

THE NATIONAL ACADEMY OF SCIENCES CORRELATION STUDY CORRECTIVE ACTION PLAN REPORT TO CONGRESS

Pursuant to Section 5221(d) of the
Fixing America's Surface Transportation Act (P.L. 114-94)
June 2018

BACKGROUND

Section 5221 of the Fixing America's Surface Transportation (FAST) Act required the National Research Council of the National Academy of Sciences (NAS) to conduct a correlation study of the Federal Motor Carrier Safety Administration's (FMCSA) Compliance, Safety, Accountability (CSA) program and Safety Measurement System (SMS). The SMS is FMCSA's algorithm for identifying patterns of non-compliance and prioritizing motor carriers for interventions. The FMCSA is prohibited from publishing percentiles and alerts on the SMS website for motor carriers transporting property until the Correlation Study is complete, and all reporting and certification requirements under section 5221 of the FAST Act are satisfied.

Additionally, section 5221 required NAS to consider the recommendations and findings of the Comptroller General of the United States, the Inspector General of the Department, and independent review team reports issued before the date of enactment of the FAST Act. The NAS panel reviewed the reports of these entities. In addition, representatives of the Government Accountability Office (GAO) presented findings at one of the public meetings.

The FAST Act also requires FMCSA to submit the results of this study to both Congress and the U.S. Department of Transportation's Office of the Inspector General (OIG). The FMCSA transmitted the NAS report to both Congress and the OIG on August 7, 2017. In addition, FMCSA must submit a corrective action plan to the Senate Commerce Committee, the House Transportation and Infrastructure Committee, and the OIG within 120 days of the date FMCSA transmitted the NAS report to Congress. The OIG will then review the action plan and submit a report to Congress on the responsiveness of the FMCSA corrective action plan. The Agency received an extension from Congress of the 120 day deadline to submit the action plan. This report satisfies the requirement to submit an action plan to Congress and the OIG.

The Agency continues to develop cost estimates and benchmarks for its action plan and will work with the OIG and Congress to provide updated information on these elements. The Agency's initial cost estimates, not including Federal staff time, total approximately \$2,500,000 over 2 years for implementation of the action plan. This will be funded from other programs within the Agency's General Operating expenses, except as noted below. The cost estimates cover the following costs:

- \$140,000 annually to create a standing committee, for a total of \$280,000 (Research funding).
- \$500,000 annually in new contract labor costs for additional expertise in statistical modeling, for a total of \$1,000,000.

- \$500,000 annually in reallocation of contract resources from current work on SMS to work on implementation of the NAS recommendations.

It is important to note that actual cost estimates may change and do not include the costs associated with changing existing FMCSA information technology systems. Final benchmarks and schedules will be revised as the work develops. However, the high-level benchmarks are as follows:

- September 2018: Run small scale Item Response Theory (IRT) model.
- April 2019: Run full scale IRT model.
- June 2019: Evaluate results and effectiveness of the full-scale model.

NAS REPORT FINDINGS

On June 27, 2017, NAS published the report titled, “Improving Motor Carrier Safety Measurement; Panel on the Review of the Compliance, Safety, and Accountability (CSA) Program of the Federal Motor Carrier Safety Administration.”¹ In preparing the report, NAS collected and analyzed the quantitative data available to FMCSA in its databases on the safety of motor carriers subject to the Federal Motor Carrier Safety Regulations and the Hazardous Materials Regulations. In addition, NAS held three public meetings to engage stakeholders from the truck and bus industry, safety advocates, researchers, and other government organizations. The meeting agendas are included in an appendix to their report.

The NAS did not recommend any immediate changes to FMCSA’s prioritization system. The NAS report concluded that SMS, in its current form, is structured in a reasonable way and its method of identifying motor carriers for alert status is defensible.

However, NAS indicated that the Agency’s should explore a more formal statistical model to replace the current SMS algorithm and that the Agency should focus on improving its data, including exposure and crash data. The report provides six specific recommendations which are explained below.

To help with the development of this action plan, on August 28, 2017, FMCSA published a Federal Register notice (82 FR 40828) advising interested parties that NAS published its report and the Agency was developing the required action plan. This Federal Register notice opened a docket for comments that closed on September 27, 2017. There were 13 comments submitted to the docket.

In addition, the Agency held a public meeting on September 8, 2017. Approximately 40 people attended the public meeting in person. Approximately 100 individuals participated through the webinar. Feedback received in this public meeting and through the docket are noted with the appropriate recommendation below in this action plan.

¹ <https://www.fmcsa.dot.gov/mission/policy/national-academy-sciences-report-improving-motor-carrier-safety-measurement>

RELEVANT RECOMMENDATIONS OF THE COMPTROLLER GENERAL AND THE INSPECTOR GENERAL

The GAO's February 2014 report titled, "Modifying the Compliance, Safety, Accountability Program Would Improve the Ability to Identify High Risk Carriers," made two recommendations to the Agency.

The GAO first recommended that FMCSA revise the SMS methodology to better account for data limitations when drawing comparisons of safety performance across carriers.

However, the NAS recommendations, as described below, provide an alternative to the approach suggested by GAO and account for the limitations that GAO identified. Importantly, the NAS report also recognized that FMCSA must stratify the industry to ensure that no motor carrier is immune from scrutiny. The NAS agreed that FMCSA's overall approach, based on crash prevention rather than prediction, is sound.

The GAO additionally recommended that FMCSA ensure that any determination of a carrier's fitness to operate properly account for limitations that GAO identified regarding safety performance information. On March 23, 2017, FMCSA withdrew its proposed rulemaking to revise its procedures for issuance of a safety fitness determination (82 FR 14848). The FMCSA advised that if it decides that changes to the safety fitness determination process are necessary and advisable in the future, FMCSA will initiate a new rulemaking that will incorporate any appropriate NAS recommendations.

In its March 2014 report titled, "Actions are Needed to Strengthen FMCSA's Compliance, Safety, Accountability Program²," the OIG issued six recommendations to the Agency, which included:

1. Issue updated DataQs guidance.
2. Implement the process for deactivating U.S. Department of Transportation numbers when carriers do not submit required census data.
3. Develop a comprehensive plan to fully implement CSA enforcement interventions in the remaining 41 States. The plan should include an estimated completion date and milestones for releasing Senti software, developing and delivering training, and using the enforcement interventions.
4. Update the SMS requirements document to (a) specify all sources of SMS data, including each of the Motor Carrier Management Information System (MCMIS) fields used, and (b) fully describe SMS validation procedures.
5. Develop and implement a process for managing SMS system documentation that includes a central file for validation records and testing results.
6. Develop and implement a configuration management policy that includes documentation of system changes and associated testing for SMS.

² <https://www.oig.dot.gov/sites/default/files/CSA%20Report.pdf>

The FMCSA implemented these recommendations. The FMCSA also believes that its plans to improve data quality, in response to the NAS recommendations, will help to address the similar data quality concerns that the OIG described in its 2014 report.

IMPLEMENTATION OVERSIGHT

The FMCSA contracted with NAS to assist with its response to the report's recommendations. The NAS established a new Standing Committee, as a follow on to the public committee, that includes subject matter experts on organization safety, statistics, research and evaluation methods, motor carrier operations, enforcement, and IRT modeling.

The committee will provide expertise, guidance, and oversight to FMCSA in developing and testing IRT modeling, providing feedback and input on the other recommendations, and providing input on how to best measure motor carrier safety and system effectiveness. In addition, the Standing Committee will solicit input from stakeholders during the implementation process and will provide advice to FMCSA in the implementation of the recommendations. The Standing Committee will hold closed and open meetings to review FMCSA's progress in implementing its action plan and to provide guidance and advice.

In addition, the Agency is planning a public forum in July 2018 to discuss data issues and availability. Also, FMCSA will establish a committee to provide feedback on the process of implementing the NAS recommendations under the Motor Carrier Safety Advisory Committee (MCSAC) to provide guidance and input as the process of implementing the NAS recommendations moves forward.

ACTION PLAN

NAS Recommendation 1:

The FMCSA should develop the suggested Item Response Theory (IRT) model over the next 2 years. If it is then demonstrated to perform well in identifying motor carriers for alerts, FMCSA should use it to replace SMS in a manner akin to the way SMS replaced SafeStat.

IRT models are used for a variety of purposes including the design, analysis, and scoring of standardized tests and have been used extensively in the healthcare field. While this type of model has not been widely used within the transportation industry, it may provide the Agency with tools to make decisions about the importance of different variables within SMS, such as which violations to include in a BASIC, severity weights and others.

Public Input:

Participants in the September 8, 2017, public meeting did not provide specific ideas for action on this recommendation. Several commenters indicated that they were unsure of the impacts of an IRT model because they cannot determine how it may impact them.

FMCSA Actions:

The FMCSA is moving forward to develop and test an IRT model. That model will be used to inform the Agency's work, with opportunities for public input. As recommended by NAS, if the new IRT model performs well, it will replace the existing SMS. The FMCSA will not substantively modify SMS while we are testing the IRT model to ensure we have a stable comparison to evaluate effectiveness.

The IRT models are used in educational, psychological, and political science research. Some common applications include standardized testing and the evaluation of healthcare programs. An IRT model can evaluate motor carriers with varying safety data and characteristics by using violations to assess the safety performance of each carrier. The IRT model develops this assessment by determining the prevalence of each violation and the violation's effectiveness in distinguishing between carriers with and without a strong safety culture. In addition, an IRT model will provide a measure of confidence in a carrier's safety assessment based on the types of violations they commit.

Actions to address this recommendation are:

- As discussed above, the Agency has contracted with NAS for a new standing committee to provide expertise, guidance, and oversight to the Agency while developing the suggested IRT model. This committee will also gather input from stakeholders moving forward.
- FMCSA is utilizing its existing Interagency Agreement with the Volpe Transportation Center for the resources needed to develop, test, and implement an IRT model. In addition, the Agency is establishing a no-cost agreement with university-based expertise in IRT modeling.
- Before starting the IRT modeling, FMCSA will review the MCMIS database to make all possible corrections to the data prior to constructing the initial models. This may include identifying existing violation codes that should be removed or consolidated for modeling purposes.
- As indicated above, the Agency plans to host a public meeting to solicit and collect public input on the data issues that impact this effort.
- After data is reviewed for short-term improvements, the first step of the modeling process will begin with an exploratory data analysis to identify the appropriate correlation structure for the violations.

The FMCSA will identify key decision points and present this information to the standing committee and the public with the opportunity to comment utilizing a public docket. In addition, the Agency is considering public meetings with the NAS standing committee or other Agency listening sessions. Interested parties will be able to see what the analysis looks like, how it

works, and how it impacts the industry. Although the underlying model will be complex, FMCSA will work to provide stakeholders with aids to ensure the output is understandable.

As reflected in NAS Recommendation 2 below, there is a direct connection between the development of the IRT model and improving data, specifically the measurement of exposure. As a result, FMCSA expects there will be multiple iterations of the IRT model over time to refine the results and measure the impact of changes.

NAS Recommendation 2:

The FMCSA should continue to collaborate with States and other agencies to improve the quality of the MCMIS data in support of SMS. Two specific data elements require immediate attention: carrier exposure and crash data. The current exposure data are missing with high frequency, and data that are collected are likely of unsatisfactory quality.

- *To improve the exposure data collected involves not only collecting higher-quality Vehicle Miles Traveled (VMT) data, but also collecting this information by State on a monthly basis. This will enable SMS to (partially) accommodate existing heterogeneity in the environments where carriers travel.*
- *Crash data are missing too often. Also, there is information available from police reports currently not represented in MCMIS that could be helpful in understanding the contributing factors in a crash. Such information could help to validate the assumptions linking violations to crash frequency. To address these issues, FMCSA should support the States in collecting more complete crash data, and in universal adoption of the Model Minimum Uniform Crash Criteria (MMUCC), as well as developing and supplying the code needed to automatically extract the data needed for the MCMIS crash file.*

Public Input:

At the public meeting, it was noted that collecting vehicle miles by State would allow the Agency to address the differences in violation rates between the States. Commenters supported accessing data that has already been collected via the International Registration Plan (IRP) and the International Fuel Tax Agreement (IFTA). This would allow FMCSA to access appropriate information, and commenters emphasized that the burden on the carriers should be considered and as many external sources as possible should be used.

It was also suggested that vehicle miles traveled (VMT) might not be the most indicative measure of exposure and some commenters asked the Agency to challenge that assumption and consider the number of trips. Similarly, it was noted that data on the number of inspections by State is available and it may be possible to get a proxy using this information.

A webinar participant asked about collecting this information from Electronic Logging Devices (ELD). The FMCSA noted that by statute, enforcement personnel may use information collected from ELDs only to determine compliance with the hours-of-service regulations. *See* 49 U.S.C. 31137(e).

FMCSA Actions:

The Agency agrees that more frequent and more detailed VMT data from motor carriers would reduce the need for FMCSA to use substitute values and would improve the quality of the data in SMS. The FMCSA currently only collects carrier VMT data every 2 years. Access to this data, by State, on a monthly basis is not currently feasible, but the Agency will continue to identify possible sources for this important data.

The FMCSA's actions include the following:

- Improve registration data. The FMCSA is identifying ways to improve data being collected during the registration and biennial update processes. The FMCSA is developing edit checks to identify highly suspect power unit and driver counts. The FMCSA plans to expand the edit checks to validate VMT data collected on the registration form as well.
- Consider external sources of data. The FMCSA previously consulted with the IRP and IFTA about access to their data, but integration was not pursued. The FMCSA will be reconvening with IRP and IFTA to determine what information is available and how it might be integrated.
- Consider voluntary reporting of data. The NAS has suggested that FMCSA consider incentivizing motor carriers to voluntarily provide more accurate, more detailed exposure data. The related incentive would be improved accuracy of their data in the IRT model.
- Conduct outreach. The FMCSA will encourage motor carriers to voluntarily update their information with the Agency and will identify ways to recognize those motor carriers working proactively with FMCSA. With the new data, FMCSA will continue to iterate the IRT modeling effort to evaluate the impacts of the new data.
- Improve inspection software. The FMCSA will evaluate and identify necessary changes for the inspection modernization program. This is a long-term project that will help the Agency improve the uniformity of inspection data.
- Implement recommendations from the Federal Advisory Committee (established pursuant to FAST Act section 5306) to review Police Accident Reports (PARs). That committee was charged with recommending changes to improve the quality and consistency of PARs data. More than half of the committee members represented States or State law enforcement officials. The FAST Act directed the working group to review existing State PARs to recommend best practices for the collection of PARs data by State and local law enforcement agencies.
 - The Post Accident Review Advisory Committee recommended that all States use the National Highway Traffic Safety Administration's (NHTSA) MMUCC and that FMCSA modify its data systems to receive all MMUCC data from the States. In January 2017, FMCSA's and NHTSA's senior leadership agreed to establish a workgroup to carry out the Committee's recommendations.
 - The FMCSA recognizes that implementation of this recommendation will take additional resources for the States for training and information technology (IT) system changes. The FMCSA is partnering with NHTSA to encourage States to participate in a USDOT national crash repository that will use the MMUCC guidance as a framework and is populated by NHTSA's Electronic Data Transfer

(EDT) Pilot. Currently, NHTSA is working with nine States to test use of the MMUCC.

- In addition, FMCSA will examine the quality of the EDT data and compare it to what the Agency receives in MCMIS. The FMCSA is identifying needed IT system changes to receive the data from NHTSA.

NAS Recommendation 3:

The FMCSA should investigate ways of collecting data that will likely benefit the recommended methodology for safety assessment. This includes data on carrier characteristics—including information on driver turnover rate, type of cargo, method and level of compensation, and better information on exposure.

Public Input:

One commenter at the public meeting noted that information on driver turnover rates should be collected and correlated with safety. However, another commenter advised that the level and methods of compensation are confidential business information and companies will not provide this data, and FMCSA does not have the jurisdiction to collect it. This sentiment was echoed by others in attendance. A webinar participant expressed concern about proprietary data provided to FMCSA being publicly available through requests made through the Freedom of Information Act.

FMCSA Actions:

The Agency agrees that additional information about carrier operations might improve the Agency's analysis and identification of non-compliant motor carriers. However, the collection of this data would come at a cost, and the benefits are unknown.

The FMCSA's actions for this recommendation are:

- Research the protections that may or may not be afforded to data provided by companies.
- Conduct a cost-benefit analysis to determine how much it would cost the industry to provide the Agency with this additional information.
- To confirm the benefits of this additional information, FMCSA will use the IRT model and simulate the impacts and value of including driver turnover rates, type of cargo, method and level of compensation, and exposure in identifying unsafe motor carriers before proceeding with an information collection. This approach will help estimate potential value-added of incorporating such new data on carrier characteristics.
- If the cost benefit analysis supports the collection of this additional data, the Agency would complete the required information collection request and submit it for approval.

NAS Recommendation 4:

The FMCSA should structure a user-friendly version of the MCMIS data file used as input to SMS without any personally identifiable information to facilitate its use by external parties, such as researchers, and by carriers.

- *In addition, FMCSA should make user-friendly computer code used to compute SMS elements available to individuals in accordance with reproducibility and transparency guidelines.*

Public Input:

While there were no specific actions identified for this recommendation, there were affirmations that a more user-friendly version of MCMIS and the IRT model would be improvements.

FMCSA Actions:

The FMCSA agrees that there could be benefits from making MCMIS data available to researchers and carriers. As a result, the Agency's first effort will be to improve data availability. The FMCSA will develop a webpage where researchers, carriers, safety consultants, and the public can obtain simplified MCMIS data snapshots.

NAS Recommendation 5:

The FMCSA should undertake a study to better understand the statistical operating characteristics of the percentile ranks to support decisions regarding the usability of public scores.

Public Input:

One commenter questioned whether FMCSA needs to put data out to the public to identify non-compliant motor carriers. Another commenter, however, noted that the inspection and investigation data are funded by taxpayers, so there should be access to the data, especially in light of the increase in truck crashes. It was further noted that public display helps reinforce the safety culture. A question was posed, asking if the motor carrier industry would be as resistant to the public display of SMS (or IRT) if the model is improved and noted that safe carriers should want this. One commenter stated that FMCSA should not spend resources to undertake an additional study because the industry already has a complete understanding of how it uses SMS data.

FMCSA Actions:

The FMCSA will be gathering public input from motor carriers, insurance companies, and shippers regarding the ways in which the public uses SMS data. Using the data collected in these public listening sessions, FMCSA will scope and complete a study specific to the issue of percentile ranks and the usability of public scores.

NAS Recommendation 6:

Given that there are good reasons for both an absolute and a relative metric on safety performance, FMCSA should decide on the carriers that receive SMS alerts using both the SMS percentile ranks and the SMS measures, and the percentile ranks should be computed both conditionally within safety event groups and over all motor carriers.

Public Input:

Several commenters expressed doubt that a hybrid system could work because users do not want to take the time to understand an even more complex calculation. It was pointed out that the Agency's MCSAC has considered this issue as well and recommended that absolute measures be used to set intervention thresholds and then use relative information for stratifications beyond that.

FMCSA Actions:

Once IRT modeling is complete, FMCSA will evaluate the use of absolute measures for set intervention thresholds. Absolute measures and percentiles are products of the SMS system. At this time, it is not known how these would be affected once the Agency completes the modeling recommended by NAS. Therefore, FMCSA defers action on this recommendation until it is confirmed this would be relevant.

STAKEHOLDER ENGAGEMENT AND TRANSPARENCY

As noted previously, FMCSA will be using a Standing Committee of the NAS and the CSA subcommittee under MCSAC to engage stakeholders and address concerns through the implementation of these recommendations. In tandem with this, the Agency will be developing and implementing a robust communications and outreach plan to manage the resulting changes.

NEXT STEPS

The FMCSA is prioritizing the work to be completed in response to the NAS study and to meet the requirements of the FAST Act. FMCSA, with the input of the NAS Standing Committee, will develop and run a small scale IRT model by September of 2018 and after evaluating the results, run a full scale IRT model by April of 2019. Additionally, FMCSA will work with the NAS Standing Committee on planning and scheduling public meetings throughout IRT development to further discuss the recommendations. The Agency is committed to completing this important work.