Automated Vehicle Location Fact Sheet: Rural Transit

Technology Overview

Use AVL to:

- Enhance communication between vehicles and control center.
- Optimize demand-response scheduling.
- Provide real-time traveler information.

Automatic Vehicle Location (AVL) systems calculate the real-time location of any vehicle equipped with a Global Positioning Satellite (GPS) receiver. Data are then transmitted to the transit center with use of radio or cellular communications and can be used immediately for daily operations as well as archived for further analysis.

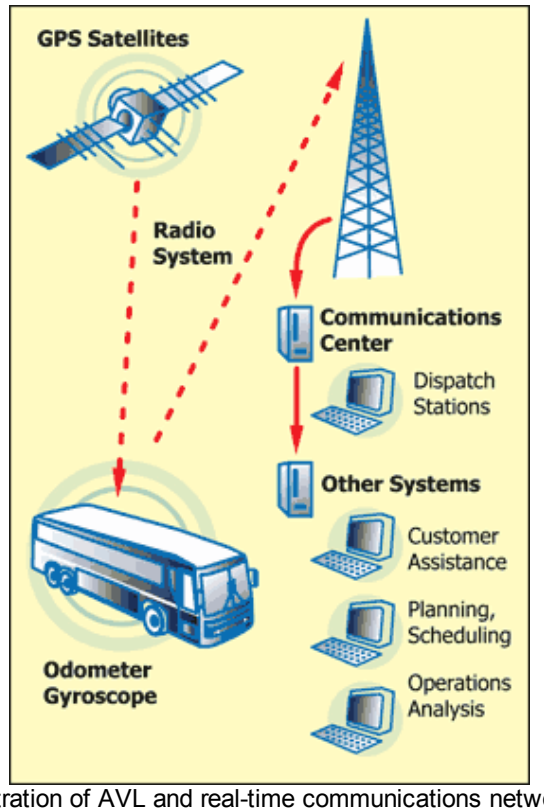


Illustration of AVL and real-time communications network.
(Source: Automatic Vehicle Location Successful Transit Applications)

As a stand-alone technology, an AVL system can be used to monitor on-time performance. When combined with other technologies, AVL can deliver many benefits in the areas of fleet management, service planning, safety and security, traveler information, fare payment, vehicle component monitoring, and data collection. Since the greatest benefits from AVL are achieved by combining it with other Intelligent Transportation System (ITS) technologies, AVL is most appropriate for **large rural agencies** with more than 30 vehicles that plan to implement a comprehensive ITS.

Common Technology Combinations

Daily Operations

Many rural transit agencies provide demand-response service. Combined with Computer-Aided Dispatch and Scheduling (CADS) and Geographic Information Systems (GIS), AVL allows vehicles to be rerouted in real time to accommodate schedule changes and optimize the number of trips provided. Agencies often realize reductions in nonrevenue miles, passenger wait times, and fleet size. With the addition of Mobile Data Terminals (MDT), drivers can be provided with maps and directions for each segment of their route.

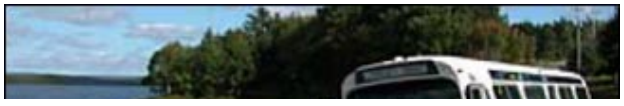
Safety and Security

Many AVL systems incorporate **silent alarms** which allow drivers to covertly alert transit management and police of emergency situations. The vehicle location is displayed on a GIS map to facilitate incident response.

More Technology Facts

Traveler Information

Cape Cod Regional Transit Authority provides AVL data to



passengers via its online GIS system. Passengers can check the status of their bus before going to the bus stop.

Maintenance

Ottumwa Transit Authority uses its AVL/MDT system to relay mechanical information about vehicles remotely. This allows maintenance staff to monitor the needs of remotely garaged vehicles.

Is this Technology Right for My Agency?

Adequate Resources

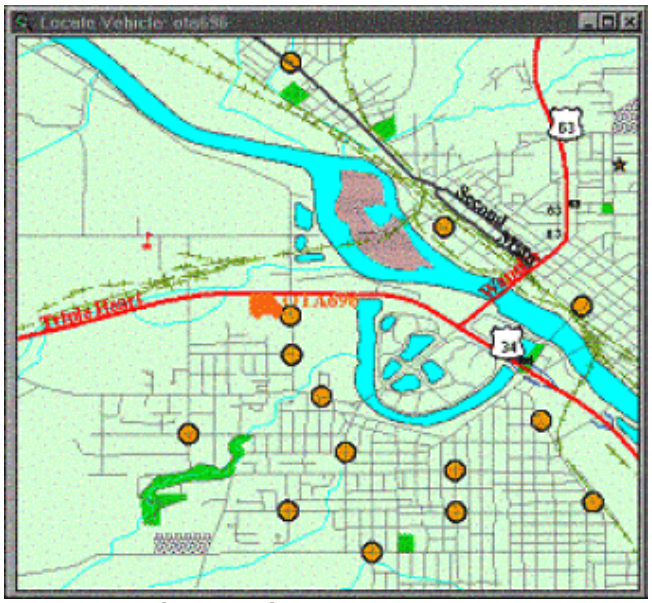
- Capacity for data transmission and storage.
- Staff resources to analyze data and maintain and manage AVL system.

Integration

- Interoperability with existing and planned technologies.
- Flexibility for changes in fleet size.
- Component of regional ITS architecture.

Implementation

- Testing technology on a subset of vehicles.
- Contracting for adequate training of all staff.



Use of AVL by Ottumwa Transit Authority.
(Source: Rural ITS Best Practices)

AVL systems are core technology only for large rural agencies (30 or more vehicles) and medium-sized agencies (10-30 vehicles) that operate demand-response service. These agencies can spread the cost of the AVL system over a larger fleet size and are most likely to benefit from the increased systems planning and fleet management capabilities provided by AVL. Adding AVL to existing CADS or GIS systems greatly expands the capabilities of these technologies.

AVL systems are available at a wide range of costs and levels of sophistication to satisfy the budget constraints and needs of most agencies. Agencies with limited technical capacity and basic AVL needs may wish to consider off-the-shelf or even web-based systems. Agencies interested in integrating existing ITS systems or desiring specialized features can contract a vendor to install customized, integrated systems.

Benefits and Costs

Benefits

- Kansas City achieved reduced incident-response time, from 7-15 to 2-3 minutes, with use of AVL.
- Ann Arbor saw voice-radio traffic reduced by 70% with use of AVL and MDTs.
- London (Ontario) saved $45,000 annually by eliminating manual schedule adherence checking.
- Collects driver log for use by payroll.
- Provides graphic or tabular report of vehicle activity (i.e., dwell time, speed).
- Sweetwater County, WY, almost doubled ridership without increasing dispatching staff by implementing AVL and CADS. Operating expenses decreased 50% per passenger mile.

- AVL and CADS allowed St. John's County Council on Aging in Augustine, FL, to reduce its scheduling, dispatching, and billing staff by half. Trips per vehicle hour have increased from 0.5 to 2.5.
- Collects driver log for use by payroll.
- Provides graphic or tabular report of vehicle activity (i.e., dwell time, speed).

Rural transit buses.
(Photo courtesy of City of Colvis, California)

Costs

Product Cost

Onboard GPS equipment ranges from $500 to $2,000 per vehicle; complete implementation costs (including control center hardware, installation, and training) range from $ 4,000 to $10,000 per vehicle. Required upgrades to communications systems can add significant costs. Additional ITS applications (CADS, real-time traveler information systems, **automatic passenger counters (APC), automatic fare cards (AFC),** video surveillance, silent alarms) are not included in these costs.

Operations and Maintenance

AVL alone provides limited operational savings. It facilitates communications and reporting and can improve systems planning. More significant savings are seen with the addition of CADS, which provides the ability to serve more customers with existing resources. Additional technology specialists are often needed to develop, manage, and maintain ITS systems. Consultants and manufacturers can provide some technical assistance, but in-house staff are more effective for all but the smallest agencies.

Rural Transit Agency Deployments

Agency Name	Contact	Vehicles	Context/Success of Deployment
Ottumwa Transit Authority	2417 South Emma St. Ottumwa, IA 641-683-0695	51	Radio-based AVL system significantly improved communications, scheduling, and service management.
Arrowhead Transit (serving Northeast Minnesota)	221 West 1st St. Duluth, MN 800-642-7155	52	Deployed AVL-MDT technologies without CADS; some technical difficulties but moderate benefits.
Cape Cod Regional Transit Authority	P.O. Box 1988 Hyannis, MA 508-775-8504	80	Added AVL to existing CADS to create web-based vehicle location system.
Capital Area Rural Transportation System (CARTS)	2010 East 6th St. Austin, TX 512-389-1011	60	Added AVL to existing automated booking and CADS systems, which reduced paperwork and improved real-time scheduling.

Additional Resources

Reports

Peng, Z.-R., E.A. Beimborn, Simi Octania, and R.J. Zygowicz. Evaluation of the Benefits of Automated Vehicle Location Systems in Small and Medium Sized Transit Agencies. University of Milwaukee. Center for Urban Transportation Studies. January 1999.

Conklin, J., et al. *Rural Transit ITS Best Practices*. FHWA. March 2003.

Institute for Transportation Research and Education, North Carolina State

University and KFH Group. TCRP Web Document 20 (Project B-17). Advanced Public Transportation Systems for Rural Areas: Where Do We Start? How Far Should We Go?. 2001.

Acadia National Park Island Explorer in Maine uses AVL to alert visitors about bus arrivals. (Photo courtesy of Managing Demand Through Travel Information Services, FHWA)

Websites

USDOT ITS Databases

- **http://www.itsbenefits.its.dot.gov**
- **http://www.itscosts.its.dot.gov**
- **http://www.itslessons.its.dot.gov**

Federal Transit Administration
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