

Research Need Statement 622

I. Need Statement Champions and Information

I.A. Need Statement Champion Information

I.A.1. First and Last Name of Research Champion: **Cory Johnson**

I.A.2. Research Champion's Office: **MnDOT CAV-X**

I.A.3. Research Champion's Phone Number: **651-234-7062**

I.A.4. Research Champion's Email: **coryj.johnson@state.mn.us**

I.B. Research Co-Champion

I.A.1. First and Last Name of Research Co-Champion:

I.A.2. Research Co-Champion's Office:

I.A.3. Research Co-Champion's Phone Number:

I.A.4. Research Co-Champion's Email:

I.C. Research Needs Title (115 Characters): **Understanding the impact of partially autonomous vehicles on Minnesota roads**

I.D. Project Sponsor: **MnDOT Research Program**

II. Research Need Background and Description

II.A. Research Need Background

II.A.1. Describe the problem or opportunity.

Autonomous vehicles have the potential to substantially alter traffic flow. In the near future, it is likely that we will witness a gradual transition toward autonomy with ever increasing numbers of vehicles having more and more autonomous capabilities. New vehicles increasingly have features like adaptive cruise control, parking assistance, emergency braking, collision avoidance, and lane-keeping assistance. But even these new, high-tech capabilities are still considered SAE Level 1 and still require hands-on driver involvement.

As technology progresses further toward automation, vehicles will someday reach SAE level 4 which is highly automated and, in theory, functions without driver input. The first generation of partially autonomous vehicles are commercially available and more advanced vehicles are being tested.

II.A.2. If applicable, describe how this project will build on previous research.

While no Minnesota-funded research project have been conducted, the national work needs to be considered and leveraged when scoping the proposal. There are several aspects that still need to be considered. No studies exist for arterials or rural highway segments. In addition, the technologies other than adaptive cruise control have not been considered in the research. The proposed work needs to consider if travel or road information presented actually changes driver behavior and safety which would ultimately impact the performance of the travel corridor.

II.A.3. If applicable, include the title/s or previous research.

In Progress Research

[Assessment of Capacity Changes Due to Automated Vehicles on Freeway Corridors](#) (Virginia Transportation Research Council (start: 2018-03-23; end 2020-05-31)

Completed Research

[Impact of Connected and Automated Vehicles \(CAVs\) on Freeway Capacity](#) (Center for Advanced Multimodal Mobility Solutions and Education, University of North Carolina, Sept. 2019)

II.A.4. What is the **objective** of the proposed research?

The research should evaluate how lower-level autonomous vehicles (e.g., SAE Level 1-3) will influence traffic behavior considering questions such as, but not limited to the items below.

- How will partial autonomy change traffic flow on different highway facilities in Minnesota considering features? Factors to consider include:
 - Rural vs urban
 - Signalized vs unsignalized intersections
 - Lane transitions
 - Interchanges
- What do changes to traffic flow mean for safe and efficient management of the highway infrastructure during transition to autonomy?
- Does the percentage of lower-level autonomous vehicles affect the influence on traffic behavior and is that relationship consistent across the evaluated features?
- Does the mix of SAE Levels 1, 2, and 3 influence traffic behavior?

III. Strategic Priorities, Benefits, and Expected Outcomes

Section III. is for MnDOT sponsored and co-sponsored projects only; all LRRB projects proceed to section IV.

III.A. MnDOT Strategic Priorities

Instructions: Briefly describe how the project aligns with the following MnDOT Research Strategic Priorities. Complete all that apply.

III.A.1. Innovation & Future Needs: **This project aligns with the future needs priority. Vehicles are becoming more technologically advanced and require more services from the DOT. The project will help identify those DOT needs.**

III.A.2. Advancing Equity:

III.A.3. Asset Management:

III.A.4. Safety:

III.A.5 Climate Change & Environment:

III.B. Expected Outcomes

Instructions: Check all expected direct outcomes of this research.

- New or improved technical standard, plan, or specification
- New or improved manual, handbook, guidelines, or training
- New or improved policy, rules, or regulations
- New or improved business practices, procedure, or process
- New or improved tool or equipment
- New or improved decision support tool, simulation, or model/algorithm (software)
- Evaluation of a new commercial product
- New or improved technical standard, plan, or specification
- Other. Please specify below:

III.C. Expected Benefits

Instructions: Select all expected benefits that may be realized if the findings and recommendations from this research is adopted or implemented

III.C.1. Construction Savings Choose an item.

III.C.2. Decrease Engineering/Administrative Costs Choose an item.

III.C.3. Environmental Aspects Choose an item.

III.C.4. MnDOT Policy **Change or inform a policy**

III.C.5. Lifecycle Choose an item.

III.C.6. Operations and Maintenance Savings Choose an item.

III.C.7. Reduce Risk **Other reduced risk**

Understanding how traffic patterns are likely to be influenced by the presence of autonomous vehicles (SAE Levels 1-3) will allow MnDOT to be prepared and able to provide safe roadways.

III.C.8. Reduce Road User Cost Choose an item.

III.C.9. Safety **Other safety benefit**

Improved understanding of how CAV technology will impact traffic safety and traffic services

III.C.10. Technology **New technology**

Increasing numbers of vehicles have features at SAE Level 1

III.C.11. Other, please describe below:

IV. Technical Advisory Panel

Instructions: Please list the name and affiliation of individuals to consider for the Technical Advisory Panel.

Ray Starr

Kristin White

Tara Olds

Cathy Huebsch

Steve Misgen

Brian Kary

Jed Falgren

Your assigned Project Advisor is available to answer questions and provide guidance (assigned by the Office of Research & Innovation).

Your Project Advisor is: Beth Klemann Email:beth.klemann@state.mn.us