THE IMPLEMENTATION OF A RISK-BASED VETTING METHODOLOGY TO IDENTIFY CHAMELEON CARRIERS APPLYING FOR OPERATING AUTHORITY REPORT TO CONGRESS – FISCAL YEAR 2014

Pursuant to the Explanatory Statement
Accompanying the Transportation, Housing and Urban Development,
and Related Agencies Appropriations Bill, 2014 (P.L. 113-76, Division L)
March 2014

The Explanatory Statement accompanying the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2014 (P.L. 113-76, division L), directed the Federal Motor Carrier Safety Administration (FMCSA) to submit a report to the House and Senate Committees on Appropriations on the implementation of a risk-based methodology to identify chameleon motor carriers and the extent to which independent commercially available data sources would enhance the Agency's capabilities. This report responds to the Committee's direction by describing the activities that took place since the last update sent to Congress in June 2013. The report updates and appends the proposed schedule with performance goals to expand vetting to the freight sector in conjunction with the implementation of the Unified Registration System (URS) now being designed and developed by FMCSA.

BACKGROUND

On June 20, 2012, the United States Department of Transportation (DOT) submitted an official response to Government Accountability Office (GAO) Report 12-364. In the response, DOT concurred with the recommendations listed in the report and indicated that they were aligned well with FMCSA's vision and direction in identifying, developing, and using robust risk-based automated screening methodologies to expand its vetting processes to include brokers, freight forwarders, and property carriers.

Subsequently, FMCSA realigned offices to bring all registration and vetting functions within the Office of Registration and Safety Information, highlighting the importance of the registration function to the Agency mission. During this realignment, FMCSA identified funds to develop and test a data-driven, risk-based prototype screening methodology that incorporates matching and motive components for targeting carriers with chameleon attributes, consistent with GAO Report 12-364. FMCSA also partnered with the Pipeline and Hazardous Materials Safety Administration (PHMSA) to leverage PHMSA's Hazmat Intelligence Portal (HIP), a web-based interface that has built-in data warehouse capabilities. The joint rapid prototyping project implemented and delivered a completed solution in March 2013. This prototype module, named the Application Review and Chameleon Investigation (ARCHI), resides in PHMSA's HIP environment.

STATUS UPDATE

Since FMCSA's previous report to Congress in June 2013, the Agency completed the following activities:

Algorithm Optimization Work

The FMCSA used ARCHI to test the assumptions used in matching and motive algorithms and also to identify additional areas of emphasis based on experience. A particular emphasis was placed on the passenger carrier and household goods carrier applications because these applications are also manually vetted and the system's risk assignment could be immediately compared to Vetting Specialists' responses. Some preliminary sensitivity analyses indicated that more data would be needed to develop a further optimized algorithm because of the small volumes of all applications these segments represent.

ARCHI was designed as a tool to aid Vetting Specialists and prove the concept in general. The study proved to be very useful; however, it was not a cost-effective module for systematic optimization research. While the funding of ARCHI was not continued at the conclusion of the rapid prototyping effort, FMCSA pursued additional activities that would better serve large scale analyses of motor carrier application data and facilitate further optimization of risk-based chameleon carrier screening algorithms. These activities include the following:

Automation of Weekly Motor Carrier Application Data

Throughout the rapid prototyping period, weekly application data and related carrier matches were manually compiled. This process is now automated. Data is automatically compiled every week and stored for future research. This is essential for any retrospective study, because our databases are continually updated with new information as it becomes available (e.g., crashes, inspections, insurance, safety ratings, and updated information about motor carriers). A retrospective study must use the data on our systems at the time an application is filed and not when the study is conducted. Implementation of this process should allow FMCSA to develop, optimize, back-test, and validate newer algorithms over a large dataset that uses timely information.

Mass Processing Capability Outside of ARCHI

FMCSA has developed basic capabilities to make adjustments to the match and motive criteria, which was proposed in GAO Report 12-364 and implemented in ARCHI. FMCSA can now mass process automatically generated datasets and produce comma-delimited files that can be imported into common analysis tools. These tools provide the foundational features that will be used in FMCSA's planned Sensitivity and Optimization Research projects.

Identification of Research and Technology Funds for Optimization Research

In August 2013, FMCSA identified limited funds for the development of a systematic optimization plan for the risk-based screening approach building upon the match and motive foundation GAO Report 12-364 proposed and to establish the performance objectives for the required research. Subsequent to FMCSA's Research Executive Board review, this request was approved. Specific research and technology funds were allocated for this activity with a projected start in Fiscal Year (FY) 2014.

FMCSA's Technology Division is in the process of outlining the Statement of Work for this procurement and is also researching the appropriate contracting vehicles suitable for this

objective. FMCSA updated its projected timeline for this study (previously referred to as "Sensitivity Analysis Research" and now revised as "Sensitivity Analysis and Algorithm Optimization Research Study") on Table 1.

Discussions with Data and Service Vendors and Planned Request for Information

The Office of Registration and Safety Information met with data and service providers to assess availability and suitability of third-party data and services that can augment and improve the explored screening algorithms.

FMCSA back-tested a set of known cases of chameleon applications from the past using the GAO criteria. This test indicated that only a subset of these cases would have been flagged if the suggested "match" thresholds were used. By lowering the "match" thresholds, all cases can be flagged; however, the ramification of such action is the exponential increase in the number of other applications that also become included in the category that requires manual vetting. With the limitations on the amount of information that can be systematically collected during the application process, establishing a manageable risk tradeoff between false-positives and false negatives requires FMCSA to assess external data sources and their cost-benefits within this framework. FMCSA anticipates that external data sources could help identify affiliations where there are loose matches between a new applicant and an existing high-risk carrier based on the amount of data that is required to be submitted at the time of application.

In addition to data sources, FMCSA is also exploring whether potential external services exist or can be developed to assist with the follow-up manual vetting process. Automatic screening algorithms have the potential to identify a small subset of all applications that may need thorough follow-on vetting. However, it should be noted that the amount of time it takes to vet a new application varies greatly, and the high-risk cases take an order of magnitude longer than typical low-risk cases. This is observable in FMCSA's experience in vetting all applications among passenger carrier and household goods carriers. With an effective screening tool, FMCSA anticipates that it will be left with a pool of "difficult" cases, which will all require substantial resources and time to vet and conclude. Hence, FMCSA is looking into the availability and feasibility of using external services that can streamline, augment, and/or automate certain functions of the manual vetting process.

FMCSA is also developing a more structured set of questions in a Request for Information package to more formally query the industry within the constraints and objectives of this program.

Award Decision for Small Business Innovation Research Phase I Project

FMCSA submitted a Phase I research topic in DOT's FY 2013 Small Business Innovation Research (SBIR) Program Solicitation (DTRT57-13-R-SBIR2), which was published on July 25, 2013, and closed on September 23, 2013. Subsequent to this solicitation, FMCSA established an evaluation panel, reviewed the submitted proposals, and made a Phase I SBIR Research award recommendation to a small business. The formal contract is expected to be awarded in early 2014. This project will assess innovative ways to develop an affiliation

strength and risk model. The approach in this model will focus on more advanced forms of matching sources to quantify affiliation strength between any two motor carriers. FMCSA anticipates the proceedings of this research to merge with and improve the mainstream research activities. FMCSA's Research and Technology budget should accommodate Phase II funds for this contractor, if Phase I studies deliver expected results.

PLANNED NEXT STEPS

As outlined above, FMCSA will continue to accumulate and process weekly data and use sampled assessment of proceedings within the strict constraints of available resources. The Request for Information is expected to be published by July 2014, and development of a Statement of Work for the Optimization and Sensitivity Analysis is underway. FMCSA continues to coordinate risk-based automatic screening activities with the URS implementation team to facilitate seamless integration of this module within URS when it is rolled out.

Table 1: Updated summary of planned activities, timelines, and performance goals.

Activity	Timeline	Performance Goal
ARCHI development (prototyping effort)	*December 2012 - March 2013*	*Prototype match and motive criteria that is used by Vetting Specialists*
Develop internal automation and processing capabilities	*March 2013 - July 2013*	*Automated processing capability for weekly updates.* *Collection of valid data with proper snapshots of databases for extended periods of time.*
Implement a pilot study with automated data	July 2013 - December 2014	Test and validate assigned risk for household goods and passenger carriers over a longer period of time. Test and validate assigned risk for a sample of freight carriers by vetting high-risk property carriers using Vetting Specialist(s). Identify process time improvements in vetting household goods and passenger carriers with the use of screening algorithms. Identify resource requirements associated with expanding vetting to include all high-risk freight carriers
Request for Information	April 2014 - July 2014	Identify sources of information and services (and costs) that can be applied to improving or sustaining automatic risk-based screening algorithms.

Activity	Timeline	Performance Goal
Small Business Innovation Research Phase I study to explore innovative methods to strengthen screening methods	Six months after award	Additional actionable data sources or criteria identified. Adaptive and self-learning methods to achieve self-sustaining criteria updates identified. Phase II feasibility assessment based on Phase I performance (resources permitting).
Sensitivity analysis and Algorithm Optimization research study	September 2014 - June 2015	Optimize weight factor and threshold settings for passenger, household goods, and freight carriers separately. Quantify and document false-negative and false-positive assessment probabilities at varying levels of settings.
Begin integration of lessons learned and implementation of the data-driven, risk-based screening algorithm in URS (resources permitting)	October 2015	Once the new methodology is funded and implemented, all applications are automatically screened and assigned a risk factor in URS.

Note: Italicized activities are completed.

CONCLUSION

FMCSA is continuing its research towards developing, tuning, and integrating automated risk-based screening algorithms within URS by October 2015.