
appendix



SUMMARY TABLES



Table 2-1. Incident Management Summary Table

Technology*	Deployment Level	Limiting Factors	Comments
Service patrols	Widespread Deployment	Cost, staffing	Successful
Common communication frequencies	Limited Deployment†	Cost, institutional issues	Successful
Automated incident detection algorithms	Medium Deployment†	Technical performance	Mixed
Cellular communication for incident detection	Widespread Deployment	Availability, institutional issues	Jury is still out
Motorist callboxes	Limited Deployment†	Being replaced by cell phone use	Successful
CCTV (ground, airborne, high magnification)	Widespread Deployment	Cost	Successful
Cellular geolocation (old generation)	Operational Testing†	Accuracy	Unsuccessful
Cellular geolocation (emerging generation)	Operational Testing†	Availability, institutional issues	Jury is still out
Regional incident management programs	Limited Deployment†	Institutional issues	Holds promise

* Cross-cutting technologies, such as telecommunications, are addressed in Chapter 7, “What Have We Learned About Cross-Cutting Technical and Programmatic Issue?”

† Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 2-2. Freeway Management Summary Table

Technology/System*	Deployment Level	Limiting Factors	Comments
Transportation management centers (may incorporate multiple technologies)†	Widespread Deployment‡	Implementation cost, staffing	Successful
Portable transportation management centers (may incorporate multiple technologies)	Limited Deployment‡	Implementation cost, staffing	Successful
Road closure and restriction systems (may incorporate multiple technologies)	Limited Deployment‡	Institutional issues	Successful
Vehicle detection systems (may incorporate multiple technologies)	Widespread Deployment	Cost, maintenance	Mixed —depends upon technology
Vehicles as probes (may incorporate multiple technologies)	Limited Deployment	Cost, integration	Jury is still out
Ramp metering (includes multiple technologies)	Medium Deployment	Politics, user appearance	Successful
Dynamic message signs (includes multiple technologies)	Widespread Deployment	Cost, changing technology	Mixed —due to operations quality
Highway advisory radio (includes multiple technologies)	Medium Deployment	Staffing	Mixed —due to operations quality
Dynamic lane control	Medium Deployment	Not in MUTCD for mainlanes§	Successful —especially on bridges and in tunnels
Dynamic speed control/variable speed limit	Technical Testing‡	Not in MUTCD; may require local legislation to be enforceable	Holds promise
Downhill speed warning and rollover warning systems	Limited Deployment‡	Cost	Successful

* Cross-cutting technologies, such as telecommunications and pavement sensors, are addressed in Chapter 7, “What Have We Learned About Cross-Cutting Technical and Programmatic Issues?”

† A transportation management center may control several of the systems listed further down the table, and will possibly utilize additional technologies, such as video display systems, local area networks, flow monitoring algorithms, geographic information systems, graphic user interfaces, and database management systems.

‡ Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

§ Mainlanes are freeway lanes that are not tunnels or bridges.

Table 2-3. Emergency Management Summary Table

Technology	Deployment Level	Limiting Factors	Comments
GPS/Differential GPS on emergency management fleets	Widespread Deployment	Cost	Successful
Mayday systems	Widespread Deployment*	Cost, vehicle choice	Successful
Mayday processing centers/customer service centers	Widespread Deployment*	Cost	Successful
Public safety answering points	Widespread Deployment*	Cost, staffing	Successful
CDPD communication	Limited Deployment*	Availability	Jury is still out
Onboard display	Widespread Deployment	Cost, user acceptance	Successful
Preemption infra-red signal system	Widespread Deployment	Institutional issues, lack of standards	Successful
Computer-aided dispatch	Widespread Deployment	Cost, support staffing	Successful
Automatic vehicle location	Widespread Deployment	Cost	Successful
Networked systems among agencies	Limited Deployment*	Institutional issues, integration cost	Holds promise

* Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 2-4. Electronic Toll Collection Summary Table

Technology	Deployment Level	Limiting Factors	Comments
Dedicated short-range communication	Widespread Deployment	Need for standard	Successful
Smart cards	Limited Deployment	Commercial and user acceptance; need for standard	Successful
Transponders	Widespread Deployment	Privacy	Successful
Antennas	Widespread Deployment	Technical performance	Successful
License plate recognition	Limited Deployment*	Technical performance	Jury is still out

* Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 3-1. Arterial Management Summary Table

Technology	Deployment Level	Limiting Factors	Comments
Adaptive control strategies	Limited Deployment	Cost, technology, perceived lack of benefits	Jury is still out —has shown benefits in some cases, cost still a prohibitive factor, some doubt among practitioners on its effectiveness
Arterial information for ATIS	Moderate Deployment	Limited deployment of appropriate surveillance, difficulty in accurately describing arterial congestion	Holds promise —new surveillance technology likely to increase the quality and quantity of arterial information
Automated red light running enforcement	Moderate Deployment*	Controversial, some concerns about privacy, legality	Successful —but must be deployed with sensitivity and education
Automated speed enforcement on arterial streets	Limited Deployment*	Controversial, some concerns about privacy, legality	Jury is still out —public acceptance lacking, very controversial
Integration of time-of-day and fixed-time signal control across jurisdictions	Widespread Deployment	Institutional issues still exist in many areas	Successful —encouraged by spread of closed-loop signal systems and improved communications
Integration of real-time or adaptive control strategies across jurisdictions (including special events)	Limited Deployment	Limited deployment of Adaptive Control Strategies, numerous institutional barriers	Holds promise —technology is becoming more available, institutional barriers falling
Integration with freeway (integrated management)	Limited Deployment	Institutional issues exist, lack of standards between systems preventing integration	Holds promise —benefits have been realized from integrated freeway arterial corridors
Integration with emergency (signal preemption)	Widespread Deployment	None	Successful
Integration with transit (signal priority)	See Chapter 5, “What Have We Learned About Advanced Public Transportation Systems?”	See Chapter 5, “What Have We Learned About Advanced Public Transportation Systems?”	See Chapter 5, “What Have We Learned About Advanced Public Transportation Systems?”

*Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 4-1. ATIS Summary Table

ATIS Service	Deployment Level	Limiting Factors	Comments
Real-time traffic information on the internet	Widespread Deployment	While deployment is widespread, customer satisfaction with the services seems related to local traffic conditions and website information quality	Mixed —the characteristics of the websites vary, depending on the availability and quality of the user interface and underlying traffic data.
Real-time transit status information on the Internet	Limited Deployment	Transit authorities have limited funds for ATIS investments and little data that establish a relationship between ridership and ATIS	Holds promise —where the service is available, reports suggest that there is high customer satisfaction with the service
Static transit system information on the Internet	Widespread Deployment	N/A	Successful
Real-time traffic information on cable television	Limited Deployment	Limited by information quality and production costs, although one service provider has developed a way to automate production	Successful —as evaluated in a highly congested metropolitan area where consumers value the easy, low-tech access to traffic information
Real-time transit status information at terminals and major bus stops	Limited Deployment	Cost	Successful —where evaluated in greater Seattle
Dynamic message signs	Widespread Deployment	Positive driver response is a function of sign placement, content, and accuracy	Successful —drivers really appreciate accurate en-route information
In-vehicle navigation systems (no traffic information)	Limited Deployment*	Purchase cost	Holds Promise —as prices fall, more drivers will purchase the systems
In-vehicle dynamic route guidance (navigation with real-time traffic information)	No commercial deployment; the San Antonio MMDI installed prototype systems in public agency vehicles*	Irregular coverage and data quality, combined with conflicting industry geocode standards, have kept this product from the market	Holds Promise —manufacturers are poised to provide this service once issues are resolved
Fee-based traffic and transit information services on palm-type computers	Unknown Deployment	Service providers make this service available through their websites, actual subscription levels are unknown	Jury is still out —requires larger numbers of subscribers becoming acclimated to mobile information services

* Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 5-1. APTS Summary Table

Technology	Deployment Level	Limiting Factors	Comments
Automatic vehicle location	Moderate Deployment	Cost, fleet size, service type, staff technological competence	Successful —use continues to grow, new systems principally use GPS technology but usually augmented by dead reckoning
Operations software	Widespread Deployment	N/A	Successful
Fully-automated dispatching for demand response	Research & Development*	Still in research and development stage	Jury is still out
Mobile data terminals	Moderate Deployment*	Most frequently deployed with automatic vehicle location systems	Successful —reduces radio frequency requirements
Silent alarm/covert microphone	Moderate Deployment*	Most frequently deployed with automatic vehicle location systems	Successful —improves security of transit operations
Surveillance cameras	Limited Deployment*	Cost	Holds promise —enhances on-board security. Deters vandalism
Automated passenger counters	Limited Deployment	Cost	Holds promise —provides better data for operations, scheduling, planning, and recruiting at lower cost
Pre-trip passenger information	Widespread Deployment	N/A	Successful —improves customer satisfaction
En-route and in-vehicle passenger information	Limited Deployment	Cost, lack of evidence of rider-ship increases	Jury is still out
Vehicle diagnostics	Limited Deployment	Cost, lack of data on benefits	Jury is still out
Traffic signal priority	Limited Deployment	Institutional issues, concerns about impacts on traffic flows	Holds promise —reduces transit trip times. May reduce required fleet size
Electronic fare payment	Limited Deployment	Cost	Holds promise —increases customer convenience

*Quantitative deployment tracking data not available. Deployment level determined by expert judgment.

Table 6-1. CVISN Summary Table

Technology	Deployment Level	Limiting Factors	Comments
Safety Information Exchange			
Laptop computers with Aspen or equivalent	Widespread Deployment	N/A	Successful
Wireless connection to SAFER at roadside	Moderate Deployment	Technical challenges with communications among systems	Holds promise —for identifying frequent violators of safety laws
CVIEW or equivalent	Limited Deployment	Connections to legacy state system	Jury is still out —being tested in three or four states
Electronic Screening			
One or more sites equipped with DSRC	Widespread Deployment (no. of states); Limited Deployment (no. of carriers)	Interoperability	Holds promise —deployment trend is positive
Electronic Credentialing			
End-to-end IRP & IFTA processing	Limited Deployment	Challenges and costs of connecting legacy systems	Holds promise —potential for significant cost savings to states and carriers
Connection to IRP & IFTA clearinghouses	Limited Deployment	Institutional issues	Jury is still out —cost savings can only be realized with widespread deployment

Table 7-1. Cross-Cutting Technical Issues Summary Table

Technology	Deployment Level	Limiting Factors	Comments
Sensor and Surveillance Technologies			
Cell phones for incident reporting	Widespread Deployment*†	N/A	Successful
Cell phones for emergency notification	Limited Deployment*†	Relatively new, mostly sold in new vehicles, takes long time to reach 30% of vehicle fleet	Successful —number of equipped vehicles growing rapidly
GPS for position, determination, automatic vehicle location	Moderate Deployment in fleets (transit, trucking, emergency vehicles)‡	N/A	Successful —use continuing to grow. See footnote
Video surveillance	Widespread Deployment	N/A	Successful
DSRC (toll-tags) for travel time data	Limited Deployment	Mostly used only in areas with electronic toll collection. Requires power and communications to readers	Successful —holds promise
Direct link between Mayday systems and public safety answering points	Limited Deployment †	Still in research and test phase, significant institutional policy and technical issues	Jury is still out —no known deployments
Cellular geo-location for traffic probes	Limited Deployment	New technologies just beginning field trials	Jury is still out —older technology unsuccessful
Communications Technologies			
Loop detectors	Widespread Deployment	N/A	Successful
Alternatives to loop detectors	Widespread Deployment	Initial cost, familiarity	Holds promise —video widespread, others limited, many cities only use for a few locations
Real-time, in-vehicle traffic information	Limited Deployment*†	Cost, commercial viability	Jury is still out
LIDAR for measuring automotive emissions	Limited Deployment †	Minnesota test was unsuccessful, technology didn't work well enough	Unsuccessful —no known deployment
Internet for traveler information	Widespread Deployment	N/A	Successful —free services Jury is still out —on commercial viability
High speed Internet	Limited Deployment †	Slow rollout, availability limited	Holds promise

Technology	Deployment Level	Limiting Factors	Comments
Communications Technologies			
Fully-automated Internet-based Exchange	Limited Deployment [†]	New technology	Holds promise
DSRC	Widespread Deployment	N/A	Successful —current use mostly limited to Electronic Toll Collection
DSRC at 5.9 GHz	Limited Deployment [†]	Frequency just recently approved for use, standards in development	Jury is still out —no known deployments in U.S., but used in other countries at 5.8 GHz
Fiber optics for wireline communications	Widespread Deployment	N/A	Successful
Digital subscriber line	Limited Deployment	New technology, first applied to ITS in 1999	Holds promise —several deployments, many more locations considering
220 MHz radio channels for ITS	Limited Deployment	ITS is too small a market to support unique communications systems	Unsuccessful —only known use during Atlanta test during the 1996 Olympic Games
High speed FM subcarrier for ITS	Limited Deployment ^{†*}	Low demand to-date for in-vehicle real-time data	Jury is still out —multiple conflicting “standards” and proprietary approaches, competition from other wireless technologies
CDPD for traveler information	Limited Deployment ^{†*}	Lack of real-time information to send, limited use of CDPD by consumers	Unsuccessful —CDPD will soon be overtaken by other wireless data technologies
Wireless Internet	Limited Deployment ^{†*}	New technology	Jury is still out —on ITS uses, general use predicted to grow rapidly
Local area wireless	Limited Deployment	New Technology	Jury is still out
Low power FM	Limited Deployment [†]	Just legalized by FCC, first licenses not yet granted	Jury is still out —Brand new, no deployments yet
High speed fixed wireless	Limited Deployment [†]	New Technology	Jury is still out
Analysis Tools			
Models incorporating operations into transportation planning	Limited Deployment [†]	Emerging technology, cost and institutional issues may become factors for some approaches	Jury is still out —IDAS available, PRUEVIIN methodology demonstrated, TRANSIMS in development

See footnotes on the next page.

** Quantitative deployment tracking data are not available. Deployment level was determined by expert judgment.*

† For in-vehicle consumer systems, deployment levels are based on the percent of users or vehicle fleet, not number of cities available. For example, real-time in-vehicle traffic is available in over two dozen cities, but the percentage of drivers subscribing to it is small.

‡ For AVL using GPS in transit, the moderate-level assessment is based on the percent of transit agencies using the technology according to a 1998 survey of 525 transit agencies conducted by the John A. Volpe National Transportation Systems Center. This measure was used for consistency with the transit section of this report. If the 78 major metropolitan areas are used as a measure, then the deployment level is “wide-spread,” as 24 of 78 cities use GPS-based AVL.