



# FAST LANE

Exploring Human Behavior

## Turner-Fairbank

Highway Research Center

### Safety R&D Program

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### Hot Off the Press

Weaver, S. M., S.-F. Chao, and B. H. Philips. 2022. *Driver Adaptation to Vehicle Automation: The Effect of Driver Assistance Systems on Driving Performance and System Monitoring*. Report No. FHWA-HRT-22-072. Washington, DC: Federal Highway Administration. <https://www.fhwa.dot.gov/publications/research/safety/22072/index.cfm>, last accessed November 2, 2022.

Federal Highway Administration. 2022. *Enhancing Conspicuity for Standard Signs and Retroreflectivity Strips on Posts*. Washington, DC: Federal Highway Administration. <https://www.fhwa.dot.gov/publications/research/safety/22066/index.cfm>, last accessed November 2, 2022.

Weaver, S., J. Calvo, A. Ahmed, and J. Eisert. 2022. *Ensuring Cooperative Driving Automation (CDA) and Vulnerable Road Users (VRUs) Safety Through Infrastructure*. Report No. FHWA-HRT-22-085. Washington, DC: Federal Highway Administration. <https://highways.dot.gov/research/publications/safety/FHWA-HRT-22-085>, last accessed November 2, 2022.

### Meet the Team

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## TRAVEL LANE

### Current Research:

- **Research Key Automated Vehicle (AV) Safety Issues for Transportation Systems Management and Operations** has finished data collection for the *Effects of Work Zone Infrastructure on the Transition to Manual Driving* field study. This study assesses the potential for work zone infrastructure to safely assist in transitioning vehicle control from an automated system to the human driver in advance of work zones. The research team started data collection for the *Impact of Rainy Weather Conditions on Automated Driving System (ADS) Equipped Vehicles in Mixed Vehicle Fleet Traffic* field study in fall 2022. This study evaluates the effects of adverse weather on drivers using an ADS-equipped vehicle on an offsite track modified to simulate rainfall. This project is led by [Michelle Arnold](#).
- **Investigate Key AV Human Factors Safety Issues Related to Infrastructure** began field data collection in fall 2022 for the Human Factors Team for the *Comparing Intersection Crossing Behavior of Human Drivers and Automated Vehicles Below and Above 10 mph* study. This study will examine how in vehicle traffic signal countdown information influences drivers' behavior in the dilemma zone. Human drivers' behavior will be compared with that of a low-speed automated shuttle traveling on the same public roads. This project is led by [Jesse Eisert](#).
- **Guidelines on Variable Message Signs (VMS) Messaging During Nonrecurring Events** completed data collection and analysis for the *Variable Message Signs (VMS) Messaging miniSim™* study. The Human Factors Team is developing a guidebook with a decision tree, a technical report, and a fact sheet from findings. This study aims to investigate the effects of different configurations of VMS messaging on driver decisionmaking in a simulated roadway. This project is led by [Michelle Arnold](#).
- The **Traffic Control Devices (TCD) Pooled Fund Study (PFS)** Consortium Annual Meeting was held in San Diego, CA, on September 14 and 15, 2022. PFS members from across the country met in person and virtually to discuss a new charter and select future research topics. [Laura Mero](#) leads this PFS and the following projects:
  - » The **Evaluation of Advisory Exit and Ramp Speed Signs** project started in summer 2022. The work plan is finalized, and the Human Factors Team is working on the research methodology. This project aims to evaluate and produce uniform recommendations to designers for advisory exit and ramp speed warning signs, including the basis for speed designation, the use of "exit" versus "ramp designations," the effects of sign placement, and the optimization of sign sequence.
  - » The **Pedestrian Signing at Unsignalized Crossings** project began in summer 2022 and is in its early stages. The goal of the study is to use human factors experiments to test various static regulatory and warning pedestrian signing options at unsignalized crossings.

## TRAVEL LANE *(continued)*

- » The **Evaluation of Additional Alternative Arrow Types and Sizes for Overhead Arrow per-Lane (OAPL) Guide Signs** project completed data analysis, and the Human Factors Team presented the project findings to the TCD PFS group on August 30, 2022 (figure 1). This project examines partial-width OAPL sign designs and arrow sizes and the effects these characteristics have on driver comprehension.
- **Exploring Potential Contributors to Racial and Socioeconomic Disparities in Pedestrian and Bicyclist Morbidity and Mortality** project kicked off in November 2022 with an anticipated completion date of November 2024. This project will assess structural causes and potential strategies to address why underrepresented populations—particularly people experiencing homelessness and people who have been



Source: FHWA.

Figure 1. Photograph. A researcher testing the OAPL visual stimulus.

displaced—are overrepresented as victims in serious injury and fatal pedestrian and bicyclist crashes. This project is led by [Jesse Eisert](#) and [Anthony Boutros](#) from the Office of Safety.

## THE ROAD AHEAD

### Looking forward

- **Transportation Research Board (TRB) Annual Meeting.** The 102nd Annual TRB Meeting will be held January 8–12, 2023, in Washington, DC. The Human Factors Team will attend and exhibit the latest research tools and results from different experimental studies.
- **Enhancing Vulnerable Road User (VRU) Detection and Volume Data Through Advanced Imaging Techniques** project finished the part of this project that focused on thermal infrared sensors. The technical brief summarizing the findings is expected to be published in spring 2023. This project will now evaluate light detection and ranging (LiDAR) sensors to detect VRUs. Overall, this project is investigating the VRU detection capabilities of the infrared sensors, LiDAR,

and the two combined through sensor fusion, as well as the applicability of the output for evaluating VRU exposure. This project is led by [Laura Mero](#).

- **Human Factors Issues Related to Truck Platooning Operations** has completed data analysis for both the first and second Federal Highway Administration (FHWA) miniSim™ experiments, evaluating signing on truck platooning signs. The Human Factors Team is developing the final report, which is scheduled to be published in summer 2023. This project is investigating drivers' behavior and reactions to simulated automated truck platoons in various conditions. This project is led by [Michelle Arnold](#).

## MILEPOSTS

### Recent activity

- **Human Factors Laboratory Tours.** On August 9, 2022, FHWA Acting Administrator Stephanie Pollack, former Acting Executive Director Mayela Sosa, and other Office of the Federal Highway Administrator leaders toured the Turner-Fairbank Highway Research Center (TFHRC) (figure 2). During their tour, the Human Factors Team presented the mission and current stage of FHWA's VRU research and demonstrated the Human Factors Team's newly renovated Virtual Reality (VR) Laboratory as a cutting-edge VRU research tool.



Source: FHWA.

Figure 2. Photograph. Acting Administrator Pollack and former Acting Executive Director Sosa touring the Human Factors VR Laboratory.

## MILEPOSTS *(continued)*

On September 13, 2022, [Brian Philips](#) led a tour for Deputy Assistant Secretary for Research and Technology Robert Hampshire, and on September 15, [Jesse Eisert](#) led a tour for staff of the Office of the Assistant Secretary for Research and Technology. They demonstrated the capabilities of the FHWA Human Factors Team's cutting-edge VR laboratory to advance VRU research.

The Human Factors Laboratory has hosted several other tours over summer 2022, including the Office of Acquisitions and Grants Management, interns for the National Highway Traffic Safety Administration, and members of the Virtual Open Innovation Collaborative Environment for Safety team.

### ■ **VR Laboratory Upgrade Completed.**

The Human Factors Team finished expanding and upgrading the VR Laboratory. Upgrades include a new omnidirectional treadmill to facilitate locomotion, enhanced tracking VR

headsets, and a large virtual walking space for unobstructed movement, allowing for 2 12-ft lanes and sidewalk space to advance VRU research. Contact [Brian Philips](#) for more information.

■ **Highway Driving Simulator Upgrade Completed.** The staff supporting the TFHRC's Highway Driving Simulator finished visual system upgrades to this full-scale device. New enhanced features include 4K projectors to increase graphical fidelity and the latest rendering software and hardware to produce more realistic simulations that will increase the fidelity of future human factors driving research. Contact [Michelle Arnold](#) for more details.

■ **2022 Intelligent Transportation Systems World Congress.** Human Factors Team representatives, led by Jesse Eisert, attended the 2022 Intelligent Transportation Systems (ITS) World Congress September 18–22 in Los Angeles, CA. The team demonstrated FHWA's VRU safety research through an interactive demonstration with a VR bike simulator and head-mounted display, as well as an articulated pedestrian dummy at a crosswalk equipped with infrastructure-based sensors (figure 3).



Source: FHWA.

Figure 3. Photograph. Members of the Human Factors Team demonstrating their laboratory's VR bicycle simulator at the 2022 ITS World Congress in Los Angeles, CA.

