U.S. Department of Transportation

Commercial Vehicle Operations

ITS Benefits, Costs, and Lessons Learned: 2014 Update Report

Commercial Vehicle Operations

Credentials Administration
Safety Assurance
Electronic Screening
Carrier Operations & Fleet Management
Security Operations

Highlights

- Dynamic mobility applications that improve data sharing among commercial vehicle drivers can improve freight travel times up to 20 percent.
- With sufficient economies-of-scale, a network wide deployment of Smart Roadside applications can yield benefit-to-cost ratios ranging from 3.5 to 6.2 over 10 years.

Introduction

This factsheet is based on past evaluation data contained in the ITS Knowledge Resources database at: www.itskrs.its.dot.gov. The database is maintained by the U.S. DOT's ITS JPO Evaluation Program to support informed decision making regarding ITS investments by tracking the effectiveness of deployed ITS. The factsheet presents benefits, costs and lessons learned from past evaluations of ITS projects.

ITS applications for commercial vehicle operations (CVO) enhance communications between motor carriers and regulatory agencies, reduce administrative costs for public and private sector operations, and assure safe reliable movement of goods and services on the Nation's roadways. As part of the Motor Carrier Safety Improvement Act of 1999 the U.S. DOT commissioned the Federal Motor Carrier Safety Administration (FMCSA) to advance these goals and implement the Commercial Vehicle Information Systems and Networks (CVISN) program to fund state participation. CVISN consists of both Core and Expanded functions where Core functions have priority for nationwide deployment.

Core CVISN

- **Electronic credentialing** – Automates the application, processing, and issuance of motor carrier operating credentials.
- **Safety information exchange** – Facilitates the collection, distribution, and retrieval of motor carrier safety information at the roadside.
- **Electronic screening** – Enables commercial vehicles with good safety and legal status to bypass roadside inspections and weigh stations.

Focusing enforcement efforts on non-compliant commercial vehicles changes the enforcement paradigm from quantity to quality.

Expanded CVISN

- **Expanded electronic credentialing** – Enables authorized stakeholders to access current and accurate credentials information.
- **Smart roadside** – Connects remote inspection sites and virtual weigh stations to CVISN networks.
- **Enhanced safety information sharing and data quality** – Provides motor carrier access to Federal and state safety data and CVISN updates.
- **Driver information sharing** – Enables enforcement personnel to access driver records and safety data.

As of July 2013, all states and the District of Columbia have deployed at least one Core CVISN element. Eleven (11) states, however, have not yet achieved Core CVISN compliance because of transponder requirements needed for electronic screening.

Recent changes in Federal Policy address these issues and enable States to use alternate types of communication devices including smartphones, tablets, fleet management systems, GPS navigational units, and onboard telematics devices to transmit data as required to meet CVISN requirements [1].

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. Although commercial vehicle operators have demonstrated a willingness to participate in these programs, participation rates nationwide have been relatively low and included only about 20 percent of all commercial motor vehicles [2]. There is now wide consensus that regulatory agencies should no longer only focus on increasing the number of inspections carried out, but use available resources to increase the percentage of non-compliant vehicles stopped for inspection. With core CVISN capabilities expected in all states by 2015, agencies have identified alternative solutions through the Expanded CVISN program. The Smart Roadside Initiative, for example, will create efficient data handling between private and public sector motor carrier systems while maintaining current operational systems. Inspections and measurements traditionally conducted at weigh stations will be provided at strategic points along commercial vehicle routes to increase the effectiveness of available resources. Currently, four ITS application areas are the focus of this initiative [3].

1. E-screening vehicles in motion to automatically detect safety issues.
2. Improving truck size and weight enforcement with virtual weigh stations, and enhancing safety and credentials assessment with e-credentialing.
3. Transmitting driver, vehicle, and carrier safety data directly from commercial vehicles to the roadside and from carrier systems to government systems.
4. Providing commercial vehicle parking information so commercial drivers can make advanced route planning decisions based on hour-of-service constraints, location and supply of parking, travel conditions, and loading/unloading.

Benefits

Core CVISN

Electronic credentialing allows carriers to register with state agencies online to improve turn-around times and lower labor costs associated with permit processing and approval.

- Ninety-four (94) percent of motor carrier companies surveyed say that electronic credentialing is more convenient, 80 percent saw savings in staff labor time, and 58 percent achieved costs savings over manual methods (2011-00738).
- With more rapid processing and reduced overhead and labor costs, carrier savings can be as high as $360,500 per year depending on fleet size (2009-00609).
- A national evaluation of the CVISN deployment program indicated electronic credentialing has a benefit-cost ratio of 2.6 (2012-00787).

The safety information exchange (SIE) portion of the CVISN program integrates national and state databases enabling a coordinated review of registration and safety data. Enforcement personnel can access national database clearinghouses to review carrier regulatory compliance data and crosscheck safety assurance information. Electronic screening systems allow transponder equipped commercial vehicles to:

- Provide expedited information to inspection stations.
- Improve inspection efficiency.
- Allow safe and legal carriers to bypass roadside inspections and weigh stations.

An evaluation of the national CVISN program found that electronic screening has a benefit-cost ratio of 1.9 to 7.5. Results varied depending on the system configuration, level of deployment, and the benefits of crash avoidance gained through increased compliance (2012-00787).

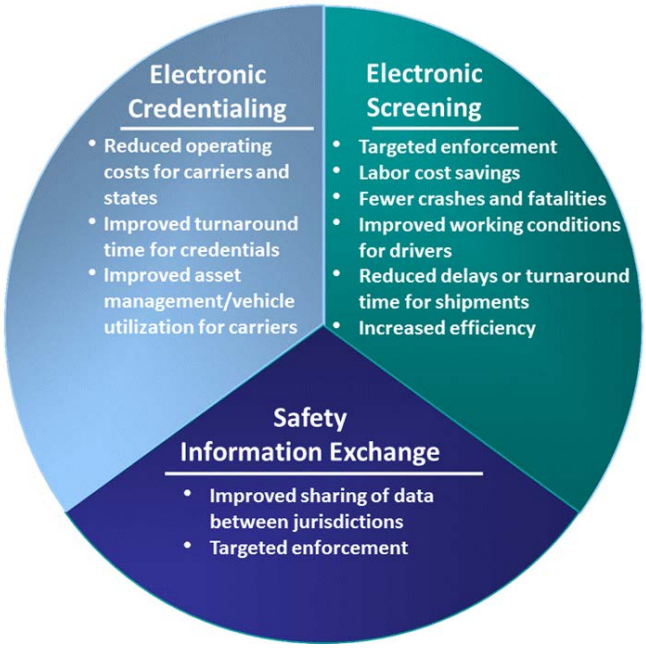


Figure 1: Summary of Benefits for Core CVISN Functions (Source: U.S. DOT, 2008 [4]).

Expanded CVISN

Initial results from limited scale field operational tests show that ITS applications for Expanded CVISN functions support Core CVISN functions and improve mobility, safety, and productivity for commercial vehicle operations. The Smart Roadside Initiative continues to develop, design, build, and test prototype applications designed to share data seamlessly between commercial vehicles, motor carriers, enforcement resources, highway facilities, intermodal facilities, toll facilities, and other nodes on the transportation system. Initial feasibility analysis conducted by the U.S. DOT suggest that with sufficient economies-of-scale, a network wide deployment of smart roadside applications can yield benefit-cost ratios ranging from 3.51:1 to 6.17:1 over 10 years [5].

Table 1: Wireless Roadside Inspection (WRI) Benefit-Cost Ratios, Nationwide (Source: U.S. DOT).

Annual Benefits	
Lives Saved	253
Injuries Prevented	6,192
Total Cost Savings	$1.7B
Annualized Costs	
Government—Facility, Equipment, IT, Communications Capital Costs (Amortized over 10 years)	$22M – $34M
Government—Facility, Equipment, IT, Communications O&M Costs	$23M – $42M
Industry—Annual Incremental Commercial Motor Vehicle (CMV) Costs. Based on 420,000 units/year ($533 - $940 per CMV)	$224M – $395M
Total Annualized Cost	$269M – $471M
Benefit-Cost Ratio	
Low-High	3.51:1 – 6.17:1
Average	4.84:1

Additional field studies in the United States and Canada show that vehicle-to-infrastructure (V2I) technologies can make surface transportation safer, smarter, and greener.

- Dynamic mobility applications that improve data sharing among commercial vehicle drivers can improve freight travel times up to 20 percent (2013-00845).
- In British Columbia, a study of the Green Light Transportation System (GLTS) found that adding an automated license plate reader (ALPR) to an electronic screening system effectively focused inspections on high-risk carriers, reduced commercial vehicle travel times, and decreased fuel consumption and emissions resulting in a benefit-cost ratio of 26.2:1 (2013-00836).

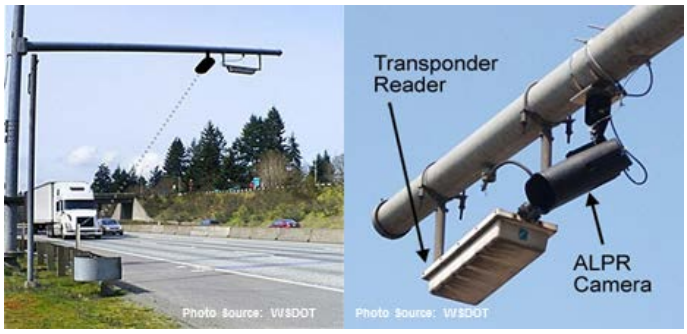
Costs

Core CVISN

Data collected from four states (Montana, New Jersey, New York, and South Dakota) show Core CVISN costs vary widely depending on the size of the state, and the level and type of systems deployed.

- The average start-up cost for electronic credentialing was estimated at $1.35 million per state (with a range of $28,037 to $8.57 million) with annual operating and maintenance costs estimated at $250,000 per year ($22,645 to $1.09 million) (2011-00229).
- The average per state start-up costs for safety information exchange systems were estimated at roughly $680,000 ($31,828 to $2.68 million) with operating costs estimated at $74,000 per year (2011-00230).
- The average per state start-up cost for electronic screening systems varied from $1 million to $2.8 million (2011-00231).

Expanded CVISN



Virtual weigh stations can monitor traffic in truck-only lanes without having to purchase extensive right of ways located adjacent to the mainline for weigh station construction. CVISN funding requests suggest that virtual weigh station system costs range from $300,000 to $1.4 million (2013-00287).

Automated license plate reading systems (ALPR) can supplement Core CVISN functions. The cost of an ALPR system used to supplement existing inspection systems at eight inspection sites was estimated at $1.06 million (CAN).

- Total hardware costs for sensors, cameras, and overview image capture equipment were estimated at $484,000.
- Total software costs including an enterprise software module, and customized optical character recognition (OCR) and electronic screening software at eight inspection sites were estimated at $382,000. (2013-00279)

Case Study – Wireless Roadside Inspection Field Operational Test

In Schodack, New York a field operational test was conducted to evaluate the performance of a smart roadside inspection station (SRIS) installed on I-90. The system was designed with a weigh-in-motion (WIM) system in the mainline, dedicated short range radio communications (DSRC), an APLR system, and enhanced imaging that enabled the system to detect overheight vehicles, read U.S. DOT Numbers, and identify HAZMAT placard symbols posted on commercial vehicles. The on-site equipment and e-screening software were connected to the New York State Commercial Vehicle Information Exchange Window (CVIEW) and New York State Commercial Vehicle Infrastructure Integration (CVII) network which enabled the system to query several databases and collect and share compliance data on high-risk carriers. The databases queried by the system included:

- FMCSA SAFER (Safety and Fitness Electronic Records) system
- FMCSA PRISM (Performance and Registration Information Systems) program
- NYS Tax and Finance HUT (Highway Use Tax) credentials database

- NYSDOT OS/OW (Oversize/Overweight) permits database.

Evaluators monitored SRIS activity for the last 10 minutes of every hour between December 6 and December 7, 2012 and a total of 240 commercial vehicles were detected and processed.

Findings

Compared to traditional commercial vehicle inspection methodologies SRIS reduced the number of Level 1 Commercial Vehicle Safety Alliance inspections required to maintain target enforcement levels (number of non-compliant carriers expected to be placed out-of-service each day). With an inspection station that performs 20 inspections per day the system was estimated to save 14 compliant carriers from 14 needless one-hour inspections and improve the out-of-service rate by 70 percent (2013-00859).

Fuel Consumption and Emissions

- Fuel savings for compliant carriers were estimated at $89,425 per year.
- Total annual emissions savings were estimated at 6.57 metric tons.

Carrier Mobility and Productivity

- Time savings for trucks at $75 per hour would save $383,250 per year.

Inspector Productivity and Efficiency

- Time savings for agency personnel at $45 per hour would save approximately $1.15 million per year with enforcement levels maintained.

References

[1] "Use of Wireless Mobile Data Devices as Transponders for the Commercial Motor Vehicle Information Systems and Networks (CVISN) Electronic Screening Systems," *Federal Register*, Volume 78, No.139, 19 July 2013, pp. 43262-43263. URL: http://www.gpo.gov/fdsys/pkg/FR-2013-07-19/html/2013-17418.htm

[2] Hammond, Paula. *The Grey Notebook 37*, WSDOT Quarterly Performance Report, GNB 37, Washington State DOT. WA. March 2010. URL: http://www.wsdot.wa.gov/NR/rdonlyres/BD26D6F0-B554-497C-9D0E-35C546BF179F/0/GrayNotebookMar10.pdf

[3] "ITS Research Fact Sheets: Smart Roadside," U.S. DOT, RITA Website. Last Accessed 15 November 2013. URL: http://www.its.dot.gov/factsheets/smart_roadside.htm

[4] *Benefits of Commercial Vehicle Information Systems and Networks (CVISN) Program*, U.S. DOT FMCSA. September 2008. URL: http://www.fmcsa.dot.gov/facts-research/media/webinar-09-29-08-slides.pdf

[5] "Wireless Roadside Inspections for Trucks and Buses," Smart Roadside Workshop, U.S. DOT FMCSA. 2008. URL: http://www.fmcsa.dot.gov/facts-research/presentations/smart-roadside-workshop/Loftus-Wireless-Roadside-Inspections-alt.pdf

All other data referenced is available through the ITS Knowledge Resources Database, which can be found at http://www.itsknowledgeresources.its.dot.gov/.