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<p>The California Department of Transportation (DOT) (Caltrans) through its Division of Research, Innovation, and System Information (DRISI) funds Research and Development (R&D) projects to provide solutions to the needs of its internal customers. The level of implementation and utilization of these R&D projects varies depending on the Technology Readiness Level (TRL) of the results as well as training and readiness of the internal customers for their implementations. Furthermore, the scope of some of the research conducted may not include consideration of customer's workflows. These shortcomings result in underutilization of some of the completed research and therefore do not provide full benefits to the customers. Caltrans needs identify completed research projects that are underutilized and have the potential to bring the department greater efficiency, saving time, money and resources that can be used to deliver more projects. Through the current research, the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center worked with DRISI to identify underutilized research projects and use seed funding to accelerate implementation. The team worked with Caltrans stakeholders to determine the needs and then use the seed funding to work out the workflows necessary for proper integration and adaptation of the research results of such underutilized research projects.</p>		14. SPONSORING AGENCY CODE Caltrans	
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Advanced Highway Maintenance and Construction Technology Research Center

Department of Mechanical and Aerospace Engineering
University of California at Davis

Research Implementation Accelerator: Workshops and Seed Funding Program

Dave Torick, Jessica Rodriguez, Ty Lasky &
Bahram Ravani: Principal Investigator

Report Number: CA23-4010
AHMCT Research Report: UCD-ARR-22-10-31-01
Final Report of Contract: 65A0749 Task 4010

February 13, 2023

California Department of Transportation

Division of Research, Innovation and System Information

Executive Summary

This report provides a summary of the work conducted over a period of slightly over 18 months developing a process through which some of the previously completed research sponsored by Caltrans were reviewed. Those for which incremental funding could lead to their implementation within Caltrans organization were identified and funded. Their progress was monitored leading to full implementation.

Background

The California Department of Transportation (DOT) (Caltrans) through its Division of Research, Innovation, and System Information (DRISI) funds Research and Development (R&D) projects to provide solutions to the needs of its internal customers. The level of implementation and utilization of these R&D projects varies and in some cases do not provide full benefits to Caltrans internal customers.

Problem, Need, and Purpose of Research

There is a need to identify completed research projects that are underutilized and have the potential to bring the department greater efficiency once fully implemented and to provide incremental funding for their accelerated implementation within Caltrans. The purpose of this research was to work with Caltrans stakeholders to determine the needs and then use the incremental funding to work out the workflows necessary for proper integration and adaptation of the research results of such underutilized research projects.

Overview of the Work and Methodology

The research methodology used involved first working with Caltrans stakeholders to determine the needs and then utilizing review workshops to select completed research to be funded through the process.

Major Results and Recommendations

Four projects were identified and funded. These were as follows:

1. Mountain Pass Road Opening Training and Use (Task 3255).
2. Exploring Non-Traditional Methods to Obtain Vehicle Volume & Class Data (Task 3311).

3. Developing MASH Bridge Railing that Satisfies State and Federal Historic Preservation Requirements (Type 86H Bridge Rails) (Task 3170).

4. Integrating Zero Emission Vehicles (ZEVs) into Caltrans Fleet (Task 3254).

The results of these implementations will benefit Caltrans in achieving its goals of efficiency, safety, and stewardship in enhancing mobility in California.

In addition to the above four accelerated implementations, a process was developed for the incremental funding for accelerated research implementation. The following are a set of recommendations related to this process:

1. It is important to use a formalized application process for requesting accelerated research implementation funding. A sample application form is provided in Appendix A. In the applications accepted for consideration there should be:
 - a. commitment and availability of the research team to perform the implementation if it is funded, and
 - b. availability of a champion within Caltrans internal customer in making sure that the work is properly implemented within Caltrans.
2. It is recommended to provide an information session for researchers and Caltrans customers who have had underutilized R&D projects will be useful to improve understanding of the process and increase the number of requests.
3. It is recommended to use two panel reviews for the project selection which could be in the form of workshops. One workshop should consist of technical and operational workforce from Caltrans and the second should involve higher level management personnel. The second review panel or workshop can be potentially integrated to the existing Caltrans Research and Development Advisory Committee (RDAC) review panel assuming the schedule would match.
4. In evaluating applications for accelerated research implementation funding, it is recommended that considerations will be given to the following type of projects:
 - a. Low hanging fruits for rapid integration into Caltrans Workflow.
 - b. Projects that can provide the best ROI.
 - c. Projects that can have a broader applicability within Caltrans.

While Considering:

- i. Enhancing the safety of the infrastructure and its operations.

- ii. Increasing the value of the transportation system's assets.
 - iii. Enabling better stewardship of the resources required to accomplish the tasks at hand.
5. Since the research organization receiving funding from Caltrans for handling the accelerated research implementation funding process cannot legally fund back any entities within Caltrans, it is recommended that some portion of the available funds be kept within DRISI for consideration of funding internal units if such units are selected through the process for accelerated research implementation funding.
 6. In order to close the loop with the internal Caltrans customer requesting research implementation support, a feedback template needs to be developed. This template would be based, in part, on the original request for research implementation support; but would also request feedback from the customer regarding the project needs, goals, and results. This feedback mechanism will provide an important opportunity at the end of the effort to touch base with each customer and assess the success of the research implementation effort.

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Acronyms and Abbreviations

Acronym	Definition
AADT	Annual Average Daily Traffic
AHMCT	Advanced Highway Maintenance and Construction Technology Research Center
Caltrans	California Department of Transportation
DOT	Department of Transportation
DRISI	Caltrans Division of Research, Innovation and System Information
GNSS	Global Navigation Satellite System
MPRO	Mountain Pass Road Opening
R&D	Research and Development
RDAC	Research and Development Advisory Committee
ROI	Return On Investment
SBAS	Satellite-Based Augmentation Service
TRL	Technology Readiness Level
UC	University of California
UCR	University of California - Riverside
ZEV	Zero Emission Vehicle

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Chapter 1:

Introduction

This report provides a summary of the work conducted over a period of slightly over 18 months developing a process through which some of the previously completed research sponsored by the California Department of Transportation (DOT) (Caltrans) were reviewed. Those for which incremental funding could lead to their implementation within Caltrans organization were identified and funded. Their progress was monitored leading to full implementation. Furthermore the process developed forms the basis for future cycles for incremental funding leading to implementation of previously completed research.

Problem

Caltrans through its Division of Research, Innovation, and System Information (DRISI) funds Research and Development (R&D) projects to provide solutions to the needs of its internal customers. The level of implementation and utilization of the results of these R&D projects varies depending on the Technology Readiness Level (TRL) of the results as well as training and readiness of the internal customers for project implementations. Furthermore, the scope of some of the research conducted may not include consideration of customer's workflows. These shortcomings result in underutilization of some of the completed research and therefore do not provide full benefits to the customers.

Objective

The objectives of this research were as follows:

1. Identifying previously sponsored research where incremental funding could result in the implementation of the research within Caltrans.
2. Providing additional incremental funding and monitoring progress leading to implementation of such research within Caltrans.
3. Developing and testing a process for research implementation incremental funding.

The overall goals are to put into practice the innovations developed through research and to increase the value of sponsored research within Caltrans units.

Scope

The scope of work was limited to Caltrans sponsored research that had been completed but had not been fully implemented within Caltrans organization.

The scope included developing a formalized process for identifying such research and a process for prioritizing them so that some can receive incremental funding based on availability of the budget leading to implementation within Caltrans organization.

Background

The level of implementation and utilization of the results of some of the R&D projects sponsored by Caltrans varies depending on several factors including, for example, the TRL of the results or the training and readiness of the internal customers for full implementation of the results. Furthermore, the scope of some of the research conducted may not include consideration of customer's workflows. These shortcomings result in underutilization of some of the completed research and therefore do not provide full benefits to Caltrans internal customers.

Research Methodology

The research methodology used involved first working with Caltrans stakeholders to determine the needs and then utilizing workshops to select completed research to be funded through the process. Finally the methodology included working with the group performing the research to work out the workflows necessary for full implementation of the research results of such underutilized research projects within Caltrans.

Overview of Research Results and Benefits

The key deliverables of this project are this final report and the accelerated implementation of four previously completed research tasks as follows:

1. Mountain Pass Road Opening Training and Use (Task 3255).
2. Exploring Non-Traditional Methods to Obtain Vehicle Volume & Class Data (Task 3311).
3. Developing MASH Bridge Railing that Satisfies State and Federal Historic Preservation Requirements (Type 86H Bridge Rails) (Task 3170).
4. Integrating Zero Emission Vehicles (ZEVs) into Caltrans Fleet (Task 3254).

The results of these implementations will benefit Caltrans in achieving its goals of efficiency, safety, and stewardship in enhancing mobility in California.

Chapter 2:

Research Implementation Process

The research implementation process started with first identifying groups who had performed underutilized research as well as Caltrans internal customers and have them apply for the accelerated implementation funding by filing an application.

Once the applications are collected and champions for each proposed research implementation are identified then the first workshop is organized. In this workshop key stakeholders from the technical and operational side of Caltrans are invited and after an overview of definition and goals of the research implementation process, a list of projects are presented. The participants are then divided into breakout sessions and asked to projects of importance and then the entire group would prioritize or rank the projects. The Agenda used in the first workshop during this work is depicted in Figure 2-1.

9:00am - 9:10am	Welcome and Introduction: <i>April Nitsos (Caltrans)</i>
9:10 - 9:20	Workshop Overview and Objectives <i>Bahram Ravani (AHMCT, UC-Davis)</i>
9:20 - 9:40	Research Implementations: Definitions, Goals, & Priorities <i>Tawney Brennfleck (Caltrans)</i>
9:40 -10:20	Examples of Successful Stories in Research Implementations <i>a. Accelerated Bridge Construction</i> <i>Dorie Mellon (Caltrans)</i> <i>b. Wrong Way Driving</i> <i>John Slonaker (Caltrans)</i>
10:20 - 10:30	Questions and Answers
10:30 - 11:15	Breakout Sessions
11:15 - 12:00 Noon	Reports of Breakout Sessions & Final Ranking

Figure 2-1. Agenda used in the first workshop

The agenda started with welcome and introduction followed by a discussion of the workshop objectives. Then there was a presentation on the definitions, goals and priorities in research implementation. This was followed by a presentation on some examples of successful stories in research implantation. This presentation was intended to give the audience a feel for the types of implementations that can be beneficial to Caltrans. Such implementations can include not only development of a new process, improving an existing process, adding to one of the Caltrans standards or manuals, providing data used in planning, training Caltrans employees in using a new technology or developing and implementing a new technology for used by Caltrans. A question and answer session was then held to make sure that there no misunderstanding of the goals and the process followed by break-out sessions prioritizing applications. Finally the entire group ranked the results of all the breakout sessions into one ranked order list of projects.

A second workshop was held this time inviting higher level management personnel from Caltrans as the workshop participants. The objective was to select the projects prioritized in the first workshop for consideration of accelerated implementation funding. The agenda for this workshop is depicted in Figure 2-2.

2:00 – 2:10	Welcome & Introduction	Dara Wheeler (Caltrans)
2:10 – 2:20	Workshop Overview & Objectives	Bahram Ravani (AHMCT)
2:20 – 2:35	Research Implementation: Definitions & Goals	Tawney Brennfleck (Caltrans)
2:35 – 2: 50	Results of the 1st Workshop	Bahram Ravani
2:50 – 3:10	Questions and Answers	All
3:10 – 3:30	Discussions & Prioritization	Group

Figure 2-2. Agenda for the second workshop

The second workshop started with welcome and introduction followed by a brief overview of the workshop and its objectives. Then a short presentation was given on research implementation definitions and goals followed by a detailed description of the results of the first workshop. This was followed by a question and answer session before the workshop participants started their discussion and prioritization of the projects selected in the first workshop.

The second workshop recommended funding the following four projects through accelerated research implementation funding:

1. Mountain Pass Road Opening Training and Use (Task 3255).
2. Exploring Non-Traditional Methods to Obtain Vehicle Volume & Class Data (Task 3311).
3. Developing MASH Bridge Railing that Satisfies State and Federal Historic Preservation Requirements (Type 86H Bridge Rails) (Task 3170).
4. Integrating Zero Emission Vehicles (ZEVs) into Caltrans Fleet (Task 3254).

This research task then initiated the process of funding these projects since they either involved adding funds through the University Master Contract to UC-Campuses or involved purchasing data from vendors and assisting Caltrans users in using the data. The contract on the project number 4 was to UC Riverside and involved having them help Caltrans Division of Equipment utilize their software in making decisions on Zero Emission Vehicle activities.

Chapter 3: Results

The experience gained in organizing the two workshops and soliciting applications for accelerated research implementation funding allowed us to develop a formal application for requesting funding through accelerated research implementation. This application is provided in Appendix A. In this application, in addition to requesting information about the project, the research team, and DRISI project manager; the applicants are asked to identify a champion within Caltrans, indicate the time duration of the implementation and provide a description of how the requested funds are going to lead to the final implementation. The applicants also need to make sure that they have commitments from both the researchers as well as Caltrans customers to complete the implementation within Caltrans.

After the applications were considered by Caltrans stakeholders in the two workshops that were conducted, the result was a recommendation to provide accelerated research implementation funding for four projects as discussed in the previous chapter. The work and outcome of the resulting accelerated implementations funded are described below.

Mountain Pass Road Opening (MPRO) Implementation Support

The MPRO system was officially deployed to Caltrans in April 2021. Based upon discussions with Maintenance and DRISI, the accelerated implementation research was intended to provide support for one additional year of system preparation, training, demonstration, and support, all for the 2022 roadway pass opening season. This work was performed by the AHMCT Research Center.

Starting this work involved procurement of the Satellite-Based Augmentation Service (SBAS), which provides the differential corrections needed by the MPRO system to achieve 10-cm-level accuracy. The SBAS service must be procured and provisioned every season. Budget must be available to procure the service, and Caltrans must retain the expertise to provision the SBAS for each MPRO system. For the current effort, AHMCT procured service for one month for each system used. The provisioning steps are documented in prior research [1]. The specific service to be used is Atlas H10 SBAS differential correction service. In 2022, this service costs \$180 per month per system, or \$485 per quarter per system. The service must be tied to an individual Vector V500 GNSS (Global Navigation Satellite System) receiver by way of the receiver serial number.

AHMCT worked with DRISI and Maintenance to arrange a date for training and demonstration at each of the maintenance yards. The final dates are provided in Table 3-1. This table has four columns designating the name of the

Maintenance Yard, the state route, the name of the roadway pass to be considered for opening and the date. The maintenance yards were Woodfords, Sonora Junction, Lee Vining and Camp Connell. The corresponding state routes were SR-4, SR-108, SR-120, and SR-4 again. The last column consisted of the dates of the training all occurring from April 4th through 8th.

Table 3-1. Training and demonstration dates for the four maintenance yards

Maintenance Yard	SR	Pass	Date
Woodfords	4	Ebbetts (East)	April 4, 2022
Sonora Junction	108	Sonora (East)	April 5, 2022
Lee Vining	120	Tioga	April 6, 2022
Camp Connell	4	Ebbetts (West)	April 8, 2022

The training was successful at each of the yards, and Caltrans Maintenance staff were prepared to use the MPRO system in their pass opening operation. The snow build-up once again was not sufficient to illustrate the benefits of the system (see Table 3-2 for snowfall information provided by Caltrans). However, Caltrans Maintenance received the needed information and training to prepare the systems and train new operators in future seasons. As such, the MPRO system is now fully deployed into regular Caltrans operations. AHMCT remains available for support questions should they arise.

Table 3-2. Snowfall records for the implementation sites

Maintenance Yard	Normal snowfall	20/21 snowfall	21/22 snowfall	20/21 % normal	21/22 % normal
Groveland	70"	48"		69%	
Long Barn	203"	94"		46%	
Caples Lake	346.5"	203.5"	251"	59%	72%
Camp Connell	320"	188"		59%	

Key seasonal MPRO preparation includes the following steps:

- Check for equipment availability/readiness
 - Confirm cabling and power are already installed on the equipment
 - Check the serial number of the Vector V500 GNSS receiver for each system
 - Purchase Atlas H10 SBAS differential correction service, either one or three months, for each system (in 2022, \$180/month or \$485/quarter per system)
 - Provision SBAS service on corresponding MPRO systems following instructions from previous report [1]
 - Test systems in yard, and train operators
 - Deploy MPRO in field as lead vehicle
-

The views of one of the passes which was opened by MPRO is depicted in Figure 3-1. This Figure shows the area covered by snow at a level that one cannot see the roadway pass and then the opened road with Caltrans equipment utilizing MPRO system showing walls of snow on the roadside.



Figure 3-1. The views of a pass before and after opening

The MPRO system was also used during implementation on California State Route 4, which is a GPS-challenged area. The system, however worked effectively as depicted in Figure 3-2. This Figure shows two views one of the inside of the cab of the blower showing piles of snow in front and one from the rear showing the clear roadway pass.

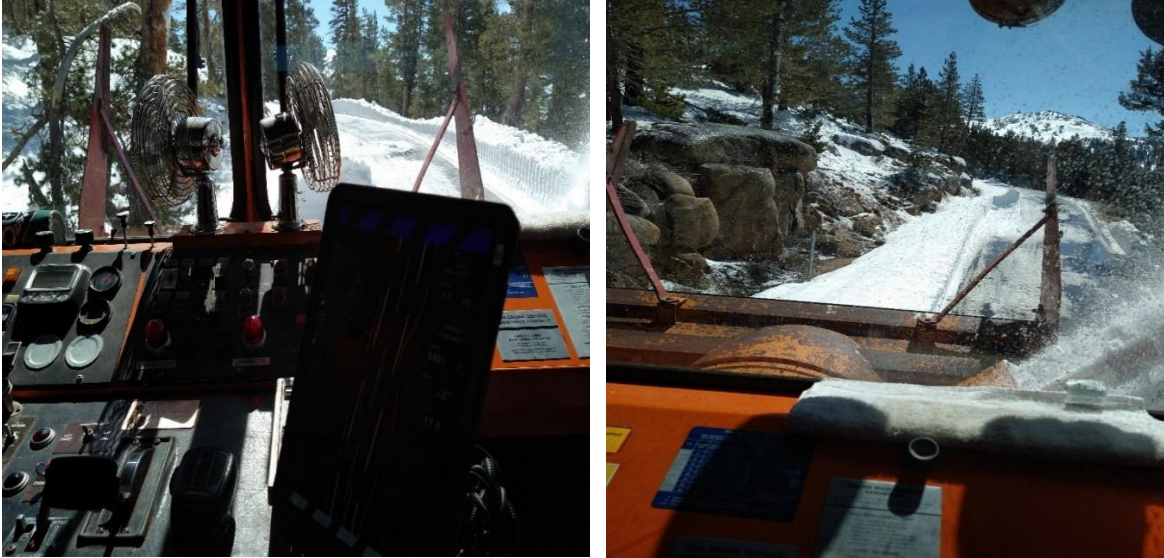


Figure 3-2. The MPRO system being used effectively on a blower on State Route 4

Exploring Nontraditional Methods to Obtain Vehicle Volumes

Caltrans uses vehicle volume data or Annual Average Daily Traffic (AADT) data in maintenance planning. The original research task had evaluated use of non-traditional methods of acquiring AADT. Traditional temporary methods require resources to place the sensors, collect the data, and remove the sensors. The placement and recovery of the data acquisition system along the roadside also places crews at risk as they are exposed to vehicular traffic. Traditional permanent methods require additional planning and construction costs in order to implement. Through a data analytics contract with Geotab, Caltrans' District 6 had evaluated the feasibility of a non-traditional method to acquire AADT.

Geotab is a leader in connected vehicle platforms with over 2.6 million connected vehicles. This connection is designed for the vehicle drivers, however, it also turns the vehicles into mobile sensors. The vehicles produce a large telematics data set that can be analyzed to determine AADT amongst other important information. The customer, District 6, accesses this data through Geotab's transportation analytics platform: "Altitude". Altitude is a web-based interface to the data, but there is also the option through free software development kits and Application Programming Interfaces to integrate the data into current Caltrans systems.

This project involved obtaining a 6-month data set from Geotab that contained telematics from April through October 2021. The vehicular traffic included in this dataset would need to have its origin or destination within District

6. Such data set was purchased through accelerated research implementation by AHMCT through coordination with District 6 and was AHMCT provide support for the usage of the data set at District 6. Figure 3-3 below, shows a sample of the Altitude interface for vehicles that travelled between Kern and Fresno County that utilized I-5. Data such as this will be compared to traditional permanent methods at Caltrans to determine the feasibility of using Geotab as an alternative method to determine AADT.

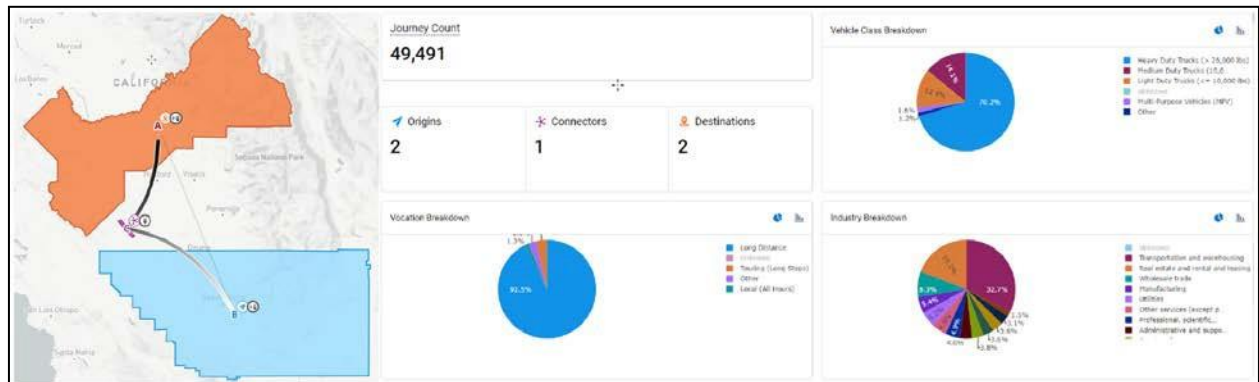


Figure 3-3. Screenshot of vehicle count, class, vocation, and industry courtesy of Geotab

Figure 3-3 shows a full screen shot of the Geotab Attitude software indicating the location of the data on a map including vehicle count, vehicle class breakdown, as well as industry and vocation breakdowns.

Develop MASH Bridge Railing that Satisfies State and Federal Historic Preservation Requirements (Marketing to Districts)

This accelerated research implementation funding was to develop marketing material for an original research task what was completed for the Caltrans Division of Structures. The original research task was to provide a bridge rail that meets federal safety requirements for use on state historic bridges and will be eligible for Federal-aid reimbursement. This project involved developing and providing marketing material and make it available for State and Nationwide use. Due to low budget for this project, it was determined that the focus will be on developing a brochure which can be electronically distributed nation-wide. The brochure developed is depicted in Figure 3-4.



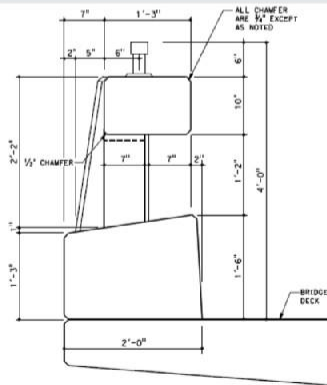
**CALTRANS
APPLIED
RESEARCH
SOLUTIONS**



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CARS



HISTORIC BRIDGE RAIL REPLACEMENT



Replacing and repairing Type 86H bridge rails is now easier, thanks to Caltrans. There is a validated and compliant design available for your consideration on your next historically registered bridge project.

- MASH TL-4 Compliant
- Eligible for Federal-Aid Reimbursement
- Design Package Available
- Reduce Time for Upgrades and Repair of Historic Bridges



[Design package and reports](#)



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Figure 3-4. The brochure for marketing the MASH Bridge

The brochure depicted in Figure 3-4 provides pictures of the bridge rails and its MASH TL4 collision with which it is compliant. It also includes a diagram providing more details of the type 86H Bridge rail illustrating its easier installation.

Integrating Zero Emission Vehicles (ZEVs) into Caltrans Fleet

Caltrans is and will be subject to mandates that require the purchase of ZEVs when replacing fleet vehicles. ZEVs will have varying ranges and refueling characteristics as well as require a different fueling infrastructure when

compared to the conventionally fueled vehicles being replaced. The business problem will be for Caltrans to place ZEVs in locations where they can be used successfully. There is currently no commercially available products or tools available for comparing and selecting optimum ZEV replacement based on usage, charging infrastructure, and vehicle type. Under a research task funded by the DRISI, University of California Riverside (UCR) has developed a software tool (ZEV Tool) that is able to analyze historical telematics trip data, ZEV performance characteristics, refueling infrastructure type and location to determine which historical trips of the replaced conventionally fueled vehicle could be successfully completed with the new ZEV.

The accelerated research implementation funding was used to fund a project for the UCR research team to support the continued operation and Caltrans' use of the ZEV tool on UCR servers with focus on the following:

- Maintain UCR ZEV Tool server to provide access to Caltrans staff to perform ZEV analysis;
- Identify and implement correction to software or database errors that create invalid output results;
- Maintain the vehicle activity database which serves as a reference analysis for ZEV compatibility;
- Assist Caltrans staff with ZEV Tool interfacing and remote connections;
- Assist Caltrans staff in interpreting input parameters and analysis results; and,
- Perform occasional ZEV analysis scenarios when Caltrans staff are unable or limited on time.

The evaluation process developed in this research task leading to proper implementation of the four projects discussed so far, does provide for a framework for future use as a model for selection of projects for accelerated research implementation. This process is discussed in the next chapter under recommendations.

Chapter 4:

Conclusions and Recommendations

This research task was initiated by Caltrans DRISI to accelerate putting into practice the innovations developed through R&D projects sponsored by Caltrans. This research task evaluated some of the recently completed R&D projects through a formalized evaluation process and selected and funded four of such projects for accelerated research implementation. Furthermore, it worked and monitored the work of the researchers for all these projects leading to successful implementation within Caltrans.

The following recommendations are made based on the experience gained in performing this research task:

1. It is important to use a formalized application process for requesting accelerated research implementation funding. A sample application form is provided in Appendix A. In the applications accepted for consideration there should be:
 - a. commitment and availability of the research team to perform the implementation if it is funded, and
 - b. availability of a champion within Caltrans internal customer in making sure that the work is properly implemented within Caltrans.
2. It is recommended to provide an information session for researchers and Caltrans customers who have had underutilized R&D projects will be useful to improve understanding of the process and increase the number of requests.
3. It is recommended to use two panel reviews for the project selection which could be in the form of workshops. One workshop should consist of technical and operational workforce from Caltrans and the second should involve higher level management personnel. The second review panel or workshop can be potentially integrated to the existing Caltrans RDAC review panel assuming the schedule would match.
4. In evaluating applications for accelerated research implementation funding, it is recommended that considerations will be given to the following type of projects:
 - a. Low hanging fruits for rapid integration into Caltrans Workflow.
 - b. Projects that can provide the best ROI.
 - c. Projects that can have a broader applicability within Caltrans.

while considering:

- iv. Enhancing the safety of the infrastructure and its operations.
 - v. Increasing the value of the transportation system's assets.
 - vi. Enabling better stewardship of the resources required to accomplish the tasks at hand.
5. Since the research organization receiving funding from Caltrans for handling the accelerated research implementation funding process cannot legally fund back any entities within Caltrans, it is recommended that some portion of the available funds be kept within DRISI for consideration of funding internal units if such units are selected through the process for accelerated research implementation funding.
6. In order to close the loop with the internal Caltrans customer requesting research implementation support, a feedback template needs to be developed. This template would be based, in part, on the original request for research implementation support; but would also request feedback from the customer regarding the project needs, goals, and results. This feedback mechanism will provide an important opportunity at the end of the effort to touch base with each customer and assess the success of the research implementation effort.

References

- [1] K. Yen, S. Donecker, T. Swanston, and T. Lasky, "Mountain Pass Road Opening (MPRO) Implementation and Training," AHMCT Research Center, UCD-ARR-21-11-30-01, 2021.

Appendix A: Research Implementation Funding Application

REQUEST FOR DRISI IMPLEMENTATION FUNDING ASSISTANCE

Date:
DRISI Task Number:
Initial Research Title:
Organization/Unit that Performed the Initial Research for Caltrans
Submitted by (name, District/Division, email, and telephone numbers):
Project Champion:
DRISI Project Manager:
Amount Requested (please note funds are for the same external organization which performed the research to complete implementation. This process is not for funding internal Caltrans units):
Short Description of What the Requested Funds are Intended For:
Expected Time Duration for Implementation:
Do you have a commitment from all parties that will be involved in this effort?

What challenges will you face during implementation?

Implementation activities planned for the funding requested:

When will these activities be completed?

Describe how these activities will facilitate implementation of the research findings:

Describe how the success of these activities will be tracked, measured, and reported back to DRISI:

What will be the result if implementation funding is not approved?

Budget table:

Implementation activity	Estimated duration of activity*	Estimated Budget of activity
Task 1		
Task 2		
Task 3		
Task 4		
Task 5		
Total		

If applicable, please attach a copy of the project's implementation plan.