways to look at occupancy of the loops to validate what comes over the loop, if it would be on-track equipment; but our research needs statement for on-track equipment was detection of equipment in advance of the highway-rail grade crossing. And that certainly could be incorporated into the system like this such that it would know that the idling circuit was going to indicate occupied on the loops at the four-quadrant system. Does that answer your question?

Thank you.

Bill.

MR. BROWDER: Bill Browder from the Association of American Railroads.

I thought about this all through your presentation, Rick. Good presentation. Then you brought it up right at the end in connection with acknowledging the chart, these participations. For these six projects is it a given that they would incorporate fail-safe systems, or is that a variable parameter that might be considered in the development of these project proposals?

MR. CAMPBELL: Well, the ones that --

MR. BROWDER: I mean where they apply.

MR. CAMPBELL: Right. And that's the issue, Bill. Like, for the GPS, obviously that's a nonvital piece of hardware to
begin with. So there's no expectation of vitality with that device. But for the alternative train detection, we actually mention that, that it has to be vital. If we're going to use it as control for preemption or four-quadrant-gate additional warning time, it will have to be a vital system.

And we do have a vital system to do that. What we don't have is the full roll-out and implementation and how we use that to be able to get the data reliably to the crossing and make it cost-effective.

In terms of the on-track equipment detection, that's also a vital device because we want to make sure that we know that that system is functioning.

MR. BROWDER: The reason that I ask you is, some of you may remember back ten, 15 years ago AAR attempted in looking at these particular project areas to suggest that, if we were ever going to get all of the grade crossings in the United States addressed with some kind of better warning device that maybe we should look at going something -- at something less than fail-safe in consideration of what we would want to consider, regardless of whether FRA or other government agencies would ever allow us to do that. I'm convinced -- and I'm still convinced -- if you could come up with a low-cost -- and I would say low-cost now less than $50,000 at a grade crossing -- I could go over on the Hill and get them to approve those type of devices for all of the public crossings that are...
left in the United States.

We tried to do that at Texas Transportation Institute, and we had a town meeting and suggested it. We never got any kind of participation from prospective contractors that would accommodate that kind of situation; but I would encourage in any of these examinations to do what Sharkey's suggestion is, to keep that in mind in terms of expenditures that might occur. Thank you.

MR. CAMPBELL: And Bill, let me just to add to that. I think that's exactly right. When we box ourselves in with vitality, then the cost goes up and, you know, not just from a hardware standpoint but the entire installation standpoint. And --

MR. BROWDER: Maintenance.

MR. CAMPBELL: We believe that the off-track system may offer some significant reduction. It may not get us to the $50,000 point but significant reduction in cost; but, again, it's another reason that we strongly looked at these LED signs for the passive crossings because it's a relatively -- or very inexpensive way to provide enhanced warning, which is what we're talking about. These are locations that are so far down on the priority list we'll never live to see active warning devices at those locations; but the LED-enhanced signs could be done on a wide-scale basis and effectively treat all of these passive crossings that exist out there because they're
typically a less-than-$10,000 fix and probably closer to $5,000 fix.

So it is something that's easy to deploy. We want to make sure there's a valid increase in safety and driver response. And that's where we think a lot of the research needs to be. Do we see a reduction in speed as the vehicle approaches the crossing? Do we get the driver looking up and down the tracks?

We believe from research that had been done on these devices at highway intersections they've proven to be extremely effective in reducing stop-sign running. And I think that we expect similar types of improvements at highway-rail grade crossings.

Let's see. Rich.

MR. BROWN: Yes, Rick.

MS. CARROLL: Could you wait for the mike, please.

MR. CAMPBELL: Oh. Well, he's got one.

MR. BROWN: Rich Brown with Transpo Industries.

On the detection, I wasn't clear. The detection devices or whatever the concept is, was the discussion that the devices may be contained within crossings; or would they be off of the crossing?

MR. CAMPBELL: Well, the devices would be up- and downstream from the crossing because the intent is to detect the train as it approaches the crossing.
MR. BROWN: I'm talking about the vehicle detection, detecting the vehicle on the crossing.

MR. CAMPBELL: The on-track equipment detection system?

MR. BROWN: Yes.

MR. CAMPBELL: Well, it would be located immediately outside in a roadway area so that, as the on-track equipment approached the crossing, there would be an area that they would pull into; and then it would automatically activate the active warning devices. But typically it would be close, within 50 feet or so of the edge of the traveled way.

MR. DORER: Bob Dorer, Volpe Center.

I thought a few years ago I saw someone making a presentation. I think it was from Wisconsin DOT. They were doing -- excuse me -- an experiment on -- it was a combination of S-volt, low-cost LED light and directing to yield at a stop sign and using peak -- a variant of a GPS locator on the short line.

MR. CAMPBELL: It was in Minnesota.

MR. DORER: And was that ever documented to the extent that that information could help further the continuing effort to come up with a more effective low-/no cost? And I don't think that one was vital, even though it accepted -- it came from this.

I never heard the results of that. I'm just wondering if it was passed out to the industry, if somebody
knows if it worked and this issue can benefit from that experience.

MR. CAMPBELL: What actually happened with that system is it initially started off -- for those of you that have been involved in this project -- as a low-cost approach. It did make use of GPS equipment on board the trains; but along the way there were a number of obstacles that were encountered such as need for vitality, the fact that the train had to be equipped with a special device to activate the system.

So, if a train -- for example, a piece of equipment operated over the crossing that wasn't equipped, the warning system would not operate. And as I understand it, the system -- as the system grew in complexity to deal with the unique characteristics that we find at crossings that the costs continued to increase and got to the point that it got away from the elusive low-cost device.

And that's a problem as we've done analysis on cost of crossings. There is an excellent paper that was done by Bill Peterson with the Burlington Northern Santa Fe Railway that Bill really went in and dissected cost of crossing warning devices and the different elements and broke it down. And what you really realize, there was no real central point that you could attack and say, if we come up with a lower cost one of these, then the whole cost will go down significantly.

But essentially, half of the costs when we put in
these devices essentially goes to installation cost. So that's the single biggest area to reduce as a way to be able to minimize installation costs. That's one of the things we're looking for with this off-rail-based system, is that it would be wireless system, that it could be easily installed, the sensors under the rails, a simple device that sits by the side of the track with solar power, with communications that would be vital to communicate back to the crossing.

So there are some potential benefits to be recognized there. You know, we look at savings in terms of power because there are certain expenses associated with delivery of power; but the trade-off for solar is equally expensive due to cost of solar panels and increased battery systems for energy storage. It's just hard to come at this from -- with conventional equipment to say we could make a significant impact on the cost.

And again, that's why we come back to this approach with the signs, that maybe we need to take a little different view and not try and mimic flashing lights and gates; but let's find a device that's effective. We're going to have locations where we need lights and gates due to train volume and the vehicular volumes, but at these passive crossings that are so far down on our priority list -- and there are so many that it's going to be hard to treat them unless we have some device that really does provide a low-cost solution.
Other questions?

MR. SOTTILE: Yes. What about the Wi-Fi device impact box from -- they have this --

MR. CAMPBELL: Hold on. Let me get you a mike, Jim.

MS. CARROLL: Would you please introduce yourself for the court reporter.

MR. SOTTILE: James Sottile, PVB Consulting.

What about the Wi-Fi on-site at YTT? On the local locomotive -- and it's proximity sensitive -- you could -- it's 25 bucks. They use them all over the country.

MR. CAMPBELL: Well, you know, there's a lot of that that's going to be rolled into PTC, is the train will actually communicate with wayside devices as it progresses down the -- down the track. You know, again, that's -- those are all doable things. And PTC likely down the road will shape how we think about crossings and do things; but, you know, we're under some pretty strict mandates to implement PTC in terms of train control right now, and crossing applications are going to fall beyond that just because of the timing.

Obviously we're dealing with infrastructure needs right now. We haven't ignored crossings; but in terms of just the magnitude of the project, to get it developed and installed it's -- the crossings are going to have to come as a separate approach. But once that comes I think we will see a lot more information.
And once we know exactly what the intentions of the train are, it's going to make a significant improvement in operation of crossing warning systems because we'll be able to deal with things like station stops before the crossings or civil speed restrictions that right now would result in increased warning times. So we'll see significant improvements; but we just -- we've got so many things to do and a short period of time to do it in. It's going to be a little further down the road.

Another question?

Okay. It looks like we're done. Thank you again for your time.

ATTENDEES: (Applause.)

MR. BROWDER: A great job.

MR. daSILVA: Thanks again, Rich. A quick housekeeping note. You were handed your copy of evaluation forms. If you could take a minute to do those and get it back to one of us or drop them off at the desk right outside the auditorium here when we go out into the break -- have a break.

The next one is regulation and enforcement; and it was really looking at a review and analysis of current initiatives, policies and programs to enhance safety along the right of way. And Debbie Freund was the team leader.

ATTENDEES: (Applause.)

MS. FREUND: Before I begin, I'd just like to thank the
people who put this workshop together and kept us going. Dee, Marco, Anya and all of your colleagues, thank you very much for giving us the venue where we could get together and exchange ideas and hopefully moving forward and improve safety.

We have a very, very lively group in the regulations and enforcement area. Our expertise, our agencies varied from law enforcement to highway engineering to regulatory policy matters to human factors research.

Clearly we had very diverse points of view, and those were reflected in the conversations that we had. We did come up with 11 ideas for research, and we were able to reach consensus on our top five. And those top five were: data needs for proactive enforcement, collection and wah -- analysis -- I haven't had my coffee this morning yet -- trespass data, photo enforcement at highway-rail grade crossings, regulation and signage for no-train-horn crossings, and a national campaign for seasonal enforcement programs.

In order to do enforcement, in order to develop regulations it's critical that we have a problem size assessment and know what the needs are. And many people who work in state and local law enforcement environments have a very difficult time getting hold of the data that they need to enable them to plan effective, proactive education and enforcement.

As we were having our conversations, we were reminded...
that the highway-rail grade crossing inventory is being updated. So there's a fine opportunity there. We also thought, well, why can't we move things forward a little bit to automate and simplify many of the common data searches that our law enforcement and educational partners need.

Our benefits, increase the efficiency of their data analysis, saving them sometimes literally weeks or months of work. Improve the knowability of additional hot spots and to target their outreach and enforcement activities much more effectively.

There are some implementation issues involving timing of the inventory's update, difficult challenges in gathering the information and the information technology coordination of these various databases. None of these insurmountable but challenges nonetheless.

The second project deals with the collection and analysis of trespassing data. Trespassing deaths are exceeding those of highway-rail grade crossing deaths. It's a concern that many of us are very worried about, a trend we don't want to see continuing.

So there is a need to update our existing data collections; but before we start collecting data, we need to define what kind of data that we are collecting. One of the gaps that we have is that there are no consistent national definitions for "trespasser" in terms of improper, unauthorized.
access to rail right of way.

We would derive benefits from improved knowledge of the state and local situations. We would be able to get additional information to look at national-level concerns. And our bottom line: improving prevention, mitigation, saving lives, reducing property damage.

We do have some implementation issues here as well. There are some incentives and disincentives for states. How are they going to fit this in among all of their other information collection needs?

There's also a certain amount of concern in terms of the ownership, risk and the liability concerning the right-of-way ownership itself as well as data availability and data sharing. Again, not insurmountable; but it will take some very serious and well-thought-out conversation.

Well, we do enforcement. And so our third item is directly premised on that, and that's evaluation of photo enforcement at highway-rail grade crossings. Can't put a trooper or a law enforcement officer of any sort at every crossing. We just don't have the personnel resources. Photo enforcement has proved its worth in many traffic enforcement situations.

But we don't have model laws. We don't have consistent guidelines. We don't have consistent recommended practices and procedures. That's what we would like to see.
developed in Project 3.

Photo enforcement has two benefits. First, it can provide solid data, a real record of the violations that occur. Secondly, it has a deterrent effect. If people know that they can be watched and their actions can be recorded, they might be a bit less likely to try to take a shortcut, so to speak.

There are implementation issues, of course. There have been some negative public attitudes that have arisen from some implementations of red-light-running cameras and photo enforcement. There are concerns about privacy. And, of course, this is equipment; so there are potential concerns about initial and ongoing national and installation operational costs.

The fourth item, regulations and signage for no-train-horn crossings, probably generated the most discussion in our group. Fundamentally, we spent a lot of time on what are these crossings about, what is the expectation of the motorist. And after going around for probably about half an hour, one of our team members said, "You know, look, we're not talking about quiet zones. We're talking about crossings where train horns are not sounded. This is something that is not matching most motorists' expectations. We need to let them know. And again, not all motorists go through the same crossings every day. Most motorists expect a train horn to be sounded when they're approaching a crossing. If it's not going to happen, let the
motorist know."

We do have a few implementation issues here. Development of the sign would require review by the National Commission on Uniform Traffic Control Devices as well as rulemaking by Federal Highway Administration to modify W10-1 or develop a new sign for the Manual on Uniform Traffic Control Devices; and, of course, after rulemaking is completed the implementation costs of resources of installing the signs.

Our final recommendation builds upon national campaigns that have been very successful in other highway safety settings. For example, Mothers Against Drunk Drivers, NCSA, many other organizations, have personal-target outreach and educational programs. They target such issues as construction work sites on highways, seat belts, drunk driving around highways, proper installation of child safety seats; but we don't have anything similar to that in the highway-rail grade crossing and trespass-prevention community.

We do have the very, very strong benefit of working with organizations -- primarily Operation Lifesaver -- that focus on outreach, but maybe some seasonal campaigns to help us to make a special focus on some of these efforts might give us that additional little spark that we need to get the public's attention and to get people thinking and knowing you can't ever beat the train.

Clearly we could not have done this work without the
great participation of the folks on our team. And they are, in alphabetical order: Lou Frangella from FRA Region 1; yours truly; Officer Jack Hanagriff of Houston Police Department; Dan Lauzon of the Brotherhood of Locomotive Engineers and Trainmen; Gina Melnik, Volpe; Lieutenant Colonel Ralph Mitchell, Louisiana State Police; Dr. Thomas Raslear, FRA Research and Development; Bob Redmond, FMCSA Enforcement office, Gerald Ruggiero from MBTA; James Sottile from PVB Consulting Group; and Guan Xu from Federal Highway Administration Office of Safety.

Also many, many thanks to our facilitator Suzanne. She did an outstanding job of keeping us on track and herding the rather challenging herd of cats. And thanks in advance to Adrienne. We've got a lot of notes and will be looking forward to seeing the write-up.

Thank you all very much for your kind attention. Be happy to take any questions.

MR. MORRISON: Mark Morrison, Wisconsin DOT.

On your regulation pertaining to no-train-horn centers focus on the W10-1 sign, hopefully, you would change that read any advance warning sign for railroad crossings because there are W10-2, -3 and -4s, these other ones.

MS. FREUND: Absolutely. We put it on the W10-1 as one example, and clearly there could be other signs that could be influenced by this. Absolutely correct.
MR. VESPA: My name is Sesto Vespa with Transport Canada. I just have a little comment about the law enforcement project. We did do a pretty extensive law enforcement evaluation in Canada, and it did lead to reduction in violation. However, this is where the issue of human factor studies are very important. We did a very careful video collection, a data collection program; and some of the behavior that you end up creating as a result of law enforcement cameras at grade crossings can be quite interesting, something that you might never even imagine.

So when we looked over the videos, for example, we had people giving us the finger. And we had people --

ATTENDEES: (Laughter and applause.)

MR. VESPA: -- and one of the things that happened in that, because of the way crossings work -- the crossings work vis-a-vis highway intersections -- there are different problems that arise. For example, we had false activations. A number of times we had activation due to exchanges of cars, railway cars at a close-by location.

To make a long story short, we had all sorts of idiotic behavior that also occurred. For example, when drivers had been at a crossing longer than they thought they should be there without seeing a train at the crossing, they would stand back, put tape on the license plates and then run across the crossings.
ATTENDEES: (Laughter.)

MR. VESPA: Believe it or not, we saw a number of incidences where drivers would actually turn around and drive backwards over the crossings.

So, just to make a long story short, we have to be very, very careful in the way we use that technology; and we came up with a list of recommendations on how to use it, but it's -- what really that project showed is how important it is when you install technology to make sure that you look after it carefully because you can get a lot of -- all sorts of strange things you had never actually expected.

MS. FREUND: Appreciate those comments. And if we could get the report number at some point to add it to this research area, if it is selected; but we certainly want to include it in a literature review.

MR. OGDEN: Brent Ogden, AECOM.

The Los Angeles County Metropolitan Transportation Authority did a law enforcement study at a Blue Line crossing. The study was done I think about six or seven years ago, and so that's also available. My understanding from their experience -- and I didn't, I didn't read the details of the report to see if there was some erratic behavior; but I know that the numbers in terms of the effectiveness at the crossing was very substantial as far as their report found.

They did -- there were a lot of legal issues with...
Met-- well, with that photo enforcement. And, actually, one of their experiences with the-- one of the first people that they caught was an assistant D.A. who ran through the crossing; and he challenged it in court and lost.

ATTENDEES: (Laughter.)

MR. OGDEN: He wasn't feeling good about that.

But the other-- I think the other thing that-- you know, in terms of the way it's implemented on the traffic side-- and this has created a big ruckus, as we know. Traffic is like the neighbor. Basically, it's a vendor-driven program that is based-- where they basically, you know, go out and they self-- basically, it's a self-financed operation. There's proceeds from tickets used to, first of all, pay the manufacturer; and also we don't pay someone on the support costs. These things are money makers.

One of the issues that came up at the San Diego conference where there was a lively debate about this was that the manufacturers-- one of the criteria for selecting locations for different models not out yet was the fact that the signals weren't timed right. They knew they were going to be able to nail a lot of people.

It's absurd, but almost half of them complained about their own systems weren't timed right. Maybe you should fix the signal first before you start issuing tickets. Well, anyway, there's just-- you know, there are probably issues.
with implementing them; but they were all effective.

MS. FREUND: Points very well taken. And I would add that it's probably important to look at differences in -- on crossings in different -- different types of facilities, urban surface rail as opposed to heavy rail and other different installation types and operational traffic concerns.

Absolutely.

Going once. Going twice. Thank you all very much.

ATTENDEES: (Applause.)

MR. daSILVA: Okay. Next up we have the Education and Public Awareness group led by Helen Sramek and Dan Di Tota, but I think Helen's going to take it; and it focused on the outreach aspect.

ATTENDEES: (Applause.)

MS. SRAMEK: Last night at dinner I drew the short straw. My colleague from Canada has decided that he will back me 100 percent in etiquette --

ATTENDEES: (Laughter.)

MS. SRAMEK: -- but I do want to single him out here. He was a very active participant in our sessions yesterday. And it's not only that he is my counterpart for Operation Lifesaver in Canada. Canada is known for some -- Canada and the wealth of records in particular is doing some very innovative work that a lot of us in the United States are also looking at. So my thanks to Dan for his involvement in this program.
We had a very spirited discussion yesterday. And we probably began with 12 to 15 research ideas; but we quickly came -- on the first vote -- to about four to five priorities that we want to share with you today.

Our top five research needs are: first of all, evaluation of social media outreach. Second is evaluation of existing education and outreach strategy. Crossing consolidation education. We want to evaluate the effectiveness of potential motorists and pedestrian signage and treatments.

And this is the last one that we got engaged in at about 4:30 yesterday, and we were really going at it. And this is the topic of evaluating the effective of mobile warning devices when approaching grade crossings. I'm going to mention it, but at about the 5:30 we decided this isn't really education. This is technology, and we are going to pump this to Rick Campbell and his team.

Okay. Our first one is evaluation of social media outreach. You know, when this was last held in 2003 a lot of the tools that we're talking about today didn't even exist. It's fairly remarkable when you think of it.

So what we would like to suggest as our description is to identify, assess and test the effectiveness of social media. The rationale is the use of new media applications offers the opportunity with limited resources to reach a broader audience. And that is something that we in the public...
Awareness and education field are always looking for. The benefits, the collection of data that has never before been utilized for captures. It will help improve the targeting of future educational efforts and better utilization of limited resources. When you deal in the area of education and awareness, you're always very aware that resources remain a constant challenge.

Here's one that I spoke about at the beginning of -- when I talked on whatever day it was, Tuesday. It's evaluation of existing education and outreach strategy. My friends, this was mentioned in 1995 as a priority area. It was mentioned again in 2003. We would like to suggest that it is time to find some sort of study to help us evaluate the effectiveness of what it is we do.

Description, to quantify the role education plays in preventing incidents on active rail lines. The rationale, it is crucial to assess the impact and effect -- effectiveness of existing education and outreach strategies in changing public behavior. We need to start finding a new way -- and there are lots of experts in here. We need to start finding a way to quantify what is the benefit. How do we measure the effective -- not just the effectiveness but can we somehow isolate what the education component brings to highway rail safety?

Benefits, identify effective current education
methods to better target and send to audiences to reduce incidents on railroad right-of-way. Implementation issues obviously is the collection of data and how you design a research study. Operation Lifesaver exists in 50 states. This is not necessarily going to be an easy project to design. Crossing consolidation education, to determine the effective methods to educate community leaders in this area. A lot of discussion on this particular topic. Many communities are unaware of the benefits of public/private partnerships regarding grade-crossing consolidation and grade-separation funding. The benefits, increased community safety forges better partnerships, long-term safety benefits and mutual benefit among cross-sectional groups. So my evaluator/researcher has got in there cross-sectional groups. I think that's pretty impressive. And so that's one of our key topics. Evaluate the effectiveness and potential of motorist and pedestrian signage and treatments. Description, assess the effectiveness of existing and potential new driver and pedestrian signage treatments on or around railroad tracks and station platforms. The rationale for signage may be misunderstood or overlooked by motorists and pedestrian traffic. The benefits we would hope would lead to further
reductions in motorist and pedestrian grade crossing and
trespass incidents, increased motorist and pedestrian awareness
of public rail safety and improved compliance to signs.

Key implementation issues would be design of a new
signage, changes in the signage and the MUTCD compliance.

Lastly, we suggest -- and since this made No. 6 in
Rick Campbell's presentation, we can say it made No. 5 if you
lop it into ours. It's evaluate the effectiveness of mobile
warning devices when approaching a grade crossing. Research
the effectiveness of mobile warning devices as means to alert
drivers and pedestrians within close proximity of active rail
lines.

Rationale, utilization of current technology --
cell phones, et cetera, as mobile warning devices can offer
additional alerts.

Benefits, active warning alert reduction in
collisions at crossings, long-term benefit to general public
and the lost-identity industry.

Implementation issues, really this is technology. It
is -- we would be the group that tries to help educate the
public on this. And it's integration with existing equipment
and a challenge of using this technology which is driver
distraction.

And rather than go and read everybody's name, I'd
like the group to stand. And I want to make a special mention
that Paul Chaput with the Brotherhood of Locomotive Engineers was left off inadvertently. It was one of those human-factor slips. But I want to -- rather than give their names -- and these are great people -- we had a very spirited discussion. Take a look at these folks.

One, they span all age groups. Two, we have practitioners. We've got Paul. Dan Tota I want you to meet. I didn't introduce him. He was a locomotive engineer in one of his past lives. And Cliff Stayton was a locomotive engineer. So we have the guys who know what this is all about. We have safety practitioners. We have evaluators. Suzanne Horton actually did an evaluation of the PEERS program. And we have law enforcement, and we have representatives from the public agency. A very good group who knows about public awareness and education, and we thank all of them. And we particularly also want to thank our facilitator, Rachael, who -- you know, we're communicators. So we talk a whole lot, and we go all over the lot. And Rachael made sure that we stayed on point. We had a number of red dots that we had to allocate accordingly. And we want to thank Tashi, who was our scribe during our sessions.

So thank you all very much. Are there any questions?

That was easy, Dan. I didn't have to point to you.

MR. DI TOTA: Thank you.

ATTENDEES: (Applause.)
MR. daSILVA: All right. And last but certainly not least -- especially since I was in that group -- Institutional Issues, a focus on successes and challenges related to planning and implementing programs at all levels of industry: state, local and Federal; and the team leader was Steve Laffey.

ATTENDEES: (Applause.)

MR. LAFFEY: It's good to see so many people have still remained and are active with us. We covered a big, broad range of issues, big institutional -- pretty much everything, big stuff that fall into our jurisdiction.

We started off with kind of developing some nice big pots to stick little ideas into, so we have seven big pots. Then after our break we ended up with little -- 71 individual ideas. So then after lunch we took our 71 individual ideas and condensed them back down to six basic themes. So we're going to end up talking about six individual projects that we did here, and I'll go over our little statements.

So our top six statements here were establishment of a railroad/transit data clearinghouse. So this data clearinghouse would cover all types of data relating to incidents and inventory.

No. 2 is do cost/benefit analysis of grade crossing improvements.

Three is a synthesis to evaluate how, when and where human perception negatively impacts railroad safety. So this
is how people view railroad safety as well as the messages that are provided to help you interpret grade and separate issues. Institutionalized evaluation as a key component of project/program and countermeasure design and implementation. Improved effectiveness of stakeholder interaction.

There are a lot of folks who are involved in this entire business, you know, well over 20, 30 various nations. The industry itself is very diverse.

5B there is identified opportunities to make legislation and regulations across jurisdictions compatible and meaningful and up to date. Those of you work for railroads obviously have to deal with a number of jurisdictions to get anything done. We simply want to put up a fence on private property. You've got to negotiate deals with folks. That gets to be very complicated and actually way too complicated.

So Project No. 1, establishment of a data -- a railroad transit data clearinghouse, a description of this is simply to take a framework and an architecture for integrating existing databases. We're not advocating the creation of a bunch of new databases. What we want to do is link existing databases together as is done in the aviation and highway fields.

A lot of states have done this now with traffic crash records. So many states -- like, Illinois has a traffic crash records coordinating committee work there; but what they do is
develop deals with various state agencies and institutions to link databases together from the private side, public side, so that all of your event data is in one easy-to-find location. And you can reference that data so you can query across multiple databases so that when a police officer wants to know where he comes across a crossroad, he can do it and not have to deal with mileposts. It can actually tell him the city and cross streets.

So it will facilitate people doing more work, and obviously the rationale is to maximize distribution of information. We want to make it easy for people to get information, use that information to do their jobs more effectively. And then the benefits obviously are to make better informed decisions.

When it came to key implementation issues, we kind of took the perspective of are there any things out there which will hinder possibly being able to do this; and for this particular topic there wasn't anything that was going to hinder us. It's relatively easy to do. It's a medium cost, and it really a very high need for folks to go out there and find information they need quickly and integrate it and get out in the field and put it in solutions.

Cost/benefit analysis of grade crossing improvements. Now, obviously, you know, this is something you really need to do. Not a lot of it is done right now.
The rationale for doing this is to really continue to deflect -- to really have a defensible argument that we need the money we get. We want more money. We don't really particularly want to see, for example, Section 130 money dumped into a huge pool of safety money. We want 130 funds to be able to stand on their own.

And until we can actually go out and defend that Section 130 money or any grade crossing to do with money -- it doesn't really make any difference -- we can't do that. So the benefits of this would be to really enable the addition of more -- some Federal funds and any funds that are routed to railroad safety. And here again, the key implementation issues, we didn't really find any negatives. And this is something that we could do pretty easily. It had a medium cost and a very, very high need, particularly once the authorization -- somewhat under progress.

The synthesis, to evaluate human perception implications on rail safety. The description of this is to evaluate the human perception to modify human behavior. We need to see how people actually interpret signs. Are signs giving them the right message? Are they giving them the wrong message? If they're giving them the wrong message, how could we change that so they actually understand what we're intending them to do.

Engineers often work at one level. The public is way
down here at a different level. The messages don't often get across.

So the rationale here is for the local authorities, the media and the public to correct some misperceptions of rail dangers. The media has one way of talking about incidents and accidents. For example, the media often will say, "A pedestrian was struck." However, there was truly a trespasser. The person was there illegally. This doesn't get across in the press or in the media so that the public has a perception that this person was innocently in the wrong place at the wrong time when in reality he was in the wrong place at the wrong time on purpose.

And the benefits of this will be to reduce collisions and to reduce fatalities. Here again, we didn't really see any key negative implementation issues. And this is something that's relatively easy to do. It's really just an education campaign, a very low cost; and it's a very high need.

Our fourth project here was the institutionalization of evaluation as a key component of projects. Now, we need to build evaluation into the initial letting of a project. You can't go back after a project is done and say, "Look, how do we evaluate this?" Well, it's too late at that point. If you haven't developed a performance menu when you build a project, when you start an education campaign, it's too late to go back afterwards and put a Band-Aid on it for yourself. So it's much
better to -- really to identify and maximize the potential benefits of your project at the front end.

For example, if you were going to put in a new pedestrian warning device, you should do your surveillance ahead of time to at least get your baseline situation. And a lot of our projects that we do an hour, that would be great because then every week you sit down and analyze those; but you need to spend a lot of money up front.

And the PEERS project, to simply evaluate that -- it was an ongoing project over about 18 months -- cost on the order of a million dollars. So you're looking at probably ten bucks. Every time a gate drops, it cuts into a college co-op. Put into identities, was there a violation? What kind of violation? So it's very expensive.

So it does add cost in the short term. There is some resistance to doing this because it will take longer, obviously; but the long-term benefits that you can really prove prevent the cost of something you're trying to do.

Improved effectiveness of stakeholder interaction.

Like I mentioned previously, there are a lot of players in this business. We all kind of communicate effectively? I really don't think so.

At the Illinois Commerce Commission we have our contact communications with local communities. We deal with townships, cities, counties, railroads. We have 50 railroads
on line. Trying to get everybody at the same page is impossible.

Now, if we can actually get some kind of pool together, if you look at how people communicate, find out who is doing it correctly and emphasize that in the future, that could really improve the communications; and improved communication is always a good idea.

Sometimes it's kind of painful. Some people don't want to talk to one another. It can be like dragging toenails or fingernails out of people to do it, but it has to be done to get the best out of our investments.

Implementations here, these are ideas. I mean, there's a huge group of stakeholders. They're very entrenched. The engineering industry is very conservative. Railroad safety must be very conservative. Trying to get things to move at, you know, other than a glacial pace is -- it's tough.

No. 5B -- or actually -- we are actually at No. 6 -- identified opportunities to make legislation/regulations across jurisdictions compatible, meaningful and up to date. Now, basically, an outburst of regulations in Ann Arbor deal with water -- with water and livestock and cars. Is there a lot of livestock shipped by rail these days? I don't think so.

There are lots of opportunities here to really go and streamline the touch of legislation and rules and regs that are out there. There's a Public Utility Commission. They've got
lots of rules. Feds have lots of rules. Railroads have their
own rules. There is not exactly a lot of harmonization between
those sets. If you can streamline all those, that would really
benefit things and speed up the whole process.

Ah, but, of course, there's a lot of inertia there.

Nobody wants listening to rules that have been there over
50 years. It's a lot of work.

We have an administrative rules committee in
Illinois, JCAR. To get anything changed in Illinois is a huge
pain in the butt. A short and sweet thing at the Federal level
from the railroads, everything is very institutionalized.

People don't want to change things if it's simple. And,
actually, there are some pretty powerful coalitions out there
who don't particularly want to see some things change after
all.

As far as some folks we have on our committee, first
of all, facilitators in our stripe, Marco and David Damm-Luhr
were fabulous. Without those assistants we could certainly not
have accomplished what we did.

Bill Browder from AAR and Ian Lake from the Railway
Safety Commission of Ireland really added a nice different
flavor to our discussions. Karen Marshall from American
Association of Suicidology helped us focus on some of the human
issues: the pedestrians and the willful, intentional
trespassers. Jordan Multer had some very nice reflections on
different industries that he did with regard to discussions, particularly from the aviation industry. Ron Ries, supports and referee. Joy Schaad from Chicago Metropolitan Agency for Planning. And John Shurson from BNSF really gave us a good railroad perspective. And also -- sorry there -- Jay Holman from Union Pacific, a public safety officer and police officer, also gave us the interpretations on how things are done. And those are our top six institutional issues. So, if anybody had any questions, it was welcome to taking a shot at them.

Okay. Thank you very much.

ATTENDEES: (Applause.)

MR. daSILVA: I know we're a little bit over, but we're going to make up for it. We have a couple of things to deal with before the break, really quickly. We do want to present our team leaders with a memento of their active participation at this conference -- at this workshop. So if we could please have Brian come up. We'll do this in order. Brian Gilleran led the Grade Crossing Modernization team.

ATTENDEES: (Applause.)

MS. CARROLL: Going to take a photo?

MR. daSILVA: Oh, you told me that.

ATTENDEES: (Applause.)
MR. daSILVA: And then Anya with Traffic Patterns.

ATTENDEES: (Applause.)

MR. daSILVA: Rick Campbell from New Tech Opportunities.

ATTENDEES: (Applause.)

MR. daSILVA: Debbie Freund with Regulation and Enforcement.

ATTENDEES: (Applause.)

MR. daSILVA: And Helen Sramek and Dan Di Tota for the Education and Public Awareness.

ATTENDEES: (Applause.)

MR. daSILVA: And, obviously, Steve Laffey, Institutional Issues.

ATTENDEES: (Applause.)

MR. daSILVA: So this is your team. Thank you so, so much, guys.

ATTENDEES: (Applause.)

MR. daSILVA: All right. I think their duties are relieved, right?

All right. So we're going to break. And we do have a handout for you that you'll pick up on your way out. It has all of the top research needs. We ask you that when you come back really start thinking about what your own priorities are. And then Anya's going to lead a discussion to wrap things up, and then we'll be done.

So thank you very much. Break is right outside, if
you want to come back in about ten minutes or so. Make it

10:30, 10:35. Thank you.

(Recess taken.)

MR. daSILVA: Okay. I have one announcement that Debbie Freind pointed out to me that we apologized for an omission but we have an omission of Richard Brown, who was on the Yellow team, on the Regulation and Enforcement team. So we apologize for that omission from the presentation.

MS. CARROLL: We'll adjust it.

MR. daSILVA: And that will be adjusted.

I'm still waiting for a few people to come back in. So the first thing I'd like to do is actually acknowledge the in-house staff, the Volpe staff that is still present this morning. If they want to stand up so that we know who everybody should thank, Volpe people. I believe that I see a bunch back there.

ATTENDEES: (Applause.)

MR. daSILVA: So thank you for all your help throughout this week and leading up to this.

The other group of people that we really need to thank is the steering committee. The team leaders are all part of the steering committee, but there were also other people. So if the steering committee -- want to stand up, please. You know who you are. You've been involved with us for the past six months or so.
ATTENDEES: (Applause.)

MR. daSILVA: Thank you for all your effort and hard work and all those conference calls which I think really paid off. So we're going to go into the last session, and Anya is going to lead the discussion and prioritization. And I hope that you got a list of all of the top 30 -- 34, right?

MS. CARROLL: 33.

MR. daSILVA: -- 33 -- 33 research needs statements. So if you don't have a copy, there are probably some extras floating around, so just phasing it and a timeline.

MS. CARROLL: Thank you. We're going to take a little bit of time. Since we had a lot of discussion with questions and answers while the team leaders were up here, we'll have some more discussion and, hopefully, a little bit of time to do some prioritization with you.

So with that, the list that you should have in hand discusses -- let me premise my comments by the fact that operator error in the wee hours of the morning may cause human error. So -- as exemplified by my earlier presentation where I missed an entire project -- I hope I've got this right.

So I'll just to through very quickly the titles. For the Grade Crossing Modernization we looked at warning device minimum requirements for high-speed rail, flange-way gap, GPS and PTC constant warning signs, second-train warning devices, personal detection device -- I see that. I've got that twice.
I forget what the fifth one is now.

Trespass -- Traffic Patterns are application of

warning devices, highway traffic signals, the effectiveness of

pedestrian gates, signage at roundabouts, driver

decision-making, review and improvement of the hazard indices

and accident prediction formulae.

The New Technology group, alternative sensors,

pedestrian treatments, on-track vehicle detection, LEDs,

minimum traffic control devices for high-speed rail, enhanced

commercial GPS systems to improve highway-rail grade crossing

safety.

As you can see, unless -- excuse me -- on my slide

I have some key -- color keys; and that's a surprise on the

next slide, if you haven't guessed already. I bet some people

have identified what that means.

Our next slide talks to the Regulation and

Enforcement, the data needs, collecting and analyzing trespass

data, photo enforcement, regulation and signage, national

campaign for targeted seasonal enforcement.

We work into the Education and Public Awareness a lot

of evaluation: evaluation of social media, evaluation of

outreach strategies, crossing consolidation education,

evaluation of effectiveness of potential motorist and

pedestrian signage, evaluation of the effectiveness of mobile

warning devices.
The Institutional group brought to bear some of the outer skin of the onion, as Jordan mentioned: you know, establishment of a data clearinghouse across the organizations; cost/benefit analysis which would provide us with some level of effectiveness of the types of warning device improvement; the synthesis to evaluate how -- how, when and where human perception negatively impacts safety; institutionalize the evaluation as a key component, improved effectiveness of stakeholder interaction, and the identification of opportunities to make legislation and regulations across jurisdictions compatible.

I want to applaud everybody here and everybody who was here for the tremendous job they did. My anecdotal information was that we generated more than 150 ideas that generated one-page sheets to the total of 70, 70 plus -- I think there might be 72 we actually generated. And what we'd like to discuss today is these top issues that the teams came up with and have a discussion about that.

My color scheme sort of tries to link across the teams some of the trends. So, as you can see, the Grade Crossing Modernization team, the Traffic Patterns and the New Technology all focused on what do we do with the incoming high-speed-rail legislation and funding; and how can we proactively get to a level of comfort to implement the high-speed-rail issue.
The GPS came up a couple of times with constant warning time and also the use of a possibility of ITS types of systems as David Matsuda brought to bear in his opening presentation on Tuesday.

The next grouping looked at grade crossing modernization, traffic patterns, new technologies and education and public awareness. We talked about pedestrians. It seems like pedestrians is a cross-cutting issue.

Yes, Scott. Could we get you a microphone first, please. And could you state your name and your organization.

MR. WINDLEY: Yeah, I'm Scott Windley with the U.S. Access Board.

I hate to do this to you, but I have to point out a human error.

MS. CARROLL: Okay.

MR. WINDLEY: You left out flange-way gaps in your next group.

MS. CARROLL: Okay. It will be in the formalized edited proper list. That's why we may do a precursory prioritization, but we're going to save that for a more consistent prioritization.

So we will add the flange-way gaps to the color blue. In yellow we talk about driver decision making a human factors area that has been with us for at least the last six years in this venue of research needs; and, hopefully, we
need to get moving on this area.

And then the last area of purple evaluation was evaluation, evaluation and more evaluation. And I was just having a sidebar conversation with Jim Sottile; and similar to what Steve Laffey and his team put together as far as having a database of where you could get information, wouldn't it be great to have a database of all the evaluation results right after they're done? It's just a thought.

So with that I would like to open the floor to anybody to discuss any issue that you have, any of these needs that you want to discuss further or anybody that would like to support one of these research needs or another. So with that I'll open it up to the floor.

Microphone, please. And please state your name and your organization, Paul, because we're trying to --

MR. WORLEY: Paul Worley, and North Carolina DOT. And also I'm representing AASHTO at this meeting.

One thing that's been very important to us at AASHTO is the Section 130 program, seeing that continue as some kind of grade-crossing safety set-aside. And every time we get into the situation of the reauthorization and transportation bills, we get into this defense-of-gate, bar-the-door-type kind of mode.

We have a lot of good reasons for the Section 130 program, not just the safety benefits that we've had over the
life of the program; but also involved in crashes are economic factors, factors of mobility and communities as well as the rail systems. And as we look in our country to develop high speed rail corridors and more intercity passenger and freight and as that becomes more important, the mobility of rail lines, the validity of those rail lines and the velocity of the trains becomes more important and maintaining a good grade crossing set for it as well.

So, with that in mind, we have been pursuing through TRB and we would love to see some kind of cost-back analysis and research done into what are the economic impacts, what are positive economic impacts and mobility impacts of railroad crossings safety and use that, that body of work that we can get out of that kind of research as our further walking-around backup to the Section 130 program. And we've also got some other ideas of where that should go; but we really need some good data on that, not just to safety but there are some other benefits we need to look at, too, and modify.

MS. CARROLL: Thank you, Paul.

Anybody have any comments for Paul's suggestion?

That was one of the research needs that was established, the cost/benefit of a grade crossing safety treatment.

Yes. Down here.

MS. FREUND: Debbie Freund, Federal Motor Carrier Safety Administration.
I'd like to add to Paul's comments. One of the reasons that FMCSA is looking at rail highway grade crossing safety as carefully as it is is not necessarily the number of events but the risk of the very, very serious catastrophe. There is more hazardous material being moved by truck than by rail at any time. The trends continue to increase.

In that way, you know, it's a little bit like aviation. It's extremely safe, and that's to protect the traveling public from risk. So do keep that in mind as we go on evaluations. It's not just what is happening. It's what potentially could happen.

MS. CARROLL: Thank you, Debbie. Right behind you?

MS. COOK: Hi, everybody. I'm Carolyn Cook, and I'm the regional crossing manager out of Region 5 for Federal Railroad Administration. And for the last five years I've been working on state action plans for -- crossing safety action plans in Louisiana and in Texas. And the big reason that I asked to come to this was because I have a big concern about traffic signal and crossing interconnections. You know, I've also served on planning committees for three different engineering conferences. And every time I've had to convince the group that we still need to be talking about this because in my region we're still having collisions.

I first got involved really with the topic when three people were killed at a grade crossing in Louisiana when the
truck driver was looking up and waiting for the light to change and failed to look at the Norfolk Southern's train approaching. It was ignored by the fact that cantilever flashers had just gone off. There wasn't a gate there, and the traffic -- signal wasn't interconnected with the traffic light.

That was in 2004 three people died. So then we did the state action plans in Louisiana and found out that close proximity to intersections was the main reason why we were having multiple collision -- multiple-incident collision. We didn't go as far with the data analysis as we've done in Texas, and now in Texas we've looked at 1328 collisions with 466 multiple-incident collisions. In 46 percent on the multiple-incident collisions -- no, 46 percent of the total collisions were at multiple-incident locations where an active crossing device was interconnected with a traffic signal.

So that's the biggest difference among the single-incident collision and the multiple-incident collision. That's the only thing, really, that separates the multiple-incident collision with the single-incident collision.

So it tells us, you know, that the big thing we've got to look at in Texas is the fact that those crossings interconnected with the signal. Something -- it's the only -- you know, it's the only indicator we have that there's something going on in those multiple-incident locations.

So my pitch to you is that some of you may think we
I have the problem solved with preemption; but I don't think that we do, at least not in my region. So just my pitch for that research need area.

MS. CARROLL: Brent. Can we get a microphone to Brent?

MR. OGDEN: Brent Ogden with AECOM.

I wanted to speak to the high-speed rail grouping. And I guess the first comment I would have would be that my understanding is that 125 is the limit for grade separation. So if you start with 110 there on some of the considerations in the statements there, I think it should go to 125.

The way -- the way the New Technology group looked at the grade crossing issue with high speed rail, I think -- well, first of all, I think in California and being that we love regulation and love -- we always go to trade on the best-available technology. So we're putting full enclosure on our new light rails. I mean, we're closing off everything, four or five gates, pedestrian gates, full standardization. It's just -- it's almost impossible for me to believe that somebody could put in a high-speed rail crossing that didn't have best-available technology.

So we're sort of starting off with the mindset that there's going to be full closure. And then the question is: What do you do next? Just put a barrier up to stop the cars from running in? Do you secure the crossing and stop the train before it gets there between -- the warning time is three
minutes, four minutes, whatever? So the way we look at the high-speed rail issue is really, you know: What do you do over and above just the best-available treatment? And so that was sort of our focus, and I just wanted to sort of clarify, you know, why we took that approach on it and why we put the barrier gate down.

We also had another one that didn't, I guess, make the short list was the video surveillance of the crossing and verify that the crossing is secure; but I think that's another thing in one of these New Technology areas, is, you know, it could actually become a very, very important consideration, is having video surveillance on these crossings, one of the countermeasures.

MS. CARROLL: Thank you, Brent. Our team, as well, in the Traffic Patterns looked at this issue as well. As you saw, there were three teams that brought this issue up.

MR. CAMPBELL: Hi. Rick Campbell.

I'm going to echo a little bit about Carolyn's statement on traffic signal interconnection and preemption for crossings. Like Carolyn, I'm convinced that this is a significant problem and that we've really failed to address it. We got all worked up after Fox River Grove, and we had the big flash in the pan; but we've really just set all this aside and in many states have taken virtually no action to deal with improvements regarding preemption.
A case in point, we were involved in a study with the State of Ohio that ultimately will evaluate and assess every interconnected location in Ohio. And we're in the very early stages of that program, and we've only looked at roughly 20 to 25 crossings as kind of a dozen sample. And it's amazing of those 20 to 25 locations 100 percent of them have problems. And the problems range from moderate to severe.

You can find locations where the presumption has been disabled. And even after all that we've learned about, we saw agencies had disabled the interconnection. And it's just inconceivable that we could take such a casual approach to such a serious problem.

And I just want to support Carolyn. There were a number of different research need statements about preemption with different elements. We had someone in our organization. I know there are other groups that did as well. So just encourage them to continue to look at that. Let's not set the research aside in terms of preemption and interconnection. It is a significant issue that's out there.

And when you look at the numbers, when the various elements line up, it's not a question of if the crash occurs. The crash will occur. It will happen. You can prove it mathematically. So it's only a case when one of the contributing elements either isn't present or at the last minute moves out of the way and removes that element that the
crash doesn't occur. So that's it for my comments about that.

MS. CARROLL: Thank you, Rick.

Up in the back, Scott?

MR. WINDELEY: If somebody has to comment about what Rick is talking about, my issue is different. So I don't want to interrupt the discussion of what we're talking about there.

So if somebody needs to comment further, I'll yield for him.

MR. SOTTILE: Jim Sottile, PVB Consulting.

Rick, one of the things that's in my experience since retirement has been with the preemption issue at certain grade crossings. The salt conditions during winters start false activations and then start the cycle. And I've done some nominative research into police departments responding because, as you know, in 49CFR234 it's a requirement before the next train movement that the railroad respond to it; but it does it all the time.

But police departments going out there and propping up gates, that's more hazardous because of the intermittent occurrences. So -- and I agree with the FRA speaker and you that there has to be some research into that because, just because you have preemption, it may cause accidents instead of helping.

MS. CARROLL: Thank you.

Let's go back to Scott in the back corner, please.
MR. WINDLEY: Actually, I just wanted to give Erica a workout, but --

ATTENDEES: (Laughter.)

-- I'm Scott Windley, U.S. Access Board.

I'd like to -- I was in the 2003 research needs meeting, and in that meeting I felt like I was the only one beating the pedestrian drum. So I'd like to commend all of us for having as many projects as with do that list pedestrian issues.

I would just like to give my support to the flange-way gap research because that's been an issue forever. And if you want -- I'll keep my horror story to a minute, a minute long -- but if you want to picture yourself in a wheelchair all by yourself and you get your wheels stuck in the flange-way and there's no one around to help you, you're either going to be a dead duck when the train comes or, if you're lucky, somebody will come along and help you out before the train comes.

So I know that this high speed rail is a real big issue right now. I would just want us to not lose sight of the fact that we need to address the flange-way gap issue because it's not just for wheelchairs. Bicyclists have that trouble.

I think I remember somebody saying in our group that there was a story about a woman who got her stroller caught in the flange-way gap and got so -- in the panic moment got so
involved in trying to get the stroller loose that she didn't think about scooping the baby out of the stroller.

So, you know, these are just things that it's more -- there's more issues here than just wheelchairs. It's for all small-wheel vehicles that are going across that pedestrian crossing. So I commend you all for all the pedestrian issues that you've brought up, and I don't feel all alone anymore.

Thank you.

MS. CARROLL: Thank you, Scott.

And the way in the back, please give your name and your organization.

MS. XU: Hi. I'm Guan Xu with Federal Highway Administration Office of Safety.

I want to remind you when you are considering prioritize the project, keep in mind that we probably want to consider "all" DOT and official strategies. Note the emphasis. I think my life pact now is that future cost studies would treat the priority of safety, name of the body and present of the learning.

So that's -- of course, safety, we're talking about safety now. That's what is on target but also the means to survive which is -- which we need look into what Scott was mentioning in the back on parking.

And also, with that in mind, I think the flange-way, the topic is right on target. And there's probably something
that will be supported by other communities like pedestrian and
the people with disabilities and may have high potential to be
funded in the use -- to that use.

And we find that I think maybe we need to change the
name of the flange-ways to make it more clear to people outside
railway society. I don't have any suggestion, but that's been
solved. And something about pathway. Like, I mentioned the
first day that -- who presented pathway design standards.

I think that's kind of, like, one solution to resolve the
flange-way problem and also have high potential to be accepted
by other communities such as the design community -- roadway
design -- and pedestrian safety groups and also the railway
community talking. So this -- so when you consider that, keep
this in mind.

And also, another point I want to make that the start
of next authorization deal I think one thing is added which is
performance of engines. So this was something they need to run
the data again. And we want to have good data to do evaluation
and also to do performance measurements.

And also the ultimate goal of the DOT is to review
fatalities and severe injuries -- severe enough injuries. So
when people look at what they have, they always see all these
causes and that made so low. If they'd spend money actually on
that it will not produce good results, to contribute so and
that fund is not inhabited.
The number is so low because we are only looking at the train and vehicle we have; but there's a lot of fatalities and injuries that are related to the vehicle on the pathways and crashes that somehow cost by the percent of the crossing or between the trains. So we need to expand our database to include those. So I think that's necessary to do that because those are overpopulated in its use. I'll expand that.

So, in conclusion, I think -- I think my priority will be such a project related to the data, looking at how a lack of rough database and also something that will relate to other fields like design conversion, certainly see these. So I'm thinking, you know, what also has had a potential to be funded.

MS. CARROLL: Thank you, Guan.

We've got to stop.

MR. WINDLEY: Just real quick. I'm Scott Windley from the U.S. Access Board.

I just forgot to mention that while my agency is only a $7-million-a-year agency in our entire budget, I will -- I can commit some dollars through a fund we have.

MS. CARROLL: For a pathways safety --

MR. WINDLEY: Yes, something. And I agree with Guan that it needs to be somehow made a little bit more understandable because I think that might be why -- while I've submitted it to NCHRP several times, I've submitted it to TCRP a couple of
times, I believe -- it never gets funded. So -- but, anyway, thank you.

MS. CARROLL: Thank you, Scott. Thank you.

Way in the back there. Rich?

MR. BROWN: Thank you. I'm Rich Brown with Transpo Industries.

I participate in a lot of these meetings. And I sit here and listen and sort of -- and I just want to reinforce what Scott is saying; but I also feel that in the research mode, the basics of a research project, you begin to look at what is currently available. We've got a number of different systems that are out there.

Some are better than others, some utilizing different types of rail seal, different manufacturers of rail seal. Rail seal has been around for a long time. I think we need to broaden research to bring in some of these manufacturers of rail seal.

And I think also as the program moves forward you need to have a base point and you need to look at what's currently in use. And I think you need to establish barometers as to some systems work better than others. We need to look at why that is. I don't have the answer but certainly would be interested in seeing that evaluation take place. Thank you.

MS. CARROLL: Thank you.

MR. O'BRIEN: Paul O'Brien, the Utah Transit Authority.

I'd just like to put in a general pitch for the pedestrian-related research and grade-crossing work and research. Now, if we looked over at the last 20 years, the number of people that are using rail transportation has grown geometrically; and it's probably not going to slow down. It covers light rail, commuter rail. Now we're talking about more intercity service. So I think it's time that we really devote some effort to both the pedestrian and the grade crossing. You know, how will we -- we are going to have more pedestrians around trains whether we -- whether we like it or not it's going to come to it.

MS. CARROLL: Thank you for your perspective. Does anybody else have a comment? A question?

ATTENDEE 3: Here, in the middle.

MS. CARROLL: Actually, I was going to call on our foreign visitors to share their insights and connections with our U.S. research.

MR. LAKE: Hello. I'm Ian Lake from the Railway Safety Commission of Ireland. Thanks for the invite available for me and crossings.

I'm just meaning to say a couple of words. And it's been interesting to observe lots of common issues, and things aren't that different that I left on the other side of the Pond over in Europe. And I'm going to hedge work some uses here on
these to outreach and education to look back a bit. It's the same issue. How do you get past reaching less than 1 percent of the population when something approaching hundreds in the population use level crossings and end up with 100 percent they give you?

Flange-way gaps, I mean, that's a potential issue, surfacing, particularly in Vienna. You have a higher grade surface in a lot of these sites in Europe, reductions just like that; and in those the last stand. It's a big issue for them. And indeed their common networks is the place. And private crossings is the bane of our lives. And we anguish having another one, that's basically where our avoidable fatalities occur, the bulk of them.

But my other point was, as well, is that -- make sure you look around and look over to Europe before you spend a lot of money on some of these things because, I mean, there's been a lot of talk about 125-mile-an-hour for high-speed and crossings on high-speed lines; but I mean, if you go and talk to the French and Germans they'd probably cost you an hour. They wouldn't even think of a level crossing on a 125-mile-an-hour.

And that not even for safety reasons. That's purely for performance reasons. If you want to get trains from A to B, never crossings with having to back up. And they cause the main bunch up. And get your method from A to B -- train
from A to B, and then we've got crossings methods. And that's even before you start with the issues of 125-mile-an-hour crossings. You're talking about CCTV or supervising level crossings; and, I mean, that's pretty much in the UK. And for over 20 years any crossing over 100 miles an hour has to be directly supervised from there or remotely by CCTV.

Now, I'm not saying that's necessarily the right way to go; but go over there and talk to someone who's got the equipment in and say, "How well did it work? How well has it performed?" And the boundaries set on it, have notes if they have any. So you can save yourself a lot of taxpayer dollars there.

And obstacle detection is something that I think we've briefly touched on today. I know in the last three weeks -- I went to a conference in London last week. And at least on those ten level crossings, automatic crossings and still we had obstacle detections radar by a system that detect any mass in a defined crossing box. So that's a vehicle, person, soggies or any other foreign object. It could be a tree.

The equipment is out there. The technology is out there. People are working on these issues, so keep your eyes open and send to me -- though I'm across a map, you phone amongst your friends and say you're not alone on this one.

MS. CARROLL: Thank you, Ian, for your insights. And
I know that a couple of the research problem statements did consider looking at, you know, looking at the international scene to see what's been done in the area.

I'd like to turn it over to Sesto to give us the Transport Canada research perspective, if he would oblige.

MR. VESPA: My name's Sesto Vespa from Transport Canada.

Actually, I was very interested to hear on the subjects come out here very similar the issues that we are looking at in Canada and certainly we're hoping towards signing an MOU with you as to create better cooperation between us.

However, I do have a comment in terms of the overall research issues. And that's that when we look at the issue of human behavior and performance, one of the things that you find is that the systems out there are really very, very safe. What generally is happening now, that when we look at human behavior we're also starting to look at the limits of human performance.

So one of the things that we need to do is really make a dent in the kind of things that we're doing right now, is we need to look at really new technology conveying information to human beings. So, for example, that's one of the reasons why I like the issue of GPS remaining a small group and an issue in a way -- the issue of LEDs and signage and how can we do something different.

Because oftentimes we put blame on human behavior, but in large part the failures of human behavior are really
failure of human performance. And a lot of our systems are forcing people to make decisions with information that they don't have; for example, in terms of second trains, in terms of higher speed trains, multispeed trains on the same track.

So there's a whole bunch of issues that if you want to make a difference in occurrence, if you will, statistics considering that we have half of the trespassing fatalities that are due to -- we're finding they're suicides, for example. When we start looking at trespassing, coverage of territory, what that involves, that we really need to have a much better understanding of how human beings make decisions and why they make those decisions and what kind of technology do we need to really help provide them with new information.

So I really want to support the issues of looking at the new technology from the point of view of how can we convey more information but in a way that human beings can actually understand and without the possibility of error. So that's what I would emphasize.

MS. CARROLL: Thank you, Sesto. I think I'm going to learn how to Tweet.

Anybody else? Would our colleague from Taiwan like to say a few words, Shou-Ren?

MR. HU: I'm Shou-Ren Hu from the National University in Taiwan, and I'm here because I realize that there's a severe problem at railroad crossings in Taiwan. Even though we have a
different number of railroad crossings, but the number of fatalities has been quite high due to this regarding data in the States and also looking at European countries. And I notice direct sorts of low fatality behavior, especially for due to drivers. Those are crazy people that -- where they don't really care about the control at the railroad crossing, for example. And secondly, I'm here to share my information. We have a high-speed rail just opened last January. It's the very first imported train, high-speed rail ground. It just opened last January. This was flown in. It's approximately 58 kilometers from northern to southern. It's a fully elevated high-speed rail system. So we don't have any crossing -- railroad crossing problems so far. And this is the kind of information I would like to show you.

My one final comment, being a Taiwanese person, you have to be very -- I think that's the data, a lot of information; but also our spirits are there in the Asian community. So I think this would be to -- it looks to me like I'm here to learn something more and also to share some international information also from me. Thank you.

MS. CARROLL: Thank you.

Any other comments? Questions?

All right. Well, we were supposed to finish at 11:15; but the conversation was going so well, and we still
have one final speaker.

So, without further ado, I would like to ask Len
Allen, who is our program manager at FRA and who has provided
the support to us to be able to conduct this workshop here, to
give us some closing remarks. Len.

MR. ALLEN: Thanks. I just wanted to say thanks to
everyone here for participating in this workshop and taking
time out of your busy schedules and coming up with the travel
funds to travel in these tough times.

I think we've done a lot of good work here. We came
up with a lot of good ideas that FRA will use to focus their
research over the next few years. And we've got -- for those
of you who don't know, we've got about $2 million in our budget
for grade crossing research which isn't a lot of money; but
I think that the ideas that we've created here today can be
used not only by FRA but by AASHTO, by TRB, AAR. Perhaps our
friends from Canada, Transport Canada can cooperate on some of
the projects that we find that we have a mutual need on.

As far as the results of this workshop are concerned,
we're planning on putting together a report of those one-page
summaries that we came up with in our workshops and probably
publishing that in a couple of weeks. And then we will have a
more comprehensive report probably in a couple of months that
will analyze some of the results and categorize them and put
them in a sort of theme that will help us focus our research.
And we've gone through and had people stand up as far as the steering committee is concerned, the speakers, the team leaders, facilitators and the Volpe staff that made this all happen; but once again, I'd like to thank you all for participating in this and helping FRA focus their research needs in the future. Thank you.

ATTENDEES: (Applause.)

MR. daSILVA: Thank you, Len.

I think this wraps up the morning session, unless Dee has anything else to add.

MS. CHAPPELL: What are the instructions for this?

MR. daSILVA: For the -- right.

MS. CARROLL: I think based on operator error and our operator overload became an error that we need to realign ourselves with the exact titles and all of the needs and go out either electronically or with Survey Monkey or something else so that we accurately reflect everybody's issues appropriately.

So you can be looking forward, thinking about --

I think they'll be one-pagers. Dee is going to give you some more information about what might be available outside as you depart. And then there's a few -- there's about 19 or so of you that are going on the tour. And, hopefully, Dee will talk to that, too.

MS. CHAPPELL: I want to thank everyone for hanging in there for these past two-and-a-half days, full of information.
And tried our darnedest to be great hosts and hostesses here. Like my mom says, "Always make sure when people come to visit you they're not happy to see you twice. Happy to come and happy to go."

So, with that, I wish you all safe travel; but for those who will be participating with the tour, I'll ask you if you could please come down front over here to my right, your left. And we'll talk to the logistics.

And is Gerry Ruggiero here? Has he made it yet?

Okay. He will be your guide over to the Silver Line.

So, with that -- those -- Dan Lauzon for the Brotherhood.

MR. LAUZON: Yes.

MS. CHAPPELL: Did you have your opportunity? I know you wanted to make that statement.

MR. LAUZON: Oh, no, no. That's okay. I covered the tracks.

MS. CHAPPELL: Excellent.

MR. LAUZON: But I will -- all right. You brought it up. The Brotherhood of Locomotive Engineers stands ready to assist anybody -- I just wanted to speak on behalf of the Brotherhood of Locomotive Engineers. We would be willing to help anybody throughout the United States, in all 49 states who have rail. So if you feel that you may have that need, you know, see me; and I'll provide you with the contact information. Thank you.
MS. CHAPPELL: Thank you. And with that, I thank everybody for coming. And please, safe travels and until next time.

ATTENDEES: (Applause.)

MS. CHAPPELL: Excuse me. One last, last announcement. There are a number of handouts outside that are -- they're all the -- all of the projects, project descriptions and project templates. We have copies of all of them outside on the table for you. Thank you.

(Ending time: 11:31 a.m.)
REPORTER’S CERTIFICATE

COMMONWEALTH OF MASSACHUSETTS

NORFOLK, SS.

I, DONNA KIMMEL, Registered Diplomate Reporter, Certified Realtime Reporter, MCRA Certified Shorthand Reporter No. 116293, and Massachusetts Notary Public whose Commission expires March 24, 2011, certify;

That the foregoing proceedings were held before me at the time and place therein set forth;

That the presentations, the questions propounded, and all statements made at the time of the proceedings were recorded stenographically by me and were thereafter transcribed;

That the foregoing is a true and correct transcript of my shorthand notes so taken.

I further certify that I am not a relative or employee of any attorney of the parties, nor financially interested in the proceedings.

I declare under penalty of perjury under the laws of Massachusetts that the foregoing is true and correct.

Dated this 21st day of July, 2009.

______________________________

DONNA KIMMEL, CSR No. 116293
Appendix F. All Research Needs

Contents

Grade Crossing Modernization
Traffic Patterns
New Technology Opportunities
Regulations and Enforcement
Education and Public Awareness
Institutional Issues
## Grade Crossing Modernization Research Needs

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCM-1</td>
<td>Warning Device Minimum Requirement for 80-110 MPH Trains</td>
</tr>
<tr>
<td>GCM-2</td>
<td>Flangeway Gap Solutions</td>
</tr>
<tr>
<td>GCM-3</td>
<td>Global Positioning Satellite (GPS)/Positive Train Control (PTC) Constant Warning Time</td>
</tr>
<tr>
<td>GCM-4</td>
<td>Second Train Warning Devices for Pedestrian Crossings</td>
</tr>
<tr>
<td>GCM-5</td>
<td>Personal Detection Device for Railroad Workers</td>
</tr>
<tr>
<td>GCM-6</td>
<td>Channelization at Pedestrian Crossings</td>
</tr>
<tr>
<td>GCM-7</td>
<td>Skewed Angle Pedestrian Crossings</td>
</tr>
<tr>
<td>GCM-8</td>
<td>Humped/High Profile Crossing Approaches</td>
</tr>
<tr>
<td>CGM-9</td>
<td>System to Monitor and Assess Existing Warning Devices</td>
</tr>
<tr>
<td>CGM-10</td>
<td>Develop Lower Cost Warning Devices for HSR</td>
</tr>
<tr>
<td>GCM-11</td>
<td>In-vehicle Warning System</td>
</tr>
<tr>
<td>CGM-12</td>
<td>Automated Vehicle (Automobile) Stopping System</td>
</tr>
<tr>
<td>GCM-13</td>
<td>Best Practices/Model Specifications for Ideal Crossing</td>
</tr>
<tr>
<td>GCM-14</td>
<td>Surface Material Performance – Entire Crossing</td>
</tr>
<tr>
<td>GCM-15</td>
<td>Best Practices for Crossing Surfaces</td>
</tr>
<tr>
<td>GCM-16</td>
<td>Investigate Alternative Warning Devices at Ped/Pathway Crossings</td>
</tr>
<tr>
<td>GCM-17</td>
<td>Lower Cost, Lower Volume User-activated Crossings</td>
</tr>
<tr>
<td>GCM-18</td>
<td>Low Cost Pedestrian 4-Quad Gates</td>
</tr>
<tr>
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</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Warning Device Minimum Requirement for 80-110 MPH Trains</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Research and determine warning device requirements for high-speed corridors in the 80-110 mph range.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>X New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Clarity of regulatory requirements.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>X High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>X High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, Volpe, Highway Agencies</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>X Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Trespassing considerations? (improved trespasser abatement)</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Flange way Gap Solutions</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Flange way gaps at level grade crossings are a problem for wheelchair users as well as bicyclists and other non-motorized vehicles with small or narrow wheels. A material needs to be researched that would fill the gap and withstand rail cars without derailment. Weather factors would also need to be addressed. Research and develop an effective treatment for rails or rail crossings so that pedestrians using wheelchairs may cross tracks without risk of entrapment.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>X Human Factors</td>
</tr>
<tr>
<td></td>
<td>X Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>X High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>X New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Improve safety for all users of crossings</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>X High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>X High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, Volpe, AAR, TTC</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>X Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues: Easy to implement in new construction and alterations once material is identified.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Injuries and fatalities have occurred from people with disabilities getting their front casters stuck.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-3</td>
</tr>
<tr>
<td>3. Title</td>
<td>Global Positioning Satellite (GPS)/Positive Train Control (PTC) Constant Warning Time</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop lower cost constant warning time system. (more cost effective) Would the use of GPS be less expensive, cost effective</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors</td>
</tr>
<tr>
<td></td>
<td>Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>Data Requirements</td>
</tr>
<tr>
<td></td>
<td>High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>X New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>More likely to be used/implemented</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>X High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>X High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, Volpe, Highway Agencies, Railroads</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>X Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td></td>
<td>If it is cheap, it is easy.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Potential to use in other areas.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-4</td>
</tr>
<tr>
<td>3. Title</td>
<td>Second Train Warning Devices for Pedestrian Crossings.</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop and recommend universal active warning devices to let pedestrians know if a second train is approaching. Pedestrians and Motorists. Standardized through MUTCD.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | ___ Human Factors  
___ Transit-oriented Communities  
X Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | ___ New  
X Supplemental (list organization & title of current research) Transport Canada Report on Second Train Warning Signs; LAMTA Report on Second Train Warning Active Devices, etc. |
| 7. Potential Benefit(s) of Identified Research Need Area | Prevent fatalities |
| 8. Research Need Urgency | X High  
___ Medium  
___ Low |
| 9. Cost of Research | ___ High >$500K  
X Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, Volpe, and FHWA. |
| 11. Ease of Implementation If medium or difficult, list key implementation issues. | X Easy  
___ Medium  
___ Difficult |
<p>| 12. Other Comments |</p>
<table>
<thead>
<tr>
<th><strong>1. Research Needs Area</strong></th>
<th>Grade Crossing Modernization (GCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Research Topic Area/Number</strong></td>
<td>GCM-5</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Personal Detection Device for Railroad Workers</td>
</tr>
<tr>
<td><strong>4. Project Statement</strong></td>
<td>Develop a type of personal protection device using GPS/PTC technology that a railroad employee could wear to warn of approaching trains. Device could be used not only at RR crossings but anywhere on the right of way.</td>
</tr>
</tbody>
</table>
| **5. Cross-cutting Areas** | X  Human Factors  
___ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| **6. Relationship to Current Research** | ___ New   X  Supplemental (list organization & title of current research)  
Railway worker protection system FRA R&D.  
FTA Right-of-way protection (PROTRAN – employee, railway, train devices – set wayside train detectors or train based detectors that notify personnel ). |
| **7. Potential Benefit(s) of Identified Research Need Area** | Safety – reduce/eliminate roadway worker injury and deaths. |
| **8. Research Need Urgency** | X  High   ___ Medium   ___ Low |
| **9. Cost of Research** | ___ High >$500K   X  Medium = $150K - $500K   ___ Low < $150K |
| **10. Potential Organization(s) to Conduct Research** | FRA (coordinate with FTA) |
| **11. Ease of Implementation** | _X_ Easy   ___ Medium   ___ Difficult  
If medium or difficult, list key implementation issues. |
<p>| <strong>12. Other Comments</strong> | FTA – is developing a PROTRAN safety system (not GPS based) Limitations to GPS technology – tunnels &amp; canyons (connectivity issues). |</p>
<table>
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<tr>
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<tbody>
<tr>
<td><strong>1. Research Needs Area</strong></td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td><strong>2. Research Topic Area/Number</strong></td>
<td>GCM-6</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Channelization at Pedestrian Crossings</td>
</tr>
<tr>
<td><strong>4. Project Statement</strong></td>
<td>Study and research the effectiveness of swing gates, “zee” style fencing leading up to the tracks, and other related channelization structures.</td>
</tr>
<tr>
<td><strong>5. Cross-cutting Areas</strong></td>
<td></td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td><strong>6. Relationship to Current Research</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>___ New   <em>X</em> Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>CPUC documents Z-gates (not effectiveness).</td>
</tr>
<tr>
<td></td>
<td>Other places implemented – effectiveness not categorized.</td>
</tr>
<tr>
<td><strong>7. Potential Benefit(s) of Identified Research Need Area</strong></td>
<td>Reduce the wide open area of a pedestrian crossing into small specific area designed to transport pedestrians smoothly.</td>
</tr>
<tr>
<td><strong>8. Research Need Urgency</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>__ High   <em>X</em> Medium   __ Low</td>
</tr>
<tr>
<td><strong>9. Cost of Research</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>__ High &gt;$500K   __ Medium = $150K - $500K   <em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td><strong>10. Potential Organization(s) to Conduct Research</strong></td>
<td>Volpe</td>
</tr>
<tr>
<td><strong>11. Ease of Implementation</strong></td>
<td></td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td><em>X</em> Easy   __ Medium   __ Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td><strong>12. Other Comments</strong></td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
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<td>------------------------</td>
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</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-7</td>
</tr>
<tr>
<td>3. Title</td>
<td>Skewed Angle Pedestrian Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Identify and recommend the maximum skewed angle for a pathway/sidewalk approaching the tracks.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors</td>
</tr>
<tr>
<td></td>
<td>Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>Data Requirements</td>
</tr>
<tr>
<td></td>
<td>High-Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New</td>
</tr>
<tr>
<td></td>
<td>Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Greatly reduce the number of incidents, accidents, and fatalities when wheels get hung up on the skewed flangeway.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>High &gt;$500K</td>
</tr>
<tr>
<td></td>
<td>Medium $150K - $500K</td>
</tr>
<tr>
<td></td>
<td>Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>If #2 (Flange way Gap) is addressed, then #7(skewed angle) becomes less important.</td>
</tr>
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</tr>
<tr>
<td><strong>1. Research Needs Area</strong></td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td><strong>2. Research Topic Area/Number</strong></td>
<td>GCM-8</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Humped / High Profile Crossing Approaches</td>
</tr>
<tr>
<td><strong>4. Project Statement</strong></td>
<td>Due to the variability in truck and trailer design, investigation is needed to determine if W10-5 warning sign should have a supplemental plaque to categorize severity of profile.</td>
</tr>
</tbody>
</table>
| **5. Cross-cutting Areas** | ___ Human Factors  
___ Transit-oriented Communities  
__ High Speed Rail |
| **6. Relationship to Current Research** | ___ New   _X_ Supplemental (list organization & title of current research)  
Possible NTSB accident report.  
FRA LIDAR project. |
| **7. Potential Benefit(s) of Identified Research Need Area** | Providing operators with advance information of high profile crossings could avoid potential catastrophic derailments. |
| **8. Research Need Urgency** | _X_ High     __ Medium      __ Low |
| **9. Cost of Research** | ___ High >$500K     _X_ Medium = $150K - $500K      __ Low < $150K |
| **10. Potential Organization(s) to Conduct Research** | NCHRP |
| **11. Ease of Implementation** | ___ Easy   _X_ Medium       __ Difficult  
Issues:  
Will require road authority to survey approaches in order to classify hump severity. |
<p>| <strong>12. Other Comments</strong> | The DOT inventory form has a field for humped crossings. This could be used by operators to identify routes. |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Grade Crossing Modernization (GCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-9</td>
</tr>
<tr>
<td>3. Title</td>
<td>System to Monitor and Assess Existing Warning Devices</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Study and develop an effective process to assess and monitor the age and condition of “older” warning devices and components, and manage a replacement or upgrading program to maximize safety with scarce funding resources. Best practices for States and RR.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>![Mark X next to the applicable area(s).](___ Human Factors, <em>X</em> Transit-oriented Communities, <em>X</em> Data Requirements, <em>X</em> High Speed Rail)</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Reduce maintenance costs and failure rates. Reduce interruption to train operations. Efficient use of scarce funding.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>__ High &gt;$500K <em>X</em> Medium = $150K - $500K __ Low &lt; $150K</td>
</tr>
<tr>
<td>11. Ease of Implementation If medium or difficult, list key implementation issues.</td>
<td>__ Easy <em>X</em> Medium ___ Difficult Issues: Determine age or Performance Standard for older devices (failure rate or maintenance calls to field).</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Grade Crossing Modernization (GCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-10</td>
</tr>
<tr>
<td>3. Title</td>
<td>Develop Lower Cost Warning Devices for HSR</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>At private crossings where train speeds or volumes will not accept manual locking gates, develop active warning devices that may include recycled active devices or components, and that may provide a simpler level of warning at the private crossing (no constant warning time). Lower cost than current systems used at public crossings.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>_ ___ Human Factors</td>
<td></td>
</tr>
<tr>
<td><em>X</em> Transit-oriented Communities</td>
<td></td>
</tr>
<tr>
<td>___ Data Requirements</td>
<td></td>
</tr>
<tr>
<td><em>X</em> High Speed Rail</td>
<td></td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Enhanced safety at private crossings that do no depend on crossing user to lock it after use, etc.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>_ ___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA through Broad Agency Agreement</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>_ ___ Easy <em>X</em> Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Property owners responsibilities (establish)</td>
</tr>
<tr>
<td></td>
<td>Maintenance responsibilities (establish)</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-11</td>
</tr>
<tr>
<td>3. Title</td>
<td>In-vehicle Warning System</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop and evaluate an in-vehicle warning system that indicates to the motorist that a train is coming. The device would use GPS to determine whether the vehicle is going to cross the grade crossing. It would also use a signal from the railroad wayside equipment which would indicate whether or not a train is approaching.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
| Please mark a mark an X next to the applicable area(s). | ___ Transit-oriented Communities  
| | ___ Data Requirements  
| | _X_ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
| | ___ Supplemental (list organization & title of current research)  
| | A number of in-vehicle warning systems have been tried |
| 7. Potential Benefit(s) of Identified Research Need Area | Collision avoidance. |
| 8. Research Need Urgency | _X_ High  
| | ___ Medium  
| | ___ Low |
| 9. Cost of Research | ___ High >$500K  
| | _X_ Medium = $150K - $500K  
| | ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Volpe, FHWA, NHTSA |
| 11. Ease of Implementation | ___ Easy  
| If medium or difficult, list key implementation issues. | ___ Medium  
| | _X_ Difficult  
| | The in-vehicle device could use existing GPS Navigation system to keep down implementation cost. Coordinate with NHTSA would be needed to implement.  
<p>| | Institutional barrier |
| 12. Other Comments | Difficult to implement – institutional barrier. Size and variability of vehicle fleet. |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Grade Crossing Modernization (GCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-12</td>
</tr>
<tr>
<td>3. Title</td>
<td>Automated Vehicle (automobile) Stopping System</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop an in-vehicle control system to stop a highway vehicle from entering the highway-rail intersection when a collision is predicted. System should have signal from wayside system (train), GPS in-vehicle that integrates with acceleration and braking of vehicle.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td>____ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>____ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em>_ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>FHWA, JPO work Stop Sign Collision Avoidance</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Positive collision avoidance</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ____ Medium ____ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> High &gt;$500K ____ Medium = $150K - $500K ____ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Volpe – auto industry - AAR</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Difficult ____ Medium ____ Easy</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-13</td>
</tr>
<tr>
<td>3. Title</td>
<td>Best Practices / Model Specifications for Ideal Crossing</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>More local governments and developers are upgrading crossings to accommodate growth and traffic. This specification would provide example of a best practice crossing installation as related to contain types of rail lines. Would place condensed recommendations of TWG 2003 Crossing document in one place. Estimating Tool</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>Please mark an X next to the applicable area(s).</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New  <em>X</em> Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>Add-on to 2002 TWG Crossing document.</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Freight and integrity rail passenger lines. Commuter rail. Other rail transit.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>__ High  <em>X</em> Medium  <em>X</em> Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K  <em>X</em> Medium = $150K - $500K  <em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>TRB / IDEA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>___ Easy  <em>X</em> Medium  <em>X</em> Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues: Determine classes/types of rail lines with stakeholders. Condemning down existing specs, w/o diluting.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Would include signal/surface and corridor (closure) best practices.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-14</td>
</tr>
<tr>
<td>3. Title</td>
<td>Surface Material Performance – Entire Crossing</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Compile performance data for crossing surfaces to established life cycles and costs of different surface types.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em> High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New  <em>X</em> Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>Some States have conducted individual research</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Better crossing surfaces can increase safety</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>TRB, FRA, NCHRP, TCRP, and FHWA.</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy  ___ Medium  ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-15</td>
</tr>
<tr>
<td>3. Title</td>
<td>Best Practices for Crossing Surfaces</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Guidelines to provide crossing surface material. Study methods used to keep grade crossings surfaces durable, maintain drainage runoff to prevent track fouling, and levels consistent to alleviate humps. Compilation of best practices compilation - document &amp; finding research – not field demo.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Allows for cost savings of crossing maintenance.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Volpe, AREMA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-16</td>
</tr>
<tr>
<td>3. Title</td>
<td>Investigate Alternative Warning Devices at Ped/Pathway Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Investigate the effectiveness of passive and active warning devices at pedestrian pathway at grade crossings.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New  ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>Multiple Agencies have compiled info but did evaluate effectiveness</td>
</tr>
<tr>
<td></td>
<td>Many States have conducted research – limited findings</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Improve warning devices for use at pathway crossings.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High  ___ Medium  ___ Low  ___</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K  ___ Medium = $150K - $500K  ___ Low &lt; $150K  ___</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>NCHRP</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>___ Easy  ___ Medium  ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Might require adoption of new warning devices in MUTCD by FHWA.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Grade Crossing Modernization (GCM)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-17</td>
</tr>
<tr>
<td>3. Title</td>
<td>Lower Cost, Lower Volume User-activated Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop low cost private crossing controlled-access equipment, such as locking gates that can not be operated in a train is an approach.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X__ Human Factors  
| | _X__ Transit-oriented Communities  
| | ___ Data Requirements  
| | _X__ High Speed Rail |
| 6. Relationship to Current Research | _X__ New  
| | ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Enhanced safety for transit systems and railroads on lines with lower train volumes, lower train speeds, or lower traffic volumes. |
| 8. Research Need Urgency | __ High  
| | _X__ Medium  
| | ___ Low |
| 9. Cost of Research | __ High >$500K  
| | ___ Medium = $150K - $500K  
| | ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA / Broad Agency Announcement |
| 11. Ease of Implementation | __ Easy  
| | _X__ Medium  
| | ___ Difficult  
| | Issues:  
| | Needs to be simple to use  
<p>| | Needs to verify that it is closed and locked. |
| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Grade Crossing Modernization (GCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>GCM-18</td>
</tr>
<tr>
<td>3. Title</td>
<td>Low Cost Pedestrian 4-Quad Gates</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Develop low-cost, four-quad gates for pedestrian crossings similar to those installed in Bregenz, Austria. The gates should reflectorized and a chain link fence should extend at least 50 feet in each direction to prevent going around the gates.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New __<em>X</em> Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>Similar system is installed.</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area.</td>
<td>Protects pedestrians</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K __<em>X</em> Medium = $150K - $500K __<em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Volpe</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>__<em>X</em> Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>A similar system was installed in Bregenz, Austria.</td>
</tr>
</tbody>
</table>
### Traffic Patterns Research Needs

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-1</td>
<td>Application of Warning Devices/Treatments at High Speed Rail Crossings</td>
</tr>
<tr>
<td>TP-2</td>
<td>Highway Traffic Signal Pre-emption at Highway-Rail Grade Crossings</td>
</tr>
<tr>
<td>TP-3</td>
<td>Effectiveness of Gates for Pedestrians</td>
</tr>
<tr>
<td>TP-4</td>
<td>Signage at Roundabouts</td>
</tr>
<tr>
<td>TP-5</td>
<td>Driver Decision Making At Complex Crossings</td>
</tr>
<tr>
<td>TP-6</td>
<td>Review and Improvement of Hazard Indices and Accident Prediction Formulae</td>
</tr>
<tr>
<td>TP-7</td>
<td>Driver Reaction to Active Advance Warning Signs and Variable Message Signs</td>
</tr>
<tr>
<td>TP-8</td>
<td>Driver Compliance with “Do Not Stop on Tracks” Sign</td>
</tr>
<tr>
<td>TP-9</td>
<td>Driver Behavior at Crossings with Mix Train Traffic</td>
</tr>
<tr>
<td>TP-10</td>
<td>Impact Of Storage Information Sign on Long-Wheel Base Vehicle Use</td>
</tr>
<tr>
<td>TP-11</td>
<td>Railroad Signals Through Roundabouts</td>
</tr>
<tr>
<td>TP-12</td>
<td>Identify Barriers to Crossing Consolidation Implementation</td>
</tr>
<tr>
<td>TP-13</td>
<td>Method for Estimating Traffic Volumes at Grade Crossings Where Counts are not Available</td>
</tr>
<tr>
<td>TP-14</td>
<td>Review of Current GIS Methods and Data for “hot spot” Analysis</td>
</tr>
<tr>
<td>TP-15</td>
<td>Investigate Safety Performance of Grade Crossings Using Microsimulation</td>
</tr>
<tr>
<td>TP-16</td>
<td>Best Methods For Linkage/Sharing of Crossing Data, Traffic Data, and Collision Data Among Stakeholders (Agencies, Industry, and Public)</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Application of Warning Devices/Treatments at High Speed Rail Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Determine adequate warning devices for High Speed Rail up to 110 MPH. Determine or evaluate whether or not existing types of warning devices are adequate for use on HSR corridors. Above 79 MPH, should different devices be required and at what speeds? Recommend treatments for pedestrian traffic at HSR crossings. Identify pathway crossing treatments for HSR crossings.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
_X_ Transit-oriented Communities  
__ Data Requirements  
_X_ High Speed Rail |
| 6. Relationship to Current Research | ___ New  _X__ Supplemental (list organization & title of current research) FRA R&D reports on the effectiveness of HSR warning devices; NCDOT, etc. |
| 7. Potential Benefit(s) of Identified Research Need Area | Standardize treatments for more effective and efficient design. Reduce likelihood of incidents at HSR crossings. |
| 8. Research Need Urgency | _X_ High  __ Medium  __ Low |
| 9. Cost of Research | _X_ High >$500K  __ Medium = $150K - $500K  __ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FHWA, AASHTO, FRA, TRB, |
| 11. Ease of Implementation | _ __ Easy  _x_ Medium  __ Difficult |
| If medium or difficult, list key implementation issues. | Issues: Broad scope of dealing with HSR between stakeholders. |
| 12. Other Comments | }
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Highway Traffic Signal Pre-emption at Highway-Rail Grade Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Assess best practices nationally to determine proper application or use of traffic signal preemption at highway-rail grade crossing. Determine proper use of advanced preemption versus simultaneous pre-emption. Review equipment (hardware and software), particularly on the traffic signal controller side, to ensure those devices can adequately perform preemption as intended. Also assess best practices of field reviewing preemption. Research accident reports to identify “hot spots” (high incident areas) and factors relevant to preemption.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em> High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Reduce incidents</td>
</tr>
<tr>
<td></td>
<td>More efficient traffic management</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High <em>X</em> Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> High &gt;$500K     ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td></td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>__ Easy ___ Medium <em>X</em> Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 3</td>
</tr>
<tr>
<td>3. Title</td>
<td>Effectiveness of Gates for Pedestrians</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Need to test the effectiveness of various gate treatments for pedestrians and passenger stations, commuter rail crossings in transit oriented development and freight rail crossings. Gather information for development of warrants.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>_<em>X</em> New</td>
</tr>
<tr>
<td></td>
<td>___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Learn effectiveness of having pedestrian treatment inside versus outside of gate mechanisms and other gate treatments at stations and transit oriented developments.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High</td>
</tr>
<tr>
<td></td>
<td>__ Medium</td>
</tr>
<tr>
<td></td>
<td>___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> High &gt;$500K</td>
</tr>
<tr>
<td></td>
<td>__ Medium = $150K - $500K</td>
</tr>
<tr>
<td></td>
<td>___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Volpe Center</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>_ Easy</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>___ Medium</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 4</td>
</tr>
<tr>
<td>3. Title</td>
<td>Signage at Roundabouts</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Evaluate alternatives for advanced warning signs within or in close proximity to roundabouts. Need to develop an advanced warning sign(s) for a crossing located within 100 feet of the yield line at a roundabout. There is currently no equivalent series of signs to the W10-2, 3, &amp; 4 for crossings in close proximity to roundabouts. A sign also needs to be developed for situations where the rail line runs directly through a roundabout. Review body of existing literature in international examples.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em> Human Factors</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em> High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>National standard signage for MUTCD.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FHWA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>x</em> Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
</tbody>
</table>
1. Research Needs Area | Traffic Patterns (TP)  
2. Research Topic Area/Number | TP - 5  
3. Title | Driver Decision Making at Complex Crossings  
4. Project Statement | Close proximity between rail/tracks and complex intersection such as roundabouts and multiple access roads near RRX. Driver must divide attention and make decision in a short period of time. Purpose: Better understanding of driver performance and information needed in order to provide means to reduce driver error. Expected outcome: Input design process and safety review and enhancements.  
5. Cross-cutting Areas | _X__ Human Factors  
                           | ___ Transit-oriented Communities  
                           | ___ Data Requirements  
                           | ___ High Speed Rail  
6. Relationship to Current Research | _X__ New ___ Supplemental (list organization & title of current research)  
7. Potential Benefit(s) of Identified Research Need Area | Reduce driver confusion and information overload.  
                                                       | Reduce driver error and improve safety and mobility.  
8. Research Need Urgency | _X_ High ___ Medium ___ Low  
9. Cost of Research | _X_ High >$500K ___ Medium = $150K - $500K ___ Low < $150K  
10. Potential Organization(s) to Conduct Research | USDOT in coordination with local DOTS (FRA)/Volpe  
11. Ease of Implementation | __ Easy _X_ Medium ___ Difficult  
                           | Issues:  
12. Other Comments | Potential to combine with grade crossing modernization and new technology opportunities.
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 6</td>
</tr>
<tr>
<td>3. Title</td>
<td>Review and Improvement of Hazard Indices and Accident Prediction Formulae</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>New methods for evaluating the system safety performance of crossings are needed. The API calculation has become less valuable as the majority of crossings with high train and traffic volumes have been signalized or grade-separated. The risk of a low-volume crossing is not fully reflected in the current evaluation standard, and the API calculation may indicate crossings for upgrade that do not warrant signalization. A standardized evaluation method should be established for multiple agency use.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td>____ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>____ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em>_ New ____ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>A holistic evaluation method will help state agencies to select crossings that most deserve improvements.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em>_ High ____ Medium ____ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em>_ High &gt;$500K ____ Medium = $150K - $500K ____ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>TRB or AASHTO</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>__ Easy <em>X</em>_ Medium ____ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues: Complexity of issue.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 7</td>
</tr>
<tr>
<td>3. Title</td>
<td>Driver Reaction to Active Advance Warning Signs and Variable Message Signs</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Signs and variable message sign. Issue: Provide advance warning and information to highway users. EX train presence and or vehicle stopped at crossings queue at crossing approach.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
_X__ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X__ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Examine feasibility and application of its technology at rail road crossings. Purpose: Provide options/alternatives to users. Provide alternative for traffic management. |
| 8. Research Need Urgency | __ High  
___ Medium  
___ Low |
| 9. Cost of Research | __ High >$500K  
___ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | |
| 11. Ease of Implementation | __ Easy  
___ Medium  
___ Difficult |
<p>| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 8</td>
</tr>
<tr>
<td>3. Title</td>
<td>Driver Compliance with “Do Not Stop on Tracks” Sign</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Compare current “Do Not Stop on Tracks” sign with Canadian sign and active “Do Not Stop on Tracks” sign. Purpose: Effectiveness of each sign Evaluation with focus group Field evaluation</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>□ X__ Human Factors □ ___ Transit-oriented Communities □ ___ Data Requirements □ ___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>□ X__ New □ ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Determine better alternative Review and if required revise warrants</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>□ High □ X__ Medium □ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>□ High &gt;$500K □ X__ Medium = $150K - $500K □ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Volpe</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>□ X__ Easy □ ___ Medium □ ___ Difficult Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
</tbody>
</table>
1. Research Needs Area | Traffic Patterns (TP)
2. Research Topic Area/Number | TP - 9
3. Title | Driver Behavior at Crossings with Mix Train Traffic
4. Project Statement | Need to understand driver behavior at crossings used by freight and passenger trains with variable speed. Purpose: To evaluate driver behavior at crossings with trains of different speeds. Drivers will have higher compliance at crossings with only high speed trains.

5. Cross-cutting Areas
Please mark a mark an X next to the applicable area(s).

|   | __x_ Human Factors |
|   | __x_ Transit-oriented Communities |
|   | ___ Data Requirements |
|   | _x__ High Speed Rail |

6. Relationship to Current Research | _x__ New ___ Supplemental (list organization & title of current research)

7. Potential Benefit(s) of Identified Research Need Area

8. Research Need Urgency | _x_ High ___ Medium ___ Low

9. Cost of Research | _x_ High >$500K ___ Medium = $150K - $500K ___ Low < $150K

10. Potential Organization(s) to Conduct Research | Volpe, TTI

11. Ease of Implementation
If medium or difficult, list key implementation issues.

|   | __ Easy _x_ Medium ___ Difficult |

| Issues: |

12. Other Comments
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 10</td>
</tr>
<tr>
<td>3. Title</td>
<td>Impact Of Storage Information Sign on Long-Wheel Base Vehicle Use</td>
</tr>
</tbody>
</table>
| 4. Project Statement | New signs have recently been implemented at warning highway users of restricted storage space between tracks and nearby intersection.  
  - Before and after survey of drive behavior  
  - Inventory of alternate signs across world  
  - Evaluation of signs |
| 5. Cross-cutting Areas |  
  _X__ Human Factors  
  ___ Transit-oriented Communities  
  ___ Data Requirements  
  _X__ High Speed Rail |
| 6. Relationship to Current Research |  
  _X__ New  
  ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area |  
  • Effectiveness of signs  
  • Possible improvement  
  • Possible alternative warning systems. |
| 8. Research Need Urgency |  
  ___ High  
  _X_ Medium  
  ___ Low |
| 9. Cost of Research |  
  ___ High >$500K  
  _X_ Medium = $150K - $500K  
  ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Volpe |
| 11. Ease of Implementation  
  If medium or difficult, list key implementation issues. |  
  _X_ Easy  
  ___ Medium  
  ___ Difficult  
  Issues: |
<p>| 12. Other Comments |  |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 11</td>
</tr>
<tr>
<td>3. Title</td>
<td>Railroad Signals Through Roundabouts</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Determine types of active warning devices to be used when a rail line runs through a roundabout. Need to determine location of devices with respect to roundabout approaches and the circular roadway and how they are to operate. Review body of existing literature in international examples.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _x_ Human Factors  
_x_ Transit-oriented Communities  
_x_ Data Requirements  
___ High Speed Rail |
<p>| Please mark a mark an X next to the applicable area(s). |
| 6. Relationship to Current Research | <em>x</em> New  ___ Supplemental (list organization &amp; title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Standardized warning devices used in roundabouts. Improve traffic management. Standardize user interaction with trains in roundabouts. |
| 8. Research Need Urgency | <em>x</em> High  ___ Medium  ___ Low |
| 9. Cost of Research | <em>x</em> High &gt;$500K  ___ Medium = $150K - $500K  ___ Low &lt; $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA, ASSHTO, TRB |
| 11. Ease of Implementation | <em>x</em> Easy  ___ Medium  ___ Difficult |
| If medium or difficult, list key implementation issues. |
| 12. Other Comments |  |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 12</td>
</tr>
<tr>
<td>3. Title</td>
<td>Identify barriers to crossing consolidation implementation</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>FRA has performed research &amp; developed guidance for consolidation (including grade separation &amp; closure) of railroad crossings. The goal of this project is to determine what the challenges are to implementing this guidance and to provide a path forward for implementing them.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors</td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td>Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>Data Requirements</td>
</tr>
<tr>
<td></td>
<td>High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New</td>
</tr>
<tr>
<td></td>
<td>X_ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>The project should smooth and speed up the decision-making process for crossing consolidation. Benefits should be short-term and will generally be for state agencies.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td><em>X</em> Low</td>
<td></td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>High &gt;$500K</td>
</tr>
<tr>
<td></td>
<td>Medium = $150K - $500K</td>
</tr>
<tr>
<td><em>X</em> Low &lt; $150K</td>
<td></td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, FHWA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td><em>X</em> Medium</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 13</td>
</tr>
<tr>
<td>3. Title</td>
<td>Method for estimating traffic volumes at grade crossings where counts are not available</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>State agencies use accident prediction formulae that rely on traffic volume values in order to prioritize crossing improvements. Traffic volume data at crossings is routinely unavailable or out-of-date. In the absence of current traffic counts, a method will be developed to estimate traffic volumes based on other criteria, such as nearby traffic volumes, roadway characteristics, and impacts of a nearby crossing, etc.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | ____ Human Factors  
____ Transit-oriented Communities  
**X** Data Requirements  
____ High Speed Rail |
| 6. Relationship to Current Research | **X** New  
____ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Standardized methods for estimating traffic volumes at railroad crossings should improve the quality of the prioritization process. State agencies would benefit. |
| 8. Research Need Urgency | **High**  
**X** Medium  
____ Low |
| 9. Cost of Research | **High >$500K**  
**X** Medium = $150K - $500K  
____ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Consultant or academia |
| 11. Ease of Implementation | **Easy**  
**X** Medium  
____ Difficult |
| **Issues:**  
Complexity of the problem; methodological issue probably involved. |
<p>| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Traffic Patterns (TP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP – 14</td>
</tr>
<tr>
<td>3. Title</td>
<td>Review of current GIS Methods and data for “hot spot” analysis</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Review and describe the use of GIS technology in identifying safety “hot spots” in the rail mode.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors</td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td>Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>Data Requirements</td>
</tr>
<tr>
<td></td>
<td>High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New</td>
</tr>
<tr>
<td></td>
<td>Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>State-of-the-art methods will be made available for use by various agencies to remedy safety problems. Benefits will be long-term.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>High &gt;$500K</td>
</tr>
<tr>
<td></td>
<td>Medium = $150K - $500K</td>
</tr>
<tr>
<td></td>
<td>Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>Easy</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Traffic Patterns (TP)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>TP - 15</td>
</tr>
<tr>
<td>3. Title</td>
<td>Investigate safety performance of grade crossings using microsimulation</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>The industry currently uses statistical methods to evaluate safety performance of grade crossings. The potential use of microsimulation for safety evaluation should be investigated. This method would allow consideration of various scenarios, such as traffic flow response to shared corridor rail operations (for example).</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas Please mark a mark an X next to the applicable area(s). | _X__ Human Factors  
_ _ Transit-oriented Communities  
_X__ Data Requirements  
_X__ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Microsimulation is a cost-effective method for stakeholders to evaluate the impact of environments and users on grade crossing safety performance and operation. |
| 8. Research Need Urgency | _X_ High  ___ Medium  ___ Low |
| 9. Cost of Research | _X_ High >$500K  ___ Medium = $150K - $500K  ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | TRB, AASHTO, and academia |
| 11. Ease of Implementation If medium or difficult, list key implementation issues. | _X_ Difficult  
Issues: Development of new microsimulation methods, including calibration and validation, would require significant effort and real-world data. |
| 12. Other Comments |  |

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1. Research Needs Area | Traffic Patterns (TP)  
2. Research Topic Area/Number | TP - 16  
3. Title | Best methods for linkage/sharing of crossing data, traffic data, and collision data among stakeholders (agencies, industry, and public)  
4. Project Statement | Data involving railroad crossings currently resides in numerous disconnected databases, within a variety of agencies and companies. Data completeness is an issue for most databases, and depends on the data owner. Improved methods and tools for sharing data among stakeholders should be investigated and piloted.  
5. Cross-cutting Areas  
| Please mark a mark an X next to the applicable area(s) |  
| ___ | Human Factors  
| ___ | Transit-oriented Communities  
| **X** | Data Requirements  
| ___ | High Speed Rail  
6. Relationship to Current Research | **X** New ___ Supplemental (list organization & title of current research)  
7. Potential Benefit(s) of Identified Research Need Area | Availability of current, accurate, and complete data supports good decisions for any stakeholder considering options for safety improvements, consolidations, or traffic separation. Benefits will be long-term.  
8. Research Need Urgency | **X** High ___ Medium ___ Low  
9. Cost of Research | **X** High >$500K ___ Medium = $150K - $500K ___ Low < $150K  
10. Potential Organization(s) to Conduct Research | FRA  
11. Ease of Implementation  
| If medium or difficult, list key implementation issues. | **X** Difficult  
Issues: Sharing data among disparate organizations is a difficult proposition that includes institutional and technical challenges.  
12. Other Comments |
## New Technology Opportunities Research Needs

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTO-1</td>
<td>Alternative Sensors and Warning Systems for Vital Applications</td>
</tr>
<tr>
<td>NTO-2</td>
<td>Pedestrian, Non-Motorized and Limited Mobility Treatments</td>
</tr>
<tr>
<td>NTO-3</td>
<td>On-Track Vehicle Detection</td>
</tr>
<tr>
<td>NTO-4</td>
<td>Effectiveness of LED Enhanced Grade Crossing Traffic Signs</td>
</tr>
<tr>
<td>NTO-5</td>
<td>Minimum Traffic Control Devices for High-speed Train (HST, formerly known as HSR)</td>
</tr>
<tr>
<td></td>
<td>Highway-Rail Grade Crossings (HRCG)</td>
</tr>
<tr>
<td>NTO-6</td>
<td>Enhanced Commercial Systems to Improve HRGC Safety</td>
</tr>
<tr>
<td>NTO-7</td>
<td>Signals Near Grade Crossings</td>
</tr>
<tr>
<td>NTO-8</td>
<td>Lower Cost Active and Passive Warning Systems</td>
</tr>
<tr>
<td>NTO-9</td>
<td>Use of Wayside Horns at HRGC on HST lines</td>
</tr>
<tr>
<td>NTO-10</td>
<td>Remote Health Monitoring and Regulatory Relief</td>
</tr>
<tr>
<td>NTO-11</td>
<td>Grade Crossing Safety Effectiveness Evaluation</td>
</tr>
<tr>
<td>NTO-12</td>
<td>Use of PTC in HRGC Applications</td>
</tr>
<tr>
<td>NTO-13</td>
<td>Use of Supplemental Surveillance at HRGC on HST lines</td>
</tr>
<tr>
<td>NTO-14</td>
<td>Evaluate alternative power options for remote sensing</td>
</tr>
<tr>
<td>NTO-15</td>
<td>Standard Traffic Signals at Highway-Rail Grade Crossings</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>New Technology Opportunities (NTO)</td>
</tr>
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<td>-----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Alternative Sensors and Warning Systems for Vital Applications</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Perform an evaluation to determine what sensors will be reliable, maintainable and cost-effective.  
• Perform an evaluation on the communication system  
• Warning system display will require human factors study. |
| 5. Cross-cutting Areas | _X_ Human Factors  
____ Transit-oriented Communities  
_X_ Data Requirements  
____ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Improve safety and security |
| 8. Research Need Urgency | _X_ High  
____ Medium  
____ Low |
| 9. Cost of Research | __ High >$500K  
_X_ Medium = $150K - $500K  
__ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
_X_ Difficult |
<p>| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
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<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Pedestrian, Non-Motorized and Limited Mobility Treatments</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Identify and evaluate the effectiveness of new and existing technology on active and passive warnings (in conjunction with barriers and channelization, including 2nd train and variable speed approaches) on the basis of:
  - Human detection/recognition and compliance
  - Cost to install and maintain
  - Energy efficiency
  - Reliability
• Develop guidance for the design of:
  - Sidewalk, pathways and station approaches
  - Line of route approaches
  - Quiet Zones |
| 5. Cross-cutting Areas | _X_ Human Factors
_X_ Transit-oriented Communities
___ Data Requirements
___ High Speed Rail |
<p>| 6. Relationship to Current Research | <em>X</em> New ___ Supplemental (list organization &amp; title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Improve Safety |
| 8. Research Need Urgency | <em>X</em> High ___ Medium ___ Low |
| 9. Cost of Research | ___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K |
| 10. Potential Organization(s) to Conduct Research | Volpe, Contractor, States |
| 11. Ease of Implementation | ___ Easy <em>X</em> Medium ___ Difficult |
| If medium or difficult, list key implementation issues. | Issues |
| 12. Other Comments | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1. Research Needs Area</td>
<td>New Technology Opportunities (NTO)</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-3</td>
</tr>
<tr>
<td>3. Title</td>
<td>On-Track Vehicle Detection</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Identify and research detection alternatives for on-track vehicles that transverse highway-rail grade crossings.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td>X Human Factors</td>
</tr>
<tr>
<td>___ Transit-oriented Communities</td>
<td></td>
</tr>
<tr>
<td>___ Data Requirements</td>
<td></td>
</tr>
<tr>
<td>___ High Speed Rail</td>
<td></td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>X New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Safety</td>
</tr>
<tr>
<td>Crossing integrity</td>
<td></td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>X High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td></td>
</tr>
<tr>
<td>__ High &gt;$500K</td>
<td>X Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, FHWA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td></td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>X Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>New Technology Opportunities (NTO)</td>
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<tr>
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<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-4</td>
</tr>
<tr>
<td>3. Title</td>
<td>Effectiveness of LED Enhanced Grade Crossing Traffic Signs</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Current retroreflective traffic control signs at grade crossings need to be more conspicuous to compete with driver inattention and distractions from ambient lighting and signage. Evaluation of the effectiveness of LED enhanced signs is needed. This includes STOP, YIELD, Crossbuck and DO NOT STOP ON TRACK signs. Evaluation to include conspicuity, 24/7 operation vs. train or vehicle activation, 24/7 vs. nighttime only, driver behavior and compliance.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
___ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Reduction of violations and crashes |
| 8. Research Need Urgency | ____ High  
_X_ Medium  
___ Low |
| 9. Cost of Research | ___ High >$500K  
___ Medium = $150K - $500K  
_X_ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA, University, Contractor, and Volpe |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
___ Difficult |
<p>| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
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</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-5</td>
</tr>
<tr>
<td>3. Title</td>
<td>Minimum Traffic Control Devices for High-Speed Train (HST, formerly known as HSR) HRGC</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Research is intended to develop the risk management model to evaluate the effectiveness of 4QG vs. physical barrier gates on HST corridors. The model should include train speed, type of rail equipment, AADT (vol. per lane), and roadway speed at a minimum.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Please mark an X next to the applicable area(s).</td>
</tr>
<tr>
<td></td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em> High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current</td>
<td><em>X</em> New  ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>7. Potential Benefit(s) of</td>
<td>Essential piece of information for traffic control policy decisions.</td>
</tr>
<tr>
<td>Identified Research Need Area</td>
<td></td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High  ___ Medium  ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K  <em>X</em> Medium = $150K - $500K  ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to</td>
<td>FRA, Volpe, University</td>
</tr>
<tr>
<td>Conduct Research</td>
<td></td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy  ___ Medium  ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key</td>
<td></td>
</tr>
<tr>
<td>implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td><strong>1. Research Needs Area</strong></td>
<td>New Technology Opportunities (NTO)</td>
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<tr>
<td>----------------------------</td>
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</tr>
<tr>
<td><strong>2. Research Topic Area/Number</strong></td>
<td>NTO-6</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Enhanced Commercial Systems to Improve HRGC Safety</td>
</tr>
</tbody>
</table>
| **4. Project Statement** | • Integrate HRGC inventory into GPS maps  
  o Identify at-grade vs. grade separated HRGC  
  o Identify humped crossings (comm. vehicles)  
  • How do we implement with GPS unit mfgs?  
  • Require this information in buses, comm. vehicles and hazmat (vehicles requiring a CDL license) |
| **5. Cross-cutting Areas** | _X_ Human Factors  
 _X_ Transit-oriented Communities  
 _X_ Data Requirements  
 ___ High Speed Rail |
| Please mark a mark an X next to the applicable area(s). |
| **6. Relationship to Current Research** | _X_ New  
 ___ Supplemental (list organization & title of current research) |
| **7. Potential Benefit(s) of Identified Research Need Area** | Improved road user behavior at HRGC |
| **8. Research Need Urgency** | _X_ High (very valuable)  
 ___ Medium  
 ___ Low |
| **9. Cost of Research** | ___ High >$500K  
 _X_ Medium = $150K - $500K  
 ___ Low < $150K |
| **10. Potential Organization(s) to Conduct Research** | FMCSA; Contractor |
| **11. Ease of Implementation** | __ Easy  
 __ Medium  
 _X_ Difficult  
 Issues: |
<p>| If medium or difficult, list key implementation issues. |
| <strong>12. Other Comments</strong> | Provide in 2010 once the inventory is updated |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-7</td>
</tr>
<tr>
<td>3. Title</td>
<td>Signals Near Grade Crossings</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Analyze crash data to determine impact of signalized intersection proximity on crash rates  
• Identify effectiveness of and warrants for use of  
  o Preemption (alone)  
  o Preemption with active DO NOT STOP ON TRACKS sign  
  o Preemption with pre-signal  
  o Queue cutter or active DO NOT STOP ON TRACKS sign  
• Identify recommended practice addressing:  
  o Min-max clear storage distance for pre-signals and queue cutters  
  o Identify known problems with each device potentially limiting effectiveness of treatments and countermeasures  
  o Identify key design features such as timing plans and signal indications |
| 5. Cross-cutting Areas | _X_ Human Factors  
___ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | ___ New  _X_ Supplemental (list organization & title of current research) – TCRP Report 69 |
| 7. Potential Benefit(s) of Identified Research Need Area | Addresses the most critical factors causing collisions – recurrent queues across tracks |
| 8. Research Need Urgency | _X_ High (very valuable)  
___ Medium  
___ Low |
| 9. Cost of Research | __ High >$500K  _X_ Medium = $150K - $500K  __ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
___ Difficult  
Issues: Deals with application of readily available existing technology |
<p>| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
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<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-8</td>
</tr>
<tr>
<td>3. Title</td>
<td>Lower Cost Active and Passive Warning Systems</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Develop technologies that are adaptable  
• Communication systems that are easily deployable and fail safe  
• Detect train and convey to road user  
• Define life-cycle cost elements |
| 5. Cross-cutting Areas | _X_ Human Factors  
___ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | ___ New  
_X Supplemental (list organization & title of current research) Canada, UK, other countries |
| 7. Potential Benefit(s) of Identified Research Need Area | Safety  
Benefactors - Highway agencies, communities |
| 8. Research Need Urgency | _X_ High (very valuable)  
___ Medium  
___ Low |
| 9. Cost of Research | _X_ High >$500K  
___ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Volpe, FRA, contractors |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
___ Difficult |
<p>| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments | Would improved technologies help since the last time this was researched? |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-9</td>
</tr>
<tr>
<td>3. Title</td>
<td>Use of Wayside Horns at HRGC on HST lines</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Does the speed of the train above 80 mph mandate the use of wayside horns?  
• Is the locomotive horn an effective warning device at speeds greater than 80 mph? |
| 5. Cross-cutting Areas |  
| Please mark a mark an X next to the applicable area(s). |  
| _X_ Human Factors |  
| ___ Transit-oriented Communities |  
| ___ Data Requirements |  
| _X_ High Speed Rail |  
| 6. Relationship to Current Research | X New ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Increased safety at HRGC on HST lines |
| 8. Research Need Urgency | _X_ High (very valuable) ___ Medium ___ Low |
| 9. Cost of Research | __ High >$500K ___ Medium = $150K - $500K _X_ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, Volpe, University |
| 11. Ease of Implementation  
If medium or difficult, list key implementation issues. | _X_ Easy ___ Medium ___ Difficult |
<p>| Issues: |  |
| 12. Other Comments | Look at TC research |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-10</td>
</tr>
<tr>
<td>3. Title</td>
<td>Remote Health Monitoring and Regulatory Relief</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Identify reliability requirements for data elements that can be monitored and have the potential to be used for regulatory relief  
• Help build case for regulatory relief from manual periodic inspections for those elements  
• Research and gather experimental/historical data to determine and justify proper level on regulatory relief from 30-day inspections at sites equipped with 7/24 monitoring. Use a few different sites on monitoring options or assessments |
| 5. Cross-cutting Areas | ___ Human Factors  
___ Transit-oriented Communities  
_X_ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | X New ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Improved safety  
Reduced inspection manual inspection costs |
| 8. Research Need Urgency | _X_ High (very valuable) ___ Medium ___ Low |
| 9. Cost of Research | ___ High >$500K  
_X_ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA |
| 11. Ease of Implementation | ___ Easy  
_X_ Medium  
___ Difficult |
| If medium or difficult, list key implementation issues. | Regulatory and industry acceptance |
| 12. Other Comments | }
<table>
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<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
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<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-11</td>
</tr>
<tr>
<td>3. Title</td>
<td>Grade Crossing Safety Effectiveness Evaluation</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Evaluate the generic data element needs to determine the effectiveness and compliance of new grade crossing treatments and warning devices. Identify what are most valuable to collect to understand grade crossing safety.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>- X_ Human Factors</td>
<td></td>
</tr>
<tr>
<td>- ___ Transit-oriented Communities</td>
<td></td>
</tr>
<tr>
<td>- X_ Data Requirements</td>
<td></td>
</tr>
<tr>
<td>- ___ High Speed Rail</td>
<td></td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>X New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
</tbody>
</table>
| 7. Potential Benefit(s) of Identified Research Need Area | Consistency of data reporting  
|                                 | Increased safety  
|                                 | Reduced costs  |
| 8. Research Need Urgency        | ___ High (very valuable) _X_ Medium ___ Low  |
| 9. Cost of Research             | ___ High >$500K _X_ Medium = $150K - $500K ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA |
| 11. Ease of Implementation      | ___ Easy _X_ Medium ___ Difficult  
<p>| If medium or difficult, list key implementation issues. | Industry and government coordination.  |
| 12. Other Comments              |  |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-12</td>
</tr>
<tr>
<td>3. Title</td>
<td>Use of PTC in HRGC Applications</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Integrate PTC into IEEE 1570 for traffic signal preemption, blocked crossing, alternate route messaging</td>
</tr>
</tbody>
</table>
| 5. Cross-Cutting Areas | Human Factors
Transit-oriented Communities
Data Requirements
High Speed Rail |
| 6. Relationship to Current Research | X New ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Improved safety, preemption
Operation and mobility |
| 8. Research Need Urgency | X High (very valuable) ___ Medium ___ Low |
| 9. Cost of Research | ___ High >$500K X Medium = $150K - $500K ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Joint AREMA Committees 36 and 39 |
| 11. Ease of Implementation | Easy ___ Medium ___ Difficult |
| If medium or difficult, list key implementation issues. | Integrates ITS required protocol/interface into PTC system. |
| 12. Other Comments | |

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-13</td>
</tr>
<tr>
<td>3. Title</td>
<td>Use of Supplemental Surveillance at HRGC on HST lines</td>
</tr>
</tbody>
</table>
| 4. Project Statement | • Should supplemental surveillance at HRGC be required where train speeds are 80 mph or greater? How should the information be used;  
○ tied into PTC and cab display for speed reduction or train stop  
○ securing the crossing for the duration of the approach  
○ reducing the collision risk/severity  
• Identify surveillance technologies and trade-offs  
○ Video  
○ Loops  
○ Radar  
○ IR  
○ Other? |
| 5. Cross-Cutting Areas | ___ Human Factors  
___ Transit-Oriented Communities  
___ Data Requirements  
_ X_ High Speed Rail |
| 6. Relationship to Current Research | _ X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Increased safety at HRGC on HST corridors |
| 8. Research Need Urgency | ___ High (very valuable)  
_ X_ Medium  
___ Low |
| 9. Cost of Research | ___ High >$500K  
_ X_ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, Volpe |
| 11. Ease of Implementation | ___ Easy  
___ Medium  
_ X_ Difficult |
<p>| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments | |</p>
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<tr>
<th>1. Research Needs Area</th>
<th>New Technology Opportunities (NTO)</th>
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</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-14</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluate alternative power options for remote sensing</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Research is needed to identify and evaluate alternatives to commercial electrical power for remote sensing locations.</td>
</tr>
<tr>
<td>5. Cross-Cutting Areas</td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Enables use of remote sensing in areas where remote sensing would not otherwise be possible</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High (very valuable) ___ Medium <em>X</em> Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K ___ Medium = $150K - $500K <em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA/FHWA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>New Technology Opportunities (NTO)</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>NTO-15</td>
</tr>
<tr>
<td>3. Title</td>
<td>Standard Traffic Signals at Highway-Rail Grade Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Perform human factors study to determine the effectiveness of standard traffic control signals versus current active flashers and effect on driver behavior/compliance</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
___ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Better driver compliance with signals  
Lower installation cost  
Lower maintenance cost/transfer to city traffic engineers |
| 8. Research Need Urgency | __ High (very valuable)  
___ Medium  
_X_ Low |
| 9. Cost of Research | __ High >$500K  
___ Medium = $150K - $500K  
_X_ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FHWA, University |
| 11. Ease of Implementation | __ Easy  
___ Medium  
_X_ Difficult  
Issues: |
| 12. Other Comments | New low energy LEDs allow for less power consumption on batteries and better reliability not previously attainable. |
## Regulation and Enforcement Research Needs

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE-1</td>
<td>Data Needs for Proactive Enforcement</td>
</tr>
<tr>
<td>RE-2</td>
<td>Collecting and Analyzing Trespassing Data</td>
</tr>
<tr>
<td>RE-3</td>
<td>Evaluation of Photo Enforcement at railroad grade crossings</td>
</tr>
<tr>
<td>RE-4</td>
<td>No Train Horn Crossings</td>
</tr>
<tr>
<td>RE-5</td>
<td>National Campaign for Targeted Seasonal Enforcement Programs</td>
</tr>
<tr>
<td>RE-6</td>
<td>Grade crossing crash data analysis</td>
</tr>
<tr>
<td>RE-7</td>
<td>Effectiveness of Various Types of Civil Penalties: HRGX Violations</td>
</tr>
<tr>
<td>RE-8</td>
<td>Judicial Education</td>
</tr>
<tr>
<td>RE-9</td>
<td>Motorist Expectations: Train and Crossing Operations</td>
</tr>
<tr>
<td>RE-10</td>
<td>Impact of Locomotive Horn Rule Implementation</td>
</tr>
<tr>
<td>RE-11</td>
<td>Quiet Zone Regulations and Signage</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>RE-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Data Needs for Proactive Enforcement</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>There is a need to work with a cross-section of stakeholders (including HRGX researchers, local law field-enforcement and administrative officers) to determine the data elements needed to enable proactive enforcement efforts. There is a particular need to inform the upcoming Grade Crossing Inventory Update. There is also a need to automate many of the data searches and sorts from FRA, railroad, and highway databases to lessen the burden on law enforcement and other safety practitioners to pinpoint hotspots and target enforcement opportunities. The data would be used to determine the opportunities for more-targeted enforcement and to assess the quantitative effectiveness of actions implemented.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | ___ Human Factors
___ Transit-oriented Communities
_X__ Data Requirements
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Short term benefits in reduction of violations, crashes. |
| 8. Research Need Urgency | _X_ High ___ Medium ___ Low |
| 9. Cost of Research | _High >$500K _X_ Medium = $150K - $500K ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA/Volpe, International Assn. of Chiefs of Police |
| 11. Ease of Implementation | ___ Easy _X_ Medium ___ Difficult
Issues: Partly contingent on Inventory update; gathering information is relatively straightforward; more challenging to get information from railroad; potentially more challenging to get disparate databases coordinated (GX 32 and other datums). |
| 12. Other Comments | |

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Regulations and Enforcement (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>RE-2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Collecting and Analyzing Trespassing Data</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Upgrade existing trespasser data collection to include sufficient definitions of the term “trespassed.” Provide effective guidelines for mode laws for consistent nationwide application.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em>_ New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Provide useful and sufficient data to develop and identify trespasser problems/issues that will further provide development of model law for local and state adoption.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>RITA/Volpe</td>
</tr>
<tr>
<td>11. Ease of Implementation If medium or difficult, list key implementation issues.</td>
<td>___ Easy <em>X</em> Medium ___ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>RE-3</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluation of Photo Enforcement at railroad grade crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Study the benefits of traffic safety and evaluate the effectiveness of photo enforcement in reducing crossing violations by motorists. Also develop model laws, guidelines, and procedures to provide standardized applications nationwide.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em>_ New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Actual data to verify that sustained, increased enforcement does in fact chance motorist behavior and develop public acceptance and buy-in for photo enforcement.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em>_ High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K <em>X</em>_ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, FHWA, NHTSA, IACP, NCHRP, TRB</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td></td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td><em>X</em>_ Medium ___ Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Could be combined with other model law guideline research.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>RE-4</td>
</tr>
<tr>
<td>3. Title</td>
<td>No Train Horn Crossings</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Each highway approach to every public and private highway-rail grade crossing within a quiet zone is required to have a no train horn advance warning sign. Although each sign is required to conform to the standards in the MUTCD, increased signage may be required to adequately warn certain drivers. Can increased signage counter balance the lack of a train horn? Should there be regulatory guidance necessary?</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X__ Human Factors  
_X__ Transit-oriented Communities  
_X__ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Enhanced motorist awareness of no-train-horn crossing – an “expected” audible warning may not be available. |
| 8. Research Need Urgency | _X_ High  
___ Medium  
___ Low |
| 9. Cost of Research | _X_ High >$500K  
___ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
___ Difficult |
| If medium or difficult, list key implementation issues. | Issues: Development of sign, review by NUTCD, rulemaking by FHWA to modify W10-1, posting of new sign. |
| 12. Other Comments | |

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Regulations and Enforcement (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE-5</td>
</tr>
<tr>
<td>3. Title</td>
<td>National Campaign for Targeted Seasonal Enforcement Programs</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Issues/challenges: Many highway safety concerns (seat belts, drunk driving, child safety seats) have seasonal targeted outreach and enforcement programs. There is no analogous program for HRGX safety and trespass prevention activities. Purpose: Raise awareness of HRGX and trespass prevention, Outcome: increase officer awareness and precision of enforcement practices.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | **__X_** Human Factors  
**___** Transit-oriented Communities  
**__X_** Data Requirements  
**___** High Speed Rail |
| 6. Relationship to Current Research | **__X_** New  
**___** Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | See above. |
| 8. Research Need Urgency | **__High**  
**__X_** Medium  
**___** Low |
| 9. Cost of Research | **__High >$500K**  
**__Medium = $150K - $500K**  
**__X_** Low < $150K |
| 10. Potential Organization(s) to Conduct Research | NHTSA, OLI, IACP, AAMVA, AAA, other organizations with successful public awareness campaigns. |
| 11. Ease of Implementation If medium or difficult, list key implementation issues. | **__Easy**  
**__Medium**  
**__X_** Difficult  
Issues: Funding will be a challenge in time of limited resources. |
<p>| 12. Other Comments |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Regulations and Enforcement (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE-6</td>
</tr>
<tr>
<td>3. Title</td>
<td>Grade crossing crash data analysis</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>The purpose of the research is to collect and study/analyze national crossing crash data to identify major causes of HRGX crashes (gate violations, deficient controls, geometric conditions, etc.). The result of the study would allow policy to focus on most effective enforcement management practices which would lead to most effective results. This would also help state/local agencies to identify safety improvement countermeasures and to identify any needed enhancement of current laws and regulations.</td>
</tr>
<tr>
<td>5. Cross-Cutting Areas Please mark a mark an X next to the applicable area(s)</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-Oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em>_ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em>_ New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Improve HRGX data collection for USDOT crossing databases, as well as analysis and practices. Improve HRGX safety countermeasures (traffic control, geometric improvements, policy enforcement, practice and results, education, and strategy.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em>_ High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, FHWA, NCHRP, TRB, NHTSA</td>
</tr>
<tr>
<td>11. Ease of Implementation If medium or difficult, list key implementation issues</td>
<td><em>X</em> Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues: Data collection, if current database provides insufficient data for the study.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Regulations and Enforcement (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE-7</td>
</tr>
<tr>
<td>3. Title</td>
<td>Effectiveness of Various Types of Civil Penalties: HRGX Violations</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Challenge: Are monetary penalties the only possible method? What about non-monetary penalties (license suspension, public service, etc.)? What are the relative effectiveness levels? Purpose: To determine enforcement methods that are more cost-effective in terms of time and money; also to determine potential deterrence effects. Expected outcome To reduce HRGX violations</td>
</tr>
<tr>
<td>5. Cross-Cutting Areas</td>
<td>Human Factors, Transit-Oriented Communities, Data Requirements, High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Measurable changes in #s of collisions, measurable and non-measurable changes in numbers of close calls; short-term.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>High</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>Medium = $150K - $500K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, Volpe, American Assn. of Motor Vehicle Administrators, AAA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>Difficult</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Issues: Depends upon whether it is federally-mandated or voluntary; State compliance may vary.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>-----------------------</td>
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</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>RE-8</td>
</tr>
<tr>
<td>3. Title</td>
<td>Judicial Education</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>How do the citations issued in the field translate into convictions? What types of actions do the courts take? How do prosecutors’ recommendations and judges’ understanding of the safety consequences influence judicial decisions. Purpose: To provide information that informs judges, to give them a clearer understanding of the highway-safety consequences of their decisions and their impact on state and national HRGX and trespass-prevention safety programs.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>___ Human Factors ___ Transit-oriented Communities ___ Data Requirements ___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Clearer, more consistent, more uniform judicial decisions; more uniform treatment of violation of national-level safety concerns.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>___ High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FMCSA, National Judicial College; National Association of Prosecuting Attorneys; OLI;</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>___ Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues: Would expand upon FMCSA’s efforts, just add more subject area; consider looking at other agencies’ best practices.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE-9</td>
</tr>
<tr>
<td>3. Title</td>
<td>Motorist Expectations: Train and Crossing Operations</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Motorist expectations and operational conditions affect motorist behaviors at HRGX. Basically, why do people try to beat the train? What are motorist expectations and their resulting behaviors that lead to appropriate (and inappropriate) actions at HRGX? And, is there a difference between commercial and non-commercial drivers? Address such issues as train speed; roughness of crossing; type and complexity of gates, lamps, and other traffic control devices; reliability of TCDs; train length, blocked crossings.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas          |  _X_ Human Factors  
  _X_ Transit-oriented Communities  
  ____ Data Requirements  
  _X_ High Speed Rail |
<p>| 6. Relationship to Current Research | ____ New  <em>X</em> Supplemental (list organization &amp; title of current research) Ongoing work on warning signal reliability. |
| 7. Potential Benefit(s) of Identified Research Need Area | Systematic assessment of crash causation and more effective prevention strategies (HRGX safety equivalent to the FMCSA/NHTSA Large Truck Crash Causation Study??); get railroads more involved in effective maintenance of crossing systems; assist law enforcement in writing citations based on quality information. |
| 8. Research Need Urgency        |  <em>X</em> High  ____ Medium  ____ Low |
| 9. Cost of Research             |  <em>X</em> High &gt;$500K  ____ Medium = $150K - $500K  ____ Low &lt; $150K |
| 10. Potential Organization(s) to Conduct Research | FRA/FHWA/FMCSA/NHTSA/Volpe |
| 11. Ease of Implementation If medium or difficult, list key implementation issues. | ____ Easy  ____ Medium  ____ Difficult |
| Issues: The challenge of implementation may be closely tied to the availability of funds to support specific programs. |
| 12. Other Comments              | Any new regulations would probably fall within FRA’s area of responsibility. |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Regulations and Enforcement (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE–10</td>
</tr>
<tr>
<td>3. Title</td>
<td>Impact of Locomotive Horn Rule Implementation</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Review effectiveness of locomotive horn rule in terms of implementation ease for communities and FRA. What are the community impacts and challenges? Does the rule need to be changed? Why is the implementation limited?</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors</td>
</tr>
<tr>
<td></td>
<td>Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>Data Requirements</td>
</tr>
<tr>
<td></td>
<td>High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New</td>
</tr>
<tr>
<td></td>
<td>Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Potential to streamline and standardize quiet zone process.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>Medium</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>Medium = $150K - $500K</td>
</tr>
<tr>
<td></td>
<td>High &gt;$500K</td>
</tr>
<tr>
<td></td>
<td>Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FRA, FHWA</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Difficult</td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Regulations and Enforcement (RE)</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>RE–11</td>
</tr>
<tr>
<td>3. Title</td>
<td>Quiet Zone Regulations and Signage</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Review effectiveness of grade crossing advance warning sign (W10-1). Determine if placement and message should be modified for quiet zone implementation.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas Please mark a mark an X next to the applicable area(s). | _X___ Human Factors  
_X___ Transit-oriented Communities  
_X___ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X___ New  ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Enhanced motorist awareness of no-train-horn crossing – an “expected” audible warning may not be available |
| 8. Research Need Urgency | _X___ High  ___ Medium  ___ Low |
| 9. Cost of Research | ___ High >$500K  
_X___ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, FHWA |
| 11. Ease of Implementation If medium or difficult, list key implementation issues | _X___ Easy  ___ Medium  ___ Difficult  
Issues: |
| 12. Other Comments |
## Education and Public Awareness Research Needs

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA-1</td>
<td>Evaluation of Social Media Outreach</td>
</tr>
<tr>
<td>EPA-2</td>
<td>Evaluation of Existing Education and Outreach Strategies</td>
</tr>
<tr>
<td>EPA-3</td>
<td>Crossing Consolidation Education</td>
</tr>
<tr>
<td>EPA-4</td>
<td>Evaluate Effectiveness and Potential Motorist &amp; Pedestrian Signage and Treatments</td>
</tr>
<tr>
<td>EPA-5</td>
<td>Evaluate the Effectiveness of Mobile Warning Devices When Approaching Grade Crossings</td>
</tr>
<tr>
<td>EPA-6</td>
<td>Evaluation of New Media</td>
</tr>
<tr>
<td>EPA-7</td>
<td>Effectiveness of Drivers Educations</td>
</tr>
<tr>
<td>EPA-8</td>
<td>Analysis of trespass patterns using GPS technology</td>
</tr>
<tr>
<td>EPA-9</td>
<td>Drivers Educations – Computer Based Training</td>
</tr>
<tr>
<td>EPA-10</td>
<td>Development of Near Miss Data System (Pilot)</td>
</tr>
<tr>
<td>EPA-11</td>
<td>Addressing Complacency of Frequent Crossing Users</td>
</tr>
<tr>
<td>EPA-12</td>
<td>Confidential Close Call Reporting System</td>
</tr>
<tr>
<td>EPA-13</td>
<td>Trespassing Behavior Analysis</td>
</tr>
<tr>
<td>EPA-14</td>
<td>Evaluating existing and potential driver signage and treatment effectiveness</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluation of Social Media Outreach</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Use of new media applications offers the opportunity to reach a broader audience with minimum resources. Traditional outreach has a limited audience. There is a need to identify, assess, and test the effectiveness of social media (i.e. internet tools, social networking sites, text messages, email and podcast) as an outreach tool for public rail safety education. Survey and testing should include number of users and absorption of message.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>X__ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current</td>
<td><em>X</em>_ New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of</td>
<td>Collection of data that has never before been utilized or captured</td>
</tr>
<tr>
<td>Identified Research Need Area</td>
<td>Improve targeting of future educational efforts</td>
</tr>
<tr>
<td></td>
<td>Better utilization of limited resources</td>
</tr>
<tr>
<td></td>
<td>Innovative method to further reduce grade crossing and trespass incidents</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>X _ High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>_ High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s)</td>
<td>FRA, Academia, Consultants, Research firms</td>
</tr>
<tr>
<td>to Conduct Research</td>
<td></td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>EPA-2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluation of Existing Education and Outreach Strategies</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>It continues to be difficult to quantify the role that education plays in preventing incidents on active rail lines. It is crucial to assess the impact and effectiveness of existing education and outreach strategies in changing public behavior. This research should explore media message styles, methods, locations, etc. that are most appropriate for age groups or other demographics and attitudinal characteristics.</td>
</tr>
<tr>
<td>5. Cross-Cutting Areas</td>
<td><em>X</em> Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-Oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Identify effective current education methods to better target intended audience. Further reductions in grade crossing and trespass incidents.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>__ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Academia, consultants, research firms</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>__ Easy <em>X</em> Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues: Collection of data Designing research study</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>This was proposed in 1995 and 2003. 2003 RNW page 68</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-3</td>
</tr>
<tr>
<td>3. Title</td>
<td>Crossing Consolidation Education</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Currently, many communities are unaware of the benefits of public/private partnerships regarding grade crossing consolidation and grade separation funding. Research is needed to determine effective methods to educate community leaders in this area.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Human Factors (<em><strong>), Transit-oriented Communities (</strong></em>), Data Requirements (___), High Speed Rail (X)</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>New (X), Supplemental (___)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Increased community safety, Forges better partnerships, Long term safety benefits, Mutual benefit among cross-sectional groups (FRA, industry, community, DOT, law enforcement, etc.)</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>High (X), Medium (<em><strong>), Low (</strong></em>)</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>High &gt;$500K (<em><strong>), Medium = $150K - $500K (</strong></em>), Low &lt; $150K (X)</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>Industry and labor</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td></td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Easy (X), Medium (<em><strong>), Difficult (</strong></em>)</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td>Links to new and innovative public outreach methods.</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>EPA-4</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluate effectiveness and potential motorist &amp; pedestrian signage and treatments</td>
</tr>
</tbody>
</table>
| 4. Project Statement | Current signage may be misunderstood or overlooked by motorist and pedestrian traffic. Research should assess the effectiveness of existing and potential new driver and pedestrian signage/treatments on or around railroad tracks and station platforms including:  
  - identification of distractions (i.e., mp3 players, visual pollution/sign saturation, cell phones)  
  - examination of pedestrian signage needs versus motorist signage needs  
  - testing of existing and new signage/treatments (e.g. pavement LEDs, colored pavement, etc.)  
  - identification of best designs for consideration in MUTCD |
| 5. Cross-Cutting Areas |  
  - _X_ Human Factors  
  - _X_ Transit-Oriented Communities  
  - _X_ Data Requirements  
  - ___ High Speed Rail |
| 6. Relationship to Current Research |  
  - _X_ New  
  - ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Further reductions in motorist and pedestrian grade crossing and trespass incidents  
  Increased motorist and pedestrian awareness of public rail safety  
  Improved compliance to signs |
| 8. Research Need Urgency |  
  - _X_ High  
  - ___ Medium  
  - ___ Low |
| 9. Cost of Research |  
  - _X_ High >$500K  
  - ___ Medium = $150K - $500K  
  - ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FHWA partnership |
| 11. Ease of Implementation |  
  - __ Easy  
  - ___ Medium  
  - _X_ Difficult  
  Issues:  
  Design of new signage, changes in signage, MUTCD compliance |
| 12. Other Comments | |

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<table>
<thead>
<tr>
<th><strong>1. Research Needs Area</strong></th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Research Topic Area / Number</strong></td>
<td>EPA-5</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Evaluate the effectiveness of Mobile Warning Devices when approaching grade crossings</td>
</tr>
<tr>
<td><strong>4. Project Statement</strong></td>
<td>Current signage may be misunderstood or overlooked by motorist and pedestrian traffic. Utilization of current technology (i.e. cell phones, GPS, PDAs, etc.) as mobile warning devices can offer additional alerts. The potential exists to offer a cost-effective alternative to traditional upgrade of warning systems. Research the effectiveness of mobile warning devices as means to alert drivers and pedestrians within close proximity of active rail lines. Determine if warning/alerts are received and effective.</td>
</tr>
</tbody>
</table>
| **5. Cross-cutting Areas** | _X_ Human Factors  
_X_ Transit-oriented Communities  
___ Data Requirements  
___ High Speed Rail |
| **6. Relationship to Current Research** | _X_ New  
___ Supplemental (list organization & title of current research) |
| **7. Potential Benefit(s) of Identified Research Need Area** | Active warning alert  
Reduction in collisions at crossings  
Long term benefit to general public and industry |
| **8. Research Need Urgency** | _X_ High  
___ Medium  
___ Low |
| **9. Cost of Research** | _X_ High >$500K  
___ Medium = $150K - $500K  
___ Low < $150K |
| **10. Potential Organization(s) to Conduct Research** | |
| **11. Ease of Implementation** | _X_ Easy  
___ Medium  
___ Difficult  
Issues: Integration with existing equipment  
The challenge to using this technology includes driver distraction. |
<p>| <strong>12. Other Comments</strong> | Related to DPE-02-2003 page 66 |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-6</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluation of New Media</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Assess impact and effectiveness of new media (i.e., internet tools, social networking sites, text messages, email, and podcast) outreach programs in public rail safety awareness including grade crossings and trespass safety.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
| | ___ Transit-oriented Communities  
| | _X_ Data Requirements  
| | ___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
| | ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Better targeting of intended audience  
| | Provide additional tools for messaging  
| | Further reductions in grade crossing and trespass incidents. |
| 8. Research Need Urgency | _X_ High  
| | ___ Medium  
| | ___ Low |
| 9. Cost of Research | ___ High >$500K  
| | _X_ Medium = $150K - $500K  
| | ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA, Academia, Consultants, Research firms |
| 11. Ease of Implementation | _X_ Easy  
| | ___ Medium  
| | ___ Difficult  
<p>| | Issues: |
| 12. Other Comments | |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-7</td>
</tr>
<tr>
<td>3. Title</td>
<td>Effectiveness of Drivers Educations</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Research if the type and amount of drivers education correlates with the number and types of collisions.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td></td>
</tr>
<tr>
<td>Please mark a mark an X next to the applicable area(s).</td>
<td><em>X</em> Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Determine if educational program effective.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>__ High ___ Medium <em>X</em> Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> High &gt;$500K ___ Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td></td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td>__ Easy ___ Medium ___ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td></td>
<td>Hard to collect needed information.</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
</tbody>
</table>
1. **Research Needs Area**  
   Education and Public Awareness (EPA)

2. **Research Topic Area/Number**  
   EPA-8

3. **Title**  
   Analysis of trespass patterns using GPS technology

4. **Project Statement**  
   1. Develop technology that would allow crewmember to use GPS plotting to target trespass hot spots and determine its effectiveness over time  
   2. Collect and report real time data  
   3. More accurately target of hot zooms for enforcement  
   4. Rapid response and prevention for law enforcement

5. **Cross-cutting Areas**  
   Please mark a mark an X next to the applicable area(s)  
   - ___ Human Factors  
   - ___ Transit-oriented Communities  
   - **X** Data Requirements  
   - ___ High Speed Rail

6. **Relationship to Current Research**  
   - **X** New  
   - ___ Supplemental (list organization & title of current research)

7. **Potential Benefit(s) of Identified Research Need Area**  
   Same as 4 under project statement

8. **Research Need Urgency**  
   - ___ High  
   - X ___ Medium  
   - ___ Low

9. **Cost of Research**  
   - ___ High >$500K  
   - ___ Medium = $150K - $500K  
   - **X** Low < $150K

10. **Potential Organization(s) to Conduct Research**  
    Railroad and labor groups

11. **Ease of Implementation**  
    If medium or difficult, list key implementation issues.  
    - ___ Easy  
    - X ___ Medium  
    - ___ Difficult  
    Issues:  
    Potential cost of technology.

12. **Other Comments**
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area / Number</td>
<td>EPA-9</td>
</tr>
<tr>
<td>3. Title</td>
<td>Drivers Educations – Computer Based Training</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Collect and analyze existing data provided by OL Canada from web based training. Determine effectiveness of online training V/S in class learning potential for pilot USA application.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em> Human Factors</td>
</tr>
<tr>
<td></td>
<td>____ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td>____ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New  <em>X</em> Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td></td>
<td>OL Canada</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Cost effective method to reach entire novice driver population.</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td>_High       <em>X</em> Medium       Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>__ High &gt;$500K  __ Medium = $150K - $500K  <em>X</em> Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td></td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy  __ Medium  __ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>EPA-10</td>
</tr>
<tr>
<td>3. Title</td>
<td>Development of Near Miss Data System (Pilot)</td>
</tr>
</tbody>
</table>
| 4. Project Statement | 1. Assess the use of near miss data to identify hot zones using FRA proposed mandatory reporting to target education efforts.  
2. Determine collection methods of near miss incidents and ensure consistency of data collection to be shared among cross-section OLI/FRA/Railroad/DOT/Law enforcement  
3. Lower incidents that results in injuries and fatalities and promote non-filtered dissemination of data between interested parties. |
| 5. Cross-cutting Areas |  
Human Factors  
Transit-oriented Communities  
Data Requirements  
High Speed Rail |
| 6. Relationship to Current Research | _X_ New ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Decreased loss of life to members of the community.  
Improve productivity for all agencies.  
Reallocate money spent in litigation and post accident evaluation and reporting.  
Short and long term advantages. |
| 8. Research Need Urgency | _X_ High ___ Medium ___ Low |
| 9. Cost of Research | __ High >$500K __ Medium = $150K - $500K _X_ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FRA coordination with host railroad and labor organization. |
| 11. Ease of Implementation If medium or difficult, list key implementation issues. | __ Easy _X_ Medium ___ Difficult  
Issues:  
The ability to cross communicate the data upfeed.  
Dependent on FRA requiring near miss data collection. |
<p>| 12. Other Comments | 2003 highway rail grade crossing research needs workshop needs HF, HF 06 pg 42 with emphasis on communication control. |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-11</td>
</tr>
<tr>
<td>3. Title</td>
<td>Addressing Complacency of Frequent Crossing Users</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Assess the means to address the complacency of those who use the crossing regularly (commuters and local residents).</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td><em>X</em>_ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td>___ Data Requirements</td>
</tr>
<tr>
<td></td>
<td>___ High Speed Rail</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Reduction in collision</td>
</tr>
<tr>
<td></td>
<td>New educational targeting</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> Medium ___ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td>___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s)</td>
<td>to Conduct Research</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues:</td>
</tr>
<tr>
<td></td>
<td>__Easy ___ Medium</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Education and Public Awareness (EPA)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-12</td>
</tr>
<tr>
<td>3. Title</td>
<td>Confidential Close Call Reporting System</td>
</tr>
</tbody>
</table>
| 4. Project Statement  | 1. A channel for communication to data input while maintaining autonomy  
                             2. Increased target of hot zone without any negative ramifications  
                             3. More accurate reporting |
| 5. Cross-cutting Areas |  
                             ___ Human Factors  
                             _X_ Transit-oriented Communities  
                             ___ Data Requirements  
                             ___ High Speed Rail |
| 6. Relationship to Current Research  | _X_ New  
                                         ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area  | Increase honest fact based reporting  
                                                         Short and long term benefits |
| 8. Research Need Urgency | _X_ High  
                               ___ Medium  
                               ___ Low |
| 9. Cost of Research | ___ High >$500K  
                               ___ Medium = $150K - $500K  
                               _X_ Low < $150K |
| 10. Potential Organization(s) to Conduct Research  | RR and labor groups |
| 11. Ease of Implementation  | _X_ Easy  
                                  ___ Medium  
                                  ___ Difficult  
                                  Issues: |
| 12. Other Comments  | |

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<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-13</td>
</tr>
<tr>
<td>3. Title</td>
<td>Trespassing Behavior Analysis</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Analyze why people are willing to take trespass risks on RR tracks in order to target specific education and outreach components for target audience.</td>
</tr>
</tbody>
</table>
| 5. Cross-Cutting Areas | _X_ Human Factors  
___ Transit-Oriented Communities  
_X_ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Better identify target audience.  
Allow for development of improved education programs. |
| 8. Research Need Urgency | _High  
_Medium  
_X_ Low |
| 9. Cost of Research | _High >$500K  
_X_ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | Academia, research firms |
| 11. Ease of Implementation | _Easy  
_X_ Medium  
___ Difficult  
If medium or difficult, list key implementation issues. |
<p>| 12. Other Comments |</p>
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Education and Public Awareness (EPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>EPA-14</td>
</tr>
<tr>
<td>3. Title</td>
<td>Evaluating existing and potential driver signage and treatment effectiveness.</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Assess the effectiveness of existing and potential new signage/treatments including review of international signage, testing of new signage. Identify best designs for consideration by the MUTCD.</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_  Human Factors  
| | ___ Transit-oriented Communities  
| | X_  Data Requirements  
| | ___ High Speed Rail  |
| 6. Relationship to Current Research | _X_  New  
| | ___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | For the reduction in grade crossing and trespass incidents. Increase driver awareness. |
| 8. Research Need Urgency | X_  High  
| | ___ Medium  
| | ___ Low |
| 9. Cost of Research | _X_  High >$500K  
| | ___ Medium = $150K - $500K  
| | ___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | FHWA |
| 11. Ease of Implementation | __ Easy  
| | ___ Medium  
| | X_  Difficult  
| | Issues:  
| | Design of new signage  
| | Changes in signage |
| 12. Other Comments |
## Institutional Issues Research Needs

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Research Need Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-1</td>
<td>Establishment of a Railroad/Transit Data Clearinghouse</td>
</tr>
<tr>
<td>II-2</td>
<td>Cost/Benefit Analysis of Grade Crossing Improvements</td>
</tr>
<tr>
<td>II-3</td>
<td>Synthesis to Evaluate How, When, and Where Human Perception Negatively Impacts Rail Safety</td>
</tr>
<tr>
<td>II-4</td>
<td>Institutionalize Evaluation as a Key component of Project/Program (countermeasure) Design and Implementation</td>
</tr>
<tr>
<td>II-5</td>
<td>Improved Effectiveness of Stakeholder Interaction</td>
</tr>
<tr>
<td>II-6</td>
<td>Identify Opportunities to Make Legislation and Regulations Across Jurisdictions Compatible, Meaningful and Up-to-Date</td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Institutional Issues (II)</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area/Number</td>
<td>II-1</td>
</tr>
<tr>
<td>3. Title</td>
<td>Establishment of a railroad/transit data clearinghouse</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Development of a framework/architecture for integrating existing databases (e.g.: Federal, states, local, industry, insurance) in order to provide a more complete and robust source of information on risk management and mitigation to the surface transportation industry. Centralized, searchable</td>
</tr>
</tbody>
</table>
| 5. Cross-cutting Areas | _X_ Human Factors  
___ Transit-oriented Communities  
_X_ Data Requirements  
___ High Speed Rail |
| 6. Relationship to Current Research | _X_ New  
___ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Better information sharing  
Better identification of issues  
Improved safety of operations  
Improved consistence  
Faster translation of research into practice  
Improved ability to track of trends |
| 8. Research Need Urgency | _X_ High  
___ Medium  
___ Low |
| 9. Cost of Research | _X_ High >$500K  
___ Medium = $150K - $500K  
___ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | TRB, USDOT |
| 11. Ease of Implementation | _X_ Easy  
___ Medium  
___ Difficult |
| If medium or difficult, list key implementation issues. | Issues: |
| 12. Other Comments | }
<table>
<thead>
<tr>
<th>1. Research Needs Area</th>
<th>Institutional Issues (II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Research Topic Area/Number</td>
<td>II-2</td>
</tr>
<tr>
<td>3. Title</td>
<td>Cost/benefit analysis of grade crossing improvements</td>
</tr>
<tr>
<td>4. Project Statement</td>
<td>Developing examples of how to conduct cost/benefit analyses of Federally funded grade crossing improvements under the Section 130 Program. Best practices review to establish recommended procedures for quantitatively evaluating improvements.</td>
</tr>
<tr>
<td>5. Cross-cutting Areas</td>
<td>Please mark a mark an X next to the applicable area(s).</td>
</tr>
<tr>
<td>Human Factors</td>
<td>___</td>
</tr>
<tr>
<td>Transit-oriented Communities</td>
<td>___</td>
</tr>
<tr>
<td>Data Requirements</td>
<td><em>X</em>_</td>
</tr>
<tr>
<td>High Speed Rail</td>
<td>___</td>
</tr>
<tr>
<td>6. Relationship to Current Research</td>
<td>___ New <em>X</em>_ Supplemental (various, including NCDOT)</td>
</tr>
<tr>
<td>7. Potential Benefit(s) of Identified Research Need Area</td>
<td>Making more efficient use of federal funds</td>
</tr>
<tr>
<td></td>
<td>Informs decision-making for policy implementation</td>
</tr>
<tr>
<td>8. Research Need Urgency</td>
<td><em>X</em> High     __ Medium      __ Low</td>
</tr>
<tr>
<td>9. Cost of Research</td>
<td><em>X</em> High &gt;$500K     <em>X</em> Medium = $150K - $500K     __ Low &lt; $150K</td>
</tr>
<tr>
<td>10. Potential Organization(s) to Conduct Research</td>
<td>FHWA, FRA, States</td>
</tr>
<tr>
<td>11. Ease of Implementation</td>
<td><em>X</em> Easy     __ Medium      __ Difficult</td>
</tr>
<tr>
<td>If medium or difficult, list key implementation issues.</td>
<td>Issues:</td>
</tr>
<tr>
<td>12. Other Comments</td>
<td></td>
</tr>
</tbody>
</table>
### 1. Research Needs Area
- Institutional Issues (II)

### 2. Research Topic Area / Number
- II-3

### 3. Title
- Synthesis to evaluate how, when, and where human perception negatively impacts rail safety.

### 4. Project Statement
- A synthesis to evaluate how, when, and where human perception negatively impacts safety. Identify what perceptions need adjusting because of extent of impacts to rail safety:
  - The impact of sensationalizing suicide reporting by the media
  - Local authorities, media and general public not understanding the difference between pedestrians and trespassers
  - Lack of public awareness about dangers of trespassing on railroad right-of-way.

### 5. Cross-Cutting Areas
- X Human Factors
- ___ Transit-Oriented Communities
- ___ Data Requirements
- ___ High Speed Rail

### 6. Relationship to Current Research
- X New ___ Supplemental (list organization & title of current research)

### 7. Potential Benefit(s) of Identified Research Need Area
- Reduced intentional deaths on rail ROW.
- Reduced trespassing and unintentional deaths and injuries.

### 8. Research Need Urgency
- X High ___ Medium ___ Low

### 9. Cost of Research
- ___ High >$500K ___ Medium = $150K - $500K ___ Low < $150K

### 10. Potential Organization(s) to Conduct Research
- 

### 11. Ease of Implementation
- X Easy ___ Medium ___ Difficult
- Issues:

### 12. Other Comments
- 

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<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Research Needs Area</strong></td>
<td>Institutional Issues (II)</td>
</tr>
<tr>
<td><strong>2. Research Topic Area / Number</strong></td>
<td>II-4</td>
</tr>
<tr>
<td><strong>3. Title</strong></td>
<td>Institutionalize evaluation as key component of project/program (countermeasure) design and implementation.</td>
</tr>
<tr>
<td><strong>4. Project Statement</strong></td>
<td>Build “evaluation” into the planning stage of a project – so you can evaluate whatever you implement (“plan to evaluate” is built into the project). Quantitative evaluation to identify high payback effective interventions and key factors in success. Case studies and best practices?</td>
</tr>
<tr>
<td><strong>5. Cross-cutting Areas</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>___ Human Factors</td>
</tr>
<tr>
<td></td>
<td>___ Transit-oriented Communities</td>
</tr>
<tr>
<td></td>
<td><em>X</em> Data Requirements</td>
</tr>
<tr>
<td></td>
<td><em>X</em> High Speed Rail</td>
</tr>
<tr>
<td><strong>6. Relationship to Current Research</strong></td>
<td><em>X</em> New ___ Supplemental (list organization &amp; title of current research)</td>
</tr>
<tr>
<td><strong>7. Potential Benefit(s) of Identified Research Need Area</strong></td>
<td>Ability to adjust mid-course to improve design and implementation</td>
</tr>
<tr>
<td></td>
<td>Identify and Maximize potential benefit</td>
</tr>
<tr>
<td></td>
<td>Informs future program decisions</td>
</tr>
<tr>
<td><strong>8. Research Need Urgency</strong></td>
<td><em>X</em> High ___ Medium ___ Low</td>
</tr>
<tr>
<td><strong>9. Cost of Research</strong></td>
<td>___ High &gt;$500K <em>X</em> Medium = $150K - $500K ___ Low &lt; $150K</td>
</tr>
<tr>
<td><strong>10. Potential Organization(s) to Conduct Research</strong></td>
<td>AASHTO, AAR, APTA, FRA, TRB, AREMA</td>
</tr>
<tr>
<td><strong>11. Ease of Implementation</strong></td>
<td>___ Easy <em>X</em> Medium ___ Difficult</td>
</tr>
<tr>
<td></td>
<td>Issues: Adds cost in the short-term, resistance due to being potential culture change for some organizations.</td>
</tr>
<tr>
<td><strong>12. Other Comments</strong></td>
<td></td>
</tr>
<tr>
<td>1. Research Needs Area</td>
<td>Institutional Issues (II)</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>2. Research Topic Area / Number</td>
<td>II-5</td>
</tr>
<tr>
<td>3. Title</td>
<td>Improved effectiveness of stakeholder interaction</td>
</tr>
</tbody>
</table>
| 4. Project Statement | Role definition and best practices for communication and coordination among diverse stakeholders (e.g. regulators, railroads, locals, districts, standards setting bodies) for rail safety initiatives. Special attention to:  
  - regional/local planning  
  - crossing closures  
  - pedestrian crossings  
  - trespass  
  - private crossings  
  - Land development (research to get recommended regs, standards, and practices to address issues relating to land development for cooperative decision making that affect grade crossing and/or rail ROW.) |
| 5. Cross-cutting Areas | Human Factors  
 _ _ Transit-oriented Communities  
 _ _ Data Requirements  
 _ _ High Speed Rail |
| 6. Relationship to Current Research | _ _ New  
 _ _ Supplemental (list organization & title of current research) |
| 7. Potential Benefit(s) of Identified Research Need Area | Improved effectiveness of stakeholder interaction  
 Improved efficiency  
 Greater clarity on ownership of and roles and responsibilities for orphan issues (e.g. pedestrian crossings, trespass, private crossings)  
 Highlighting conflicting mandates/goals/objectives and requirements for reconciliation |
| 8. Research Need Urgency | _ _ High  
 _ _ Medium  
 _ _ Low |
| 9. Cost of Research | High >$500K  
 _ _ Medium = $150K - $500K  
 _ _ Low < $150K |
| 10. Potential Organization(s) to Conduct Research | USDOT |
| 11. Ease of Implementation | _ _ Easy  
 _ _ Medium  
 _ _ Difficult |
| If medium or difficult, list key implementation issues. | Issues: Diverse group of stakeholders with entrenched interests and well defined positions. |
| 12. Other Comments |  

1. Research Needs Area | Institutional Issues (II)

2. Research Topic Area/Number | II-6

3. Title | Identify opportunities to make legislation and regulations across jurisdictions compatible, meaningful and up to date

4. Project Statement | Identify what the purpose of the original legislation or regulation was. Does the problem still exist? Is the original legislation or regulation still relevant? Do other types of legislations or regulations conflict (noise abatement, air quality…) and to what extent? How consistent is the approach across jurisdictional boundaries? Has the original legislation created new problems or unintended consequences?

5. Cross-cutting Areas | ___ Human Factors  
| _X__ Transit-oriented Communities 
| ___ Data Requirements  
| _X__ High Speed Rail

6. Relationship to Current Research | _X__ New  ___ Supplemental (list organization & title of current research)

7. Potential Benefit(s) of Identified Research Need Area | Streamlining of project implementation  
Fewer and more effective laws and regulations  
Reduction of legislative conflict

8. Research Need Urgency | _X_ High  ___ Medium  __ Low

9. Cost of Research | _X_. High >$500K  ___ Medium = $150K - $500K  ___ Low < $150K

10. Potential Organization(s) to Conduct Research | 

11. Ease of Implementation | ___ Easy  ___ Medium  _X_ Difficult  
Issues: Legislative and regulatory inertia, long lead times and powerful coalitions needed.

12. Other Comments |