

**Request for Research Funding for FY 2022-2023**

**SPR Subpart B Project:** TEO-23-07

<b>Requesting Office</b>	State Traffic Engineering and Operations Office	<b>Priority</b>	7 of 23
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**Proposed Title** Evaluating the Effectiveness of the Strategic Response Plan to Wrong-way Driving Events on Freeways

**Justification**

Wrong-way drivers, especially on freeways, pose a serious risk to the safety of themselves and other motorists. On a nationwide scale, an average of 355 fatalities occur each year due to wrong-way driving (WWD). WWD mitigation has therefore been on the national front, with several states tackling this issue from several avenues, focusing on the 4E's, i.e., *Engineering, Education, Enforcement, and Emergency Medical Services*; policy-oriented changes; and adopting state-of-the-art technology to detect, verify, and respond to WWD incidents in real-time. Understanding the seriousness of WWD incidents, the Florida Department of Transportation (FDOT) has endeavored to continually explore ways to strategically draft, design, and deploy countermeasures while proactively identifying areas that can help mitigate these incidents. FDOT's strategy has included policy-oriented changes propelled by the leadership's commitment and vision to create actionable WWD initiatives; extensive research on understanding the underlying WWD crash patterns and causes, and driver behavior while intoxicated; motivation to implement and compare several pilot countermeasures; commitment to develop and execute a comprehensive WWD Countermeasure Implementation Plan; and vision to develop the Strategic Response Plan to WWD events on freeways.

The WWD countermeasures generally provide cues to the wrong-way drivers to prevent them from entering the freeway from the exit ramp. If the wrong-way driver misses all these cues on the arterial and the exit ramp and enters the freeway from the exit ramp, the last and final resort would be to alert the right-way traffic on the freeway and the police to prevent a WWD crash on the freeway. As such, the response to an ongoing WWD event has to be strategic, comprehensive, effective, and timely. This response may constitute the use of several traditional and innovative approaches, including verifying the WWD event using closed-circuit television (CCTV) cameras, Road Rangers Service Patrol (RRSP), and Florida Highway Patrol (FHP); alerting the public through Dynamic Message Signs (DMSs), Highway Advisory Radio (HAR), and Waze application; coordinating the response at the Regional Transportation Management Center (RTMC) with several agencies including the FHP, RRSP, etc.; and documenting the event and the response in the SunGuide™ application. A successful intervention of a wrong-way driver could only be possible by executing a well-coordinated inter-agency and multi-jurisdictional response plan. As such, the Department, in coordination with the districts, has developed a WWD strategic response plan. The response plan has been shared with the RTMC operators through the RTMC Standard Operating Guidelines (SOGs).

This research project aims to conduct a comprehensive evaluation of the FDOT's strategic response plan to WWD events on freeways. The specific objectives include:

1. Evaluate the effectiveness of the existing WWD DMS messaging.
2. Evaluate the effectiveness of the existing WWD response plan provided in the RTMC SOGs.

**Objective 1: DMS Messaging**

Dynamic Message Signs (DMSs) are programmable electronic signs that appear along highways. They typically display real-time alerts about unusual traffic conditions such as Wrong-Way Driver, adverse weather conditions, construction activities, traffic incidents, etc. These messages are intended to influence driver behavior by providing real-time traffic-related information to alert drivers, regulate traffic flow, suggest alternate routes, and manage congestion on the roadways.

During an active WWD event, the following message is pushed to the DMSs upstream and within 10 miles of the WWD event: WRONG WAY DRIVER REPORTED USE EXTREME CAUTION. However, the performance of DMS messaging in the event of a WWD incident is unknown. The effectiveness of the existing WWD DMS messaging will be evaluated using the following two approaches:

	<ul style="list-style-type: none"> <li>• <b>Field Data-based Observation Study:</b> A field-based observation study using real-time traffic data will assist in quantitatively assessing the reactions of drivers to WWD-related DMS messages in terms of speed adjustments and lane use. The DMS location data, WWD message logs, and archived real-time traffic data from Regional Integrated Transportation Information System (RITIS) will be analyzed to measure the reactions of drivers to the WWD messages. The results could help FDOT better understand how drivers react to WWD messaging on DMSs in a real-world scenario.</li> <li>• <b>Human Factors Study:</b> A two-pronged approach will be taken to ensure WWD messages are quickly and easily understood by diverse drivers in the state of Florida. A set of possible messages and message formats will be developed by human factors experts at Florida State University, consistent with human factors guidelines and best practices. (1) These messages will be presented to a series of focus group of younger, middle-aged, and older drivers to initially refine these messages and improve comprehension if necessary. (2) A laboratory experiment will present younger, middle-aged, and older drivers with these messages embedded within the context of highway scenes to determine which refined messages produce quick and accurate comprehension. Participants will be diverse with respect to age, gender, and race/ethnicity.</li> </ul> <p><b>Objective 2: WWD Event SOGs</b></p> <p>The FDOT’s official TMC SOGs facilitate the proper operation of Florida’s roadway transportation system by providing general guidance to TMC administrative and management personnel in the form of a strategic blueprint for success. The existing SOGs discuss the protocols pertaining to WWD events on freeways. It provides the framework regarding how TMCs plan and manage a WWD event from the beginning to its end. Well-structured SOGs are critical for a successful intervention of a wrong-way driver. To assist the Department in evaluating the response plan, the research team will conduct the following analyses:</p> <ul style="list-style-type: none"> <li>• <b>Review WWD Event Logs:</b> Across the state of Florida, at least a few dozen WWD events are logged in the SunGuide™ database every year. A detailed review of the SunGuide™ event logs of all the WWD events in the past five years will help understand the current state of the practice in responding to the WWD events. It will help document the best practices and lessons learned. This approach will provide us with insights on the operating procedures that are effective in responding to WWD incidents in real-time.</li> <li>• <b>Evaluate the Current WWD Response Plan:</b> Even though WWD incidents are rare, they are often serious and rightfully trigger a multi-agency response of the highest priority. As such, the State Traffic Engineering and Operations Office has developed the WWD response plan and incorporated it in the FDOT’s official TMC SOGs. These SOGs will be reviewed closely to evaluate their effectiveness. Based on the review, recommendations will be developed to revise the SOGs, if needed.</li> </ul>
<b>Impact</b>	The study will conduct a comprehensive evaluation of the strategic response plan to WWD events on freeways. This study will also attempt to measure the effectiveness of the response plan in having a consistent and well-coordinated response to WWD events. This project will assist in leveraging the existing ITS systems (e.g., DMSs and CCTV cameras) and TSM&O strategies (e.g., RRSP) along the freeways to respond to WWD events in real-time.
<b>Affected Offices</b>	State Traffic Engineering and Operations Office, District Traffic Operations Offices, Safety Office
<b>Existing Work</b>	One of the most recent WWD-related research on freeways focused on developing WWD Countermeasure Implementation Plan and recommending specific WWD countermeasures for all the exit ramps in Florida. The Central Office, in coordination with the districts, has recently developed the WWD Strategic Response Plan. This project builds on these efforts to evaluate the effectiveness of this response plan and provide any recommendations to the existing plan.
<b>Keywords Used In Existing Work Search (Cannot leave blank)</b>	<p>WWD (6 studies): None of these studies focus on evaluating a response plan to WWD events.</p> <p>Response Plan (79 studies): Only a few are related to transportation safety and traffic operations. None of them are related to WWD events.</p>

<b>Related Contracts (Give contract numbers)</b>	BDV29-977-36		
<b>Funding Request</b>	\$245,000	<b>Anticipated Duration</b>	21 months
<b>Project Manager</b>	PM: Edith Wong Co-PM: Eric Gordin Co-PM: Jeff Frost	<b>Contracting Method</b>	FIU (lead) FSU (sub)
<b>Equipment</b>	Estimated equipment cost (or N/A)	NA	
<b>Urgency</b>	1=highest, most immediate need	FDOT has been deploying strategies to mitigate WWD incidents on freeways. This research will help evaluate the effectiveness of the WWD strategic response plan and suggest recommendations, potentially improving the Department's response to WWD events.	
<b>Implementability</b>	1=greatest likelihood of and proximity to implementing results	The research results will be readily implementable. The results will be disseminated to the DTOEs, DSEs, District TSM&O Engineers, and other stakeholders for immediate adoption.	
<b>Project Benefits (Succinct, complete explanation)</b>			
<ul style="list-style-type: none"> <li>✓ This project will use a data-driven approach to conduct a comprehensive evaluation of the existing strategic response plan to WWD events on freeways.</li> </ul>			
<b>Project Benefits (Select all that apply and explain)</b>	<b>Quantifiable Benefits (units, dollars, etc...if applicable)</b>	<b>Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits</b>	
<input type="radio"/> Materials Enhancement			
<input type="radio"/> Materials Savings			
<input type="radio"/> Time Savings			
<input type="radio"/> Lives Saved/Injuries Prevented	Reduce WWD crashes and secondary crashes	The project outcomes include a comprehensive evaluation of the strategic response plan to WWD events on freeways. A strategic, data-driven, timely, effective, comprehensive, and multi-agency response will potentially reduce WWD crashes on freeways. Efforts will be made to accurately quantify the crashes potentially reduced by implementing the WWD strategic response plan.	
<input type="radio"/> Other (Explain)	Better comprehension of WWD messaging	The project will identify and recommend specific messages that produce quick and accurate comprehension.	

\*Comments should explain and support urgency, financial benefit, and implementability scores