Automatic Vehicle Location (AVL) on Agency and Public Vehicles

RTM 3

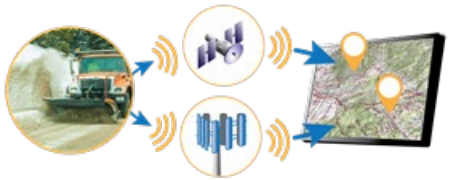

Photo: Courtesy of Neil Hetherington, WTI

Description: Automatic vehicle location (AVL) systems track the real-time position of a vehicle. AVL uses a wireless communication system to communicate vehicle location to a central location or control center.

AVL is used for fleet management by many types of agencies, including emergency response, construction, trucking companies, and service agencies. When combined with GIS (see #TM3) or mapping software, AVL can be used to dispatch vehicles to priority areas of need; for example AVL can optimize snow plow routes during winter storm events. An AVL system could also be used to dispatch an ambulance that would arrive at the scene more quickly. Typically, AVL is used for fleet management, but vehicles equipped with AVL could also serve as a traffic probe for real-time traffic information.

Rural Transportation Critical Needs

- ☐ Crash Countermeasures
- ☑ Emergency Services
- ☑ Operations & Maintenance
- ☑ Rural Transit & Mobility
- ☑ Surface Transportation & Weather
- ☐ Tourism & Travel Information
- ☐ Traffic Management

Issues Addressed

- ☑ Rural Transit Service Response Time
- ☑ Rural Transit Wait Time
- ☑ Rural Transit Traveler Information
- ☑ Rural Transit Availability
- ☑ Resource Mapping & Monitoring
- ☑ Fleet Management

Strategies Achieved

- ☐ Road User
- ☐ Road
- ☑ Vehicle
- ☐ Safety Culture
- ☐ Engineering
- ☑ Emergency Response
- ☐ Enforcement
- ☐ Education

Applicability

- AVL provides a tool for facilitating fleet management, which is applicable to many transportation agencies and their vehicles: service vehicles, emergency vehicles, trucks, etc. AVL is also useful for ensuring the most cost effective use of agency resources (for example, dispatching snow plows to critical areas). AVL also provides safety benefits; if there is an emergency while an agency vehicle is in operation, the agency can easily share vehicle location information (Global Positioning System (GPS) coordinates) with emergency services.

Partnerships

- Applications benefit from collaboration among numerous agencies, which may include:
  - Departments of transportation
  - Transit agencies
  - Trucking companies
  - First responders
  - Public/private service agencies

Key Components

- Location hardware
  - GPS receiver
  - Signpost beacons
  - Signpost receiver
- Wireless data transmitter
- Computer to display location data

Examples of Implementation

- **METropolitan Special Transit**

The METropolitan Special Transit, a paratransit agency in Billings, Montana, equipped 15 vehicles with GPS based AVL. The AVL system was used with computer aided scheduling and dispatching to allow a dispatcher to assign a customer to the nearest paratransit vehicle.

- **Pennsylvania Department of Transportation (PennDOT)**

PennDOT ran a pilot test of AVL systems on 119 snow plows during 2014-2015. AVL was used to monitor vehicle movement and snow plow coverage during winter storms. The location of vehicles was also shared on the state's 511 website.

Opportunities for Future Expansion

- AVL can be combined with GIS mapping software to determine optimal routes for agency vehicles.
- AVL can be used in coordination with weather sensors to determine real-time road conditions as a vehicle moves along its route.
- AVL equipped vehicles can be displayed on integrated traveler information systems and applications so the public can know the location of agency vehicles.
- AVL can be combined with connected vehicles to provide real-time traffic information or information from snow plows equipped with AVL to provide information on which roads have been plowed or sanded.

Implementation Considerations (General)	Implementation Considerations (Pro)	Implementation Considerations (Con)
•The two most commonly used types of AVL are: •GPS: GPS uses a system of earth orbiting satellites in order to determine the location of a receiver. The GPS data is very accurate but there can be issues with signal interference in areas with high amounts of tree cover or in canyons. •Signpost: A signpost tracks a vehicle as it passes specific points using various methods including short-range radio, beam emission, and optical scanners. As a vehicle passes one of these signpost beacon systems along a route, the vehicle's ID as well as the signpost ID are transmitted to a central location. This type of system would not allow the vehicle to be tracked if it moves away from its route.	•AVL systems allow agencies to monitor their vehicles in real-time. •They optimize dispatch of agency vehicles. •Systems provide improved safety on roadways during inclement weather and can improve response time for snow removal. •They improve response times for emergency vehicles. •Systems can monitor and relay information from the vehicle to a central location in real-time. •AVL systems share location data easily among agencies, which allows for interagency coordination efforts during storm events.	•Staff may object to the use of AVL (some feel like they are being "watched"). •GPS signal can degrade in areas with dense tree cover or canyons. •Signpost beacons only work along a fixed route.

Additional Resources

- *USDOT Intelligent Transportation Systems Joint Program Office, Automatic Vehicle Location Fact Sheet for Transit*, found here: https://www.pcb.its.dot.gov/factsheets/avl/avl_overview.aspx#page=tech
- *AVL Systems for Bus Transit: Update*, found here: https://nap.nationalacademies.org/catalog/22019/avl-systems-for-bus-transit-update
- *State-of-the-Practice of Automatic Vehicle Location for Winter Maintenance Operations*, found here: https://www.researchgate.net/profile/Xianming_Shi/publication/228947437_State_of_the_Practice_of_Automatic_Vehicle_Location_for_Winter_Maintenance_Operations/links/0deec523b1bb5e2103000000.pdf

Useful Tip

AVL can be used in coordination with an existing integrated traveler information system to inform the public of where agency vehicles are located (snowplows, maintenance vehicles, etc.)

Cost Range

(Cost/financial information, where noted, is based on 2016 dollars (unless otherwise specified). Cost/financial information is estimated, and will vary based on size and scope of project, number of units, etc. In general, capital costs include initial purchase costs of hardware, software, and other required equipment. Maintenance and operations costs include staff time to operate, monitor and maintain systems; data collection; system upgrades; evaluation; etc.)

Capital Costs: The total capital costs for this tool range from low (less than $50,000) to medium ($50,000 to 100,000), depending on the type of system that an agency installs.

For example, on-board AVL equipment (GPS) costs $1,700 per vehicle. The METropolitan Special Transit Service in Billings, MT equipped 15 vehicles with AVL technology including a GPS and on-board computer in order to track the real-time location of its vehicles. The cost of this project was $50,700[1].

Operations Costs: The operations and maintenance costs for this tool are low (less than $50,000). On-board AVL equipment (GPS) maintenance costs are approximately $70 per year.

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