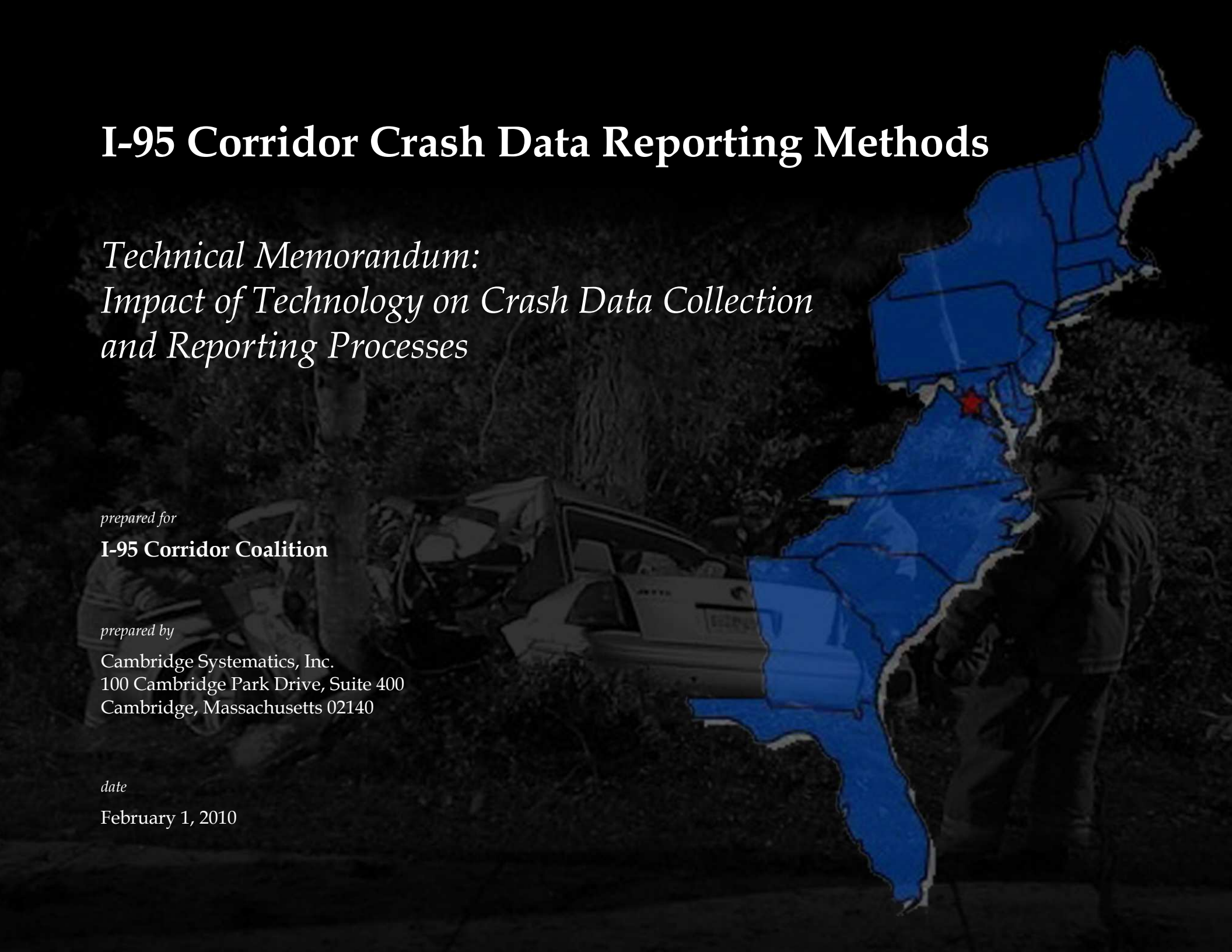
I-95 Corridor Crash Data Reporting Methods

Technical Memorandum:
Impact of Technology on Crash Data Collection and Reporting Processes



prepared for

I-95 Corridor Coalition

prepared by

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date

February 1, 2010

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1.0 Introduction

Crash data is essential to improving safety and efficiency on the I-95 Corridor's transportation network. Crash data can be analyzed to identify safety hot spots along the Corridor and factors contributing to crashes. The results can be used to identify areas in need of specific safety applications, technologies, programs, practices, and enforcement. The timely transmission of crash data is critical for identifying areas and situations prone to incidents and their causes, particularly with respect to commercial vehicles. Frequently, however, this data is not accessible in a timely manner to law enforcement, Departments of Transportation (DOTs), and other entities which utilize the crash data. Often there is a significant lag time in the available data, and the crash reports are frequently inaccurate or incomplete.

1.1 Data Quality Measures

While the data collection systems and practices vary amongst the Coalition states, there are common measures which can be used to evaluate data quality. National Highway Traffic Safety Administration (NHTSA) established the following six data quality measures commonly referenced as the "six pack":

- **Timeliness** is a measure of how quickly an event is available within a data system;
- **Accuracy** is a measure of how reliable the data are, and if the data correctly represent an occurrence;
- **Completeness** is a measure of missing information, including missing variables on the individual crash forms, as well as underreporting of crashes;
- **Uniformity** is a measure of how consistent information is coded in the data system, and/or how well it meets accepted data standards;
- **Data integration** is a measure of how well various data systems (e.g., roadway inventory, driver licensing, EMS, etc.) are connected or linked; and
- **Accessibility** is a measure of how easy it is to retrieve and manipulate data in a system, in particular by those entities that are not the data system owner.

The overall objective of this project is to identify the current state of practice and best practices in I-95 Corridor Coalition States' crash data collection and reporting systems to improve the timeliness, accuracy, and accessibility of crash data among the Corridor states. The first task in this process was to obtain comprehensive and detailed information about the present status of each state's crash data collection and reporting systems. The current task in this process is to compare key elements of the states' crash data systems and related processes to determine the impact of technology on crash data collection and reporting, which includes both the benefits and challenges to utilizing the latest technology.

1.2 Report Overview

This technical memorandum serves as the final deliverable for Task 2 of Project 2-2-16-7C, *Study Crash Data Reporting Methods*, and summarizes the team's findings regarding the impact of technology on crash data collection and reporting processes. This memorandum provides a compilation of the following:

- Crash data systems – key elements of state crash data systems and related processes currently in place in Corridor states.
- Crash data collection technology – inventory of crash data collection technology and processes for crash data systems used by law enforcement agencies in Corridor states.
- Evaluation of technology on crash data collection performance – effects on timeliness, accuracy, and accessibility, as reported by law enforcement agencies and crash data managers (e.g., impact of technology on Police Accident Report (PAR) completion times, submission and data entry times, and roadway clearance times).
- Crash data reporting technology – inventory of crash data reporting technology and administrative policies for law enforcement agencies in Corridor states where electronic crash data reporting has been deployed. (e.g., database used by crash manager agency for crash data system).
- Evaluation of technology on crash data reporting performance – effects on timeliness, accuracy, and accessibility, as reported by state crash data managers (e.g., impact of technology on timeframe for closing out crash data files).
- Electronic crash data technology implementation – advantages and challenges to implementing electronic crash data collection and reporting systems.

2.0 Crash Data Collection and Reporting Technology

This chapter provides findings of the crash data collection and reporting technology assessment conducted for Task 2. Crash data systems are the primary means through which states are able to analyze crash data to help determine traffic safety problem areas. These systems also help identify high crash locations in order to prioritize transportation improvement funding; develop appropriate countermeasures; and effectively and efficiently allocate resources. This section details key elements of state crash data systems and related processes currently in place in Corridor states.

2.1 Crash Data Systems

Each Corridor state utilizes a unique process for crash data collection and reporting. These processes are tailored to fit the current crash collection and reporting technologies used by a state and are modified when new technology is incorporated into the system. This often includes implementation of electronic data transfer, digital scanning of crash reports and crash diagrams, or development of various data analysis tools for end users. One of the easiest ways to comprehend a state's crash data system process is to display it visually through a flow chart. Figure 2.1 illustrates an example of a crash data system process utilized by one Corridor state, Massachusetts, which currently relies primarily on paper-based crash data collection.

As shown in Figure 2.1, the Massachusetts crash data component is created from a mix of two primary data sources: the Motor Vehicle Crash Police Report and the Motor Vehicle Crash Operator Report. The two sources of crash data are collected from law enforcement officers and drivers, respectively, with preference given to police reports of crashes for creation of the official crash record. Operator reports, submitted by involved drivers, are entered into the official record if the officer report is missing or lacks complete data. Both the police and operator reports are capable of documenting the time, location, environment and characteristics of individual crashes. Crash reports are received annually by the Registry of Motor Vehicles (RMV) and entered into the Crash Data System (CDS). Data are added to the CDS through receipt of both paper and electronic crash reports. Paper reports require manual data entry by RMV clerks while electronic crash reports are received electronically through a file transfer protocol portal set up by the RMV with individual law enforcement agencies operating one of the currently supported Records Management Systems (RMSs). The current process is labor-intensive and includes manual entry (and subsequent re-entry) of crash data at a number of points throughout the process.

Figure 2.1 Crash Data System Flow Chart – Massachusetts Current System

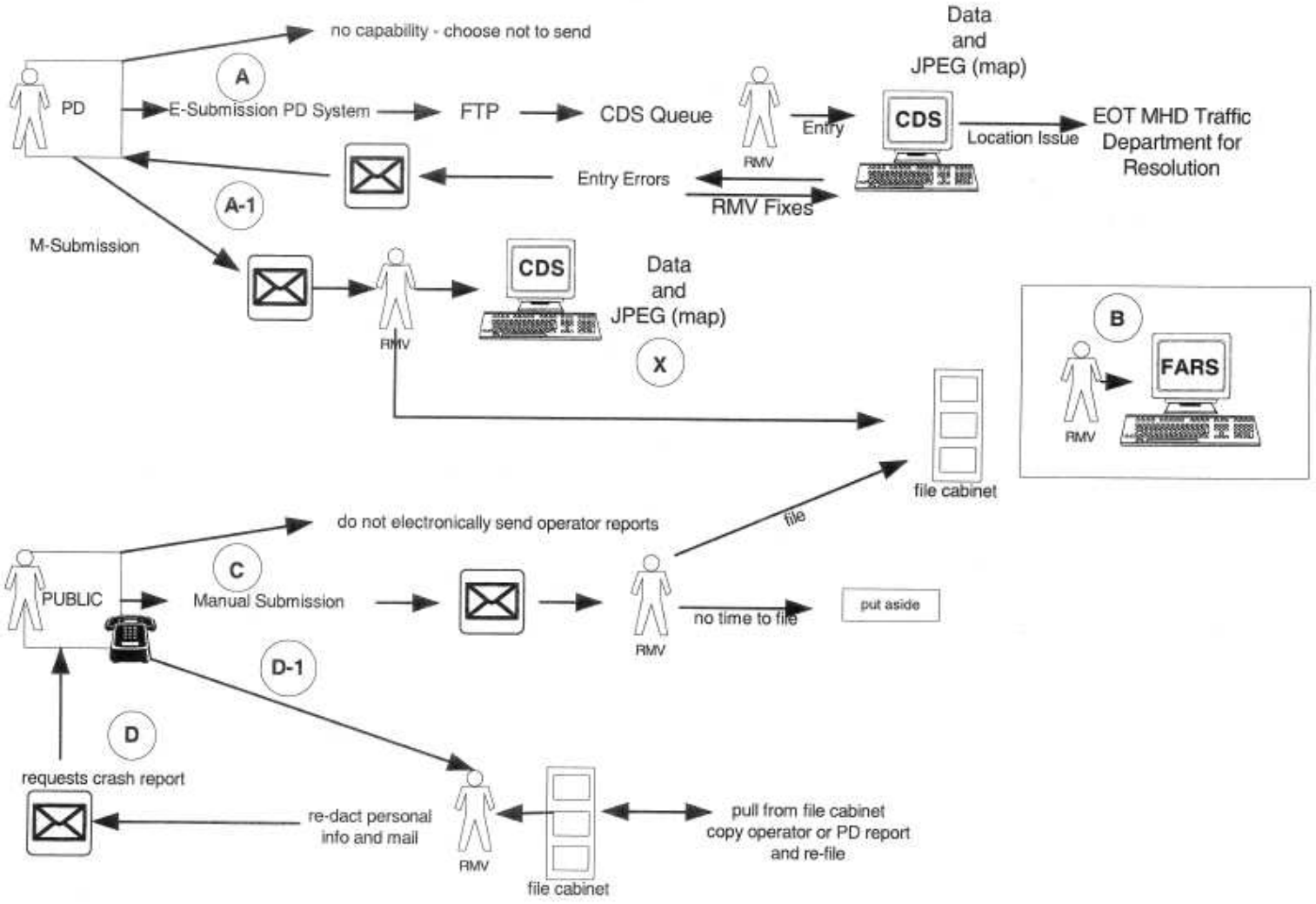
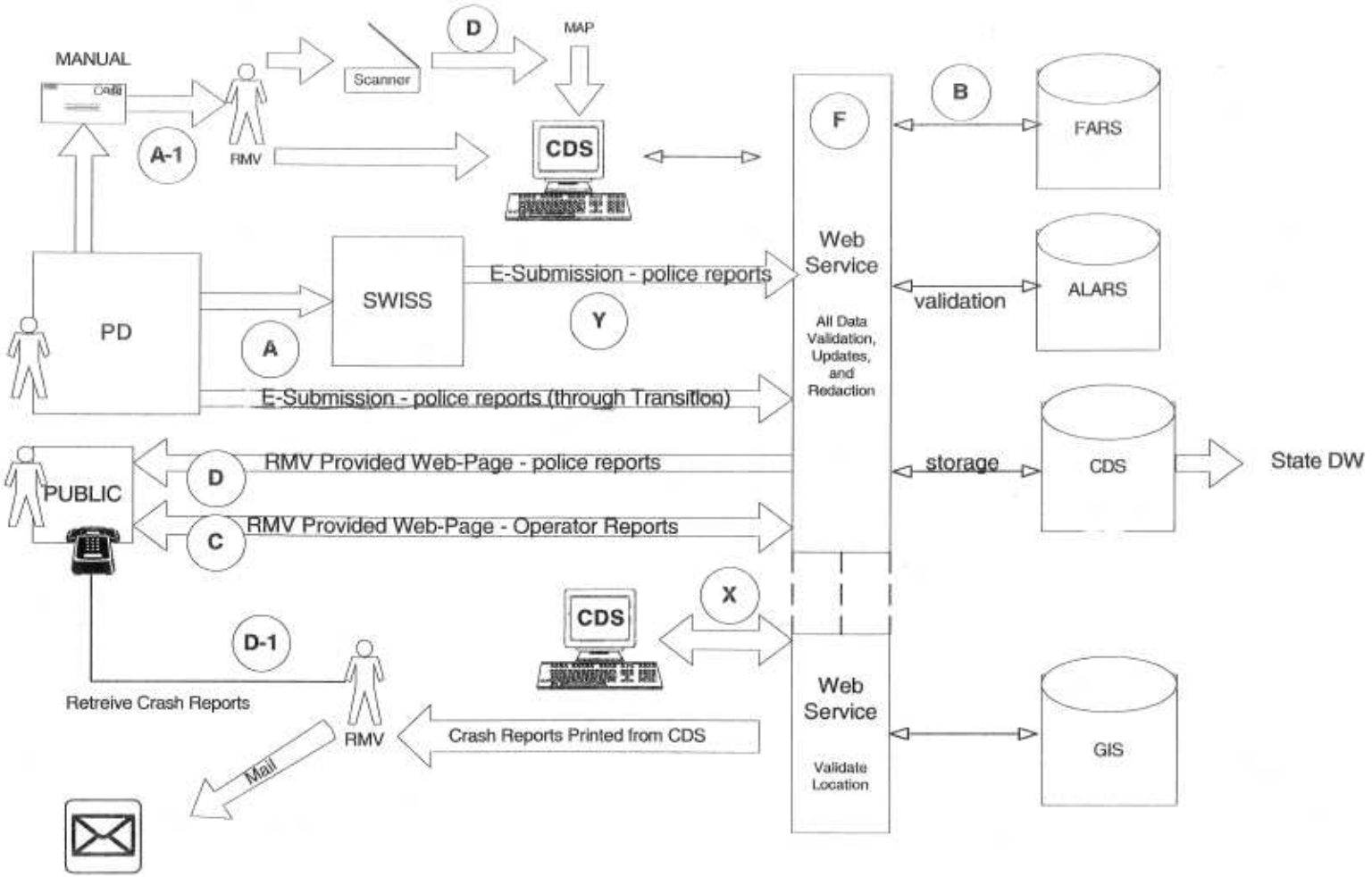


Figure 2.2 diagrams a proposed future crash system flow chart for Massachusetts, which aims to improve the efficiency of the process and accessibility of the crash data for end users. As shown in Figure 2.2 below, the future crash data system flow chart incorporates more advanced technology into the process, including scanning of the crash reports and crash diagrams; enhanced electronic crash data submission from local law enforcement agencies to the state crash data manager; and a web-based system for crash data retrieval and analysis by partner agencies.

Figure 2.2 Crash Data System Flow Chart – Massachusetts Proposed Future System



Each state's process may vary somewhat from Massachusetts' existing and proposed processes, but these examples provide a general understanding of the steps involved in the crash data collection process. As the future process illustrates, technology can simplify the collection process.

2.2 Crash Data Collection Technology

The ability to provide more timely and accurate final crash data to law enforcement agencies, DOTs, Departments of Motor Vehicles (DMVs), and other key stakeholders through the use of technology has resulted in some states providing access to crash data within one week of the crash or sooner. "Real-time" data allows law enforcement and transportation safety professionals to respond more quickly to escalating trends and "hot spots" and helps ensure limited resources are allocated to areas with greatest need. Deploying electronic crash collection modules can improve the timeliness, accuracy, and accessibility of crash data being collected by law enforcement agencies at the scene of a crash. There are a variety of electronic crash systems currently utilized throughout the Corridor states. Some states have vendor-built systems, while others have developed systems in-house. Table 2.1 provides an inventory of crash data collection technology used by the Corridor states, including whether the crash system is paper-based or electronic; technology used for identifying crash locations; and the type of systems used for data entry into the law enforcement agency crash system (and subsequent submittal of crash data/reports to the state crash data repository).

Table 2.1 Technology Used to Collect Crash Data

State	Crash Data System	Technology Used to Identify Crash Locations	Single Police Accident Report (PAR) Used by the State and All County/Local Jurisdictions	Crash Data Collection Software Provided to Police Agencies	Database Used for the Master Crash Data
Connecticut	The Connecticut State Police (CSP) currently uses both paper and electronic reporting; however, with the recent passing of signature, CSP anticipates transitioning to totally electronic.	Crash locations are captured at the scene by trunk modems in the officer cruisers.	NR	CAPTAINs, NexGen (RMS)	Oracle Database

State	Crash Data System	Technology Used to Identify Crash Locations	Single Police Accident Report (PAR) Used by the State and All County/Local Jurisdictions	Crash Data Collection Software Provided to Police Agencies	Database Used for the Master Crash Data
Delaware	The state is currently using an electronic system, TraCS. However, in early 2010 a new E-Crash system will be initiated.	The state uses a locator tool which pinpoints location by latitude/longitude coordinates and GIS mapping.	Yes	TraCS	NR
Florida	The crash data system is a combination of paper and electronic. For collection of crash data, the technology and software utilized is determined by each law enforcement agency. For maintenance and distribution of crash data, the technology and software utilized is Oracle and open source with custom code.	GPS is not currently used to record location data. However, the Department is in the process of implementing a new crash form. This new form will utilize GPS when available.	NR	NR	Oracle Database
Georgia	Georgia currently uses a combination of both paper and electronic crash systems. GDOT completed modernization of its crash repository in 2009 so as to allow the receipt of electronic crash data. This included publishing an extensive listing of data validation rules/edits and a XML transfer specification.	While some law enforcement agencies do utilize GPS for locating crashes, the most effective method observed and utilized by GDOT is a map-based location tool using GDOT's base maps. This ensures that GDOT engineers are able to link to data within the Department's Roadway Characteristics file and critical to safety analyses.	Yes	TraCS	IBM DB2
Maine	100 percent of crashes submitted to the state repository are submitted electronically. The Maine Crash Reporting System is comprised of a state Oracle database with an import service that collects data from local agencies. The state database has web and client based report tools. Maine is currently developing a major upgrade to the Maine Crash Reporting System that will use Microsoft.NET technologies and incorporate the newly revised 2010 Maine Crash Report form. Approximately 70% of the crashes	GPS is not currently used for locating crashes. The Maine Crash Reporting System uses GIS maps where the officer clicks on the map to indicate crash location. This location is recorded as links and nodes in the electronic crash report that directly locates the crash on the roadway.	Yes	State-developed crash reporting software is provided to law enforcement agencies and third party Records Management System.	Oracle Database

State	Crash Data System	Technology Used to Identify Crash Locations	Single Police Accident Report (PAR) Used by the State and All County/Local Jurisdictions	Crash Data Collection Software Provided to Police Agencies	Database Used for the Master Crash Data
	reported in Maine are collected with the Maine Crash Reporting System. The remaining 30% are collected using local law enforcement records management system that exports data and is imported into the Maine Crash Reporting System.				
Maryland	Maryland's crash data system is paper based, but a few counties and several Maryland State Police (MSP) barracks collect electronically. However, the MSP Central Records Division (CRD) only accepts paper at this time. The acceptance of electronic data will be in development in the next few months.	GPS is used by the MSP with electronic citations. It is assumed that some counties do collect GPS on scene but CRD does not accept this data at the present time.	Yes	None	Oracle 11g Database
Massachusetts	The crash system consists of a combination of both electronic (30%) and paper (70%). Electronic crash reporting was implemented in 2003.	GPS is used in some jurisdictions. The state police use GPS to accurately record latitude and longitudes of crashes. Very few local jurisdictions use GPS. Lack of resources cited.	Yes	None	ORACLE database written with Visual Basic on a stand alone platform. The software was developed in house.
New Jersey	The crash system is paper based, but the state is currently pilot testing electronic data transfer with five police departments.	GPS is used by some police departments. Geocode reports through a nightly programmatically process when SRI and distance/milepost are identified.	NR	NR	Oracle Database
New York	Both electronic and paper reporting is used. The New York State repository is the Accident Information System (AIS). AIS utilizes Kofax scanning software to create images, and releases them to AIS, which is comprised of an Oracle data and ODOC workflow product. (PDF or TIF images of the reports are presented to	GPS coordinates can be used, but it is not mandated.	Yes	TraCS	Oracle Database

State	Crash Data System	Technology Used to Identify Crash Locations	Single Police Accident Report (PAR) Used by the State and All County/Local Jurisdictions	Crash Data Collection Software Provided to Police Agencies	Database Used for the Master Crash Data
	users on data entry screens and data from these are entered manually by staff, converted to XML format and stored in AIS).				
North Carolina	A combination of electronic and paper-based reporting is used. Crash Reporting System (CRS) and TraCS are used.	GPS is not used on the DMV electronic reporting form. Anticipated implementation of a location toll in 2010.	NR	TraCS	Oracle Database
Pennsylvania	The crash data system consists of both paper and electronic. There are two different platforms to submit data electronically. The state police department uses the TraCS system to report all crashes on I-95. The crash data is uploaded to the state repository via a FTP site. Captivia software is used to scan crash reports. In house data portal used to maintain collected data for DOT.	Some agencies have GPS units. Crash form includes a space for latitude and longitude if GPS unit is available.	NR	NR	IBM DB2
South Carolina	The state currently has a paper-based system. However, South Carolina is in the process of implementing an electronic process (called South Carolina Collision and Automated Traffic Ticketing System, SCCATTS) but it will be many years before it is complete. The data is housed at the state's Central Information Office. The South Carolina Department of Public Safety (SCDPS), Office of Highway Safety (OHS), also maintains a MasterFile that is used to conduct various statistical programs.	The officers who are completing the collision reports have handheld GPS units but the information is not always recorded on the collision report accurately.	NR	NR	ADABASE

State	Crash Data System	Technology Used to Identify Crash Locations	Single Police Accident Report (PAR) Used by the State and All County/Local Jurisdictions	Crash Data Collection Software Provided to Police Agencies	Database Used for the Master Crash Data
Vermont	Vermont utilizes both electronic and paper-based crash reporting, but is moving closer to 100 percent electronic. Vermont Agency of Transportation (VAOT) has created a web based reporting tool called Web Crash. Paper reporting is manually entered into SQL server database, and electronic reports are exported to same database.	Yes	NR	NR	Microsoft Access
Virginia	The system is currently paper based; however, the state is in the process of developing a Traffic Records Electronic Data System (TREDS), which includes crash data.	NR	Yes	None	Mainframe

Note: District of Columbia, New Hampshire, and Rhode Island have not provided the requested information.

NR – Not reported by the state.

2.3 Crash Data Collection Performance Evaluation

Technology incorporated into the crash data collection process can improve the timeliness, accuracy, completeness, and accessibility of the states' crash data. When law enforcement electronically submits crash reports, the data entry step (at the state crash repository) in the data collection process is virtually eliminated, which not only improves the timeliness, it also improves the accuracy by eliminating errors from illegible reports. In addition, most electronic systems have internal audits that do not allow officers to submit reports with missing data, which improves completeness. This section provides an evaluation of the impacts of technology on crash data collection and roadway clearance times.

Crash Data Collection

Performance measures on the timeliness of crash data were collected through interviews with state crash data managers and law enforcement, state 408 applications, state traffic records strategic plans, and the NHTSA Traffic Records Inventory. Table 2.2 provides the average time from a crash incident to submittal of the crash report, the average timeframe for subsequent entry of crash report into the state's crash database, and the total average time from a crash to entry in the state's database for both electronic and paper systems.

Table 2.2 demonstrates that electronic crash systems have improved the timeliness of the crash data collection process among the states. The law enforcement agencies interviewed all reported a significant decrease in the average timeframe for crash report collection for electronic versus paper-based reporting. State data managers also reported significant improvements in the timeliness of crash report entry into the state database and increased efficiency with electronic data collection. Some of the law enforcement agencies also reported increased efficiencies in collecting data at the scene through the use of electronic systems that automatically populate various data fields, reducing the data entry time. Additionally, some agencies have set up electronic feeds with real time crash data maps which are submitted to the DOT's operations center. This allows DOTs to have real time information pertaining to road closures and requests for services.

Many of the states also reported fewer errors and more complete reports with electronic systems compared to paper-based systems. For example, Pennsylvania State Police reported an average of 8.5 errors on paper reports versus 0.5 errors for electronic reports, indicating an increase of accuracy with implementation of electronic crash data systems. In addition, most of the states reported that their electronic system had internal audits that would not allow an incomplete report to be submitted into the system.

Table 2.2 Crash Data Collection Performance Measures

	Average Time from Crash to Report Submittal		Average Time from Report Submittal to Entry in Crash Database		Total Average Time from Crash to Entry in Crash Database	
State	**Paper**	**Electronic**	**Paper**	**Electronic**	**Paper**	**Electronic**
Connecticut	1 Month	N/A	11 months	N/A	12 months	N/A
Delaware	10 days	10 days	2-4 weeks	At submittal	3-5 weeks	10 days
Florida	NR	30 days	NR	At submittal	90 days	30 days
Georgia	U/K	U/K	U/K	U/K	45 days	U/K
Maine	NR	NR	NR	NR	180 days	15 days
Maryland	U/K	N/A	U/K	N/A	2 months	N/A
Massachusetts	53 days	16 days	407 days	64 days	460 days	80 days
New Jersey	64 days	N/A	4 weeks	N/A	3 months	N/A
New York	30-45 days	13 days	51-79 days	79 days (manual review)	81-124 days	92 days
North Carolina	NR	24 hours	NR	24 hours	35 days	24 hours
Pennsylvania	35 days	12 days	NR	NR	NR	NR
South Carolina	NR	N/A	NR	N/A	35 days	N/A
Vermont	U/K	U/K	3 months	33 days	U/K	U/K
Virginia	NR	N/A	7 days	N/A	NR	N/A

Note: District of Columbia, New Hampshire, and Rhode Island have not provided the requested information. Pennsylvania performance measures reflect State Police only.

N/A – Information not applicable; state has recently initiated or does not have electronic collections system.

NR – Not reported by the state.

U/K – Information unknown to state data manager.

Roadway Clearance

There has been no reported impact of electronic crash collection on the timeliness of roadway clearance at the crash scene. Pennsylvania State Police (PSP) was the only law enforcement agency contacted that could provide a quantitative measure of the timeliness of roadway clearance times "before and after" implementation of electronic capture, and therefore no substantive conclusions could be made. However, the crash clearance time performance measures provided by the PSP do not indicate any change in roadway clearance times upon implementation of an electronic crash data collection system. Some law enforcement agencies indicated that there are too many variables in the field when investigating an accident to accurately measure roadway clearance times for pre- and post- electronic crash implementation. For instance, the type of accident being investigated (i.e., personal injury, property damage, or fatality) has a direct effect on how long the officer would be involved in processing a crash report and clearing the roadway. Other variables affecting roadway clearance times include; how many people are involved in the collision, how many vehicles are involved in the crash, traffic conditions, weather conditions, and roadway type. Another common circumstance cited affecting roadway clearance timeliness and crash report completion is if an officer begins completing a crash report and he/she is interrupted by something that would require his/her attention at the scene of the collision. Agencies acknowledged that unless a specific measuring method or process is applied, they are unable to provide performance data related to roadway clearance.

Other agencies suggested that it would be inaccurate to presume that automation would have any impact on roadway clearance times. Upon arrival, officers first check for injuries, and then when the human needs are addressed, work to clear the vehicles out of the travel lanes as quickly as practical (with the exception of a fatal crash, where the roadway is closed until the scene can be reconstructed). Information such as driver license, registration, insurance cards, and crash statements are obtained only after the travel lanes have been cleared. In many cases officers do not address the crash report (regardless if electronic or paper-based) until they clear the scene and all parties are on their way, and report writing is often done in a non-crash scene location.

2.4 Crash Data Reporting Technology

States have a variety of crash reporting technologies to choose from and various users of the data. This section presents an inventory of crash data reporting technology and administrative policies for Corridor states. Table 2.3 summarizes the technology used for crash data reporting by Corridor states, users of the technology/software, and crash data linkages to other databases (i.e., Citation, Driver License, Vehicle Registration, and Emergency Medical Services (EMS)).

Table 2.3 Technology Used for Crash Data Reporting

State	Technology/Database Used for Data Analysis	Technology/Software Users of Crash Data	Crash Data Linkage to Other Databases (Citation, Driver License, Vehicle Registration, and EMS)
Connecticut	NR	NR	NR
Delaware	NR	Everyone involved in crash data collection and reporting	E-crash will be linked to driver license, citation, and vehicle registration.
District of Columbia	NR	NR	NR
Florida	NR	Law Enforcement, Government, Private Industry, and Citizens.	Citation, driver license
Georgia	IBM DB2, Microsoft Access and Excel All crash report images are available electronically in pdf format. Images can be accessed via the mygdot portal - also in process of migrating to a GDOT contracted vendor – Open Portal Solutions (OPS). OPS will provide a new portal which will allow designated users access to crash data collected as well as web-based ad hoc data querying tools. Basic mapping tools will be provided as well. GDOT continues to make the crash data available to users via its Crash Analysis Reporting Environment software in conjunction with the University of Alabama.	Individual Law Enforcement Agencies throughout the state. GDOT also uses the software internally to make changes or pass updates to individual crash reports received. This function is primarily used for commercial vehicle crashes.	None
Maine	Analysis based on Oracle Database using query tools (ad hoc)	State and local law enforcement use the MCRS Windows client application that can be configured at the agency for standalone or agency-wide network use. This local agency software contains basic reporting capabilities.	Driver license
Maryland	Oracle 11g	SHA DBAs, Towson University (grantee), front end use by CRD staff	None
Massachusetts	Oracle Database, along with other programs	The Registry of Motor Vehicles, Executive Office of Public Safety and Security, MassHighway, and State Police (Commercial Motor Vehicle Unit).	Driver license
New Hampshire	Microsoft Access and Excel	NR	NR
New Jersey	SAS Database Data warehouse is updated every night and data is available to a limited user base.	Analytical software tool available to outside users (currently over 450 users). The tool utilizes static crash data, which is updated twice a year.	None

State	Technology/Database Used for Data Analysis	Technology/Software Users of Crash Data	Crash Data Linkage to Other Databases (Citation, Driver License, Vehicle Registration, and EMS)
New York	Use Microsoft Access, SQL and SAS to extract and program data from Oracle Database	Accident Records and the Certified Document Center (document sales)	Citation, driver license
North Carolina	Oracle Database	North Carolina Division of Motor Vehicles	Vehicle registration, driver license, roadway
Pennsylvania	IBM DB2. An internet web portal is available for police to upload reports to the statewide database.	Police departments and DOT	Citation, driver license
Rhode Island	NR	NR	NR
South Carolina	SAS Database	The OHS Statistician, Research Manager, and FARS analyst.	NR
Vermont	Microsoft Access and SAS Database. Queries on the database are done via programs built into the SQL server program. OHS uses SAS record search, and query tools.	VAOT uses the software to conduct queries and provide reports to anyone requesting it including consultants (both private and State), Health Department staff, law enforcement, researchers, public. Engineering, law enforcement, education, health, and EMS can use crash data for safety initiatives. Data entry application is used by statewide law enforcement. Secure password access necessary.	None
Virginia	Mainframe, PC-based (Microsoft Access, Excel)	NR	NR

Note: NR – Not reported by the state.

2.5 Crash Data Reporting Performance Evaluation

Technology can impact the timeliness and accessibility of crash data files made available to partner agencies for data analysis purposes. Table 2.4 documents the timeliness of crash data reporting for electronic and paper-based crash systems, as reported by Corridor states. Most states have set cut-off dates for when to "freeze" crash data included in closed-out calendar year crash files provided to partner agencies. However, it is not unusual for states to continue collecting crash data from law enforcement agencies after the year has been "closed" and some states are required to do so pursuant to state statute.

Table 2.4 Crash Data Reporting Performance Measures

State	Crash Data System Used	Timeframe for Closing Out Calendar Year of Crash Data	Time Until Data is Available to Partners/ Public
Connecticut	Paper/Electronic	> 1 year	> 1 year
Delaware	Electronic	4-5 months	NR
Florida	Paper/Electronic	6 months	NR
Georgia	Paper/Electronic	NR	NR
Maine	Electronic	NR	NR
Maryland	Paper	5-6 months	5-6 months
Massachusetts	Paper/Electronic	NR	NR
New Jersey	Paper	4 months	5 months
New York	Paper/Electronic	9 months	9 months
North Carolina	Paper/Electronic	NR	35 days
Vermont	Paper/Electronic	3 months	5 months

Note: District of Columbia, New Hampshire, Pennsylvania, Rhode Island, South Carolina, and Virginia have not provided the requested information.

NR – Not reported by the state.

According to Corridor state survey responses, states do not appear to be tracking pre- and post-electronic crash system implementation timeliness for closing out a calendar year of crash or the time it takes for crash data to become available to partner agencies or members of the public. However, the crash reporting performance measures detailed in Table 2.4 can be used as a baseline to guide future tracking of crash reporting timeliness. Although states may not be currently tracking this performance measure, improvements in the timeliness of crash data entry into the system will ultimately improve the timeliness of the data availability. For example, prior to Vermont implementing a system to electronically collect crash data from the police departments, crash data were not typically entered into the database until almost 18 months after the crash; but with the electronic reporting system, the 2008 state crash data file was closed out and available for use in May of 2009, which represents a significant improvement in timeliness.

2.6 Electronic Crash Data Technology Implementation

There are many benefits to utilizing the most current crash data technology, such as electronic collection and reporting, but many challenges to successful implementation also exist. This section takes a closer look at both the advantages and potential challenges to implementing electronic systems.

Advantages

The widespread support for advancement of electronic crash systems stems from the heavy reliance of paper-based crash collection and reporting activities on manual procedures, which are costly to administer and can result in untimely reporting. For example, paper-based processes require crash forms to be sorted and mailed to different locations and manually entered, perhaps multiple times, into different systems. An electronic crash system provides a number of advantages, including:

- Crash data can be entered and verified at the roadside, which improves data quality;
- Electronic systems that incorporate barcoding can reduce the amount of time it takes an officer to collect information at the crash scene and improve accuracy by allowing the officer to scan the driver license to input person and vehicle data without having to key in the information;
- Electronic systems that incorporate drawing tools can reduce the amount of time it takes an officer, once trained, to complete a crash report and improve the uniformity and accuracy of the crash diagram;
- A properly designed system (e.g., keyboard shortcuts, on-line help) can increase officer efficiency at the roadside, which will provide more time to address other duties;
- Electronic systems provide internal audits to ensure the report is complete before submission and improve accuracy;
- Field-based location tools and GPS can improve the accuracy of the location data;
- Linking databases can provide efficiencies with other data systems and increase analytic capabilities for data users;
- Electronic records can be transmitted directly to the agencies administering the crash data systems, which improves timeliness and saves costs by eliminating the requirement to sort and mail forms; and
- By capturing crash data electronically, manual data entry is eliminated, which improves both quality (e.g., reduced errors due to illegible reports) and timeliness and reduces staffing needs for data entry.

Challenges

One of the most significant potential challenges to implementing electronic crash systems, especially on a multi-state basis, is the failure to achieve consensus that an electronic crash system is a top priority. State priorities are often politically-driven, constantly shifting, and competing for limited funding. Challenges to implementing an electronic crash system may include:

- Law enforcement agencies which are not required to submit crash reports electronically necessitate that the state to identify ways to encourage use of the electronic system;
- The state has several agencies using various electronic collections systems, which are not compatible with the existing crash database;
- Law enforcement agencies in the state currently use different paper-based crash forms with various data elements collected, and disagreements arise when determining which crash data elements will become standard for electronic capture;
- Some existing systems are difficult to upgrade or update (e.g., add new data fields);
- Wireless network coverage is not universally available, which could hinder a law enforcement officer's ability to transmit crash data directly from the field;
- Law enforcement agencies do not have the necessary equipment or funding available to purchase the equipment;
- Electronic systems often require upgrades, which requires additional funding and support staff;
- Although GPS systems are intended to provide accurate location data, several agencies have reported inaccurate data (e.g., when officers fail to complete the crash report at the crash scene); and
- Law enforcement needs additional technical support and training to implement an electronic system.

While there are various challenges to implementing an electronic system, some states have been successful. The final report will include recommendations for overcoming these challenges.

2.7 Next Steps

The purpose of this document was to compare key elements of the Corridor states' crash data systems and related processes to determine the impact of technology on data collection and reporting, including both the benefits and challenges of utilizing the latest technology. This data will be used in Task 3 to identify efficiencies and best practices amongst the states' crash data systems. In addition, the project team will compile any additional Task 2 information that becomes available and reflect these updates in the Task 5 final project report.