Vision Zero & For-Hire Transportation in New York City

2016 Vision Zero Fleets Safety Forum
November 29, 2016
Causes of Fatal Crashes

Factors Contributing to Pedestrian Fatalities

- Dangerous Driver Choices: 53%
- Dangerous Pedestrian Choices: 30%
- Dangerous Driver and Pedestrian Choices: 17%

Source: NYC DOT 2008-2012
Vision Zero: New York City

- Education
- Engineering
- Enforcement
Vision Zero at TLC

Education  Outreach  Enforcement  Technology
Vision Zero: Education

- Pre-licensure Driver Course: Vision Zero Curriculum
  - Emphasis on sharing the road with other users
  - New types of streetscapes (e.g., bus lanes, bike lanes)
  - Unsafe driving behaviors that lead to serious crashes
  - Viewing of “Drive Like Your Family Lives Here” film

- Expanded Pre-Licensure Course to Livery, Black Car, and Limousine Drivers in December 2015
  - Highest growth sectors under TLC regulation in recent years
  - In 2016, over 25,000 active licensees passed the course
  - On average, 3,300 TLC applicants take the course each month
Vision Zero: Outreach

- Messaging to Drivers, Passengers, Base and Fleet Managers, and Industry Organizations
- Emphasis on changing driver behavior, victim perspectives
- Annual TLC Safety Honor Roll Ceremony
- Meetings with drivers at their base or garage
- PSAs and “Drive Like Your Family Lives Here” film available online
Vision Zero: Enforcement

- Vision Zero Safety Squad equipped with LIDAR guns
- Increased enforcement of traffic safety violations
  - Speeding
  - Failure to Yield Right of Way
  - Stop Sign & Signal Violations
- Fatigue Prevention Rules
- Critical Driver Program
- Coordination with NYPD & DOT on priority corridors
Vision Zero: Technology

- Vehicle Safety Technology Pilot
  - Black boxes, cameras, driver alert and collision avoidance systems, and analytics platforms
Vision Zero: Data-Driven Solutions

- Data analysis allows TLC to target and evaluate Vision Zero programs and enforcement
- Providing useful data for the public and licensees
- Vision Zero Base Reports
- Fatigue Prevention Rules
- Targeted Fleet Safety Outreach & Materials
Madeline Labadie
New York City Taxi & Limousine Commission

madeline.labadie@tlc.nyc.gov

NYC.gov/taxi
Truck Sideguards Installed

<table>
<thead>
<tr>
<th>Agency</th>
<th>Total Vehicles</th>
<th>Percentage</th>
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<tr>
<td>DCAS</td>
<td>70</td>
<td>12.05%</td>
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<tr>
<td>DEP</td>
<td>21</td>
<td>3.61%</td>
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<tr>
<td>DHMH</td>
<td>6</td>
<td>1.03%</td>
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<td>DOCN</td>
<td>1</td>
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<tr>
<td>DOTR</td>
<td>35</td>
<td>6.02%</td>
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<td>DPAR</td>
<td>174</td>
<td>29.95%</td>
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<tr>
<td>DSNY</td>
<td>208</td>
<td>35.80%</td>
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<tr>
<td>FDNY</td>
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<td>NYPD</td>
<td>55</td>
<td>9.47%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>581</strong></td>
<td><strong>100.00%</strong></td>
</tr>
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</table>

*DCAS includes Client Fleets*
SAFE DRIVING IS FOCUSED DRIVING!
NO CELL PHONES INCLUDING HANDS FREE AND NO TEXTING WHILE DRIVING.

VISION ZERO
nyc.gov/visionzero
TURN CAUTIOUSLY.
MOST NYC
PEDESTRIAN
INJURIES AND
FATALITIES
OCCUR AT
INTERSECTIONS.

VISION ZERO
nyc.gov/visionzero
SLOW DOWN
FOR A SAFER NYC
SPEED LIMIT 25

nyc.gov/visionzero
BUCKLE UP!
THE LIFE
YOU SAVE
WILL BE
YOUR OWN.
SEAT BELTS REDUCE
CRASH-RELATED
INJURIES AND DEATHS
BY HALF

VISION ZERO
nyc.gov/visionzero
THE LEADING CAUSE OF FLEET INJURIES IS REAR-END COLLISIONS. KEEP A SAFE FOLLOWING DISTANCE AT ALL TIMES
<table>
<thead>
<tr>
<th>Safety Feature</th>
<th>Respondents</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Backup Camera</td>
<td>6,761</td>
<td>34.8%</td>
</tr>
<tr>
<td>Backup Alarm</td>
<td>3,639</td>
<td>18.7%</td>
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<tr>
<td>Navigational System</td>
<td>3,102</td>
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<tr>
<td>Driver Alert System</td>
<td>3,068</td>
<td>15.8%</td>
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<tr>
<td>Extra Mirrors</td>
<td>2,821</td>
<td>14.5%</td>
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<tr>
<td>Extra Lights</td>
<td>38</td>
<td>0.2%</td>
</tr>
<tr>
<td>Other Cameras</td>
<td>4</td>
<td>0.0%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>19,433</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

-Multiple responses were allowed
Contact

Keith Kerman
Chief Fleet Officer
New York City
Deputy Commissioner,
Department of Citywide Administrative Services

kkerman@dcas.nyc.gov
THANK YOU
Advanced Driving Assistance Systems
And Other Programs to Save Lives Now

Alex Epstein
Sr. Director, Digital Strategy & Content
National Safety Council
Alex.Epstein@nsc.org
The National Safety Council eliminates preventable deaths at work, in homes and communities, and on the road through leadership, research, education and advocacy.
Key Transportation Initiatives

Road To Zero
National Safety Council, National Highway Traffic Safety Administration, Federal Highway Administration and Federal Motor Carrier Safety Administration, announced the Road to Zero initiative. The aim is to eliminate traffic fatalities within the next 30 years. Participating are scores of safety advocates including Vision Zero through executive director Leah Shahum

Distraction
Working toward total Cell Phone Ban in all driving environments. Evolving problem is that distractions come from so many aspects of our environment

Fatigue
Blue Ribbon Panel to be constituted in December – NSC managing

Teen – GDL
Continued work in passing stronger GDL laws – and parents of new teen driver campaign - DriveitHOME

Child Passenger Safety Seats / Hot Cars
Manage National Child Passenger Safety Board – support other advocates

Defensive Driver Courses
Train over one million each year

Advanced Technology
What Does This Icon Represent?
What Does This Icon Represent?

TPMS
What Does This Icon Represent?
What Does This Icon Represent?

Lane Keeping Assist
What Does This Icon Represent?
What Does This Icon Represent?

Drowsiness Alert
Why This Initiative?
Why This Initiative?
Vehicle Experience

• 40% reported their vehicle had acted in a way that startled them or in a manner they did not expect

• 33% sought information to understand why their vehicle behaved the way it did
Bottom Line: Drivers Uncertain

While drivers had exposure to ALL of the technologies, there was significant uncertainty about all of them.
It’s All About Improving Safety

- NHTSA assigned the critical reason for crashes (the last event in the crash causal chain) to be the driver in 94% of crashes investigated.

- When we consider the top three factors in crashes: alcohol, speed and distraction - autonomous vehicles that are not drunk, reckless or distracted have the potential to impact preventable deaths in an unprecedented way.

Traffic deaths climb 8%
Highest one-year jump in 50 years

Active Safety Features May Provide Huge Potential Benefit!

• IIHS estimates:
  – 32% decrease in crashes
  – 21% decrease in injuries
  – 31% decrease in fatalities
If forward collision warning, lane departure warning, side view assist, and adaptive headlights were available in all cars.

• Boston Consulting Group estimates:
  – A reduction of 9,900 fatalities a year
Workplace Fatalities

• BLS Estimates:
  – Transportation deaths are leading cause of death in the workplace. 1,865 in 2013 – latest final BLS count.
  – Roadway incidents are highest in this category. 1,099 – this subcategory alone also would rank as the leading cause of workplace deaths.
Challenges

• Safety Features Have Different Brand Names
• Safety Features Have Different Capabilities across Manufacturers, Trim Levels and Time
• Safety Feature Limitations May Not Be Intuitive or Obvious
• Warning or Icon standardization issues
The Solution:

MyCarDoesWhat.org

Know More. Drive Safer.
What is MyCarDoesWhat?

• MyCarDoesWhat is the first of its kind – evidence based and independent.
• Vehicle Agnostic
• Partnership between University of Iowa and NSC
• Almost 6 billion exposures – U.S. population 18+
Website

BACK-UP CAMERA
ANTI-LOCK BRAKING SYSTEM
BLIND SPOT MONITOR
AUTOMATIC EMERGENCY BRAKING
LANE DEPARTURE WARNING
TIRE PRESSURE MONITORING SYSTEM
What You Can Do

• Suggest vehicles with “5-Star” ratings and advanced safety features
• Share MyCarDoesWhat.org with your members, drivers, staff, families – It is a trusted, credible, non-branded source
• Tell us what you think!
• Email alex.epstein@nsc.org
• Follow us Facebook, Twitter
VISION ZERO
nyc.gov/visionzero
Students against Destructive Decisions

The Nation's Premier Youth Health & Safety Organization

YOUR PARTNERS IN TEEN TRAFFIC SAFETY

Reaching teens through strategic partnerships
History

Founded
after suffering the loss of several students in separate, alcohol-related crashes in Wayland, MA

1981

Mission Expands
Student leaders request expansion of mission and a name change
Mission expands to address other issues that matter to teens.

1997

Teen Traffic Safety
Substance Abuse
Personal Health & Safety

Today
SADD’s network of 7,500+ chapters in middle, high schools and community organizations in 50 states

2016
OUR FIELD

7,500 + ACTIVE CHAPTERS
Student-led chapters in schools and community organizations in all 50 states

ADULT ADVISORS
Each chapter has at least one adult advisor to guide and facilitate the group

STATE COORDINATORS and AFFILIATES
Prevention professionals tasked with implementation of grants, growing the network, providing technical assistance and program support in their state
SADD AS A RESOURCE

PROGRAMMING
Develop and disseminate effective peer-to-peer programming, communications, and educational tools in our core areas of teen traffic safety, substance abuse, and personal health & safety issues

RESEARCH
Conduct relevant and cutting-edge research on teen behavioral health related to traffic safety to benefit teens, parents, educators, and the highway safety community

EXPERTISE
Ensure state level leaders have expert guidance to carry out their work, build strong relationships within the community, and implement an effective annual plan for SADD's partners in safety
This means we want to do what works! SADD programs now use evidence-based strategies and Countermeasures that Work to ensure that our efforts are going to end teen injury and death behind the wheel.

Each of our programs comes with an evaluation tool, which allows our chapters, our states, and our national team to look at the data and see what’s happening. Is this working? What should be modified?

To create some consistency, we launched what we call the SADD Strong programs. These are core programs and campaigns that we are asking all chapters to implement at certain times of the year to magnify the message and the impact across the country.
SADD Programs

ROCK THE BELT

IS IT WORTH THE RISK?

EMPOWERING TEENS

ENGAGING PARENTS

MOBILIZING COMMUNITIES

CHANGING LIVES

LONG HISTORY OF PEER-TO-PEER IMPAIRED DRIVING PROGRAMS

OVERVIEW GUIDE FOR Law Enforcement

Policy Task Force MANUAL

Student Activity GUIDE
Our Partnerships
Our Partnerships

FOUNDATION FOR ADVANCING ALCOHOL RESPONSIBILITY.ORG
Our Partnerships

- Toyota
- RADD
- State Farm
- GHSA
- Office of National Drug Control Policy
- Federal Motor Carrier Safety Administration
- National Sheriffs' Association
- NHTSA
- Ford Driving Skills for Life
- Ford
- Liberty Mutual Insurance
- The Clay Center for Young Healthy Minds
Why Involve Youth?

• Car crashes remain the leading cause of death for teens in the United States.

• Youth want to be a part of a positive solution!

• Leaders of today- not tomorrow!
How to Involve Youth?

• Partner with SADD at the local, state, or national level!

• Reach out to a local SADD chapter or other student group!

• Engage youth in the collation- ask us what we think. We may surprise you 😊
Alyssa Royce
National Student Leadership Council- Vice President
SADD, Inc.

201 Boston Post Road
Suite 202
Marlborough, MA 01752
(508) 481-3568
info@sadd.org

SADD.org
Child Seat Test Program

Emily A. Thomas, PhD
Automotive Safety Engineer

Vision Zero Fleet Safety Forum
November 29, 2016
Consumer Reports Auto Test Center
Leading the Charge to Protect Our Most Vulnerable Consumers: 1972-Present

• 1970: NHTSA adopts 1st federal safety standard for child seats – FMVSS 213 (not a dynamic crash test)

• 1972: Consumer Reports publishes child seat crash test results for the 1st time – 12 out of 15 seats deemed “Not Acceptable”
Leading the Charge to Protect Our Most Vulnerable Consumers: 1972-Present

- 1972-1977: Consumer Reports tests child seats 4x with dynamic sled tests
- 1974: NHTSA submits Notice of Proposed Rulemaking (NPRM) for FMVSS 213 to include dynamic crash test
- 1979: NHTSA adds Final Rule for FMVSS 213 to include 30 mph simulated frontal crash effective January 1, 1981
Leading the Charge to Protect Our Most Vulnerable Consumers: 1972-Present

• 1995: Consumer Reports deems 3 child seats as “Not Acceptable” (poor crash performance)
  – 1 manufacturer issued voluntary recall
  – 1 manufacturer implemented replacement buckle design to remedy the problem

• 2008: Child Restraint testing moves to CT Auto Test Center & CPS Techs conduct testing

• April 2014: Consumer Reports releases new child seat crash test protocol
  – Updating sled test environment & crash pulse

• October 2014: NHTSA submits NPRM to upgrade FMVSS 213 bench and pulse
  – Awaiting Final Rule
FMVSS213 vs. CR Crash Test

Soft, thick cushion
Excursion/back angle requirement
30mph acceleration pulse
Minimum standard/compliance test

Cushion from actual vehicle
Simulated front seatback
35mph acceleration pulse
Comparative ratings for Consumers
Messaging to Drive the Future
Crash Protection Benefit: Load Leg

Consumer Reports:
- 4 infant seats rated “BEST” for crash protection
- Reduced head injury risk by 46% compared to seats without load leg (CR crash testing)

Government Limitation:
- Seats need to comply without using load leg → 213 sled lacks a floor

Industry Limitation:
- Can’t use load leg in some vehicles → floors with hatches can’t withstand additional forces

![2017 Chrysler Pacifica with Stow ‘n Go seats]

**WARNING!**
Do not install a rear-facing car seat using a rear support leg in this vehicle. The floor of this vehicle is not designed to manage the crash forces of this type of car seat. In a crash, the support leg may not function as it was designed by the car seat manufacturer, and your child may be more severely injured as a result.
Head Contact: Rear-facing Only vs. Convertibles

- Our tests showed greater frequency of head contact with 12 month dummy in rear-facing infant seat than with rear-facing convertible
  - Infant seats: 16 of 30 (excludes those with structural issues)
  - Rear-facing convertible seats: 1 of 23

- New advice: **Switch to rear-facing convertible no later than 1st birthday**
Child Seat Timeline

- Our updated Real Child Seat Timeline reflects the recommendation to switch from infant seat to rear-facing convertible seat **no later than** 1st birthday

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<td>Convertible Rear-Facing</td>
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<td>Belt-Positioning Booster</td>
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</table>

Darker areas indicate recommended use periods
Lighter areas indicate transition periods
HOT CARS Act

(Helping Overcome Trauma for Children Alone in Rear Seats)

- Vehicle integrated reminder system to alert driver if child is left unattended
- Requires DOT to issue final rule within 2 years
- Consumer Reports has signed in support of proposed bill
  - On record: Integrated reminder systems would be most effective and life-saving
  - Evaluated Evenflo SensorSafe (child seat integrated) and GMC Acadia Rear Seat Reminder (vehicle integrated)
Thank you!

Questions?
Contact:
Jennifer Shecter
Director,
Content Impact & Corporate Outreach
externalrelations@cr.consumer.org
VISION ZERO
nyc.gov/visionzero
SAFE KIDS WORLDWIDE™

Protecting kids from preventable injuries
Our Mission

We work to keep all kids safe from preventable injuries
About Us

• A global leader in childhood injury prevention, saving children’s lives for almost 30 years.

• Recognized as the most influential childhood injury prevention organization in U.S. and worldwide and the most quoted in news outlets.

• Unites parents, communities and corporations to prevent childhood injuries on the road, at home and at play.
How We Work

**RESEARCH**
Collect and analyze data and measure impact

**PROGRAMS**
Reach parents, caregivers, educators and kids

**AWARENESS**
Deliver consistent, compelling messaging

**ADVOCACY**
Advocate for new and improved laws
A grassroots collaboration of individuals and organizations supported by a “lead agency” in a community that conducts multifaceted childhood injury prevention efforts.

Safe Kids Worldwide has over 400 coalitions in the United States.
Safe Kids Worldwide provides resources to deliver community programs.

Our Work

- **Road Safety**
  - Child Passenger Safety
  - Teen Driving
  - Pedestrian
  - Bike/Motorcycle
  - Distraction

- **Home Safety**
  - Fire, Burns, CO
  - Poisoning
  - Suffocation
  - Falls
  - Drowning
  - Medication

- **School & Play**
  - Sports Safety
  - Water Safety
  - Pre-K Start Safe

**Emerging Issues**
e.g. Button Battery; TV Tipovers; Laundry Packets
Our Partners

Road Safety

Honeywell

McNeil

Nationwide

Kidde

Consumer Technology Association

P&G

SANUS

Home Safety

School & Play

Founding Sponsor

Johnson & Johnson

Bell

Children’s Motrin

GM
Chevrolet

FedEx

DENSO

Safety 1st

britax

GRACO

State Farm

UBER

NHTSA
Our Reach

MEDIA IMPRESSIONS
16,750,000,000
(2015)

FACEBOOK FANS
1,279,922
(as of 11/28/16)

TWITTER FOLLOWERS
72,064
(as of 11/28/16)
ROAD SAFETY
Pedestrian Safety

**Challenge:** Road crashes are a leading cause of death around the world.

**Response:** Safe Kids teaches safe behavior to motorists and child pedestrians to create safer, more walkable communities

- *Walk This Way* is currently implemented in Brazil, Canada, China, India, South Korea, Philippines, South Africa, Thailand, United States and Vietnam
- Annual research report – e.g. *Alarming Dangers in School Zones*
- Awareness – International Walk To School Day
- Education and Needs Assessment - Take Action Against Distraction
- Environmental Improvements – Creating Safer School Zones

**Program Reach to Date:**

- Annually, the program reaches more than **1.3** million children in **2,500** schools globally
Buckle Up Program

Challenge: 3,045 children die each year in car crashes in the United States.

Response: Multi-dimensional program to prevent motor vehicle related injuries to kids.

- **Buckle Up**, Safe Kids’ signature child passenger safety (CPS) program launched in the United States 20 years ago
- Annual research report- e.g. *Reducing Risks for Teen Drivers*
- Educational outreach and support
- Parent-friendly tips and resources – e.g. The Ultimate Car Seat Guide
- Annual national awareness campaign- CPS Week
- Advocacy for stronger laws in the U.S. and global road safety

Program Reach to Date:

- **99,815** car seat check up events hosted
- Nearly **2** million car seats checked
- **698,620** car seats distributed
Priorities in 2017

Pedestrian Safety Program
- Education and Awareness in School Zones

Buckle Up Program
- Protecting Teen Drivers and Passengers
- Reaching Multicultural and Diverse Communities

Distraction
- Reinforcing Our Primary Message of Buckle Up with ALL Passengers
How You Can Get Involved

Find Your Safe Kids
• Connect with your community and join the people who truly care about keeping kids safe.

Share Our Resources
• Help spread the word by printing our tip sheets and sharing them at community events, schools, child care centers or in neighborhoods.

Partner With Us
• Become a trusted partner and champion to help us innovate and improve how we reach parents, caregivers and kids.

Take Action
• Support legislation that affects how leaders approach important issues relating to child safety.
Make **every** kid a **safe** kid.

Torine Creppy  
Chief Program Officer  
Tcreppy@safekids.org

For more tips, facts, and background information visit [www.safekids.org](http://www.safekids.org)
So you want to drive in the city:
Do you have the vision of an athlete?

Daniel M. Laby, MD
Associate Professor, SUNY College of Optometry
Director, Sports and Performance Vision Center
Disclosure

• I have a financial interest in the EVTS system.
• I have no financial interest in any of the other systems presented in this discussion

• I am honored to have been part of 4 World Series Championship and 1 American League Championship teams
Background ...

- Sports Vision research begun in 1992 at UCLA with the LA Dodgers

- Teams: **LA Dodgers**, LA Kings, NY Mets, St Louis Cardinals, **Boston Red Sox**, **Tampa Bay Rays**, **Cleveland Indians**, NY Yankees, **Houston Astros**, **Chicago Cubs**, Boston Celtics, US Olympic team, Boston College ... Professional race car drivers

- Currently Associate Professor, SUNY Optometry

- Director – Sports and Performance Vision Center
SUNY College of Optometry
33 West 42nd Street, New York, NY
Web: WWW.SUNYOPT.EDU/SPORTSVISION
dlaby@sunyopt.edu    Tel: 866-697-9222
Some data and facts ...

• NY State Department of Motor Vehicles: 15,182 Pedestrians involved in accidents
• NYC 2012 data: 148 of 274 (54%) traffic related deaths were Pedestrians
• 2013: 173 Pedestrians struck and killed
• 80% survival rate if hit by vehicle at 30 mph
• 30% survival rate if hit by a vehicle at 40 mph
• Manhattan: 1.00 injured pedestrian per million miles traveled for all vehicles, in other boroughs 0.60 pedestrian per million miles (1.5X more dangerous in Manhattan)
Vehicles on the road in NYC

- ~2.7 Million vehicles enter NYC each day
- ~29,000 vehicles are NYC/DCAS
- ~13,500 medallion taxis in NYC
- ~40,000 for hire Black/Luxury vehicles

Goals:
  - Develop common accident tracking and training offerings across all agencies
  - Improve fleet reporting and metrics
Statistical Summary

- Anything above zero Pedestrians killed is too much
- In NYC, more than half of all traffic deaths were Pedestrians
- Survival rate for Pedestrians plummets with increased speed
- Increased risk of being struck in Manhattan (1.5 X)

DANGER
Driving is similar to athletic competition

• In sports competition, **athletes are at their best** to perform optimally and hopefully bring home the gold medal.

• In driving there are no gold medals, the equivalent is reaching one’s destination safely.

• This doesn’t happen by “accident” and also requires a good deal of training, experience and focus on the task (of driving).

• **Athletes who do not perform well do not remain on the competitive team, drivers who do not perform well simply keep driving ...**
Current visual requirements to drive in NY

- Vision in one eye of at least 20/40.  \(20/40\) vs. 20/20 vs. 20/8
- Current requirements use high contrast, infinite viewing time, stationary target ... Far removed from the vision demands encountered while driving
- In sports we are not happy with minimal ability (20/40), but strive for maximal ability to aid performance – why are we satisfied with 20/40 vision on an unrelated test of vision?

Vision requirements & restrictions

You must pass a vision test when you apply for a driver license or to renew your license. The test must show that you have visual acuity of at least 20/40 (based on the Snellen Visual Acuity Scale) in either or both eyes, with or without corrective lenses.
Visual Challenges in the big city

- Targets often of small size, low contrast and brief viewing time
- Constantly moving targets require efficient eye-hand and eye-foot coordination
- Need to track multiple objects simultaneously
Snellen Chart vs. Real World Vision
Scientific Literature - Acuity

- Reduced vision (+2.00 D blur) resulted in delayed hazard response times as well as changes in eye movement patterns while driving.
- Both Blur and Distraction independently resulted in delayed hazard response times.
- Noted decrease in number of fixations and duration of fixations in blur groups.
- Wood et al report “Drivers’ ability to recognize pedestrians at night is degraded by common visual impairments, even when the drivers’ mean visual acuity meets licensing requirements.”
EVTS – Acuity/Contrast/Exposure time

- MLB study (580 unique MLB players) of top 20% visually vs bottom 20% ... Top 20% had:
  - 57% **better** miss percent score
  - 74% **fewer** missed fastballs in the zone score
  - 52% **less** chasing pitches out of strike zone
  - 31% **better** in-zone fastball swing percentage
  - 64% **better** walk rate (number of at-bats before gaining a walk)
    - 18 at-bats vs 6.5 at-bats before gaining a walk
    - For 610 at-bats, this translates into an additional 20 runs for the season
Eye-Hand Coordination
Scientific Literature – Eye/Hand Coordination

• **Brief interruption** of vision **effects** a driver’s ability to resume appreciation of a pre-cued hazard.

• Report suggests that even **when the driver resumes looking at the road in front, they have a decreased sensitivity for coming hazards** as compared to those who did not look away.

• Authors note that drivers who are even momentarily distracted or are no longer viewing the road are at risk of **missing important information even after they return to viewing** the roadway.

• **False sense of security**: Drivers who looked away felt driving was “easier” than those drivers who did not look away and felt the same drive was more “difficult”.

Eye-Hand Coordination in Baseball

Better H/E coordination group had:

- Three fewer at bats before gaining a walk (10.28 vs 13.11, 22% increase (percent change = 100*((mean Bot-Mean Top)/Mean Bot)))
- Missed 15% less fast-balls in the strike zone (0.094 vs 0.080)
- Chased 12% fewer fast-balls out of the strike zone (0.152 vs 0.134)
- Missed on swings 8% less often (0.232 vs 0.212)

The pooled standard deviation is used to calculate the intervals.
Concentration/Multiple Object Tracking
Scientific Literature – “MOT”

• Thought to be integral to visuo-motor coordination and driving (Feria, 2008; Horowitz et al., 2007; Kunar, Carter, Cohen, & Horowitz, 2008; Trick, Enns, Mills, & Vavrik, 2004)

• Multiple-object tracking performance decreases with age (Trick, Perl, & Sethi, 2005)

• multiple-object tracking predicts road-test performance in older drivers (Bowers et al., 2013)
Multiple-object tracking while driving: the multiple-vehicle tracking task

Martin J. Lechman - Lina M. Erik

Published online: 16 June 2014
© The Psychonomic Society, Inc. 2014

Abstract: Many current car driving and automobile research involve multiple-object tracking. In this study, we have tested this idea, and it is unclear how multiple-object tracking would coordinate with other activities involved in driving. To address some of the initial and most basic questions about multiple-object tracking while driving, we modified the task for use in a driving simulator, removing the multiple-vehicle tracking task. In Experiment 1, we employed a dual-task methodology to determine whether there was interference between tracking and driving. Findings suggest that although it is possible to track multiple vehicles while driving, driving reduces tracking performance, and tracking components interfere and often produce a negative effect on driving. Modified attention-deficit paradigms were used to assess whether there was negative tradeoff between tracking and driving. Findings suggest that although it is possible to track multiple vehicles while driving, driving reduces tracking performance, and tracking components interfere and often produce a negative effect on driving. Modified attention-deficit paradigms were used to assess whether there was negative tradeoff between tracking and driving. Findings suggest that although it is possible to track multiple vehicles while driving, driving reduces tracking performance, and tracking components interfere and often produce a negative effect on driving.

Keywords: Object-based attention - Perception and attention - Dual-task performance - Driving - Multiple-object tracking

The multiple-object tracking task (Pylypow & Driver, 1990) was originally devised to test a hypothetical mechanism proposed to interact small number of visual items at once (targets) and monitor their independent positions as they moved among other identical items (information). This tracking mechanism was thought to be integral to visual attention (Pylypow & Driver, 2005), and in the basic research, many have argued that multiple-object tracking is critical to driving an automobile (e.g., Fata, 2009; Henseke et al., 2005; Kuiper, Caste, Cohen, & Henseke, 2005; Hoek, Giezendanner, & Verbruggen, 2005). However, although tracking has been studied for over 25 years, there has never been much interest in multiple-object tracking among those who actually do driving research, and there are no investigations of the topic in the literature. In fact, it is not even clear whether it is possible to perform multiple-object tracking while driving or whether there are any advantages or disadvantages to tracking while driving. In this article, we present a series of studies (Experiments 1-3) investigating multiple-object tracking while driving in a driving simulator environment, focusing on the importance of a driving task. In the studies that follow, we will begin with a brief summary of the tracking literature as it relates to driving and then go on to describe the experiments.

When multiple-object tracking was first studied, Pylypow and Driver (1990) proposed that it relies on a mechanism that assigned mental labels to a small number of target objects at once (time to finish is most salient). The mechanism allowed people to attend to and track a small number of moving objects (targets) among others with similar properties, even if the objects’ properties and positions changed from

Fig. 2 Percentages of correctly identified targets in tracking in the single-tracking only and dual-task (tracking + driving) conditions. Standard error bars are included.
Basketball: MOT and Concentration

**Visual Tracking Speed Is Related to Basketball-Specific Measures of Performance in NBA Players**


**Abstract**


**Introduction**

In professional basketball, each position has a predefined strategic role where aptitude is measured by game-related metrics of productivity (3,15). The ability of a specific player to meet the demands of their role is considered to be a function of several physiological, visual-motor reaction speed, and perceptual-cognitive capabilities (2,12,29,30). To date, however, only one study has related player-specific characteristics to game-related performance measures in professional basketball players (2). McGee et al. (2) reported that stability, agility, and flexibility were associated with minutes played, assists (AST), rebounds, blocked shots, and steals (STL) per game. However, the specific role of visual-motor reaction speed and perceptual-cognitive capabilities to game-related measures of performance in professional basketball players are unknown.

Although generally unique, a clear distinction of how visual-motor reaction speed and perceptual-cognitive capabilities affect athletic performance does not exist. Visual-motor reaction speed is measured as the length of time necessary to complete a motor task in response to a stimulus (1,12,15). Perceptual-cognitive abilities are defined as the ability to efficiently and accurately respond to the movement patterns of several key components within a dynamic environment.
MOT and Concentration: Benefit of Training in Soccer
Improved City Driving Performance

- Apply knowledge learned from Sports Vision to driving
- Determine tasks critical to driving and treat drivers as athletes – in terms of visual ability
- Willingness to move beyond basic 20/40 standard, to level of visual function needed to make roads safer
- Apply higher level visual and integrative abilities (H/E coordination and MOT) to further enhance safety
- Correction and Training possibilities
“What we know is a drop, what we don’t know is an ocean”

- Sir Isaac Newton
Together for Safer Roads: Advancing Road Safety Best Practices for Companies and Their Fleets

Vision Zero Fleets Safety Forum
November 29, 2016
A Life and Death Issue

Road safety is a critical global public health challenge and a barrier to human development and economic growth.

Road crashes are rising to the 7th leading cause of death by 2030 and already cost the world USD $518 billion a year.

**EVERY YEAR**
on the world’s roads

1.25 MILLION people die and
50 MILLION people are injured

**EVERY DAY**

500 children die

**EVERY MINUTE**

2 people die

Five Pillars to Solving the Problem

The United Nations General Assembly proclaimed the **Decade of Action for Road Safety 2011-2020** in a landmark resolution co-sponsored by 100 countries.

1. **PILLAR 1** - Road Safety Management
2. **PILLAR 2** - Safer Roads and Mobility
3. **PILLAR 3** - Safer Vehicles
4. **PILLAR 4** - Safer Road Users
5. **PILLAR 5** - Post-Crash Response
TSR’s Vision

A world where roads are safer for all people.
Working together, we aim to **bend the curve on road traffic collisions**, so they are no longer one of the leading causes of death and injuries worldwide.

**Action • Collaboration • Engagement**
TSR’s Goals

To create a measurable and sustainable impact in road safety through results-driven initiatives by:

• Leveraging member companies’ collective intellectual capital and expertise to advance best practices for companies and their fleets;

• Addressing strategic road safety challenges in select locations by working with local government and stakeholders;

• Identifying actionable insights through data collection and management to advance innovative solutions; and

• Collaborating with the broader road safety community to be the leading voice for the private sector.
Together in 2016, member companies engaged more than 1 million people across 45 countries on how to be safer road users.
Launch Three Safer Roads Challenges

Support safer roads in:

- Atlanta, Ga., United States
- São Paulo, Brazil
- Shanghai, China
Global Imperative for the Private Sector

Working with TSR’s independent Expert Panel to make the role the private sector can play in road safety a **global imperative**.
Best Practices for Companies and Their Fleets

Leveraging member companies’ collective insights, TSR created **best practice guidelines** for developing and managing transportation programs.
Pillar 1 – Road Safety Management

• Institute safe transportation policies
  o Use Motor Vehicle Safety (MVS) Policy

• Manage external contractors
  o Appoint contractors
  o Influence vendors
  o Set road safety standards

• Collect and analyze data
  o Perform data collection on company vehicles and drivers
  o Conduct review and analysis
  o Establish baseline on driver behavior
  o Share and report data
Pillar 2 – Safer Roads and Mobility

• Plan journeys
  o Set realistic schedules
  o Account for speed limits, rush hour, other possible hold ups
  o Schedule multiple drivers on long journeys

• Map hazardous routes
  o Avoid residential communities and areas with heavy foot traffic
  o Avoid areas with steep hills, sharp turns, poor road conditions, etc.
  o Develop a Journey Management Plan (JMP)
Pillar 3 – Safer Vehicles

• Create vehicle selection criteria
  o Tailored to specific task
  o Equipped with standard and functioning safety requirements

• Maintain and service vehicles
  o Vehicle inspections
  o Servicing and vehicle turnover
  o Reporting on malfunctions
Pillar 4 – Safer Road Users

- Develop a safety culture
- Assess drivers’ skills and qualifications
- Establish driving guidelines and key performance indicators
- Train, educate, and develop drivers
- Monitor drivers
Pillar 5 – Post-crash Response

- Prepare for post-crash scenarios
  - Equip truck with first aid kits
  - Train drivers on administering first aid

- Report and investigate incidents
  - Create policies and procedures for reporting
  - Set deadline for reporting
Access the Report Online

www.TogetherforSaferRoads.org
Get Involved Today

Facebook.com/togetherforsaferroads

Linkedin.com/company/together-for-safer-roads

Twitter.com/TSRcoalition

Youtube.com/user/tsrcoalition

www.TogetherforSaferRoads.org

Contact us at info@togetherforsaferroads.org.
Thank you.
Vehicle Automation: Its Role in Fleet Safety

by

Alain L. Kornhauser, PhD

Professor, ORFE
(Operations Research & Financial Engineering)
Director, CARTS
(Consortium for Automated Road Transportation Safety)
Faculty Chair, PAVE
(Princeton Autonomous Vehicle Engineering)

Princeton University

Presented at

November 29, 2016
Queens Theater
Corona Park, NY
Making Sure We Are Using the Same Terminology...

• Lots of confusion... ‘Connected’; ‘Autonomous’, ‘Automated’, ‘4 NHTSA Levels’ ‘5 SAE Levels’...

• Only 3 kinds:
  – ‘Safe-Driving ... (Cars, Trucks or Buses)’
    • Always on Automated Emergency Braking & Lane Centering
    • Delivers Safety
  – ‘Self-Driving ... (Cars, Trucks or Buses)’
    • Safe-Driving + Sometimes Capable / User Choice: Hands-Off &/or Feet-Off
    • Delivers User Convenience + some Environmental Benefits
  – ‘Driverless ... (Cars, Trucks or Buses)’
    • Safe-Driving + Always: Hands-Off, Feet-Off
    • Delivers Fleet Productivity + Environmental Benefits
Why should Fleets be Focused on ‘Safe-Driving …’???

• They ‘Bail out’ Drivers when they do something ‘stupid’...
• We already accept some of this automated technology...
  – Anti-lock Brakes
  – Electronic Stability Control

Both: Override the driver and “Do the right thing”
Why should Fleets be Focused on ‘Safe-Driving Cars’???

• They ‘Bail out’ Drivers when they do something ‘stupid’…
• We already accept some of this…
  – Anti-lock Brakes
  – Electronic Stability Control
  – Extend these to…
    • Don’t run into things
  – These Must Work much better than they have been…
<table>
<thead>
<tr>
<th>Speed reduction (mph)</th>
<th>12 mph test</th>
<th>25 mph test</th>
<th>Forward collision warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 5</td>
<td>0</td>
<td>0</td>
<td>n/a</td>
</tr>
<tr>
<td>5 to 9</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10 or more</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>less than 5</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5 to 9</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10 to 21</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>22 or more</td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Speed reduction in 12 and 24 mph tests**

- **Volvo S60**
  - 2 point advanced
- **Dodge Durango**
  - 3 point advanced
- **Subaru Outback**
  - 6 point superior
<table>
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<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

- **25 mph**: $28,131
- **12 mph**: $5,715
<table>
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<tr>
<th></th>
<th>12 mph test</th>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**2014 Infiniti Q50**

**Speed reduction**

- 7 mph

**2015 Subaru Legacy**

- 6 mph

**2014 Volvo S80**

- 4 mph
Summary of technology effects on insurance claim frequency

Results pooled across automakers

-20%  -15%  -10%  -5%  0%  5%  10%

-20%  -15%  -10%  -5%  0%  5%  10%

forward collision warning  fcw with autobrake  adaptive headlights  lane departure warning  side-view assist (blind spot)

Collision  Property Damage Liability  Bodily Injury Liability
Why should Fleets be Focused on ‘Safe-Driving Cars’???

• They ‘Bail out’ Drivers when they do something stupid..

• We already accept some of this...
  – Anti-lock Brakes
  – Electronic Stability Control
  – Extend these to...
    • Don’t run into things
    • Don’t depart from the lane unless you signal
    • No Crazy speeding
Why should Fleets be Focused on ‘Safe-Driving Cars’???

• They ‘Bail out’ Drivers when they do something stupid..
• We already accept some of this...
  – Anti-lock Brakes
  – Electronic Stability Control
  – Extend these to...
    • Don’t run into things
    • Don’t depart from the lane unless you signal and it is safe
    • No Crazy speeding

• Should be able to reduce Collisions by > 50%
  – Make real progress towards VISION ZERO
  – Print $$$$$
Fleet Example from Transit Industry...
## 2013 Nationwide Bus Casualty and Liability Expense

Source: FTA NTD

| Casualty and Liability Amount | Vehicle-related | 119 Fatalities  
15,351 Injuries |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>80,795 Buses</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Casualty and Liability Amount Per Bus $6,187/Bus/Year

Print $$$$$ Fleet Example from Transit Industry...
### 2013 Nationwide Bus Casualty and Liability Expense

**Source:** FTA NTD

<table>
<thead>
<tr>
<th>Casualty and Liability Amount</th>
<th>Vehicle-related</th>
</tr>
</thead>
<tbody>
<tr>
<td>119 Fatalities</td>
<td>$499,872,628.</td>
</tr>
<tr>
<td>15,351 Injuries</td>
<td></td>
</tr>
</tbody>
</table>

**Total Buses**

- Commuter Bus (CB), Motor Bus (MB), Bus Rapid Transit (RB), Demand Responsive (DR)
- **80,795**

**Sub-Total Casualty and Liability Amount Per Bus**

- **$6,187/Bus/Year**
Print $$\equiv$$

Bottom Line...

Fundamental Business Model:

Cost of ‘Safe-Driving ... (Cars, Trucks or Buses)’ Technology

<

Present Value {Expected Liability Savings over life of the ...}

• It Prints $$\equiv$$ & Makes a Dramatic Move Towards Vision Zero

• All by just adopting near-term ‘Safe-Driving ... (Cars, Trucks or Buses)’ Technology
Discussion!

Thank You

alaink@princeton.edu

www.SmartDrivingCar.com
Toyota Safety Sense™
Overview
TSS is a Driver’s Partner for a Safer World

TOYOTA has developed TSS to be “a driver’s partner in an injury-free environment.”
11 models received 2016 IIHS Top Safety Pick +

To qualify for 2016 Top Safety Pick+, a vehicle must earn good ratings in the five crashworthiness tests and an advanced or superior rating for front crash prevention.
FOCUS ON THE THREE MOST COMMON CAUSES OF ACCIDENTS
Frontal Collisions
Unintended Lane Departures
Night Visibility
Accidents
Toyota’s Response: Toyota Safety Sense™

MULTIPLE ACTIVE SAFETY TECHNOLOGIES

- Pre-Collision System
- Pedestrian Pre-Collision System
- Auto High Beam
- Lane Departure Alert
- Dynamic Radar Cruise Control

SUPPORTS COLLISION AVOIDANCE AND DRIVER AWARENESS
Two TSS Systems

TSS-C
Compact models

TSS-P
Mid-sized models
Large models
“Toyota will begin to include the *Lexus Safety System+™* and *Toyota Safety Sense™* packages, anchored by automatic emergency braking (AEB), on almost every new vehicle by the end of 2017. **26 out of 30 models**

- Earlier than ANY automaker
- 4 years ahead of NHTSA’s target

- Bill Fay  
  General Manager, Toyota Division  
  Toyota Motor Sales
• Pre-Collision System (PCS)
• Automatic High Beams (AHB)
• Lane Departure Alert (LDA)

TSS-C Compact Models
Pre-Collision System (PCS) on TSS-C

Provides warning & automatic braking for possible collisions with a preceding vehicle

- Alerts approx. 7-85 MPH
- AEB approx. 7-50 MPH
Automatic High Beams (AHB) on TSS-C and TSS-P

Automatically switches between high and low beams

• Speeds over 25 MPH
Lane Departure Alert (LDA) on TSS-C

- Warns driver when vehicle is about to deviate from a visibly marked lane
  - Speeds over 32 MPH
- Pre-Collision System (PCS) with Pedestrian Detection function
- Automatic High Beams (AHB)
- Lane Departure Alert (LDA) with Steering Assist function*  *EPS models
- Dynamic Radar Cruise Control (DRCC)
Pre-Collision System with Pedestrian Detection (PCS w/PD) on TSS-P

Provides warning & automatic emergency braking for potential collisions with a preceding vehicle or a pedestrian.

**Vehicle**
- Alerts approx. 7-110 MPH
- AEB approx. 7-110 MPH

**Pedestrian**
- Alerts approx. 7-50 MPH
- AEB approx. 7-50 MPH
Along with alerts, provides a slight Steering Assist

- Speeds over 32 MPH
Dynamic Radar Cruise Control (DRCC) on TSS-P

D.detects speed & distance of vehicle ahead and adjusts speed accordingly

- Approx. 25-110 MPH
Full-Speed Range Dynamic Radar Cruise Control (DRCC) on 16MY/17MY Prius & Prime

- Approx. 0-110 MPH
MID Screens
GLOBAL VEHICLE SAFETY MISSION STATEMENT
SET A NEW STANDARD FOR CUSTOMER SAFETY - WITH THE CUSTOMER AT THE CENTER OF EVERYTHING WE DO

“Quality and safety – both customer and workplace – are foundational commitments, never compromised. We’ve also made a clear commitment to become the industry leader in workplace and vehicle safety, and we are working diligently and making steady progress toward achieving this goal.”

CHAIRMAN & CEO MARY BARRA
May 10, 2016
TRAFFIC SAFETY FACTS: US

PER YEAR
32,675 DEATHS
2.3 MILLION INJURIES
6.1 MILLION CRASHES

94% of CRASHES related to HUMAN ERROR/CHOICE

RISKY BEHAVIORS | ODDS OF CRASH ARE
--- | ---
HANDHELD CELL PHONE TEXTING AND DRIVING | 5.9 TIMES HIGHER
DROWSY DRIVING | 3.4 TIMES HIGHER
EMOTIONALLY IMPAIRED DRIVING | 10 TIMES HIGHER
SPEEDING | 14 TIMES HIGHER
DRUG/ALCOHOL IMPAIRED DRIVING | 36 TIMES HIGHER

GM
GLOBAL VEHICLE SAFETY
GM GLOBAL CONTINUOUS SAFETY STRATEGY

GENERAL MOTORS
OUR CUSTOMERS’ SAFETY DRIVES EVERYTHING WE DO
GM’S CONTINUOUS APPROACH TO SAFETY

AVOIDING CRASHES
These technologies alert drivers at the risk of a collision. Front and Rear Automatic Braking actually intervene to help avoid a crash.

- Front Automatic Braking
- Forward Collision Alert
- Lane Keep Assist
- Lane Departure Warning
- Lane Change Alert
- Rear Cross Traffic Alert

Strong body structures create a protective “safety cage” around occupants.

Special glass collapsible pedals and steering columns, seat belts and pretensioners, and strategically located air bags help save lives.

With OnStar, our vehicles know when they have been in a crash.

**Not all vehicles may transmit all crash data. Subscription Service Agreement required.**
THE ATMA™ (THE AUTONOMOUS TMA)

*NO DRIVER NEEDED

THE NEXT GENERATION OF SAFETY

PRESENTED BY:

ANDREW ROBERTS
STRATEGIC ACCOUNT DIRECTOR

ROYAL TRUCK & EQUIPMENT, INC.

ATMA AS SEEN IN

INSIDE EDITION
CBS NEWS
NBC
BUSINESS INSIDER
HUFFINGTON POST
MSN
ÚBERGIZMO
YAHOO! NEWS
DISCOVERY CHANNEL
MARKETWATCH
WHO IS ANDREW ROBERTS?

- Has worked as Royal Truck & Equipment’s Strategic Account Director for 4 years
- Has presented to over 40 DOT agencies throughout the U.S. about TMA Truck best practices
- Heads up the Autonomous Research and Outreach Group within Royal Truck & Equipment
- Manages all Government-related activity for Royal
- Travels as Royal’s spokesperson for the new Autonomous TMA Truck
- Is an industry-expert when it comes to TMA Truck safety

- Is America’s largest manufacturer of TMA Trucks
- Owns over 80,000 sq. ft. of facility space to manufacturer trucks
- Has won 5 awards all relating to innovation and safety:
  1. 2011 ATSSA Innovation Award
  2. 2014 ARTBA Innovation in Technology
  3. 2014 ATSSA Innovation Award
  4. 2015 ARTBA Innovation in Technology
  5. 2016 Best of Coopersburg Awards – Transportation Manufacturers

- Founder of the world’s only Autonomous TMA Truck (launched in August of 2015)
- All of Royal’s initiatives contribute to Royal’s position as the industry leader in TMA trucks by producing trucks with the highest efficacy for keeping construction zones safe, and providing the greatest liability protection available for customers.
THE TMA INDUSTRY IN AMERICA

20,000* TMAs nationwide ➔ most not built to industry standard

*ONLY the TMA Trucks in shadow operations would use the autonomous technology

As states adopt MUTCD build standards, TMA Truck usage increases

Growth in TMA usage is in line with infrastructure spending

Currently working on industry best for autonomous lane accuracy (centimeters not inches)
INTRODUCING THE NEXT GENERATION OF SAFETY

A SELF-DRIVING (AUTONOMOUS) TMA

THE ATMA

- GPS WAYPOINT NAVIGATION
- REMOTE CONTROL DRIVING
- LEADER/FOLLOWER
How does it work? The vehicle kit

1. The vehicle control module
   - Converts manned vehicle into unmanned system

2. The steering ring
   - Short installation times

3. The actuators
   - Modular design
**MARKET INTRODUCTION**

- **Vehicle Control Module**
- **Steering Ring**
- **Actuators**

- Demonstrated a **working prototype** to Florida DOT officials.
- June 2015 - Made a presentation about this revolutionary product to Federal DOT officials at the AASHTO Intermodal Conference in Cheyenne, Wyoming.
- April 2016 – Demonstrated first ATMA demo to international company outside of Europe.
THE WORLD'S FIRST AUTONOMOUS TMA TRUCK
In memory of Allison Liao
and all those who have lost their lives to traffic violence.

End distracted, rushed and angry driving
Sign the #SafeDriverPledge »