

Santa Teresa RFID E-Screening Demonstration Project Evaluation

Programs of the Federal Motor Carrier Safety Administration (FMCSA) encompass a range of issues and disciplines, all related to motor carrier safety and security. FMCSA's Office of Analysis, Research and Technology defines a "research program" as any systematic study directed toward fuller scientific discovery, knowledge, or understanding that will improve safety, and reduce the number and severity of commercial motor vehicle crashes. Similarly, a "technology program" is a program that adopts, develops, tests, and/or deploys innovative driver and/or vehicle best safety practices and technologies that will improve safety and reduce the number and severity of commercial motor vehicle crashes. An "analysis program" is defined as economic and environmental analyses done for the agency's rulemakings, as well as program effectiveness studies, state-reported data quality initiatives, and special crash and other motor carrier safety performance-related analyses. A "large truck" is any truck with a Gross Vehicle Weight rating or Gross Combination Weight rating of 10,001 pounds or greater.

Currently, FMCSA's Office of Analysis, Research and Technology is conducting programs in order to produce safer drivers, improve safety of commercial motor vehicles, produce safer carriers, advance safety through information-based initiatives, and improve security through safety initiatives. The analyses described in this Tech Brief were designed and developed to support the strategic objective to produce safer drivers. The primary goal is to provide an analysis of the economic benefits, expected costs, and industry returns on investment for the safety systems described herein



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Thousands of Mexico-domiciled commercial motor vehicles cross into the United States daily through International Border Crossings (IBCs) in New Mexico, Texas, Arizona, and California. Most are permitted to travel only in U.S. Commercial Zones, extending 3 to 20 miles north of the municipalities on the U.S.-Mexican border. The truck drops or unloads the trailer at a warehouse in this area, turns around, reloads—or picks up another trailer in Mexico—and makes one or more additional northbound trips a day.

These trucks are processed through a facility operated by U.S. Customs and Border Protection (CBP) and then through clearance conducted by State Motor Carrier Safety Assistance Program (MCSAP) agencies and Federal Motor Carrier Safety Administration (FMCSA) inspectors. The inspectors are tasked with ensuring that Mexican vehicles meet safety and compliance requirements related to:

- Driver credentials—commercial driver's license (CDL) status, class, and restrictions.
- Federal operating authority status.
- Proof of insurance at the appropriate coverage level.

State MCSAP agencies are also concerned with validating:

- Mexican vehicle registration status.
- Compliance with State size and weight limitations.
- Other, State-specific requirements.

At present, State and FMCSA inspection selection and clearance processes at virtually all sites are manual—limited in efficiency and "coverage," as they may require parking a vehicle and bringing driver and paperwork into an office, which can take up to 15 minutes. Even if handheld devices are used (obviating the need to park), verifications can take several minutes.

Overview of the Project

This project sought to determine whether utilizing radio frequency identification device (RFID) transponders to screen and identify drivers and vehicles, in conjunction with an electronic database and screening algorithm to verify compliance with safety and credential compliance requirements, would be feasible and increase efficiency.

The Santa Teresa, NM, port of entry was selected as the demonstration test site because it is low-volume (~120–140 trips per day), staffed 5.5 days/week with a full complement of FMCSA border inspectors and State MCSAP officers, where new technologies can be tested and evaluated more quickly than at higher-volume sites.

RFID technology was selected because 80–90 percent of trucks entering the United States from Mexico are already equipped with RFID transponders issued by CBP—either Free and Secure Trade (FAST) transponders or User Fee transponders. Hence, participants did not need a second vehicle ID device. This allowed eventual interface of the e-screening system with the subset of the International Trade Data System data already being exchanged between CBP and FMCSA.

Concept of Operations

For purposes of evaluation, the demonstration test ran from March 5, 2007, when vehicle enrollment was initiated, to May 12, 2007, when the last transaction statistics were downloaded. Fourteen carriers agreed to participate. Among them, 100 trucks and five drivers were enrolled in the system. More than 5,500 transponder reads were recorded during the 10-week period; of those, more than 2,400 involved enrolled transponders. By the end of vehicle enrollment, on a daily basis, 56 percent of the reads were enrolled reads.

An RFID reader at the Santa Teresa Port captured the transponder identification number (ID) from the FAST or User Fee tag and read the transponder number from the driver ID cards. The transponder IDs were then transmitted to the screening system, whose Roadside Operations Computer (ROC) displayed transponder number, basic identifying information about the driver or vehicle, and the results of the screening decision. Vehicles were screened to validate:

- Currency of truck CVSA decal, and currency of truck registration.
- Federal operating authority status of carrier operating the vehicle.
- Current insurance.
- For driver tags, CDL status.

If the screening showed that either vehicle or driver was not enrolled in the program, an alarm sounded, and a New Mexico Department of Public Safety, Motor Transportation Division (MTD) officer or FMCSA inspector parked the truck, noted the issue date of the CVSA decal, and examined the driver's paperwork for enrollment and verification. When that driver or truck next entered the Santa Teresa Port, the RFID reader transmitted the vehicle and driver ID numbers to the screening system, triggering a query to the local database:

- Where the query resulted in a "pass" (vehicle/driver were compliant for all factors verified by the e-screening system), the inspector could wave the vehicle on or inspect it for compliance.
- Where the query resulted in a "fail" (vehicle/driver were noncompliant for one or more factors verified by the system), the ROC sounded an alarm and showed a "fail" message and the underlying reasons.

Table 1 details the findings of the baseline evaluation observation/staged events conducted on-site over a 6-hour period on February 27, 2007. These observations/events established a series of benchmarks against which to evaluate the findings of the demonstration test.

Major Findings

The demonstration project was designed to demonstrate, using the transponders used by CBP, the potential value of e-screening in improving the efficiency and effectiveness of the safety/compliance verification and inspection selection processes at secondary IBC facilities. Results indicate that the technology performed reliably and as expected, and the demonstration met the objectives defined in five of the six hypotheses; results for the final hypothesis were inconclusive. Table 2 summarizes the project's hypotheses and discusses related results.

Limitations of Operational Concept

From a technical and operational standpoint, the system performed as intended. However, there are key limitations to use of the system when considering "full-service" e-screening needs:

- Currency of truck CVSA decal.
- On-site enrollment is time-consuming.
- An on-site enrollment process requiring manual updates in the field limits data currency and may result in false "fail" reads.
- There was no way to identify the trailer electronically, or to verify the currency of the trailer's

Table 1. Baseline Evaluation Findings

Criteria	Measure	Comments
Average daily trip volume	120–140 trips per day	
Average full safety/compliance checks per month	237 per month	Based on number of Level 1 inspections conducted January–March 2007 observations indicate that, generally, a full compliance check is conducted for all elements included in e-screening verification only when officers are conducting an inspection.
Time required to manually verify all factors considered by e-screening system	15 minutes	Requires parking vehicle, bringing driver and paperwork into office, querying multiple databases to verify information on paper forms as well as Federal operating authority; CDL status.
Vehicle processing	92 trucks processed in 6-hour period. 18 selected for further inspection; 5 were found fully compliant; 13 were found out-of-service or in violation.	Average of 27 minutes out of productive service for fully compliant trucks.

Table 2. Hypotheses Underlying Demonstration and Related Results

Premise Tested	Results
RFID Technology can be used to reliably identify vehicles/drivers at ramp speeds	The RFID readers and tags used in the demonstration project performed reliably (99+% read rate).
In-station e-screening can reduce the time required to process vehicles for inspection selection, resulting in productivity improvements for both inspectors and carriers	Full electronic verification of enrolled vehicles was routinely accomplished via the e-screening system in less than 1 second, vs. 15 minutes required to manually verify all items checked by the screening system.
In-station e-screening has the potential to increase the number of vehicles/drivers routinely subject to full compliance verification.	The Baseline evaluation showed that, on average, 237 vehicles per month were subject to full safety/compliance verifications of all criteria included in the e-screening system. Subsequent to e-screening system implementation, the number of vehicles screened for full compliance was increased to an average of 965 vehicles per month, an increase of 307%.
In-station e-screening focuses limited enforcement resources on noncompliant/unknown vehicles/drivers	The system identified compliant/noncompliant vehicles more than 99 percent of the time, enabling officers to focus their efforts on vehicles with “fail” reads and those that are not transponder-equipped.
In-station e-screening has the potential to reduce processing time for compliant vehicles	Average time saved per vehicle when distributed among all vehicles in the queue was 1.8 minutes per vehicle.
In-station e-screening provides the potential to increase capacity/throughput	Traffic volumes at Santa Teresa were too low to draw significant conclusions—positive or negative—regarding this hypothesis.

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CVSA decal, especially since trailers are not equipped with separate RFID tags.

- Drivers of carriers participating in the FAST program are likely to have driver ID cards. Drivers participating only in the User Fee transponder program (of carriers enrolled in the Santa Teresa Phase 1 Demonstration Project) did not have CBP-issued driver ID cards.
- Because the system was developed as a 6-week demonstration with limited funding, the screening decision is displayed only inside the MTD/FMCSA facility on the ROC.

Addressing Limitations

The Santa Teresa Project Team identified various ways to address the limitations of the Phase 1 demonstration. Central to these solutions is the potential to access the subset of the International Trade Data System (ITDS) data set being shared by CBP with FMCSA.

Motor carriers and other eligible parties are required to file an electronic manifest with CBP prior to entering the United States through any Southern land port and at least 24 hours prior to a trip. Data from the manifest are “packaged” by CBP’s ITDS system and transmitted to each Federal agency that requires documentation to clear or license cargo. FMCSA receives the data, electronically verifies them, and transmits the data set (with flags on potential compliance issues) back to CBP.

The Santa Teresa Project Team identified a need to interface the subset of ITDS data verified by FMCSA with e-screening systems at Southern and Northern IBCs. Access to the ITDS data subset would address many limitations identified in the Phase 1 Project, including:

- Access to the ITDS data set would obviate the need for on-site enrollment.
- The ITDS data set ties the truck, trailer, and driver together on a per-trip basis. If the truck can be identified via the RFID tag, the driver and trailer can be identified and screened electronically, even in the absence of driver and trailer RFID tags.
- Access/interface to the ITDS, SAFER/ CVIEW, MCMIS data sources.

Response to the Demonstration Project

Informal discussions with participating carriers indicate the following responses to the project:

- The enrollment process, within the context of the demonstration, was not viewed as overly cumbersome.
- Carriers agreed that interface with centralized data sources to maintain currency of the screening database would improve screening system performance (and better meet their expectations of reduced clearance time for safe and compliant vehicles).
- Carriers are interested in continuing participation in the project, and see potential for increased value, particularly if enhancements are implemented.
- Some carriers are interested in trailer compliance issues and assignment of violations to trailer owners as an incentive to increase owner compliance with inspection requirements.