Transit Advisory Committee for Safety (TRACS)

FTA Initiatives

Safety Risks and Potential Mitigations

March 26-27, 2019

Briefed by Lisa Staes
Center for Urban Transit Research
Presentation Outline

• Areas of Greatest Risk

• Transit Safety Innovations – Considerations and Complexities

• FTA’s Demonstration Programs and Performance-Based Evaluations

• Potential Innovations to Address Collision Events and Transit Assaults

• Considerations for TRACS Discussion
Areas of Greatest Risk

• Fatalities/injuries – occupants of other vehicles

• Fatalities/injuries – persons waiting or leaving rail platforms or bus stops and stations

• Person collisions – Heavy Rail and Light Rail
  – includes trespassers and suicides

• Collision events with fatigue or distraction causal factors

• All transit assaults – transit operators and passenger, on vehicle and while waiting/ leaving
TRANSIT SAFETY INNOVATIONS – CONSIDERATIONS AND COMPLEXITIES
Not all innovations/technologies are the same

• Same platforms/technologies - differing experiences

• Parameters/metrics for evaluating technologies

• Evaluation elements and minimum metrics/data collected

• May not have applicability across agencies and areas of risk – decision based on local circumstances/needs

• “Innovation” – reflected in process or procedural improvements
FTA’S DEMONSTRATION PROGRAMS AND

PERFORMANCE-BASED EVALUATIONS
FTA’s Demonstration Programs – Focus Areas

- Collision avoidance and mitigation
- Transit worker safety
- Operational safety
- Infrastructure or equipment resiliency
- All-hazards emergency response and recovery methods
- Autonomous track inspections
- Autonomous vehicles
- Driver workstations
- Standards development
## FTA Safety Demonstration Projects

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<th>Project Title</th>
<th>Project Recipient</th>
<th>City and State</th>
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<tr>
<td>Pierce Transit Collision Avoidance and Mitigation Safety Demonstration</td>
<td>Pierce Transit</td>
<td>Lakewood, WA</td>
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<td>Transit Bus Mirror Configuration Research and Development</td>
<td>NY Metropolitan Transit Authority</td>
<td>New York City, NY</td>
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<td>CTA Operations Control Center Safety Enhancements Project</td>
<td>Chicago Transit Authority</td>
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<td>Enhanced Secondary Warning System for Track Worker Protection</td>
<td>Sacramento Regional Transit District</td>
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<td>Fixed-Mounted Train Detection and Worker Warning System Demonstration</td>
<td>Maryland Department of Transportation</td>
<td>Baltimore, MD</td>
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<td>Collision Avoidance and Mitigation Technologies on LA Metro Bus Pilot</td>
<td>LA County Metropolitan Transportation Authority</td>
<td>Los Angeles, CA</td>
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<td>Track Inspector Location Awareness with Enhanced Transit Worker Protection</td>
<td>Washington Metropolitan Area Transit Authority</td>
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<td>Automatic Track Inspection System Demo</td>
<td>Metropolitan Atlanta Rapid Transit Authority</td>
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<td>Metropolitan Atlanta Rapid Transit Authority</td>
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<td>Development of Bus Exportable Power System for Emergency Response</td>
<td>Center for Transportation and the Environment</td>
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<td>Coordinated Transit Response Planning and Operations Support Tools for Mitigating the Impacts of All-Hazards Emergency Events</td>
<td>University of Chicago</td>
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<td>Evacuation and Return: Increasing Safety and Reducing Risk</td>
<td>City of New Orleans</td>
<td>New Orleans, LA</td>
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<td>Driver Assist System Technology to Support Robust, Flexible Bus-on-Shoulder and Narrow-Lane Operations</td>
<td>Minnesota Valley Transit Authority</td>
<td>Burnsville, MN</td>
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<td>New Jersey Transit Critical Infrastructure Storm Surge Warning System</td>
<td>New Jersey Transit Corporation</td>
<td>Newark, NJ</td>
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<td>Connected Vehicle Infrastructure - Urban Bus Operational Safety Platforms</td>
<td>Battelle Memorial Institute</td>
<td>Columbus, OH</td>
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<td>Smart, Shared, and Social: Enhancing All-Hazards Recovery Plans with Demand Management Techniques</td>
<td>Portland State University</td>
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<td>Innovative Platform Track Intrusion Detection System Technology: A Demonstration on Los Angeles Metro Rail System</td>
<td>Metropolitan Transportation Authority</td>
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<td>Resilient Concrete Crosstie and Fastening System Designs for Light Rail, Heavy Rail, and Commuter Rail Transit Infrastructure</td>
<td>University of Illinois</td>
<td>Urbana, IL</td>
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<td>Integrated Wheel/Rail Characterization and Safety through Advanced Monitoring and Analytics</td>
<td>New York Metropolitan Transportation Authority</td>
<td>New York, NY</td>
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POTENTIAL INNOVATIONS TO ADDRESS COLLISION EVENTS AND TRANSIT ASSAULTS
Innovations to Reduce Collisions – Heavy Rail

• Collisions with Trespassers/Suicides
  – Intrusion detection technologies
    • Automated proximity alerts
    • Automated motion and noise detection
    • Thermal cameras
    • Facial recognition with alerts
    • Drones
  – Platform edge screens/doors
Innovations to Reduce Collisions – Heavy Rail

• Collisions with Other Rail Vehicles
  – Automatic Train Control/Positive Train Control/Communications Based Train Control

• Collisions with Transit Workers
  – Vehicle to Vehicle/Vehicle to Worker Collision Avoidance Systems
  – GPS and/or LiDAR ROW protection systems
Innovations to Reduce Collisions – Light Rail and Bus

• Three Categories – Onboard Collision Warning and Avoidance Systems
  – Passive Systems
    • Provide enhanced awareness (video surveillance)
  – Active with No Control
    • Provide alerts to operator
  – Active with Control
    • Provide alerts to operator and capable of stopping the light rail vehicle if necessary
Passive Systems

- Real time 360 degree video surveillance
- Provides enhanced operator awareness
- No alerts are given
- Common technology in buses
- Could be applied to light rail

Active Systems with No Control

• Utilize camera, short range radar sensors, and LiDAR
• Enhanced blind spot operator awareness
• Lane departure warnings
• 360 degree monitoring and alert systems available
• Audio and visual alerts

Active Systems with No Control

- Utilize artificial vision sensors capable of detecting other vehicles, pedestrians, and cyclists.
- Continually measure the speed and distance to “vulnerable road users”.
- Advanced systems can detect objects within the vehicle envelop and determine braking distance required.

Active System with Control – Collision Avoidance Systems

• Utilize camera, radar, and LiDAR

• Monitor the track ahead and detect obstacles

• Send a visual and or acoustic warning

• Forward collision avoidance warning and correction

• Advanced systems perform risk assessments and provide braking alerts depending on collision probability (systems may also engage automated braking)

Tram forward collision warning system, 10/11/2018. Retrieved from Bosch Engineering
Other Notable Technologies

- Pedestrian Bluetooth Beacons
- Connected Vehicles
- Embedded Lighting Synced with Vehicle Arrival and/or Intersection Signaling
- Light rail vehicle airbags
- Zombie Lighting
Innovations to Identify Fatigue Risk

- Vehicle mounted cameras/computer vision technologies that include facial analysis to determine fatigue – eyelid closures and head position
- Eye gazing technologies
- Wearable devices that read brain wave patterns
- Psychomotor vigilance testing (PVT) – fitness for duty indicator of potential sleep deprivation
- Electroencephalogram (EEG) – indicator of changes to alertness
- Responsive alerts – in-vehicle alarms or vibrations
Innovations and Methods to Reduce Assaults

• Driver compartment barriers

• Off-vehicle fare collection technologies
  – Smart card - proximity readers or swipe/tap at entry door or at stop/station locations

• Facial recognition technologies to identify trespassed individuals

• Panic/emergency alert buttons tied to local law enforcement and/or transit police
Procedural/Process Changes to Mitigate Risks

• Safety Management System process maturity
• Agency procedural/policy innovations
• Improved internal communication
• Training designed to address areas of greatest risk
• Service delivery changes
• Public awareness and outreach

The most successful “innovative” programs include: technology deployments and adoption, procedural/policy changes, training, and public awareness and outreach
TRACS DISCUSSION
Considerations

• Is the innovative technology mature?
• What is the anticipated cost of deployment across the agency?
• Will implementation be cost prohibitive?
• Does the particular technology have national applicability?
• Can the technology be standardized or must it be designed for each specific deployment site?
• What can be done to make it “off the shelf” ready?

*Note - expectations consistently outpace progress in terms of actual technology AND project schedule
Complexities

• Technology/innovation procurement processes
• Vendor contracting
• Private and/or for-profit partners
• Evaluations via 3rd party
• Establishing clear and understood performance measures
• Identifying the data needed to track performance measures
• Ensuring that the vendor can capture those data
• DELAYS - contracting, delivery and installation, beta testing, personnel acceptance and training, troubleshooting, changes in vendor or agency personnel, etc.
Thank You!

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