

**MONTGOMERY COUNTY, MARYLAND'S  
ADVANCED TRANSPORTATION MANAGEMENT SYSTEM (ATMS) -  
THE FOUNDATION FOR THE COUNTY'S IVHS PROGRAM**

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**Abstract**

Montgomery County, Maryland is developing an extensive Intelligent Vehicle Highway System (IVHS) program. The start of this program is the development and implementation of an Advanced Transportation Management System (ATMS). The ATMS is designed to use automation to the fullest extent to manage Montgomery County's 2000 mile transportation network.

**Background**

Montgomery County, Maryland is part of the Washington, D.C. metropolitan area. Montgomery County with a population of 750,000, 2000 plus miles of roadway, and the busiest interstate system in Maryland, has the usual multitude of transportation problems associated with developing urban areas. Montgomery County for the past several years has had an energetic road construction program to attempt to keep pace with rapid development. As federal, state, and local funding for new roadway construction has been reduced it has become increasingly more difficult to build the roadway systems to keep pace with development. The Montgomery County Department of Transportation realized an effective transportation

management program would have to be implemented if Montgomery County was to make the most efficient use of its transportation infrastructure.

Montgomery County began a traffic management program in 1980 with the start of a computerized signal system. The computerized signal system has grown from ten intersections in 1980 to controlling all of the approximately 630 traffic signals maintained by Montgomery County in 1993.

Experience with the computerized signal system proved to Montgomery County further automation would be critical to managing the transportation system.

A Transportation Management Center (TMC) has been constructed to house the central operations. The TMC is staffed from 6:00 AM to 11:00 PM 365 days per year. As future budgets allow the TMC is planned to be staffed on a 24 hour per day basis.

**Transportation Management**

Montgomery County's transportation management program can be divided into five areas to include:

1. Systems Engineering and Design:

a. Analysis of the existing transportation network to determine, recommend, and implement short and long term improvements.

b. Development of specifications, testing, and implementation.

c. Design, construction, testing, and implementation of transportation management related procedures and programs.

2. Surveillance:

a. Operation of an electronics based surveillance program.

b. Operation of a ground based surveillance program.

c. Operation of an aerial surveillance program.

3. Control:

a. Operation of Montgomery County's Transportation Management Center.

b. Operation of the Advanced Transportation Management System (ATMS) including all ATMS subsystems.

4. Coordination

a. Coordination of all activities and communication with other agencies.

5. Information and Education:

a. Motorist information.

b. Transit information.

c. Media information.

d. Education and training of

staff, other agency personnel, media, and citizens.

Advanced Transportation Management System (ATMS)

Montgomery County's Advanced Transportation Management System (ATMS) is the heart of the County's transportation management program. The ATMS is designed to be an integrated transit/traffic management system and will use the latest in automated technology to help manage the transportation network. The central portion of the ATMS will be housed in the Transportation Management Center (TMC). The central system will be interfaced to a variety of sophisticated on-street devices over a 200 plus mile Montgomery County owned and operated communication network. The communication network will include extensive use of fiberoptics.

Through the use of sophisticated automated subsystems the ATMS will normally be operated by from one to three people depending on the level of activities impacting the transportation system.

The ATMS is based on an open architecture and features a common man machine interface to all applications and systems. This open architecture provides the capability to readily add new technologies and subsystems.

ATMS Subsystems

The ATMS will be composed of multiple subsystem performing specific functions.

Subsystems include:

1. Computerized Signal System (CSS) - The computerized signal system is a real time traffic responsive system capable of controlling 1500 intersections, monitoring 3000 vehicle sampling detectors, and 10 reversible lane control systems.

2. Electronic & Variable Message Sign Control System (EVMSCS) - will provide automated control of electronic route guidance signs, lane control signs, information signs, and variable message signs.

3. Automatic Vehicle Locating System (AVLS) - The AVLS will monitor the location, speed, and other relative data on vehicles. AVL will be a critical portion of the transit/traffic integration. Global Positioning System (GPS) will be used as a major component of the AVL.

4. Video Surveillance System (VSS) - The VSS will provide real time control and monitoring of a planned 200 video camera system. The system will feature intelligent cameras capable of being programmed to point, zoom, and focus as automatically directed by the ATMS or manually controlled by TMC personnel. The video surveillance system will include live video from Montgomery County's airplane.

5. Electronic and Intelligent Detection System (EIDS) - the EIDS will provide real time monitoring of the transportation network. The detection system may include

inductive loop detectors, radar, microwave, infrared, sonic, and machine vision technologies.

6. Real Time Graphics Display System (RTGDS) - The RTGDS is based on a time critical geographic information system (GIS). All applications will interface to the RTGDS system to display statuses and other information in a user freindly format. The system includes the capability to georeference support data and to add vector layers on top of bit mapped images.

7. Travelers Advisory Radio System (TARS) - The TARS subsystem will provide automated radio reports on traffic and transit conditions.

8. Automated Transportation Information System (ATIS) - The ATIS will be a graphical and video based system. The system will provide a continous graphical display of tranportation conditions. Live video pictures from the video surveillance system will be integrated into the display. The system will be capable of outputing the display in NTSC format for use by television broadcast and cable stations. Montgomery County is planning to implement a Transportation Channel on the franchised cable television system using the displays generated by the ATIS.

#### Transit/Traffic Integration

Montgomery County's Division of Traffic Engineering and Division of Transit Services are working jointly to develop an integrated transit/traffic system based on the ATMS.

Montgomery County operates a fleet of 250 buses. Montgomery County believes developing a system capable of improving bus scheduling and reliability will increase ridership and reduce the use of single occupancy vehicles.

A system based on the ATMS and its subsystems, including AVL, will provide the capability to adjust traffic signals to accommodate the movement of transit vehicles without adversely impacting the movement of other traffic.

On demand scheduling will be possible as the system will know where the buses or other transit vehicles are located and be able to adjust scheduling to respond to off route locations.

The system will provide real time schedule information at key transit stops. Kiosks will be provided at major transit centers, such as shopping malls, business parks, and metrorail facilities.

#### Shared Central Database

The ATMS will have at its core a relational database management system (RDMS). Data which is gathered and processed by the various subsystems for real time operations will be stored in the RDMS and will be accessible as historical data. This historical data can be used by various planning agencies.

The ATMS will compare real time information to a historical "normal conditions" database to make decisions on adverse or unusual changes to the transportation system.

Threshold levels will be set and as these thresholds are surpassed the system will advise through alphanumeric and graphical displays the "problem" areas.

#### Incident and Special Events

The ATMS is designed to provide enhanced incident management and special event capabilities. The system can be programmed with transportation management plans which are implemented automatically in response to abnormal conditions such as a major incident or special event. The system will automatically adjust traffic signals, signs, etc. when a special plan is implemented. At the end of the incident or special event the system will automatically change all parameters back to normal.

#### Real Time Simulation

A future ATMS subsystem will be developed for real time simulation of what will happen to the transportation system if certain changes are made because of situations or incidents which adversely impact the transportation network. The simulation subsystem will provide the TMC staff the capability to do "what ifs" prior to actually implementing one or more changes. The simulation system must be capable of taking real time information and historical information and determine and display what will occur prior to actual implementation. Results must be available within a couple of minutes after request.

### Other Support Subsystems

The ATMS will require subsystems which are capable of "learning" what actions were taken for a particular circumstance and be able to advise TMC staff on what actions should be taken if the same or similar situation occurs.

Subsystems which monitor system performance, manage the communication network, ensure or improve reliability, coordinate activities, provide maintenance management, automate operations and monitoring, and others are required.

### Future

The ATMS will be the foundation of Montgomery County's Intelligent Highway and Vehicle System (IVHS). The ATMS is being developed with the capability to readily interface to the intelligent highways of the future. The ATMS will provide the capabilities to directly communicate real time transportation information to and from future "smart" vehicles.

### Benefits

Montgomery County anticipates the ATMS will improve the efficiency of the transportation network with the net result of reduced emissions, fuel consumption, and loss of work productivity. Improved incident management, special event management, customer service, coordination of activities between agencies, transportation planning, emergency response, and etc.

will be products of the ATMS. The integrated transit/traffic functions will improve and increase the use of transit with the net result of improved capacity and throughput of the transportation network.