FTA

FEDERAL TRANSIT ADMINISTRATION

Transit Advisory Committee for Safety (TRACS)

FTA Initiatives

Safety Risks and Potential Mitigations

March 26-27, 2019

Briefed by Lisa Staes
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U.S. Department of Transportation
Federal Transit Administration

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

Project Title	Project Recipient	City and State
Pierce Transit Collision Avoidance and Mitigation Safety Demonstration	Pierce Transit	Lakewood, WA
Transit Bus Mirror Configuration Research and Development	NY Metropolitan Transit Authority	New York City, NY
CTA Operations Control Center Safety Enhancements Project	Chicago Transit Authority	Chicago, IL
Enhanced Secondary Warning System for Track Worker Protection	Sacramento Regional Transit District	Sacramento, CA
Fixed-Mounted Train Detection and Worker Warning System Demonstration	Maryland Department of Transportation	Baltimore, MD
Collision Avoidance and Mitigation Technologies on LA Metro Bus Pilot	LA County Metropolitan Transportation Authority	Los Angeles, CA
Track Inspector Location Awareness with Enhanced Transit Worker Protection	Washington Metropolitan Area Transit Authority	Washington, DC
Automatic Track Inspection System Demo	Metropolitan Atlanta Rapid Transit Authority	Atlanta, GA

FTA Safety Demonstration Projects (cont.)

Project Title	Project Recipient	City and State
Demonstration and Commercialization of LRV Bumper for Enhanced Safety in Shared Right-of-Way Street Environments	Applied Research Associates	Albuquerque, NM
TrackSafe Phase II Demonstration Project	Metropolitan Atlanta Rapid Transit Authority	Atlanta, GA
Development of Bus Exportable Power System for Emergency Response	Center for Transportation and the Environment	Atlanta, GA
Coordinated Transit Response Planning and Operations Support Tools for Mitigating the Impacts of All-Hazards Emergency Events	University of Chicago	Chicago, IL
Evacuation and Return: Increasing Safety and Recucing Risk	City of New Orleans	New Orleans, LA
Driver Assist System Technology to Support Robust, Flexible Bus-on-Shoulder and Narrow-Lane Operations	Minnesota Valley Transit Authority	Burnsville, MN
New Jersey Transit Critical Infrastructure Storm Surge Warning System	New Jersey Transit Corporation	Newark, NJ
Connected Vehicle Infrastructure - Urban Bus Operational Safety Platforms	Battelle Memorial Institute	Columbus, OH
Smart, Shared, and Social: Enhancing All-Hazards Recovery Plans with Demand Management Techniques	Portland State University	Portland, OR
Innovative Platform Track Intrusion Detection System Technology: A Demonstration on Los Angeles Metro Rail System	Metropolitan Transportation Authority	Los Angeles, CA
Resilient Concrete Crosstie and Fastening System Designs for Light Rail, Heavy Rail, and Commuter Rail Transit Infrastructure	University of Illinois	Urbana, IL
Integrated Wheel/Rail Characterization and Safety through Advanced Monitoring and Analytics	New York Metropolitan Transportation Authority	New York, NY

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

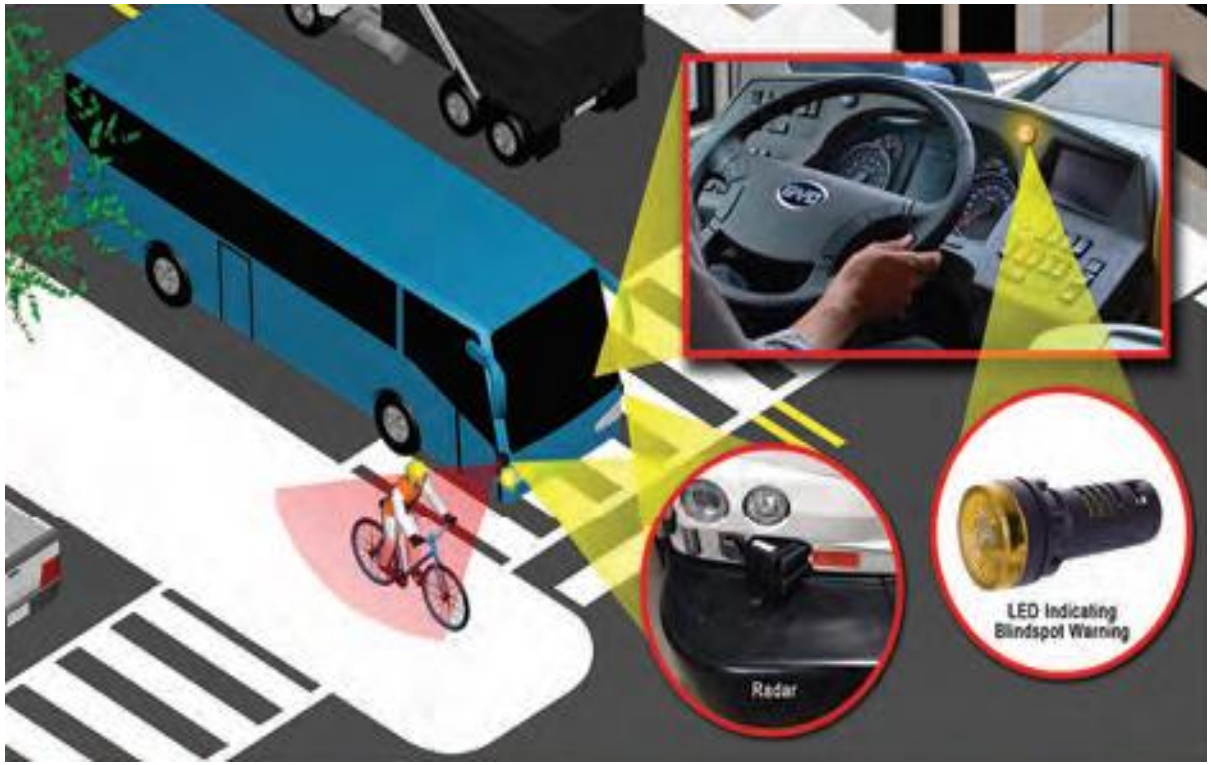
Passive Systems

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

Around Vehicle Monitoring System inView 360. (2018, October 11). Retrieved from Seon: www.seon.com/products/collision-avoidance-systems/inview-360

Active Systems with No Control

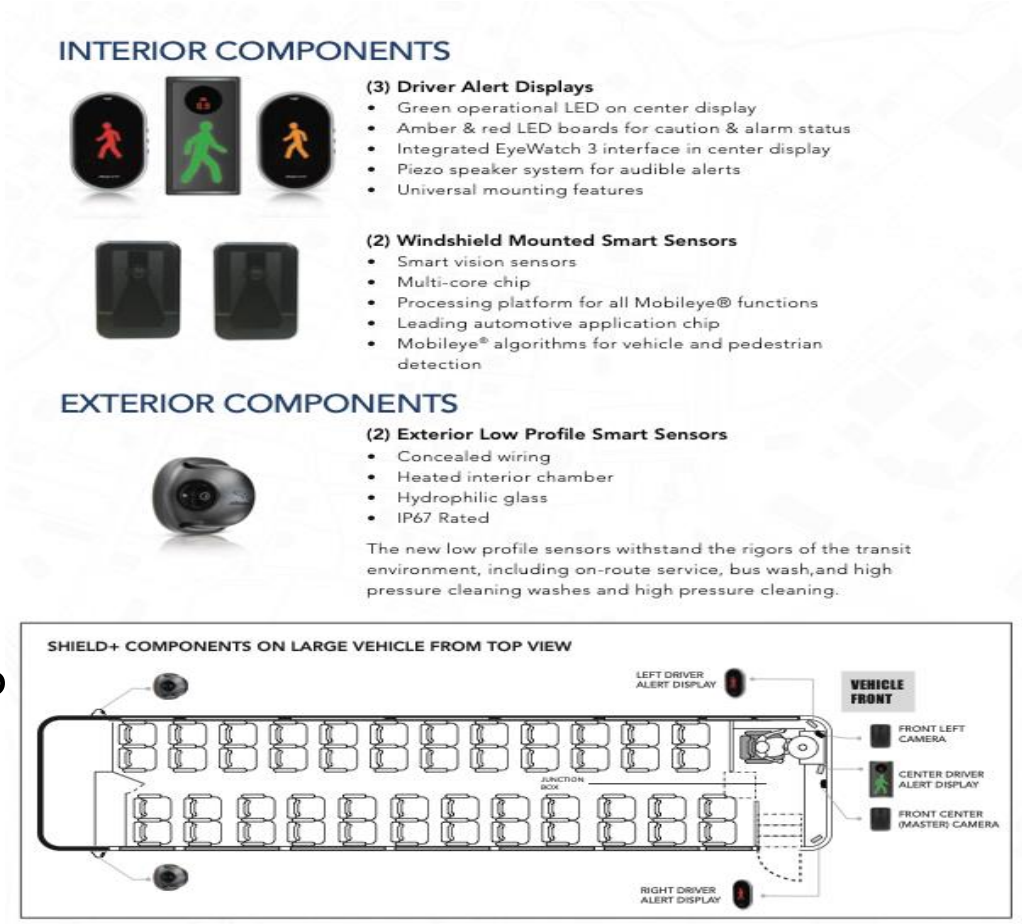
- Utilize camera, short range radar sensors, and LiDAR
- Enhanced blind spot operator awareness
- Lane departure warnings
- 360 degree monitoring and alert systems available
- Audio and visual alerts



Blind Spot Awareness. Retrieved from Protran Technology (10/11/2018)

Active Systems with No Control

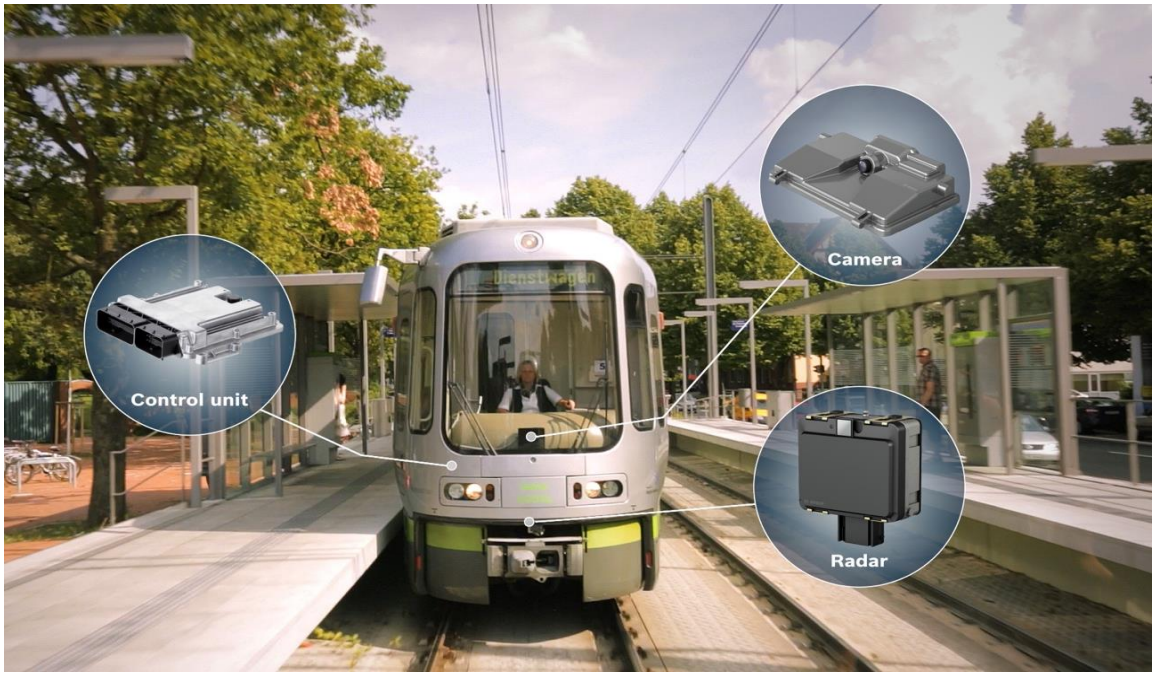
- Utilize artificial vision sensors capable of detecting other vehicles, pedestrians and cyclists
- Continually measure the speed and distance to "vulnerable road users"
- Advanced systems can detects objects within the vehicle envelop and determine braking distance required



VQS4560. Retrieved from Rosco Vision Systems: (10/11/2018)

Active System with Control – Collision Avoidance Systems

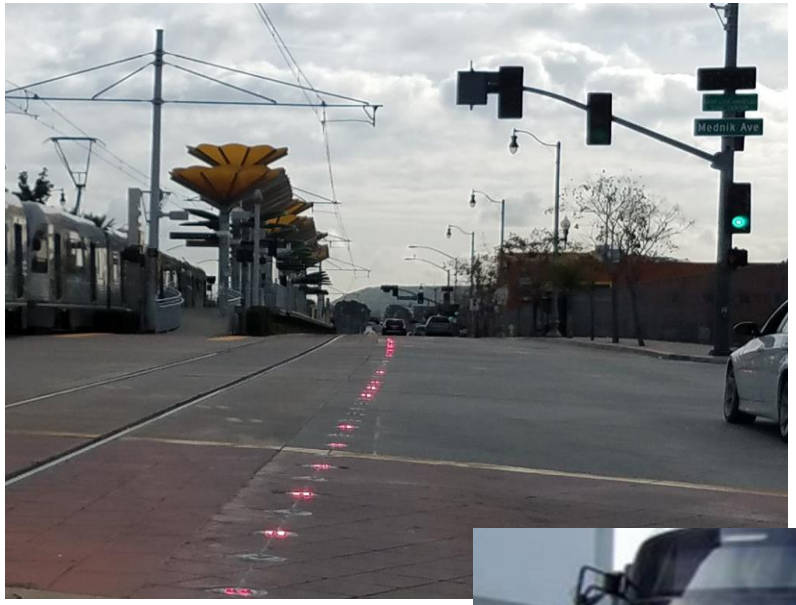
- Utilize camera, radar, and LiDAR
- Monitor the track ahead and detect obstacles
- Send a visual and or acoustic warning
- Forward collision avoidance warning and correction
- Advanced systems perform risk assessments and provide braking alerts depending on collision probability (systems may also engage 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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