**TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT**

# Colorado Department of Transportation

Lead Agency (FHWA or State DOT):

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Transportation Pooled Fund Program Project #**  TPF-5(380) | | **Transportation Pooled Fund Program - Report Period:**  □Quarter 1 (January 1 – March 31)  □Quarter 2 (April 1 – June 30)  □Quarter 3 (July 1 – September 30)  ✔ Quarter 4 (October 1 – December 31) | |
| **Project Title:**  Autonomous Maintenance Technology (AMT) Pool Fund | | | |
| **Name of Project Manager(s):**  David Reeves | **Phone Number:**  303-757-9518 | | **E-Mail**  [david.reeves@state.co.us](mailto:david.reeves@state.co.us) |
| **Lead Agency Project ID:**  WBS 22610.06.01 | **Other Project ID (i.e., contract #):** | | **Project Start Date:**  8/14/2018 |
| **Original Project End Date:**  12/31/2024 | **Current Project End Date:**  12/31/2024 | | **Number of Extensions:**  0 |

# Project schedule status:

□✔ On schedule □ On revised schedule □ Ahead of schedule □ Behind schedule

Overall Project Statistics:

|  |  |  |
| --- | --- | --- |
| **Total Project Budget** | **Total Cost to Date for Project** | **Percentage of Work Completed to Date** |
| $369,269 (4 projects encumbered)  $725,000 (transferred to CDOT) | $110,263 (amount invoiced to date) | 25% |

***Quarterly*** Project Statistics:

|  |  |  |
| --- | --- | --- |
| **Total Project Expenses and Percentage This Quarter** | **Total Amount of Funds Expended This Quarter** | **Total Percentage of Time Used to Date** |
| Ongoing Project (N/A) | Ongoing Project (N/A) | Ongoing Project (N/A) |

**Project Description**:

The Colorado Department of Transportation (CDOT) has helped to develop a first‐of‐its kind work zone vehicle designed to advance safety for roadway maintenance crews. Customarily positioned behind road construction crews in order to protect workers from the traveling public, the Autonomous Impact Protection Vehicle (AIPV) increases work zone safety by removing the driver from a truck that is actually designed to be hit. The objective of the Autonomous Maintenance Technology (AMT) Pool Fund is to develop, demonstrate and refine the AIPV in preparation for its wide‐spread deployment nationwide in DOT maintenance operations.

Currently there are three projects related to this pooled fund:

1. 5380-18-01 AMT Coordination (CSU) $71,700 - Dr. Tom Bradley (PI), Ann Batchelor (PM). Colorado State University (CSU). Provides administrative management and support of the pool fund. This includes travel for annual meetings.
2. 5380-19-02 Human AMV Interaction (CSU) $74,997 - Dr. Erika Miller (PI), CSU. Evaluating the Human‐Automated Maintenance Vehicle (AMV) for Improved Safety and Facilitating Long Term Trust
3. 5380-19-03 ATMA Dev Guide (MST) $92,572 - Dr. Xianbiao (XB) Hu (PI). Missouri University of Science and Technology (MST)
4. 5380-20-04 ATMA Tabletop $22,300 – Will Moorhead (PI), All Clear Emergency Management, Golden, Colorado
5. 5380-20-05 ATMA Cybersecurity Complement $50,000 – Dr. Jeremy Daily (PI), Colorado State University, Fort Collins.
6. 5380-20-06 ATMA Documentation – Dr. Xianbiao (XB) Hu (PI), Missouri Tech University.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

Significant progress in Q4 2020 includes:

* AMT Pooled Fund Annual Virtual meeting held and included over 40 participants from states, local governments, federal, academia and industry. Meeting featured presentations from researchers involved the pooled fund, state deployer updates, discussion on COVID precautions and operations and planning for the upcoming research round.
* 5380-19-02 Human AMV Interaction (CSU) $74,997 - Dr. Erika Miller (PI), CSU. Evaluating the Human‐Automated Maintenance Vehicle (AMV) for Improved Safety and Facilitating Long Term Trust
* Dr. Miller presented her research findings at the AMT Pool Fund in October 2020 to the team. Will be finalizing the project report and closing out the project.
* Pooled fund approved three projects to move forward (5380-20-04, 5380-20-05, 5380-06) all noted above. Will provide updates on projects moving forward – CDOT working on contracting for these projects. Approval of three additional projects and beginning the contracting process for the projects:
* 5380-20-04 – ATMA Tabletop Facilitation Lead (TBD)
* 5380-20-05 – ATMA Tabletop Cybersecurity (Dr. Daily, CSU)
* 5380-20-06 – ATMA Documentation (Dr. Hu, Missouri S&T)
* 5380-19-03 ATMA Dev Guide (MST) - Dr. Xianbiao (XB) Hu (PI). Missouri University of Science and Technology (MST)
* XB presented his research findings to date of his project. The pooled fund is still working on getting cameras installed on an ATMA so Dr. Hu can validate his model with real-world date.
* North Dakota officially added to the AMT Pool Fund.
* Pre-Deployment and Deployment Toolkit compiling resources, tools and lessons learned by autonomous truck mounted attenuator states drafted.
* Outreach and discussion with Connecticut and Iowa

**Anticipated work next quarter**:

In the 4th quarter of 2020, the team plans to accomplish the following:

* Continued refinement of the the Toolkit
* Continued monthly meetings
* Quarterly report and project status
* Continued work on revising outwardly facing website
* Continued work on all projects and contract projects 4, 5, and 6
* Hold official kick offs for project 4, 5, and 6

**Significant Results:**

* Even though virtual, AMT Annual Pooled Fund was very successful. Participation and engagement were fantastic , even in a virtual setting and included both members and non-members. New development by VTTI of an ATMA system and that was presented during the meeting.
* Dr. Erika Miller completed her findings and presented them to CDOT – illustrating various items to consider in how the training can be improved for the operators.
* Group has significantly discussed challenges due to COVID social distancing restrictions in maintenance operations and how states are grappling with those requirements.
* Beginning to compile various lessons learned among the several deployments and seeing patterns and similarities. States that are facing similar challenges and barriers that others have tackled are leveraging those lessons learned.
* Toolkit development illustrating various themes in pre-deployment activities, program setup and procurement challenges that others have faced and new deployers should consider as they begin deployment activities.
* Collaboration and information sharing is one of the most valuable components as states tackle these innovative technology deployments.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

No challenges at this time.

**Potential Implementation:**

Currently five states in some phase of deployment with purchase of a vehicle: California, Colorado, Missouri, Minnesota, and Virginia. This has increased since 2018 when Colorado was the only infrastructure owner operator of an ATMA and who had deployed an ATMA.

CDOT working through a second ATMA deployment

Assisting new states with ideation and project discovery

Potential new state – North Dakota to be added to the pool fund group