

RESULTS SUMMARY

After surveying and interviewing practitioners, researchers compiled key findings and made recommendations for agencies interested in maximizing the potential of AVL/GPS systems for multiple maintenance purposes.

PROJECT DETAILS

Project Title: Expanded Use of AVL/GPS

Project Number: CR20-04

Project Cost: \$73,124

Report Date: December 2022

Project Co-Champions:

David Gray

New Hampshire Department of Transportation
david.a.grayjr@dot.nh.gov

Steve Spoor

Idaho Transportation Department
steve.spoor@itd.idaho.gov

Investigator:

Ming Shiun Lee

AECOM Technical Services
ming.shiun.lee@aecom.com

DECEMBER 2022

EXPANDED USES OF AVL/GPS SYSTEMS MAXIMIZE VALUE

Need for Research

Automated vehicle location (AVL) and GPS technologies have improved the service, safety and efficiency of winter maintenance operations for transportation agencies around the country. A [2018 Clear Roads research project](#) summarized procurement, data collection and other best practices of winter maintenance uses.

Many AVL/GPS systems have applications that extend beyond winter maintenance practices, increasing the benefits and value of these technologies.

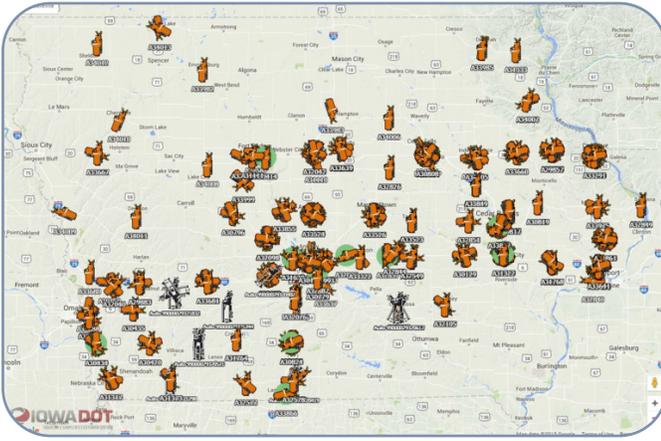
Some agencies transition equipment between vehicles to use AVL/GPS technologies year-round for a wide range of maintenance purposes, including monitoring task or project progress, increasing driver safety and tracking maintenance assets used in all four seasons. By using these technologies throughout the year, state transportation agencies can maximize the value of these systems and increase the returns on agencies' investments.

Objectives and Methodology

The goal of this project was to demonstrate applications for using AVL/GPS technologies to support winter and all-season maintenance activities. Clear Roads agencies also needed information about the transferability of the technologies to transition the systems between winter and other seasonal maintenance activities.

A review of the literature provided a better understanding of nonwinter maintenance uses of AVL/GPS systems among transportation agencies. To supplement the findings of the literature review, researchers surveyed state departments of transportation (DOTs) and municipal transportation agencies to gather information about agency applications of these technologies across seasons.

Follow-up interviews were conducted with staff from three of the state DOTs and two municipal agencies that reported the highest nonwinter use of the systems. These interviews provided additional details about AVL/GPS system planning, procurement and operations, and were used to develop five in-depth case studies. Finally, three additional state DOTs were interviewed, two of which transfer AVL/GPS systems between vehicles.



Iowa DOT's SkyHawk tracking software uses AVL/GPS technologies for year-round applications, such as identifying the location of maintenance vehicles, performing equipment checks, and collecting materials and engine data.

Results

Out of 52 agencies responding to the survey, 31 reported varying levels of AVL/GPS technology use for year-round maintenance tasks. In some agencies, maintenance managers may not be fully utilizing the AVL/GPS system capabilities because of insufficient or inexperienced staff.

The five agencies interviewed for the case studies all reported implementing AVL/GPS technologies on their entire fleets. Vehicles are used year-round by four agencies with the technologies serving multiple purposes. Additionally, AVL/GPS systems have been integrated with a variety of onboard and other systems for nonwinter maintenance such as sprayer controllers, dashcams and dynamic messaging signs.

Two of the three transportation agencies interviewed for additional input—Massachusetts and New Hampshire DOTs—reported transferring AVL/GPS equipment between vehicles for winter and nonwinter uses. More intervehicle transfers may not be occurring due to specific provisions in vendor contracts and/or the reduced cost of AVL/GPS technology, which makes it possible to purchase enough for all vehicles that an agency may want to equip. Additionally, some agencies have the systems on both winter and nonwinter maintenance vehicles, and some use vehicles with AVL/GPS systems across seasons for multiple purposes.

Below are recommendations based on these information-gathering efforts:

- **Planning for AVL/GPS systems.** Manage expectations by deciding at the outset what data

to collect for specific tasks. If agencies haven't yet acquired the technologies, start with a pilot project to demonstrate the benefits and create manager and operator buy-in.

- **Implementation.** Work with technology vendors on automated and customized reports or other unique circumstances. Verify data in reports to ensure system accuracy. Encourage staff to propose new uses.
- **Education and understanding.** Ensure operators and maintenance supervisors know how AVL/GPS technologies are being used and how they can benefit the safety and efficiency of operations to alleviate any staff concerns that their performance is being monitored. Have a knowledgeable champion in the agency to address technical, software or integration issues.

Benefits and Further Research

While the benefits of AVL/GPS technologies for winter maintenance are well established, using these technologies for year-round maintenance will increase their efficiency and value. When integrated with other equipment, these systems can serve many functions, such as providing information on the status of nonwinter maintenance operations, including road miles swept or stripes painted, and connecting to dynamic message signs or warning beacons to alert travelers of road conditions. As maintenance managers' knowledge and experience increase, they can share information about system benefits and issues, further enhancing implementation among other transportation agencies.

"Seeing how other agencies are using and benefiting from these technologies is helpful, though evidence of the hardware being transferred between vehicles when the seasons change was limited. The technology and its applications are maturing, and we're all learning as we go."

Project Co-Champion Steve Spoor
Idaho Transportation Department
steve.spoor@itd.idaho.gov