Research Project Name: Comprehensive Evaluation of Safety and Operational Issues at Florida's Highway-Rail Grade Crossings Located in Rural Areas

Recipient/Grant (Contract) Number: 69A3552348321

Center Name: Rural Safe Efficient Advanced Transportation (R-SEAT) Center

Research Priority: Transportation Safety, Innovation and Technology, Resilience

Principal Investigator(s): Maxim A. Dulebenets, Ph.D., P.E., S.M.IEEE

Project Partners: Pasco County Government, Manhattan Associates (Consultant)

Research Project Funding: Requested federal fund amount: $92,733

Non-federal matching fund amount: $46,366

Project Start and End Date: March 26, 2026 – March 25, 2027

Project Description:

Rail transportation is one of the important transportation modes in Florida for movement of people and cargoes. Highway-rail grade crossings, where railroad segments intersect highways at the same elevation, pose safety concerns due to the existing risk of collisions between passing highway vehicles and approaching trains. Florida is one of the states that experience a significant number of accidents at highway-rail grade crossings not only in urban areas but in rural areas as well. Various interventions are typically considered to improve safety and operations at highway-rail grade crossings, including crossing closures, countermeasures, and grade separations. Closure of crossings to highway traffic can be an effective alternative but may be opposed by communities due to longer alternative routes. Countermeasures, such as flashing lights, gates, and median barriers, can improve safety as well. However, all hazardous crossings cannot be upgraded with the desired countermeasures due to the limited budget. Grade separations will completely eliminate the risk of collisions between trains and highway vehicles but will require million-dollar investments. Since the crossing safety improvement program has a limited budget, urban crossings are often prioritized for upgrading, while safety and operational issues at rural crossings are often overlooked.

This project aims to perform a detailed analysis of safety and operational issues at rural highway-rail grade crossings located in the State of Florida. The records from the crossing inventory database, which is maintained by the Federal Railroad Administration (FRA), will be investigated to determine the characteristics of rural highway-rail grade crossings that may cause their vulnerability to accidents. Moreover, the accident data available through the FRA database will be evaluated as well to identify the common features of collisions between passing highway vehicles and approaching trains in rural areas of Florida. Last but not least, customized statistical models will be developed and applied for the collected data to determine statistically significant factors that are likely to cause accidents at rural highway-rail grade crossings in Florida. The outcomes of this research will be instrumental to decision-makers and practitioners, so that they can better understand the causes behind highway-rail grade crossing accidents in rural areas and take the appropriate initiatives. Along with improving safety of highway and rail users, this research will also promote continuity of passenger and freight flows across the State of Florida, including its rural areas, and facilitate the state economic development.

US DOT Priorities*:

Outputs: The proposed project activities and developed statistical models are expected to provide important insights for relevant decision-makers and practitioners, so that appropriate actions can be taken to reduce the likelihood of highway-rail grade crossing accidents. Moreover, the ultimate goal of this research is to promote continuity of passenger and freight flows across the State of Florida, including its rural areas, improve safety of highway and rail users, minimize potential delays caused by accidents, and facilitate the state economic development.

Outcomes/Impacts:

1) Perform a detailed review of the state of the art focusing on highway-rail grade crossing research and rural crossings specifically;
2) Conduct a detailed investigation of rural highway-rail grade crossings to determine which characteristics of these crossings make them vulnerable to collisions between passing highway vehicles and approaching trains;
3) Review the patterns of accidents that have occurred at rural highway-rail grade crossings in the State of Florida over the years;
4) Develop statistical models to identify statistically significant factors that are likely to cause accidents at rural highway-rail grade crossings;
5) Provide constructive recommendations to the relevant decision-makers and practitioners with the objective to reduce the likelihood of highway-rail grade crossing accidents in rural areas;
6) Promote continuity of passenger and freight flows across the State of Florida, including its rural areas, and facilitate the state economic development.

Final Research Report: N/A

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