



**NIOSH Center for
Motor Vehicle Safety**

Occupational Motor Vehicle Safety: Engineering and Technology-Based Research

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Presentation outline

- Center for Motor Vehicle Safety (CMVS) overview
- Current and future engineering work
- CMVS midcourse review: Engineering/technology results and future directions
- Complementary work with partners



What we do

The CMVS conducts research and develops recommendations to prevent work-related motor vehicle crashes and resulting injuries.

✓ **Knowledge**

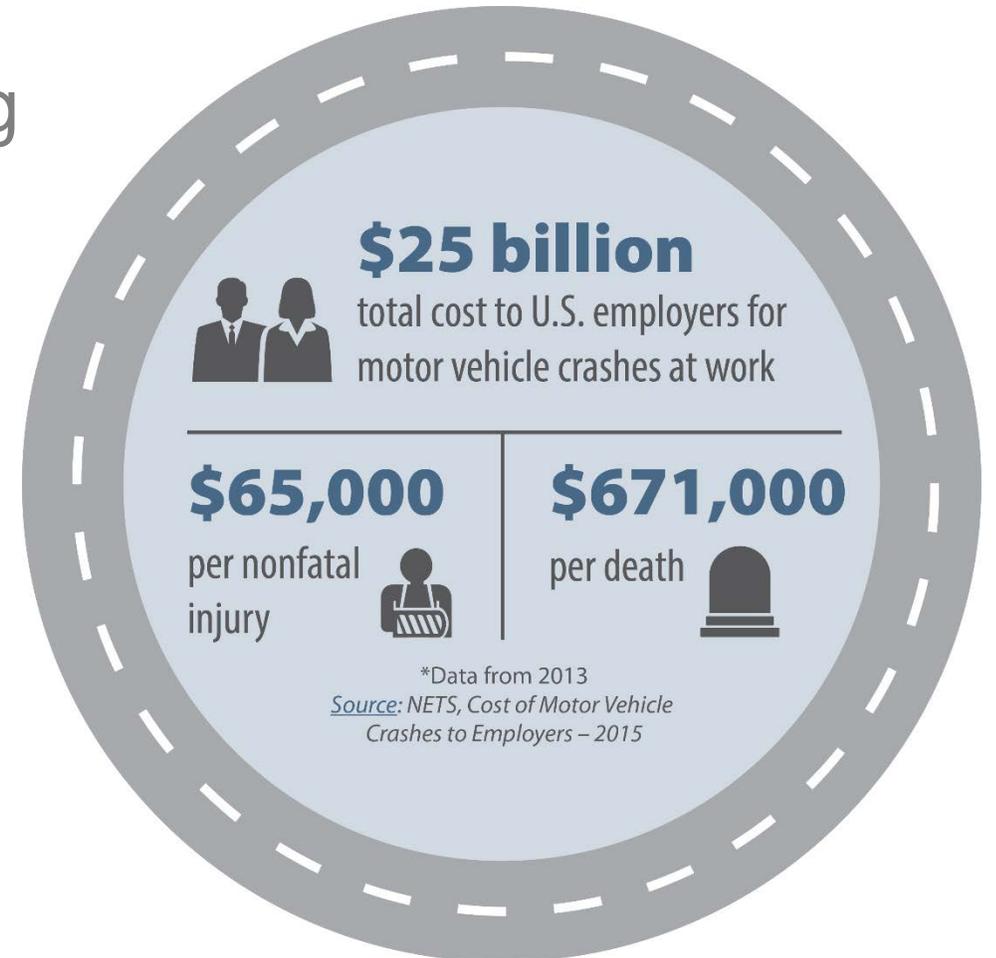
✓ **Policy**

✓ **Partnerships**

✓ **Communication**

Why we do it

- Motor vehicle crashes are the leading cause of U.S. work-related deaths.
- Over 23,000 deaths 2003-2015
- 1st or 2nd leading cause of death in every major industry group



CMVS strategic goals 2014-2018

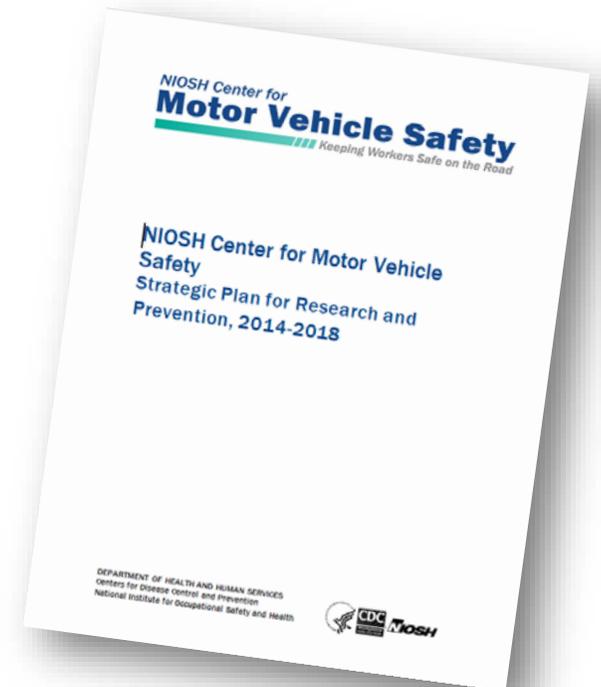
Goal 1: Identify risk factors for work-related crashes

Goal 2: Apply engineering and technology-based safety interventions

Goal 3: Promote evidence-based policies and practices

Goal 4: Share NIOSH research with global partners

Goal 5: Communicate safety and policy recommendations



Strategic Goal 2

Reduce the incidence and severity of work-related motor vehicle crashes by implementing **engineering and technology-based safety interventions** and studying the positive or negative safety consequences of new technologies installed in vehicles.

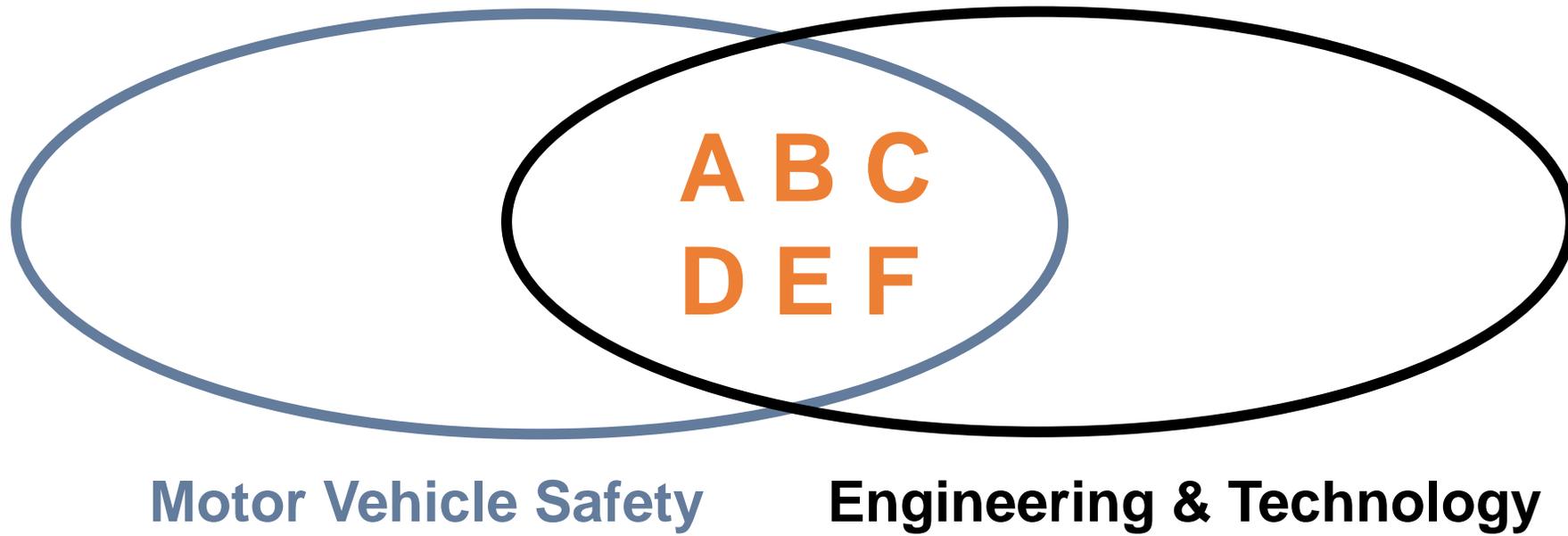
Current and future engineering work



Background • Experience • Resources • Initiative

Vehicle safety and engineering & technology

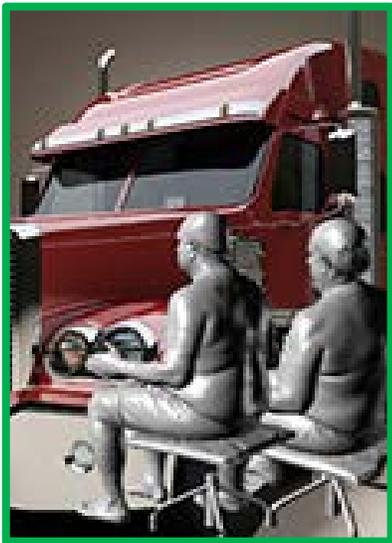
Relation: Anthropometry, Biomechanics, Cognitive issues,
Digital simulation, Emerging technology, and Fatigue control



Anthropometry

Aim:

- Improved driver visibility and control operation
- Increased post-crash survivability by enhanced seat and body restraint configurations



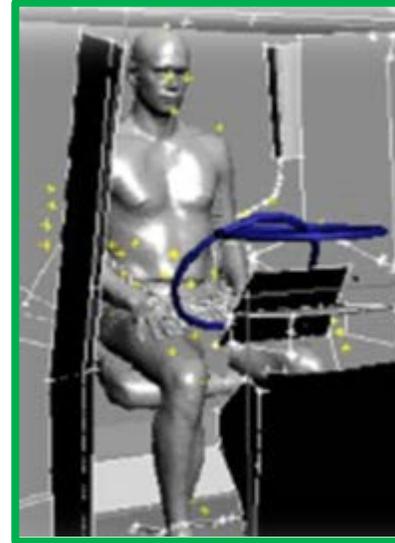
Truck drivers



Fire fighters



EMS



Cab design



Law enforcement

Anthropometry

- [NIOSH Anthropometry Webpage](#)
- [Anthropometric Study of U.S. Truck Drivers: Methods, Summary Statistics, and Multivariate Accommodation Models](#) (NIOSH Publication No. 2015-116, 2015)
- [Seat and Seatbelt Accommodation in Fire Apparatus: Anthropometric Aspects](#) (Applied Ergonomics, 2015)
- [EMT Anthropometry Datasets](#) (NIOSH Dataset RD-1008-2016-0)
- [Anthropometric Procedures for Protective Equipment Sizing and Design](#) (Human Factors, 2013)

To retrieve a publication, please place your cursor over the title, right click your mouse, and select Open Hyperlink

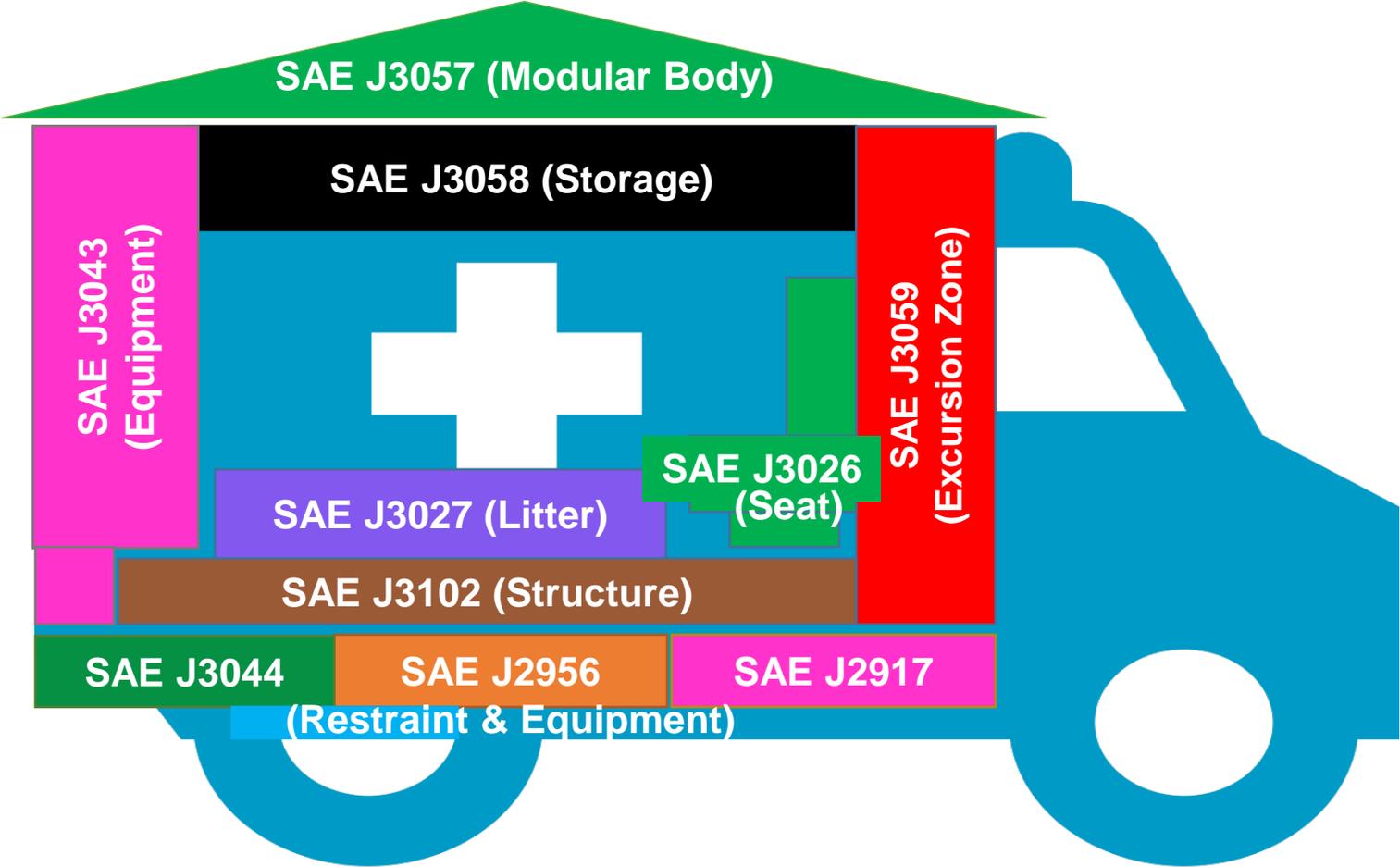
Biomechanics

Aim:

- Enhance vehicle design and configurations to improve occupant impact survivability when in a crash



Biomechanics



Cognitive issues

- How do occupational drivers respond to yellow lights?
- When and where should a driver stop or prepare to stop?
- What level of effectiveness can an in-vehicle assistant device have to reduce red-light running?



Cognitive issues

- Science-based safety guidelines will be available to stakeholders, community, and professional drivers.
- Developed intersection modules, vehicle dynamic models, and digital dashboards can be used for hazard recognition training.



Digital simulation

- Digital simulations overcome crash hazards that human subjects and researchers may encounter in field experiments.
- NIOSH is establishing its capacity in vehicle safety digital simulation, building on experience in digital human modeling.



Digital simulation

- We are building a driving simulation scenario library which includes a series of intersections, roads, and townships.
- The simulation modules and vehicle dynamic models can be shared with research partners for collaborative research.



Emerging technology

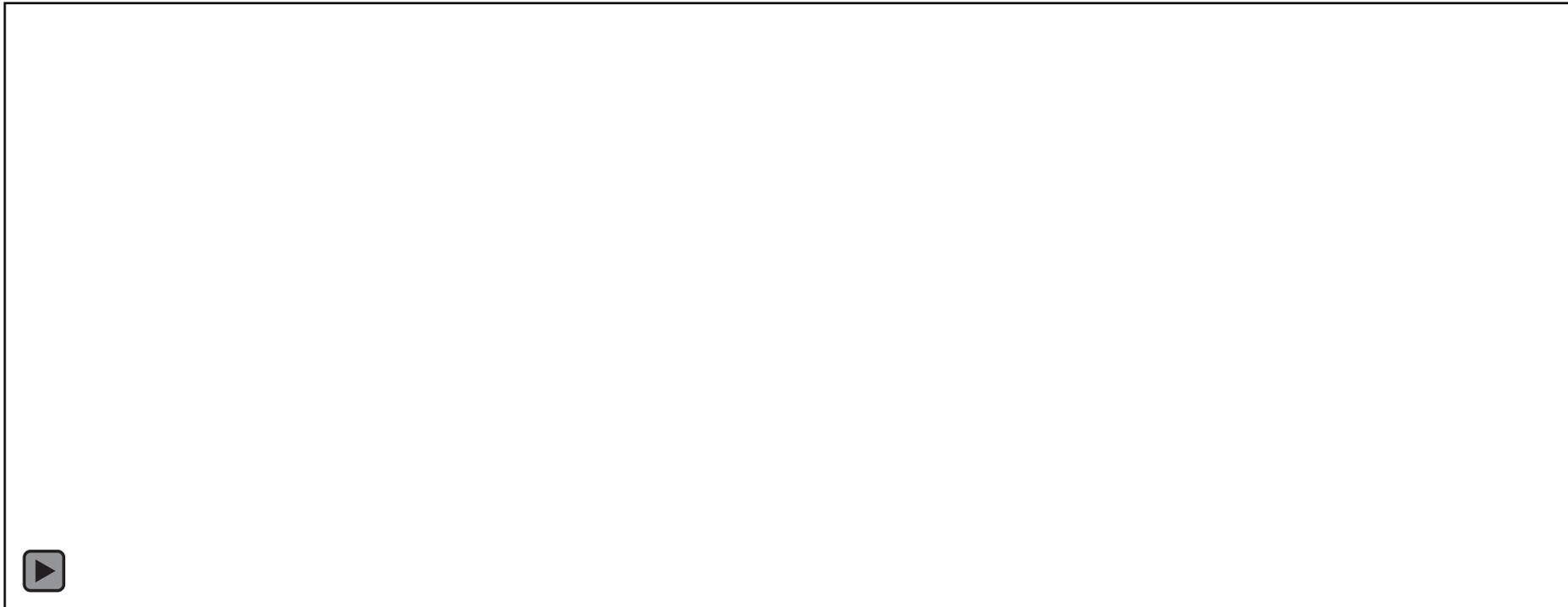
Aim:

- Effectiveness of advanced driving assistance systems
- Effectiveness of connected-vehicle technologies



Emerging technology

- Evaluating the performance and acceptability of an advanced speed warning system for fire trucks



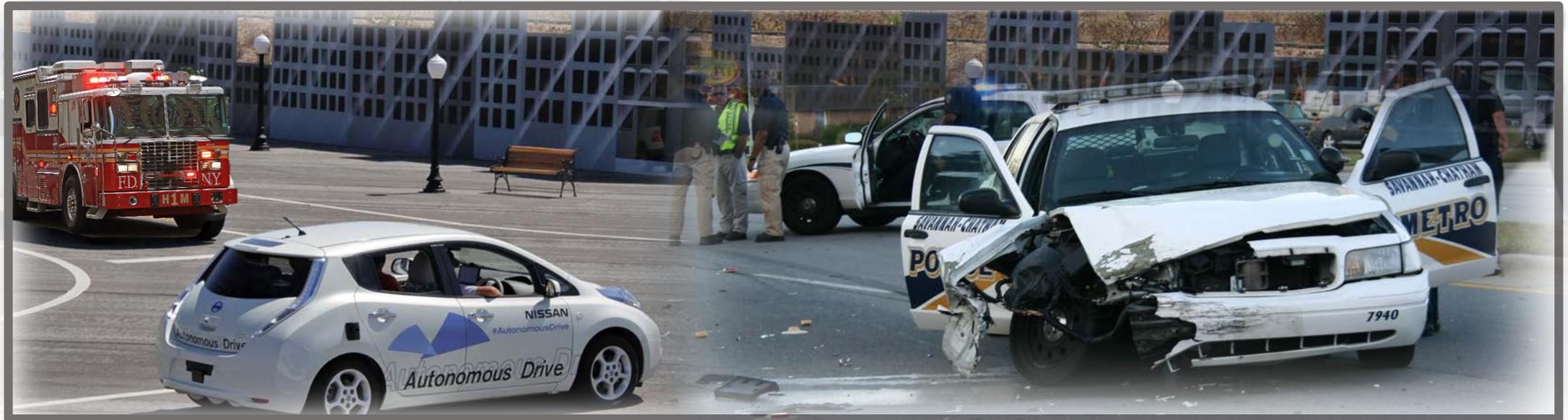
Fatigue

- Truck driver sleep pattern study shows importance of drivers receiving adequate sleep the night before they drive.
- Build capacity in evaluating fatigue controls through eye tracking, electrocardiography, and other assessment methods.



Fatigue

- Interaction of emergency vehicles with autonomous vehicles
- Safe operation of connected emergency vehicles
- Procedures to take over autonomous vehicles in emergency conditions



Epidemiologic research involving technology

Field evaluation of an in-vehicle monitoring system

- Interventions: in-vehicle lights and supervisory coaching
- Warning lights alone reduced risky driving behaviors, but lights combined with coaching was more effective

New research on fatigued and distracted driving in the oil and gas extraction industry

- Describe driving practices
- Examine correlation between results from fatigue detection technology and IVMS
- Co-variates: job tasks, time on task, shift types and lengths

CMVS midcourse review

NIOSH Center for Motor Vehicle Safety Progress Report 2016

The *NIOSH Center for Motor Vehicle Safety Strategic Plan for Research and Prevention, 2014-2018* outlines the Center's five strategic goals. This document serves to feature progress highlights, more information about the Center, a big-picture analysis of internal strengths and weaknesses and external opportunities and threats, and our plans moving forward.

A progress bar depicts the percentage of each goal's performance measures that have been at least partially met. For detailed examples of progress to date, see *NIOSH Center for Motor Vehicle Safety: Performance Measures*.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



[Progress report](#)



NIOSH Center for Motor Vehicle Safety

Performance Measures

The *NIOSH Center for Motor Vehicle Safety Strategic Plan for Research and Prevention, 2014-2018* sets performance measures for each of the Center's five strategic goals. This document serves to display progress we have made to meet these measures. The Center's team assessed current status towards meeting performance measures for each strategic goal. Each performance measure is rated as: Not Met, Partially Met, or Met or Exceeded. A Partially Met rating required funding of a project, initiating work under an existing project, or completing work addressing a part of the performance measure.

For progress highlights, a big-picture analysis of internal strengths and weaknesses and external opportunities and threats, and our plans moving forward, see the *NIOSH Center for Motor Vehicle Safety Progress Report 2016*.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



[Performance measures report](#)

NIOSH Center for Motor Vehicle Safety Results from 2016 Midcourse Review

The NIOSH Center for Motor Vehicle Safety conducted a midcourse review of its *NIOSH Center for Motor Vehicle Safety Strategic Plan for Research and Prevention, 2014-2018*. This document outlines midcourse review purpose, methodology, results of internal review and external input, and research topics to consider for the remaining two years of the strategic plan.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



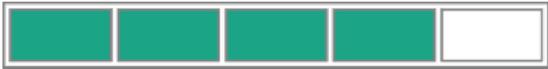
[Final report](#)

Results of our self-assessment

Goal 1: Identify risk factors for work-related crashes



Goal 2: Apply engineering and technology-based safety interventions



Goal 3: Promote evidence-based policies, standards, and regulations



Goal 4: Collaborate with global partners



Goal 5: Communicate safety and policy recommendations



Progress on CMVS performance measures

- Two-thirds of 46 total performance measures (PMs) fully or partially met
- Strategic Goal 2 PMs:
 - Fully met: Truck driver and emergency responder anthropometry
 - Partially met: ADAS for fire apparatus, intersection safety



Comments from reviewers and the public

In-vehicle technologies:

- How engineering- and technology-based tools (ADAS, crash avoidance) in work vehicles affect safety of all road users
- Emergency response settings
- Drivers' interactions with in-vehicle technologies, and tools to educate workers

Connected-vehicle technologies:

- Assess effectiveness in reducing work-related crash risk in emergency response settings and other occupational driving



Comments from reviewers and the public

Highly-automated vehicles (HAVs):

- Engage companies using “driverless” cars as research partners to learn how HAVs impact safety of all road users
- Build enough flexibility into future strategic plans to allow timely response to emerging issues



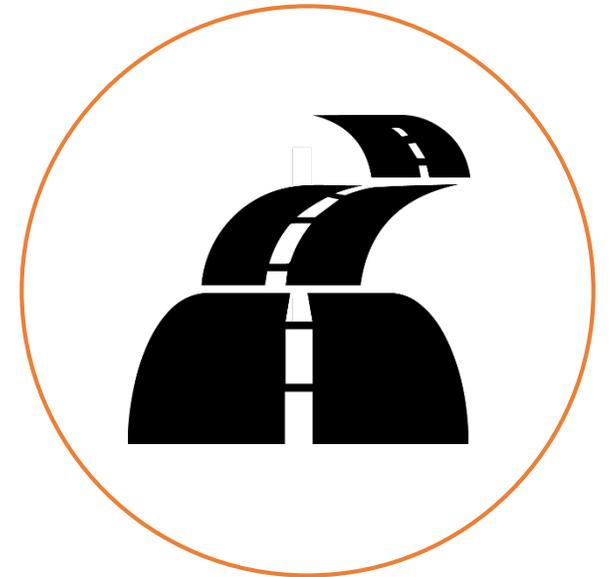
Midcourse review: The way forward with engineering and technology

Research

- Maintain current niche: special-use vehicles operated in work environments
- Build foundation for research on HAVs and connected-vehicle technology

Policy and communication

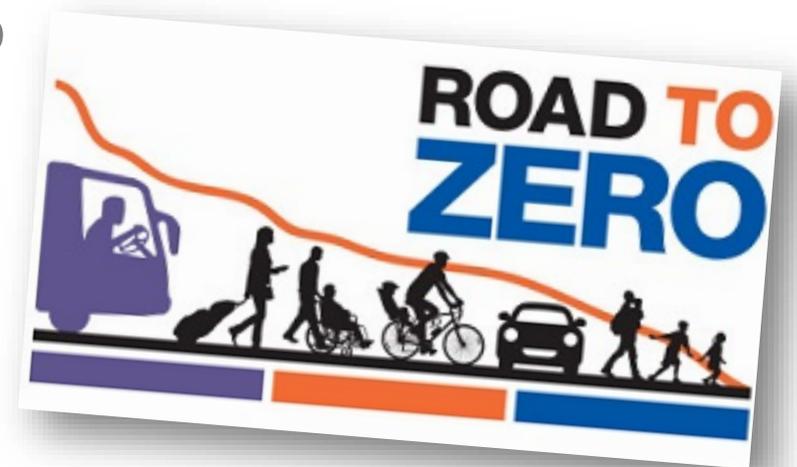
- Consider policy implications of new technology for all types of workplace vehicle operations



Road to Zero Coalition

Goal: Eliminate traffic fatalities within the next 30 years.

- **Led by:** National Safety Council and U.S. DOT agencies
- **Short-term:** Reverse increase in traffic deaths
- **Long-term:** Develop scenarios leading to zero deaths, including HAV deployment



MyCarDoesWhat.org

A national campaign to help educate drivers on new vehicle safety technologies designed to help prevent crashes.

The screenshot shows the MyCarDoesWhat.org website. At the top, there is a navigation menu with links for SAFETY FEATURES, VIDEOS & GRAPHICS, DEEPER LEARNING, GAMES, SHARE THE BUZZ, BLOG, and ABOUT. The main header features the site's logo and tagline, "Know More. Drive Safer." Below this, a list of safety features is displayed with corresponding icons: BACK-UP CAMERA, ANTI-LOCK BRAKING SYSTEM (ABS), BLIND SPOT MONITOR, AUTOMATIC EMERGENCY BRAKING, LANE DEPARTURE WARNING, and TIRE PRESSURE MONITORING SYSTEM. A search bar is located at the bottom right of the feature list. On the right side, there is a call-to-action section titled "Look Up Info" with the text "on your car brand's safety features" and a "SEARCH" button. A small blue car character is also visible, with a speech bubble that says "You are your car's best safety feature. Learn more >". At the bottom of the page, there are logos for the NATIONAL SAFETY COUNCIL and THE UNIVERSITY OF IOWA, along with social media icons and a copyright notice: "© 2017 National Safety Council | Media Room | Terms & Privacy".

NIOSH blog post for MyCarDoesWhat.org

Main messages:

- Workers can use *MyCarDoesWhat* to better understand advanced safety features.
- As major vehicle purchasers, employers can increase road safety for all by demanding safe vehicles.

Employers: How to Make Safer, More Knowledgeable Drivers - On and Off the Job

Posted on February 8th, 2016

As an employer, what can you do to help workers understand and learn how to use safety features built into vehicles they drive for work—whether you provide these vehicles, or workers drive their own vehicles? Read more to find out!

READ MORE



ASSE/NSC Subcommittee on Automated Vehicles

Aim: Develop standards for automated vehicles in fleets

- Subcommittee of the ANSI Z15 committee
- Will consider technical and policy implications of highly-automated vehicles for fleet operations



Questions for the Board of Scientific Counselors

Q1: Within the niche we've established, are there other engineering and technology research topics NIOSH should pursue?

Q2: What expertise and lab facilities should we prioritize for development, to better fulfill our mission to improve the safety of occupational drivers?

Q3: Would further policy engagement around highly-automated vehicles be helpful – both to inform our own research and to enable us to provide timely and accurate information to our stakeholders?



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The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

