COMMERCIAL VEHICLE OPERATIONS

AS OF AUGUST 2007, 18 STATES HAD COMPLETED CORE DEPLOYMENT OF CVISN AND WERE WORKING ON EXPANDING THE CORE CAPABILITY.

FREIGHT

With trucks responsible for much of the overall freight movement and carrying approximately two-thirds of the value of goods in the United States, traffic conditions and operational factors that result in unreliable delivery times and missed deliveries can have major business implications. Recent reports indicate that business inventories are creeping up and reversing the trend towards leaner logistics. In 2005, increased traffic congestion, unpredictable travel times, and higher fuel expenditures contributed to a 17 percent increase in inventory-carrying costs and a $74 billion increase in trucking costs.[465]

ITS applications for commercial vehicle operations (CVO) are designed to enhance communication between motor carriers and regulatory agencies, particularly during interstate freight movement. ITS can aid both carriers and agencies in reducing operating expenses through increased efficiency and assist in ensuring the safety of motor carriers operating on the Nation's roadways.

The Commercial Vehicle Information System and Networks (CVISN) program has created a nationwide framework of communication links that State agencies, motor carriers, and stakeholders can use to conduct business transactions electronically. Electronic registration and permitting at State agencies allows carriers to register online, decreasing the turn-around time associated with permit approval. In addition, safety information exchange (SIE) programs have been implemented as part of CVISN to standardize the exchange of vehicle and driver safety information between states and jurisdictions. Enforcement personnel at check stations can use national database clearinghouses to confirm carrier regulatory compliance data and crosscheck safety assurance information.

The Federal Motor Carrier Safety Administration (FMCSA) has created the CVISN program with the goal of improving the safety and efficiency of CVO. The CVISN program includes a collection of information systems and communications networks that support CVO. These systems and networks include information systems owned and operated by governments, motor carriers, and other stakeholders. Nationwide CVISN deployment will be accomplished by developing and deploying information systems that will support new capabilities in three areas: SIE, credentials administration, and electronic screening. CVISN deployment in a state is measured by the achievement of a core capability within each of the three major capability areas.[466]

A State achieving a core CVISN capability is required to meet the following criteria:

- An organizational framework for cooperative system development has been established among State agencies and motor carriers.
- A State CVISN System Design has been established that conforms to the CVISN Architecture and can evolve to include new technology and capabilities.
- All the elements of the three capability areas have been implemented using applicable architectural guidelines, operational concepts, and standards.

Specific requirements for each of the three major capability areas are shown in table 15.

COMMERCIAL VEHICLE OPERATIONS CATEGORIES IN THE ITS KNOWLEDGE RESOURCES

Credentials Administration
- Electronic Funds
- Electronic Registration/Permitting

Safety Assurance
- Safety Information Exchange
- Automated Inspection

Electronic Screening
- Safety Screening
- Border Clearance
- Weight Screening
- Credential Checking

Carrier Operations and Fleet Management
- Automatic Vehicle Location/ Computer-Aided Dispatch
- On-Board Monitoring
- Traveler Information

Security Operations
- Asset Tracking
- Remote Disabling Systems

OTHER ITS KNOWLEDGE RESOURCE CATEGORIES RELATED TO FREEWAY MANAGEMENT

Refer to other chapters in this document.

Intermodal Freight

- Freight Tracking
- Asset Tracking
- Freight Terminal Processes
- Drayage Operations
- Freight-Highway Connector System
- International Border Crossing Processes

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Table 15—CVISN Core Capability Requirements

Capability Area	State CVISN Core Capabilities
Safety Information Exchange	• ASPEN (or equivalent) at all major inspection sites. • Connection to the Safety and Fitness Electronic Records (SAFER) system to provide exchange of interstate carrier and vehicle snapshots among states. • Implementation of the Commercial Vehicle Information Exchange Window (or equivalent) system for exchange of intrastate and interstate snapshots and connection to SAFER for exchange of interstate snapshots.
Credentials Administration	• Automated processing (i.e., carrier application, state application processing, credential issuance, and tax filing) of at least International Registration Plan (IRP) and International Fuel Tax Agreement (IFTA) credentials: ready to extend to other credentials (intrastate, titling, oversize/overweight, carrier registration, and hazardous materials (HAZMAT)). Note: processing does not necessarily include e-payment. • Connection to IRP and IFTA clearinghouses. • At least 10 percent of the transaction volume handled electronically, with the state ready to bring on more carriers as carriers sign up and ready to extend to branch offices where applicable.
Electronic Screening	• Implemented at a minimum of one fixed or mobile inspection site. • Ready to replicate at other sites.

Electronic screening promotes safety and efficiency for commercial vehicle operators. Trucks equipped with low-cost, in-vehicle transponders can communicate with check stations. Communication equipment at the roadside can automatically query regulatory data as trucks approach these stations and issue a red or green light on in-vehicle transponders, so drivers know whether to continue on the mainline (bypass) or report to the station for possible inspection.

In the United States, there are currently two major national electronic screening programs, the North American Pre-clearance and Safety System (NORPASS) and the PrePass™ program.[467] As of March 2008, the NORPASS program was available in 11 states and Canadian provinces and had an enrollment of more than 93,000 trucks, and the PrePass™ program was available in 28 states and had an enrollment of more than 423,000 trucks.[468] The Oregon Green Light program has also reported significant growth. Since the first Green Light station was opened in 1997, 21 stations have been equipped and more than 40,000 transponders have been distributed.[469]

Day-to-day CVO are supported by many other ITS technologies. Automated vehicle location (AVL) and computer-aided dispatch (CAD) technologies assist with scheduling and tracking of vehicle loads. On-board monitoring of cargo alerts drivers and carriers of potentially unsafe load conditions. Real-time traffic information dissemination helps carriers choose alternate routes and departure times and avoid traffic congestion and inclement weather. Asset tracking technologies enable motor carriers to monitor the safety and security of fleet assets and cargo.

Related to CVO tehnologies are technologies that facilitate efficient freight transport—especially across modal connections, such as truck-air, truck-rail and rail-sea—which are technologies discussed in the intermodal freight chapter.

In addition to the ITS technologies profiled in this chapter, the Electronic Freight Management (EFM) initiative, a major ITS initiative being conducted by the U.S. DOT, has the potential to enhance CVO and freight management. Through the EFM, the U.S. DOT seeks to develop service-oriented, Web-based technologies that will improve information exchange between multiple entities (both government and commercial) and increase the efficiency of cargo transfer. The new Web-based services are intended to improve the visibility of shipments in the supply chain, reduce redundant data entry, improve diagnostic tracking, simplify interfaces with government authorities, and enhance security. [470] Additional information on this initiative is available at the ITS JPO's Web site: *www.its.dot.gov/efm*.

Findings

Benefits

Table 16 documents experience with the ITS applications for CVO. The various strategies that have been evaluated have shown substantial improvements under the safety, mobility and productivity goal areas. Electronic credentialing reduced paperwork and saved carriers participating in the CVISN Model Deployment 60 to 75 percent on credentialing costs.[471] Electronic screening has been shown to moderately reduce emissions through reduced congestion at inspection stations. Drivers and operating companies are generally satisfied with the various programs, though particular applications have been troubling to truck drivers in some instances. Both motorcoach and truck drivers held favorable opinions of commercial vehicle electronic clearance, while a survey of Maryland motor carriers found that carriers with large fleets (25 or more vehicles) conducting business with State agencies value electronic data interchange and Internet technologies more than small fleets.[472]

Table 16—Commercial Vehicle Operations Benefits Summary						
	Safety	Mobility	Efficiency	Productivity	Energy and Environment	Customer Satisfaction
Credentials Administration				●		●
Safety Assurance	●					
Electronic Screening		●		●	✚	●
Carrier Operations and Fleet Management		●		●		●
Security Operations						

● Substantial positive impacts
✚ Positive impacts
❍ Negligible impacts
✱ Mixed results
✖ Negative impacts
blank Not enough data

Costs

To help States track their own progress in deploying CVISN technologies, a self-evaluation requirement was included in the partnership agreements between the U.S. DOT and individual States. This self-evaluation was tied to the U.S. DOT's support of infrastructure deployment, and research and development in cooperation with the States. Self-evaluation reports are expected to foster the widespread deployment of CVISN through the sharing of timely, accurate, usable information among States. States now in the planning, decision making, or early deployment stages can learn from the experiences of others; and States further along in the deployment process can learn new ideas that might help them improve their existing systems and networks.[473] To this end, a process for reporting CVISN costs data was established, and the results of the costs data collection and analysis were published and the costs data imported to the ITS Costs Database. Examples of the CVISN costs data are presented in the "Selected Highlights from the ITS Knowledge Resources on Commercial Vehicle Operations" section below. The reader is encouraged to access the ITS Costs Database for complete details on CVISN unit costs.

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ITS strategies were identified for "full" deployment scenarios to determine the potential benefits from a coordinated and complementary system in three metropolitan areas: Seattle, Tucson, and Cincinnati. The ITS strategies for CVO included weigh-in-motion (WIM), SIE, and a combination of screening and clearance for credentials and safety. For Seattle and Cincinnati, the average life cycle costs of the resources necessary to implement, operate, and maintain CVO estimated for 2003 conditions were $23 million and $23.1 million, respectively. For Tucson, the average life cycle costs of the resources necessary to implement, operate, and maintain CVO estimated for 2025 conditions was $20.2 million. It is important to note for CVO, a portion of these costs are to the private sector for the equipment needed on commercial trucks to enable automated screening and clearance deployments at check stations. The number of trucks in the scenarios ranged from 53,000 to 60,000.[474]

BENEFIT-TO-COST RATIOS RANGE FROM 2:1 TO 12:1 FOR ELECTRONIC SCREENING.

Benefit-Cost Studies

CVISN technologies are cost-effective, increasing safety; simplifing credential checking and tax administration; and lowering the costs of freight handling, fleet management, and vehicle operations. Evaluation data have shown that costs and benefits vary depending on system configuration and cost, level of deployment, and the benefits of crash avoidance gained through increased compliance. Benefit-to-cost ratios range from 2:1 to 12:1 for electronic screening,[475] 0.7:1 to 40:1 for electronic credentialing[476], and 1.3:1 to 6.1:1 for roadside safety inspection systems.[477]

Deployment

As of August 2007, 18 states had completed core deployment of CVISN and were working on expanding the core capability. Twenty-seven (27) states and the District of Columbia are in the process of deploying the core capability. Five states are the process of planning and design of their core CVISN capability.

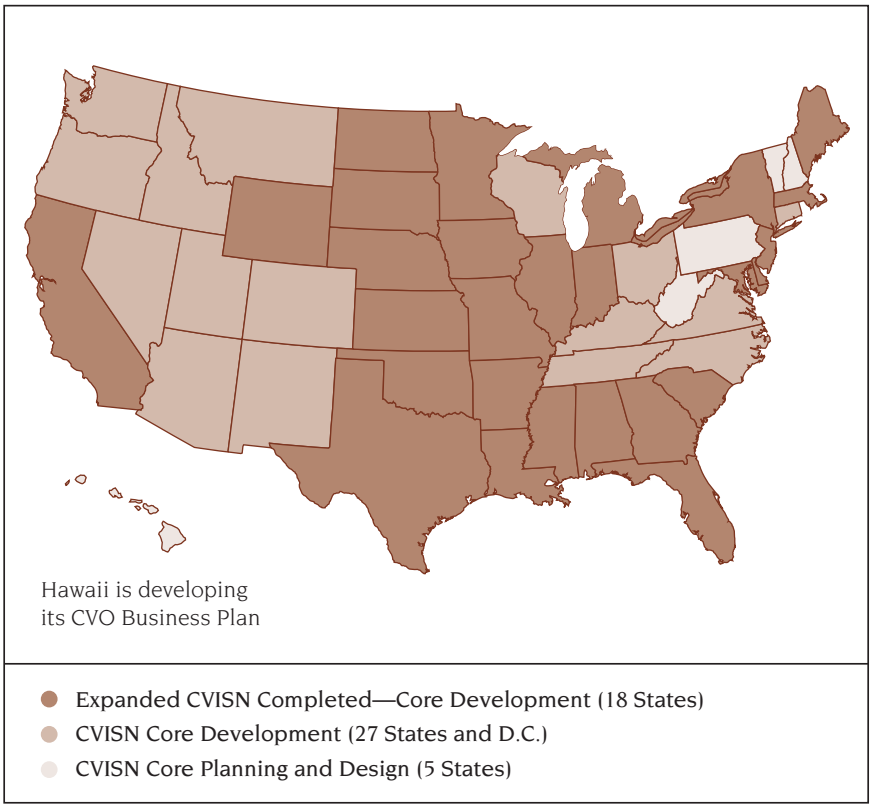

Figure 20 – Status of CVISN Deployment

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Selected Highlights from the ITS Knowledge Resources on Commercial Vehicle Operations

Credentials Administration

Electronic registration and permitting at State agencies allows carriers to register online, decreasing the turn-around time associated with permit approval.

Credentials Administration	
Benefits	
ITS Goals	**Selected Findings**
Productivity	Three motor carriers surveyed during the CVISN Model Deployment Initiative indicated that electronic credentialing reduced paperwork and saved them 60 to 75 percent on credentialing costs. In addition, motor carriers were able to commission new vehicles 60 percent faster by printing their own credential paperwork and not waiting for conventional mail delivery.[478]
Customer Satisfaction	Approximately 50 percent of CVISN managers surveyed indicated that CVISN electronic credentialing systems can save staff time and labor, allowing additional support to be assigned to more critical agency functions. Comments from several State agencies show that CVISN electronic credentialing and safety inspection software can improve data quality, reduce clerical errors, and make it easier and less time consuming for carriers to apply for and renew credentials.[479]
Costs	
Unit Costs Data Examples (See Appendix A for more detail)	
Commercial Vehicle Electronic Credentialing/Administration subsystem: • State Employee Labor International Registration Plan (IRP) Credentialing (Legacy): $46K-$163K (annually) • Contractor Labor for IRP Credentialing: $6.4K-$17K (annually) • State Employee Labor International Fuel Tax Agreement (IFTA) Credentialing: $13.8K-$111.8K (annually) Vendor Labor for IFTA Credentialing: $1K-$19.2K (annually)	

Safety Assurance: Safety Information Exchange

Safety information exchange programs assist the safe operation of commercial vehicles, providing inspectors with electronic access to carrier and vehicle safety information from previous inspections.

Safety Assurance—Safety Information Exchange	
Benefits	
ITS Goals	**Selected Findings**
Safety	The results of field testing in Connecticut indicated that inspection selection systems supplemented with electronic sharing of safety inspection data increased out-of-service order rates by two percent. Modeling efforts estimated that the systems could prevent 84 commercial vehicle crashes per year nationwide. Further analysis indicated that if the system deployment was accompanied by a 10 percent increase in motor carrier safety compliance, then the number of crashes avoided would jump to 4,332 each year.[480]
Customer Satisfaction	In 2000, a survey of Maryland motor carriers found that large fleets (25 or more vehicles) that conduct business with State agencies value electronic data interchange and Internet technologies more than small fleets.[481]
Costs	
Unit Costs Data Examples (See Appendix A for more detail)	
Commercial Vehicle Safety Information Exchange (SIE) subsystem: • SIE Software Purchased Off the Shelf: $6.1K-$20.2K • State Employee Labor for New SIE Software Development: $20K-$121K • State Employee Labor for SIE: $20.2K-$67.1K (annually) • Contractor Labor for SIE: $14.9K-$42.6K (annually)	

LESSONS LEARNED

Ensure active oversight by knowledgeable government staff for complex ITS integration work.

As part of the national Commercial Vehicle Information System and Networks program, the State of Connecticut deployed a safety information exchange system. SIE is the electronic exchange of current and historical safety data and the supporting credential data regarding commercial motor carriers, vehicles, and drivers. In the CVISN deployment, Connecticut sought to establish and maintain an integrated statewide safety and credential data exchange network that links with regional and national data sources. Commercial Vehicle Information Exchange Window, a database storage and integrated software operating system, is being used by the State to access this information.

- Employ a technologically knowledgeable person to manage CVISN contractors.

(*Continued on next page.*)

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Safety Assurance: Automated Inspection

Automated inspection equipment can be implemented to remotely test commercial trucks for faulty equipment, such as non-functioning brakes.

Safety Assurance—Automated Inspection	
Benefits	
ITS Goals	**Selected Findings**
Safety	Four States (Georgia, Kentucky, North Carolina, and Tennessee) participated in a year-long test to evaluate the performance of an infrared brake screening system designed to inspect commercial vehicles for brake problems as they enter weigh stations. Eighty-four (84) percent of vehicles selected for inspection had some form of brake impairment compared to 34 percent under ordinary inspection selection procedures.[483]
Customer Satisfaction	In a survey of truck and motorcoach drivers, participants were asked about the utility of various ITS applications in commercial vehicles. Truck drivers held much less favorable opinions of automated roadside safety inspections than motorcoach drivers.[484]

Electronic Screening: Safety Screening

In-vehicle transponders can communicate with inspection stations to pre-screen trucks for safety records.

Electronic Screening—Safety Screening	
Benefits	
ITS Goals	**Selected Findings**
Mobility	Most truck drivers and CVO inspectors surveyed during the CVISN Model Deployment Initiative felt that electronic screening saved them time.[485]
Customer Satisfaction	Motor carriers surveyed during a model deployment of CVISN were concerned with the cost-effectiveness of electronic screening methods and the expansion of State regulation. However, most truck drivers felt that electronic screening saved them time. Inspectors also noted that CVISN saved time, and improved the accuracy and speed of data reporting.[486]

LESSONS LEARNED

(*Continued from previous page.*)

Effective development and deployment of complex technologies require management of contractors by a government employee with knowledge of the technologies and good management skills. States have varying levels of in-house programming, computer hardware, and information technology capabilities. For States that plan to contract out significant portions of their CVISN software development, it is critical to have an internal staff member who can effectively represent the State's approach to administering commercial vehicle operations and enforcing regulations, so that the contractor-provided CVISN equipment and programs complement and extend the State's existing work processes.[482]

Electronic Screening—Safety Screening
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Commercial Vehicle Electronic Screening (Pre-Clearance) subsystem: • Mainline (High Speed) Weigh-in-Motion Scale: $59.8K-$249.2K • Automated Vehicle Identification Equipment/System: $50K-$99K • Contractor Labor for Electronic Screening Software Development: $196.9K-$200.1K • Costs for Marketing, Outreach, Publicity: $0.6K-$5.6K (annually)
Benefit-Cost Studies
United States: Analysis of the CVISN Model Deployment Initiative considered start-up costs, operating costs, and crash avoidance from better, targeted screening over the expected lifetime of the technology. Without considering the cost-saving benefits of crash avoidance from increased motor carrier compliance, the study estimated that electronic screening would have a benefit-to-cost ratio of 2:1.[487]

Electronic Screening: Border Clearance

In-vehicle transponders can communicate with customs check points to pre-screen trucks for safety records, border clearance, and proper credentials.

Electronic Screening—Border Clearance	
Benefits	
ITS Goals	**Selected Findings**
Mobility	Simulation models of traffic on the U.S.-Canadian border at the Ambassador Bridge connecting Detroit, Michigan with Windsor, Ontario showed that electronic border clearance could save equipped trucks 50 percent of the delay through customs.[488]
Benefit-Cost Studies	
United States: A study of electronic border clearance along the mid-continent transportation corridor from Minnesota to Texas technologies found that benefit-to-cost ratios for motor carriers ranged from 85:1 to 718:1.[489]	

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Electronic Screening: Weight Screening

In-vehicle transponders can communicate with weigh stations to pre-screen trucks for compliance with weight regulations. WIM scales can be used for more efficient weight screening.

Electronic Screening—Weight Screening	
Benefits	
ITS Goals	**Selected Findings**
Mobility	A simulation study of an Indiana weigh station found that implementing WIM technology and equipping 40 to 50 percent of trucks with electronic screening transponders would significantly reduce queue overflows.[490]

Electronic Screening: Credential Checking

In-vehicle transponders can communicate with weigh stations and customs check points to pre-screen trucks for proper credentials.

Electronic Screening—Credential Checking	
Benefits	
ITS Goals	**Selected Findings**
Mobility	In Colorado, an automated pre-screening system installed at three port-of-entry check stations allowed PrePass™ subscribers to bypass inspection stations if their credentials were in order. Evaluation data indicated that the automated system saved approximately 8,000 vehicle-hours of delay per month.[491]
Productivity	Pre-clearance systems that use interagency coordination to deploy interoperable electronic toll collection (ETC) and electronic screening systems improve the efficiency of motor carrier operations by saving them time and money. Interoperable applications incorporated into a single transponder can save carriers between $0.63 to $2.15 per event at weigh stations. The greater the number of interoperable applications incorporated into a single transponder, the greater the benefit. The estimated benefits realized by industry through participation in ETC and electronic screening, when combined through interoperability, double in value.[492]
Energy and Environment	In Colorado, an automated pre-screening system installed at three port-of-entry check stations allowed PrePass™ subscribers to bypass inspection stations if their credentials were in order. Evaluation data indicated that the automated system saved 48,200 gallons of fuel per month.[493]

LESSONS LEARNED

Be sure to identify and take into account features unique to each State when designing and deploying ITS technology projects across multiple States.

The use of the databases and human interfaces, developed as part of the field operational test projects, varied significantly among the participating States. Much of the variation had to do with the technological and institutional environment within each State.

- Be sure to account for State differences in the commercial vehicle operating environment.

  Each State has a unique operating environment for commercial vehicles that will need to be considered when designing and deploying Commercial Vehicle Information System and Networks technologies intended to be integrated with out-of-state systems.

(*Continued on next page.*)

Electronic Screening—Credential Checking	
Customer Satisfaction	Drivers of trucks and motorcoaches were asked about the utility of various ITS applications in commercial vehicles. Both motorcoach and truck drivers held favorable opinions of commercial vehicle electronic clearance.[494]

Carrier Operations and Fleet Management: Automatic Vehicle Location/Computer-Aided Dispatch

AVL and CAD can assist carriers with scheduling and tracking of vehicles and freight.

Carrier Operations and Fleet Management—AVL/CAD	
Benefits	
ITS Goals	**Selected Findings**
Mobility	In Europe, several projects investigated management systems designed to improve the operating efficiency of carriers. Centralized route planning systems reduced vehicle travel distances by 18 percent and decreased travel time by 14 percent.[496]
Productivity	A survey conducted by the American Trucking Associations Foundation found that CAD systems increased productivity 5 to 15 percent by increasing the number of pickups and deliveries per truck per day.[497]
Costs	
Unit Costs Data Examples (See Appendix A for more detail)	
Commercial Vehicle subsystem: • Global Positioning System (GPS)/Differential GPS (DGPS): $0.5K-$1.8K • Cargo Monitoring Sensors and Gauges: $0.13K-$0.27K Fleet Management subsystem: • Vehicle Location Interface: $10K-$15K • Software for Tracking and Scheduling: $10K-$33K	

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Carrier Operations and Fleet Management—AVL/CAD
Costs
Sample Costs of ITS Deployments
United States: The HAZMAT Transportation Safety and Security Field Operational Test (FOT) was conducted to assess commercially-available, off-the-shelf technology that could be deployed in the near term to enhance the safety and security of HAZMAT transportation operations. Part of the assessment included collecting cost data of the different technologies. On-board monitoring technologies included software products to monitor engine diagnostics and vehicle maintenance that ranged in costs from **$10,000 to $33,000**.[498]

Carrier Operations and Fleet Management: Traveler Information

Targeted traveler information systems can help carriers choose alternate departure times, avoid traffic, and arrive on time.

Carrier Operations and Fleet Management—Traveler Information	
Benefits	
ITS Goals	**Selected Findings**
Customer Satisfaction	The FleetForward operational test conducted by the American Trucking Associations Foundation provided commercial truckers with real-time traffic information to facilitate routing decisions and improve the operational efficiencies of motor carrier operations along the eastern corridor. Although operating efficiencies were not significantly impacted, 75 percent of motor carriers felt traffic information was a valuable tool for identifying congestion.[499]

LESSONS LEARNED

(*Continued from previous page.*)

For example, during the design and deployment of the Safety and Fitness Electronic Records Data Mailbox, it became apparent that New York faced some significant challenges that other States did not encounter. New York is substantially larger and more geographically differentiated than any of the other states participating in the program, except Pennsylvania. New York has a border with Canada, so information related to Canadian provincial addresses is more important there than in other states. New York's large cities result in greater statewide complexity of routes and commercial traffic as well as a wider diversity of local and regional trucking companies. Its large geographic area also means that a large number of inspectors use the systems.[495]

Security Operations

ITS applications can be used to ensure the security and safety of motor carriers. Asset tracking technologies can monitor the location and condition of fleet assets (e.g., trailers, cabs, and trucks), and remote disabling systems can prevent the unauthorized use of fleet vehicles and assist in asset recovery.

Security Operations
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Commercial Vehicle subsystem: • Driver and Vehicle Safety Sensors, Software: $0.9K-$1.7K • Cargo Monitoring Sensors and Gauges: $0.13K-$0.27K
Sample Costs of ITS Deployments
United States: The HAZMAT Transportation Safety and Security FOT was conducted to assess commercially-available, off-the-shelf technology that could be deployed in the near term to enhance the safety and security of HAZMAT transportation operations. A digital cellular phone with pickup and delivery software with phone/on-board directions/mapping costs approximately **$250 per vehicle**. This technology would also include on-site vehicle disabling with the wireless panic remote. Basic asset tracking units using satellite, terrestrial triangulation, and global positioning system-based locators cost $**139 to $500 per unit**; mid-range units cost **$375 to $450 per unit**.[500]

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