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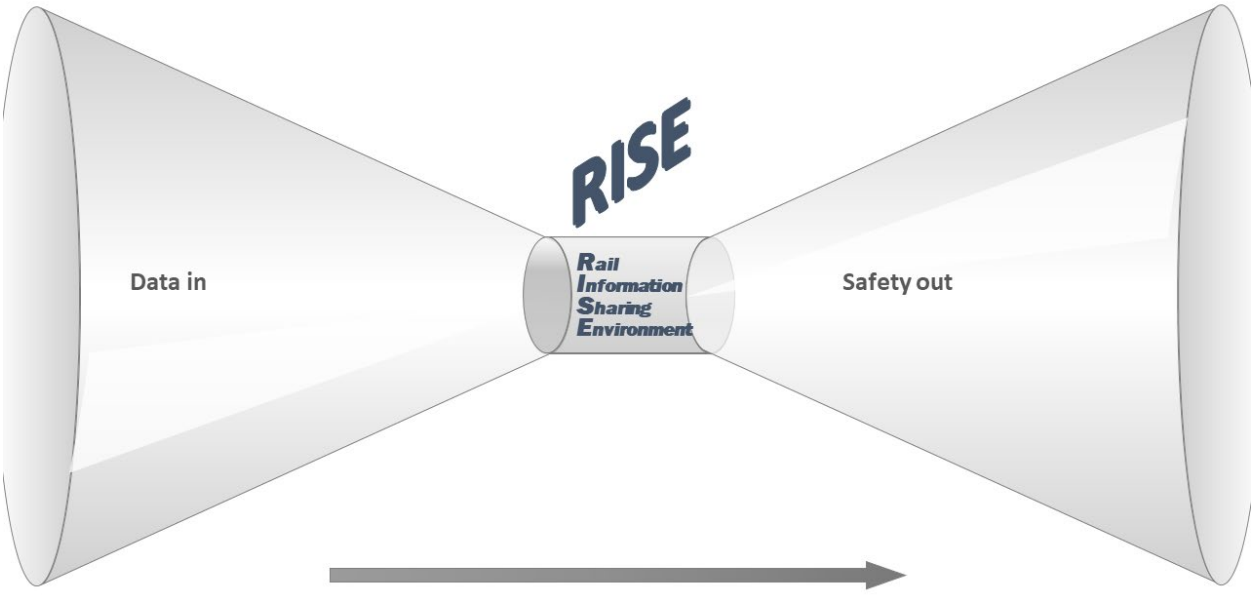
Lessons from the Railroad Information Sharing Environment (RISE) Pilot Project



DOT/FRA/ORD-21/30

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14. ABSTRACT
This research documents lessons learned from the development of the Railroad Information Sharing Environment (RISE), a voluntary partnership for sharing safety sensitive information among multiple railroad industry stakeholders for the purpose of identifying, evaluating, and managing safety risks. RISE provides a secure platform for sharing safety sensitive information using a trusted third party or steward. The Federal Railroad Administration (FRA) conducted a demonstration project to test the feasibility and challenges of standing up a process by which the railroad industry stakeholders could share safety sensitive information in an aggregated form that provide a new way for managing safety.

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METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in)	=	2.5 centimeters (cm)
1 foot (ft)	=	30 centimeters (cm)
1 yard (yd)	=	0.9 meter (m)
1 mile (mi)	=	1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2)	=	6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2)	=	0.09 square meter (m^2)
1 square yard (sq yd, yd^2)	=	0.8 square meter (m^2)
1 square mile (sq mi, mi^2)	=	2.6 square kilometers (km^2)
1 acre = 0.4 hectare (he)	=	4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz)	=	28 grams (gm)
1 pound (lb)	=	0.45 kilogram (kg)
1 short ton = 2,000 pounds (lb)	=	0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp)	=	5 milliliters (ml)
1 tablespoon (tbsp)	=	15 milliliters (ml)
1 fluid ounce (fl oz)	=	30 milliliters (ml)
1 cup (c)	=	0.24 liter (l)
1 pint (pt)	=	0.47 liter (l)
1 quart (qt)	=	0.96 liter (l)
1 gallon (gal)	=	3.8 liters (l)
1 cubic foot (cu ft, ft^3)	=	0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3)	=	0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

[(x-32)(5/9)] °F = y °C

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm)	=	0.04 inch (in)
1 centimeter (cm)	=	0.4 inch (in)
1 meter (m)	=	3.3 feet (ft)
1 meter (m)	=	1.1 yards (yd)
1 kilometer (km)	=	0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2)	=	0.16 square inch (sq in, in^2)
1 square meter (m^2)	=	1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2)	=	0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2)	=	1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm)	=	0.036 ounce (oz)
1 kilogram (kg)	=	2.2 pounds (lb)
1 tonne (t)	=	1,000 kilograms (kg)
	=	1.1 short tons

VOLUME (APPROXIMATE)

1 milliliter (ml)	=	0.03 fluid ounce (fl oz)
1 liter (l)	=	2.1 pints (pt)
1 liter (l)	=	1.06 quarts (qt)
1 liter (l)	=	0.26 gallon (gal)
1 cubic meter (m^3)	=	36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3)	=	1.3 cubic yards (cu yd, yd^3)

TEMPERATURE (EXACT)

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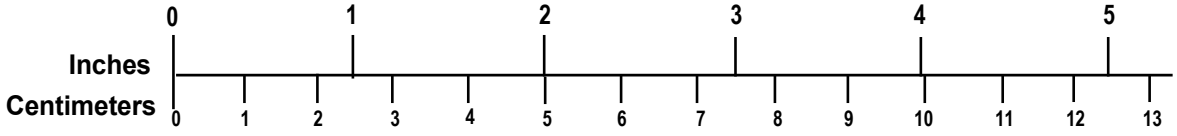
QUICK INCH - CENTIMETER LENGTH CONVERSION



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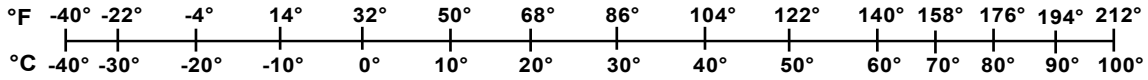

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Executive Summary

This research documents lessons learned from the development of the Railroad Information Sharing Environment (RISE), a voluntary partnership for sharing safety sensitive information among multiple railroad industry stakeholders for identifying, evaluating, and managing safety risks. RISE provides a secure platform for sharing safety sensitive information using a trusted third party or steward. From May 2019 to March 2021, the Federal Railroad Administration (FRA) conducted a pilot project to test the feasibility and challenges of a process by which the railroad industry stakeholders could share safety sensitive information in an aggregated form that provide a new way for managing safety. Researchers conducted this research at the University of Maryland's Center for Advanced Transportation Technology Laboratory (UMD CATT Lab).

What distinguishes RISE from other programs or mechanisms for sharing safety sensitive information is its focus on pooling safety data from multiple stakeholders who can decide how the safety data will be used. This pooling of data may allow for individual stakeholders to investigate safety concerns for which they have insufficient data to identify trends or patterns.

This pilot involved several steps to test the feasibility of RISE. FRA invited a small group of railroad stakeholders to participate, including Volpe National Transportation Systems Center, based on their previous experience sharing safety sensitive data with each other. The participants/stakeholders set up a charter that described a governance structure for how the group would operate and make decisions regarding the use of the data. The stakeholders identified a variety of potential topics to investigate and sources of data to support the investigations while FRA procured a third party to serve as the trusted party to collect and manage the collected data. After the completion of the contract, the third party worked with the stakeholders to select the topics for investigation.

The stakeholders selected two topics both involving the benchmarking of safety data: personal injuries and operations rule violations. The third party spent several months reviewing and collecting the data and standardizing the data so that the data could be aggregated. Next, the third party created a series of charts for the stakeholders to view to support benchmarking and analysis. The third party provided the login and password to access this information and showcased how to view the charts, which were displayed in a series of dashboards using the software program Tableau. Each stakeholder was interviewed to solicit their opinions about the value of the RISE process and the use of the data for each topic.

Overall, all the stakeholders indicated that the RISE pilot project was worth the time and effort to share safety sensitive data. They uniformly indicated that this initiative should continue and expand. The ability to benchmark their data against peers provided valuable information to inform decision making around the use of personal injuries. The lack of data collected for operating rules made this data less valuable for benchmarking and analysis by the stakeholders.

Based on this experience, authors documented a variety of the opportunities to improve and expand RISE. These opportunities go beyond the use of RISE as a data trust and suggest ways to enable railroads to learn more effectively from the collection of safety data.

1. Introduction

This research documents lessons learned from the development of a data trust for the railroad industry. A data trust is a process for sharing safety sensitive information among multiple railroad industry stakeholders for the purpose of identifying, evaluating, and managing safety risks. The Federal Railroad Administration (FRA) conducted a pilot project to test the feasibility and challenges of standing up a data trust.

1.1 Background

Several factors contribute to FRA's desire to develop establish a data trust. First, FRA data suggests that safety, as measured by fatalities, has improved as a whole over the past 40 years, however, these improvements have plateaued since 2011 and in some cases fatalities have increased as shown in Figure 1.[1] Further reducing accidents, injuries and harm to railroad systems may require new strategies.

Railroad operations are growing increasingly complex. New technologies (e.g., energy management systems and Positive Train Control) increase the level of automation in railroad operations. Changes in how railroads operate (e.g., Precision Scheduled Railroading) change the use of employees, equipment, and infrastructure. These new technologies and operating practices have created interdependencies that make it more difficult to identify the causal mechanisms that contribute to safety and failure. No one person or group has a complete picture of how the railroad industry operates; perspectives from multiple disciplines must be integrated to fully understand safety.

Bringing these multiple perspectives together in the form of people from different disciplines, multiple railroads, vendors, regulators, and labor representatives provides an opportunity to better identify, evaluate and manage railroad safety. The Railroad Information Sharing Environment (RISE) pilot project described in this report tests the feasibility of this concept.

FRA contracted with the University of Maryland's Center for Advanced Transportation Technology Laboratory (UMD CATT Lab) as an independent steward to receive, store, manage and support the analysis of safety sensitive information that railroad stakeholders agree to share. This concept is referred to as a "data trust," as the stakeholders agree to trust a third party with the management of potentially sensitive data. The stakeholders identify safety concerns to pursue and work collaboratively to identify strategies to address those safety concerns. While this concept has been successfully adopted in other domains (i.e., aviation), the challenges to successful adoption by the railroad industry have yet to be identified. This report describes the process of identifying and addressing those challenges.

[1] Data from Overview Reports (last accessed May 20, 2021). Note that "trespass fatalities" do not include incidents that were determined to be a suicide, these data are captured and presented separately by FRA.

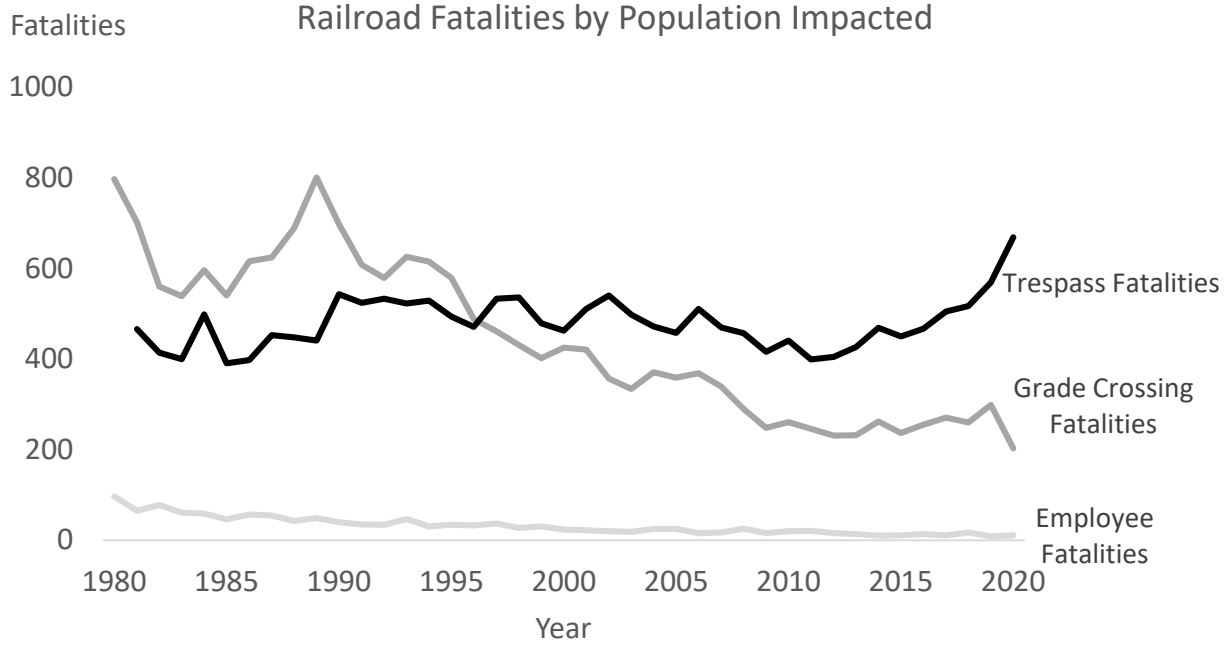

Figure 1. Railroad fatalities by population impacted

1.2 Objectives

This research evaluated the feasibility of establishing a data trust in the railroad environment. The RISE pilot project examined the extent to which FRA and stakeholders could:

1. Create a trusted environment in which railroad stakeholders with a diverse set of interests can share safety sensitive information for improving safety
2. Develop a charter and governance structure that serves the stakeholders' interests
3. Identify the requirements to enable UMD CATT Lab to provide a secure environment and to receive and manage stakeholders' data
4. Identify how multiple forms of data from multiple stakeholders are successfully managed, integrated, and analyzed
5. Learn how to bring together multiple sources of safety data that can inform insights that might not otherwise take place

1.3 Overall Approach

The Volpe National Transportation Systems Center (Volpe) in collaboration with FRA, several passenger railroads, and a third party demonstrated the feasibility of adopting a platform for sharing safety sensitive information and addressing one or more safety concerns. FRA procured UMD CATT Lab to serve as an independent steward for receiving, storing, managing, and analyzing the safety sensitive information. Volpe researchers met with stakeholders, developed a charter documenting how RISE would be used and facilitated meetings to identify and analyze several safety concerns. Volpe documented issues that were raised during the RISE pilot project and how they were addressed. This report documents those issues.

1.4 Scope

This report covers the RISE pilot project.

1.5 Organization of the Report

This report is organized into three sections. Section 2 provides background information on the evolution of data trusts within the U.S. Department of Transportation, and the conception of RISE within FRA and how it developed. Section 3 describes the lessons learned from demonstrating the RISE pilot concept. Section 4 provides some concluding remarks and recommendations for next steps.

2. The Background of RISE

This section describes how the idea for RISE emerged and describes how it operated for the demonstration project.

2.1 What is RISE

RISE is a voluntary initiative in which stakeholders bring multiple data sources together in one place to address a common interest in safety. RISE provides a secure platform for sharing safety sensitive information using a trusted third party/steward. RISE stakeholders set up a charter that describes the governance structure for how the group operates and makes decisions regarding the use of the data.

RISE stakeholders used a consensus-based approach to decide what safety issues to study and what data to provide to support these studies. The studies can involve:

- Identifying emerging risks
- Examining an existing vulnerability
- Assessing mitigations
- Monitoring known risks
- Benchmarking performance

What distinguishes RISE from other programs or mechanisms for sharing safety sensitive information is its focus on pooling safety data from multiple stakeholders and the involvement of these stakeholders in deciding the purpose for which the safety data will be used. This pooling of data may allow for individual stakeholders to investigate safety concerns for which they have insufficient data to identify trends or patterns.

The data is stored and managed by a third party so that the regulator does not have access to the raw data. RISE provides an opportunity to evaluate multiple forms of pooled data that are not available to the stakeholders, individually. It provides a picture that is unavailable through any other safety program supported by FRA or the industry.

2.2 Emergence of RISE and Similar Initiatives

In transportation, there is a history of using data trusts for the collection of safety sensitive information that normally goes unreported, such as information about near misses or close call events (e.g., ASRS, Confidential Close Call Reporting System [C^3RS], Mariner Safety Research Initiative [MSRI], and Safe Outer Continental Shelf Reporting System [SafeOCS]) or for aggregating information across an industry (e.g., Federal Aviation Administration's [FAA] Aviation Safety Information Analysis and Sharing [ASIAS]) to obtain a more holistic, cross-industry view of a safety concern.

The desire for data trusts like RISE within the transportation domain emerged from several factors. One factor involves the increasing amounts of data that transportation operators and regulators are collecting. These new sources of safety data are often segregated within organizational silos and may not be combined for analysis. Pooling this safety data provides new opportunities to learn how failures occur and safety can improve.

A second factor involves an acknowledgement that safety within many transportation domains has improved to the point where it is becoming increasingly challenging to continue reducing accidents with traditional methods. While trends toward safer operations is positive, much of the more straightforward solutions have already been implemented; this makes it more challenging to identify how to further improve safety using existing methods for understanding why unsafe events occur.

A third factor involves the predominant approach to accident reduction in which analysts break down the source of the problem into its elemental parts (i.e., a reductionist approach). The increasing use of technology, changes in organizational practices, and regulatory reforms improved safety while also increasing the complexity of transportation systems. This complexity makes it more challenging to untangle the causal factors that contribute to accidents. This complexity suggests that no one person or organizational unit has a holistic view of the system.

A fourth factor involves a reluctance to share safety information outside of the organizations that collect it. Organizations may be reluctant to share information that, if exposed could harm their reputation, create legal hazards, or competitive threats. RISE and similar initiatives provide a governance mechanism to address the reluctance to share this information. Involving UMD CATT Lab to manage data aides in fostering confidence that organizations can share data safely with one another. This is discussed in more detail in Section 2.3.

2.2.1 FAA ASIAS Program

Within the United States, aviation was the first transportation sector to use a data trust. The FAA, in cooperation with airlines, labor unions, suppliers, and other interested parties formed a public-private partnership called the ASIAS program in 2007 (Office of the Inspector General, 2013).

The FAA formed the ASIAS to support a better understanding of why accidents were occurring. It was a natural outgrowth of the increasing collaboration and information sharing that aviation industry stakeholders began during the previous decade. Programs like ASRS for confidentially reporting near miss events and Commercial Aviation Safety Team (CAST) which involved a public-private partnership for analyzing the factors that contribute to accidents provided an environment in which stakeholders were comfortable working with each other to solve system safety challenges.

FAA formed a division responsible for the development and sustainment of voluntary safety programs. In addition to ASRS, these programs included:

- Aviation Safety Action Program (ASAP)
- Flight Operational Quality Assurance (FOQA)
- Internal Evaluation Program (IEP)
- Line Operations Safety Audit (LOSA)
- Voluntary Disclosure Reporting Program (VDRP)

These programs provide incentives for collecting and reporting safety related information to provide actionable insights to improve training, operational procedures, maintenance and engineering procedures and air traffic control procedures (Federal Aviation Administration, 2020).

FAA started with a small group of stakeholders to build trust among the members in sharing information before embarking on addressing specific safety concerns. This small group worked together to discuss the value of pooling their data and consider options for how this could be done before moving on to develop the program structure (W. Randolph, personal communication, May 19, 2019).

The stakeholders developed a governance structure addressing data access, data sharing, data protections (e.g., legal protections, data security, and privacy protection), how the information would be used, and how decisions would be made. The governance structure evolved over time as the initiative matured and the stakeholders developed trust in each other and saw valuable outcomes. The group discarded program elements that did not work and adapted the initiative to meet the needs of the stakeholders. The group developed a charter or Memorandum of Understanding (MOU) that documented the principles that would govern stakeholders' behavior and the governance structure. This MOU evolved over time as desires for the use of the system changed and the members learned what contributed to an effective data trust.

Figure 2 shows the governance structure for ASIAS. The structure consists of two bodies, an executive board (EB) and an Issues Analysis Team (IAT). Participating stakeholders provide members to participate on both bodies. The EB is chaired by government employees and industry stakeholders. The board engages in a variety of activities including:

- Selects the topics stakeholders will devote resources to such as human resources and data for the stakeholders to collect
- Approves how the information will be shared among the stakeholders such as documents to be shared among stakeholders or a wider audience

The IAT consists of one or more working groups that address a specific study topic identified by the EB. This group consists of a larger number of participating stakeholders.

A third party serves as an independent data steward to receive, store, analyze and present information on behalf of the stakeholders. The independent steward is a member of the IAT and participates with industry stakeholders to jointly analyze safety concerns. Stakeholders own the data they provide to the independent steward, and the independent steward acts as a fiduciary to securely store safety data. The independent steward cleans and integrates the pooled data to enable the analysis of data in ways that could not otherwise occur. Data are presented in a way that allows for safety insights to be gained while not allowing for the identification of data from any single stakeholder. Examples of the data provided to the independent steward included:

- Proprietary data (e.g., avionics and manufacturer data)
- Safety data (e.g., operational errors and deviations, and runway incursions)
- Air traffic information (e.g., traffic management delays and airport configurations)
- Other information (e.g., weather and Bureau of Transportation statistics)

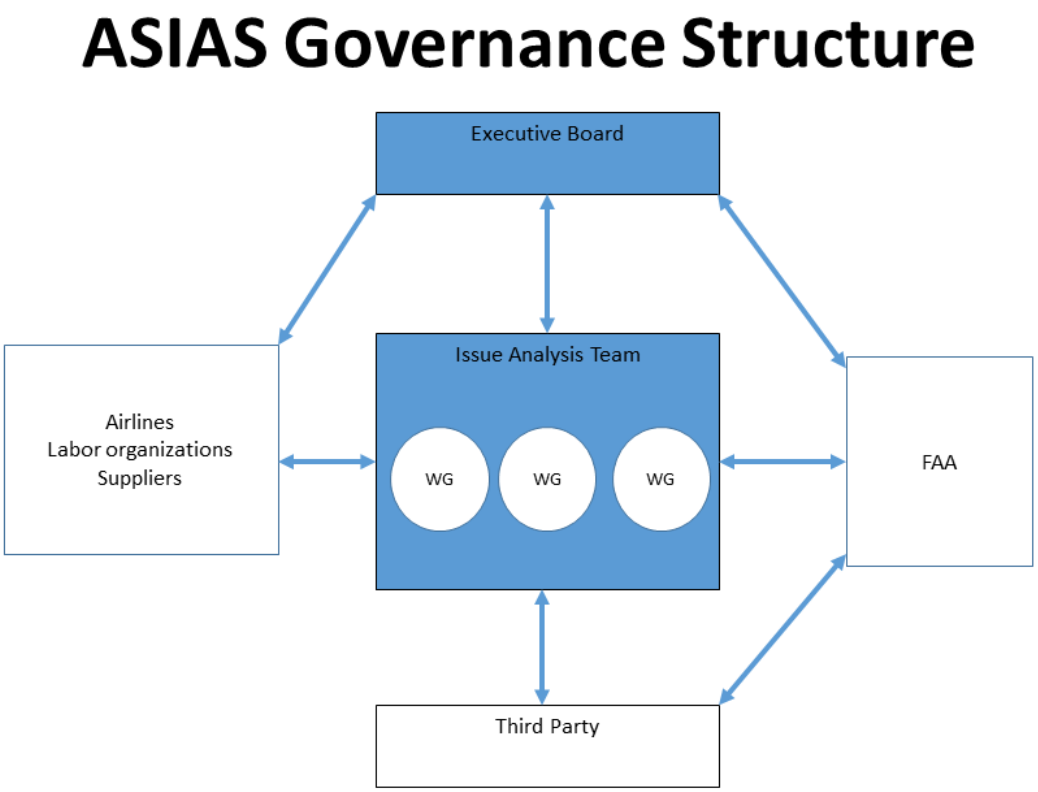

Figure 2. ASIAS governance structure

2.2.2 National Highway Transportation Safety Administration (NHTSA) – Partnership for Analytics Research in Traffic Safety (PARTS)

The National Highway Transportation Safety Administration's (NHTSA) effort to develop an environment for pooling safety data, named the Partnership for Analytics Research in Traffic Safety (PARTS), began in 2017 as a pilot project. The project grew out of a desire to work more proactively with industry to cooperatively solve safety problems. FAA's ASIAS program served as a model for NHTSA to adapt to solve highway related safety concerns (J. Kolly, Personal Communication, April 4, 2019). The partnership was also intended to better understand potential safety implications from the adoption of rapidly changing technologies (Kolly, J., 2019).

The complexity of these technologies could be better understood through the pooling of data from multiple sources than from traditional safety assessment approaches. This approach offered the opportunity to gain insights from benchmarking and aggregation of data that the partners could not obtain otherwise.

The effort began with NHTSA seeking potential stakeholders to join the partnership. The first year was spent identifying and persuading key stakeholders of the partnership's value and building trust that proprietary information could be shared among potential competitors to solve

safety concerns without causing harm to their position within the industry. Unlike the aviation industry, automotive companies compete based on safety features.

The PARTS governance structure was similar to the ASIAS program, but simpler in its structure, since it was set up as a pilot project to assess the value of this idea for the highway safety domain. In the pilot phase, the number of stakeholders is more limited, thus all stakeholders can participate in executive decision making. Figure 3 displays the governance structure. The governing body was made of industry stakeholders, NHTSA and an independent steward procured by NHTSA to receive, store, manage, and analyze the data on behalf of the participating stakeholders. As a part of building trust among the stakeholders, each member had an equal voice in decision-making. To remove itself from a position of privilege, NHTSA used Volpe to facilitate and manage the pilot project.

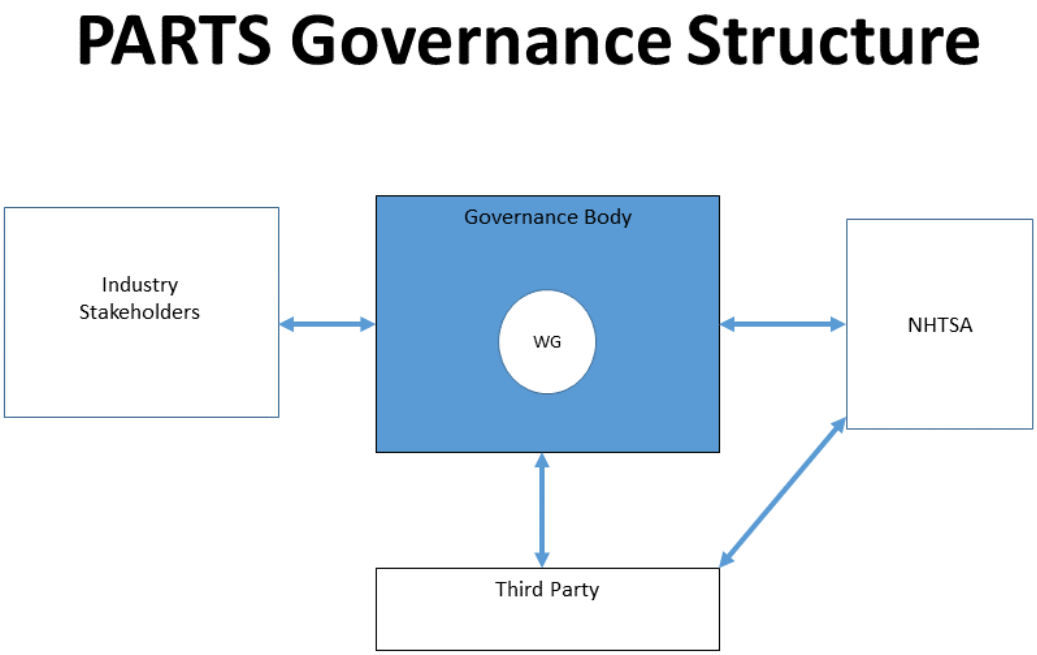

Figure 3. PARTS governance structure

PARTS stakeholders identified a single topic, automatic emergency braking (AEB), to address and for which the stakeholders provided data. Phase 1 of the demonstration began in 2018 with six original equipment manufacturers (OEMs) participating and completed its work in 2019 (U.S. Department of Transportation, 2020). The U.S. Department of Transportation announced in January 2020 that NHTSA will move forward with Phase 2 of the pilot project. This phase will address a second study addressing driver assistance technologies for reducing crashes.

2.2.3 Pipeline and Hazardous Material Safety Administrator (PHMSA) – Voluntary Information Sharing (VIS)

The Pipeline and Hazardous Material Safety Administration (PHMSA) formed a Federal advisory panel to recommend options for the development of a Voluntary Information-Sharing

System (VIS). VIS's goal is to encourage collaboration and improve inspection feedback and information sharing to improve risk analysis associated with gas transmission and hazardous liquid pipeline facility integrity (Voluntary Information-Sharing System Working Group, 2019). Congress mandated that PHMSA establish an advisory committee to recommend collaborative, voluntary sharing of information related to gas transmission and hazardous liquid pipeline facilities.

The advisory panel offered the following benefits for creating a VIS:

- Serve as a trusted repository of high-volume, high-quality data and information
- Increase public safety and decrease environmental risk
- Improve operators' awareness of potential threats and risks to their facilities that they might not have previously encountered
- Improve responses to new threats
- Improve understanding of existing and emerging technologies and potentially accelerate development and demonstration of new technology
- Improve effectiveness of technologies to identify specific threats and to enhance an operator's decision-making
- Provide technical support for service providers' technology investments to improve technology performance
- Determine gaps in pipeline information to drive continuous improvement
- Improve communication between the industry, the public, and pipeline safety stakeholders through greater transparency and relationships built on trust
- Provide a greater understanding among operators on applying rate-payers' funds to reduce risk

The advisory panel made many recommendations for the establishment of a voluntary information-sharing system. The recommendations included the following:

1. Congress should authorize and stand up a VIS including a technology platform and include participation by pipeline operators, PHMSA and other stakeholders.
2. Congress should enact legislation to provide confidentiality, non-punitive, and other legal protections to pipeline operators to participate in the VIS.
3. Information sharing should include gas distribution system data in the VIS program to significantly reduce industry incidents nationwide, across all three key industry segments: natural gas transmission, natural gas distribution, and hazardous liquids transportation.

The more detailed recommendations addressed the following topics:

- Best Practices
- Regulatory, Funding, and Legal
- Governance
- Competency, Awareness, and Training

- Process for Sharing Information
- Technology, Research, and Development (including information technology architecture considerations)

The advisory panel's report provides a comprehensive examination of issues to consider in developing a system for pooling and sharing safety information. While some of the issues are specific to the pipeline and hazardous material environment, many of the issues can inform development of an information sharing system in any transportation mode. The advisory panel recommends a governance structure similar to the ASIAS structure.

The panel proposed a 5-year timeline to develop and deploy the VIS. The timeline calls for obtaining Congressional authorization and legal protections, followed by the establishment of a PHMSA project management structure and the development of the governance structure. The panel would obtain funding while forming the VIS and procuring the third-party steward. The panel would also establish the processes for sharing information and building trust with stakeholders, processes that take several years.

2.2.4 FRA - RISE

The desire to develop RISE was a natural evolution in FRA's safety mission. In 1996, FRA transitioned from a focus on prescriptive regulations to a preference for negotiated rulemaking and performance-based rules. FRA set up the Railroad Safety Advisory Committee (RSAC) to collaborate with railroad industry stakeholders that included the railroads, labor crafts, trade associations, and suppliers. This group worked collaboratively to develop a variety of regulations. This process provided a forum for industry stakeholders to gain confidence in working together to address a common interest in safety while also considering the different interests of the stakeholders.

Over the next two decades, FRA created several other initiatives by which the regulator and the industry could come together to solve safety concerns. FRA created small working groups designed address specific safety concerns such as fatalities associated with switching operations (Switching Operations Fatalities Analysis [SOFA]) and track work (Fatality Analysis of Maintenance-of-way Employees and Signalmen [FAMES]). FRA brought together a diverse set of railroad industry stakeholders to identify why these unwanted events were occurring and to propose solutions to address them.

In 2007, FRA began a demonstration of C^3RS, a system for confidentially reporting near miss related safety events. The demonstration became an FRA voluntary safety program in 2013. This program provided railroads with an opportunity to collect safety data that was previously unknown to railroad managers and enabled them to proactively address unsafe events before they resulted in harm. A third initiative supporting public-private partnerships included grants to support the development of the Short Line Safety Institute (SLSI), an organization devoted to helping short line railroads measure and improve their safety cultures.

Experience among FRA and its railroad industry stakeholders in collaborating on voluntary safety programs contributed to an environment in which some stakeholders were comfortable sharing safety sensitive information in a protected setting, but if made public, could harm their interests. FRA has continued to pursue additional non-regulatory safety initiatives to complement its regulatory approach to safety enforcement and compliance. RISE is the latest effort in the

development of FRA-promoted public-private safety initiatives. RISE is a natural progression from the development of small railroad committees, C^3RS and technology transfer of successful methods for fostering safety in other transportation modes.

Like NHTSA's PARTS program, FRA initiated RISE as a pilot project to assess the feasibility of a data trust for pooling safety sensitive information and addressing railroad safety issues. Bringing together sources of safety data in new ways can contribute to improved safety outcomes. FAA's, NHTSA's, and PHMSA's previous efforts demonstrate that stakeholders can come together to voluntarily share safety sensitive information. Can a similar effort succeed in the railroad industry? What obstacles must stakeholders overcome to sustain this safety initiative? The demonstration was designed to answer these questions.

Figure 4 shows the sequence of activities beginning in 2018. FRA invited a diverse range of railroad stakeholders that included the Association of American Railroads (AAR), several passenger railroads, several labor union representatives, and representatives from FAA and MITRE to introduce the concepts underlying a data trust and gauge interest. Following the kick-off meeting, FRA invited five passenger railroads to participate in the demonstration. The invited railroads were selected because of their similar operations and proximity to each other. FRA believed that these shared characteristics would increase the likelihood that the railroads would be able to identify safety concerns of mutual interest that they wanted to address.

The initial development and implementation of RISE was a pilot demonstration of the data trust concept in the railroad domain. The goal was to set up a prototype process and infrastructure for sharing safety sensitive information and document the initial challenges. The pilot project assessed the potential for RISE to succeed and provide guidance for how to adapt the data trust concept to operate successfully in the railroad domain.

In collaboration with the independent steward and the participating stakeholders, Volpe sought to determine the potential to achieve safety benefits and worked to document the potential value in expanding this effort. FRA and participating stakeholders were responsible for deciding if the concept showed promise and would continue. If the effort continues, FRA can use the lessons learned from the initial demonstration to continue the pilot project or expand into a formal program via adding stakeholders and exploring additional safety concerns.

During the project's first year, the stakeholders developed an MOU that laid out the principles by which the project would operate and govern decision-making related to the use of and protection of pooled data. FRA procured a third party to serve as the independent data steward. FRA awarded the UMD CATT Lab the contract to receive, store, manage and analyze the data on behalf of the stakeholders. FRA also asked Volpe to continue facilitating meetings with stakeholders, develop a charter, and support UMD CATT Lab. In particular, Volpe helped UMD CATT Lab to better understand the rail domain, as their expertise was largely in other transportation modes. This support included meetings with UMD CATT Lab and facilitation of stakeholder meetings.

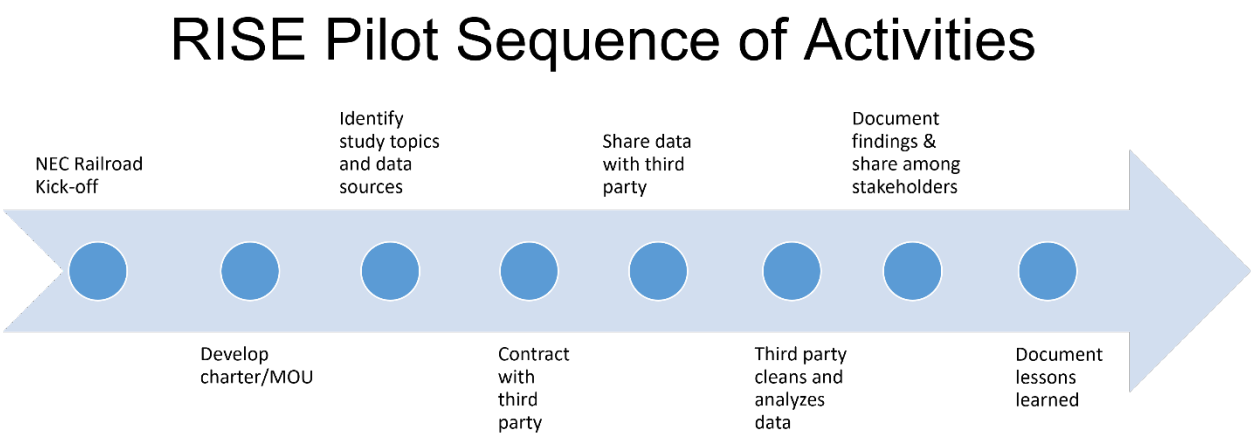

Figure 4. RISE pilot sequence of activities

The stakeholders spent several months developing a charter representing the governance structure and working out how the RISE pilot project would operate. Figure 5 shows the governance structure. Like the NHTSA pilot project, the governance structure has a simpler structure compared to ASIAS, with a single body made up of the railroad stakeholders, the regulator, and the third party. With a smaller set of stakeholders involved during the pilot phase, a more complex structure was not necessary. Section 2.3 discusses the principles guiding the governance on data trusts.

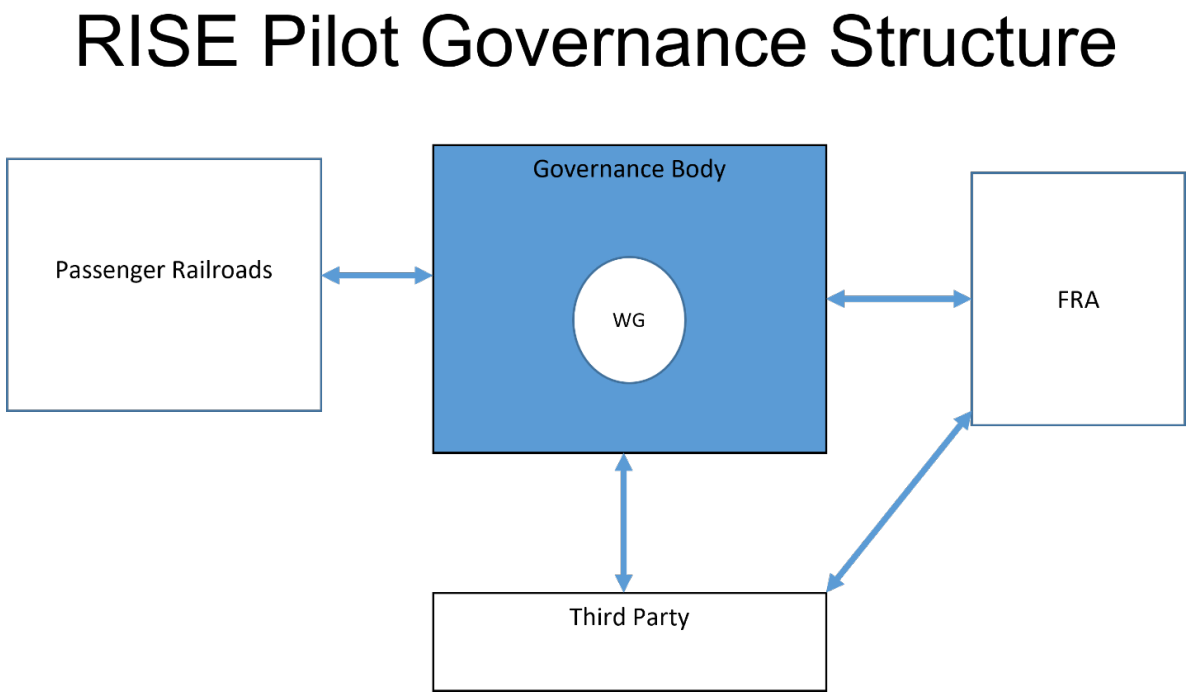

Figure 5. RISE pilot governance structure

The remainder of the pilot project consisted of selecting a study topic, identifying data sources, establishing and implementing the data anonymization processes, collecting and analyzing the data and deciding how to use the results of this analysis. Section 3 describes the results from this demonstration.

2.3 Data Trusts

A data trust is a mechanism for providing an independent fiduciary stewardship of data (Wylie, B., & McDonald, S., 2018). The fiduciary is an independent, third party organization that is separate from the organization(s) that may create or own safety data. As a fiduciary, this independent steward is responsible for caring for the data on behalf of the organizations that share their data. Fiduciary trusts are used in a variety of ways to govern shared resources that include financial resources, public lands, as well as information. Fiduciaries serve as legally accountable for the resources they hold and to manage risks, in this case, around the use of safety data. The fiduciary manages the assets on behalf of the beneficiaries (e.g., the organizations that share their data). In a fiduciary relationship, a person or organization puts the fiduciary in a position of trust to act on their behalf and interest. As a steward, the managers of the data trust make decisions about how the assets, in this case data, are used and who gets access.

Another important element of a data trust is the governance structure that determines how the data trust will operate. The governance structure addresses the scope of the data trust, what it will be used for, how it will make decisions and how information will be used and shared. A governing body consists of select members who oversee the data trust and facilitate adherence to the data trust agreement (e.g., a charter that describes the roles and responsibilities of members participating in the data trust).

Data trusts promote beneficial uses of data and protect the beneficiaries from the potential for harm. Data trusts have been established to protect the interests of the people and organizations that share or pool safety sensitive information. They provide a mechanism for data owners to control who can access their information and how that information is used (Ruhaak, A., 2019).

Safety information collection can benefit or harm the organization. The data trust provides a mechanism for sharing safety sensitive data while protecting the data owners from the potential harms that may otherwise prohibit them from sharing this information.

Harms include the potential for legal liability, financial loss, competitive threats, and reputational harm. Across the transportation industry, many organizations worry that simply collecting and documenting new safety information creates unwanted risks associated with legal actions, regulatory enforcement activities, and freedom of information requests (Freedom of Information Act [FOIA]) that may result in financial penalties or negative exposure to the organization's reputation. Recent regulations in the railroad industry establishing the requirement to develop safety management systems address this concern by creating protection for new sources of safety information (Title 49 Code of Federal Regulations [CFR] Part 270 and 49 CFR Part 271). These regulations protect this information from legal liability and FOIA requests.

The third parties serving in the role of data trust steward have typically been:

- Federal government agencies that have no regulatory authority such as National Aeronautics and Space Administration (NASA) and the Bureau of Transportation Statistics (BTS)

- Federally funded research and development centers (FFRDC) such as MITRE
- Academic institutions such as Lamar University and UMD

One challenge for data trusts is ownership and use of work products produced by the shared activities of the group. While the data that stakeholders contribute belongs to the individual stakeholders, the results of the work that the group produces raises questions about who owns the work product(s) and who can access it. This issue of how to protect and share this information has typically been addressed by the governing bodies rather than the independent steward. Depending upon the nature of the work product, the governing body's decision to share information may range between keeping the information confidential to publicly sharing the information.

To protect information provided to the data trust, the third party must address a variety of concerns that can be divided into two categories: unauthorized and authorized access. The independent steward addresses unauthorized access through data security measures. The independent steward determines who can access the system and sets up a system by which only identified individuals can access these data. The second form of data protection addresses authorized access for information. A variety of mechanisms may be used to manage authorized access. Based on decisions agreed to by the governing body, the independent steward limits access to different types of users. Some users may receive unlimited access to view information. Some users may receive limited access in terms of what they can view. As part of protecting the information, the independent steward may remove or modify information such as date, time and location, so that individuals and organizations cannot be identified. The level of de-identification is frequently determined with the support of the participating members to balance the desire for confidentiality with the need for details to ensure that the outcomes of the analyses are actionable.

In addition to these measures, data trust members may seek legislative authority and/or regulatory relief from Federal and State FOIA requests and legal proceedings. The language in these laws and regulations sets the conditions under which this information can be protected. In some cases, it may not be possible to provide full relief from certain oversight or potential litigation, but it is important to make this all clear throughout this process.

Together, establishment of the governance structure and a data trust can create conditions where industry stakeholders develop sufficient trust to share information for the common good. It takes a significant amount of time to educate stakeholders about how these mechanisms will protect them from harm while enabling them to learn from this data in ways that they could not using only their own data and staff.

2.4 Demonstration Objectives

This demonstration examined the feasibility of pooling railroad safety data to address safety concerns of the industry in ways that individual railroad industry stakeholders could not otherwise identify. Unlike in the highway environment where stakeholders compete on safety, railroads and labor crafts have a common interest in solving safety issues collaboratively. Bringing multiple railroad stakeholders together with different interests pose a variety of obstacles to the pooling of safety data and making effective use of this data.

A second objective was to identify obstacles to the effective use of RISE in the railroad domain and begin the process of overcoming those obstacles. The potential obstacles include barriers to building trust to facilitate data sharing, challenges associated with collecting and integrating the data into a database for analysis. This includes the technology challenges associated with data integration and management. It also includes the identification of meaningful study topics, given the available safety data. The pilot needs to determine if RISE can achieve safety benefits for industry stakeholders and if so, to identify how to effectively expand the demonstration to include more stakeholders while addressing common safety concerns. Specifically, this demonstration sought to answer the following questions:

1. Did the stakeholders trust the third party to share, store, and analyze data?
2. Could the third party establish a common platform for sharing and managing data?
3. Did the study topics of interest to stakeholders intersect with the available data?
4. Did the analysis and presentation of the safety data provide a perspective that stakeholders would otherwise not have observed?
5. What are the challenges to the collection, analysis, interpretation, and presentation of the pooled safety data?
6. Did the stakeholders find value in the results?
7. Did the demonstration inform decisions and actions to address safety concerns?
8. What are the challenges and next steps to moving this concept forward?

3. Lessons Learned

3.1 Context

3.1.1 Distinguishing RISE from Other Voluntary Safety Data Collection Initiatives

As discussed in Section 2.2.4, FRA collaborated with railroad industry stakeholders on a variety of voluntary safety initiatives that involve sharing safety data since the mid-1990s. Based on the knowledge of these existing safety initiatives, stakeholders asked how RISE differed from these other initiatives and what value it would offer. The authors explained how RISE differed from these other initiatives and the value it would bring to their organizations. RISE pools data from multiple sources to better understand safety concerns. Divergent sources of data enable railroad stakeholders to see emergent patterns that may otherwise remain invisible. It leverages large data streams to answer a variety of safety concerns. These concerns include the following:

- Identifying emerging risks
- Identifying the nature of a specific vulnerability
- Assessing mitigations
- Monitoring known risks
- Benchmarking safety performance

Clearly distinguishing among these programs is important because safety resources are limited and each stakeholder, including FRA, wants to allocate their safety resources effectively and efficiently. Allocating scarce safety resources to a duplicative or redundant safety initiative would be perceived as poor use of these resources. If FRA decides to continue RISE beyond the pilot project, clearly explaining this initiative's value to new stakeholders will be critical to adding more participants.

The selection of stakeholders to participate in the initial demonstration took place organically as FRA staff engaged with various stakeholders across the industry. One stakeholder, a passenger railroad whose Chief Safety Officer was familiar with FAA's ASIAS program, expressed interest in participating in the pilot project. This interest led to conversations about inviting stakeholders from additional passenger railroads. Given this initial interest from a passenger railroad, it was determined that engaging with additional passenger railroads, as opposed to short line or freight railroads, may increase shared interests and help reach consensus on a charter and in potential study topics for the pilot project. RISE requires participation from multiple participants to achieve its goals of advancing safety through shared data analysis. Starting with passenger railroads would help ensure that the initial efforts included carriers with similar operating practices. FRA staff reached out to additional passenger railroads to invite them to participate.

A kick-off meeting was held to discuss the RISE pilot and formally invite the stakeholders to participate. During the meeting, the stakeholders discussed how the RISE pilot project would work, how it was different from similar initiatives and the benefits that would accrue from their participation. Following the meeting, the representatives discussed this information with the leadership at each railroad. All the railroads agreed to participate.

3.1.2 Steps in the RISE Pilot

Figure 6 shows the steps followed as part of the pilot. Two steps, developing a charter to document the governance structure and identifying the study topics/use cases, took place in parallel. The group borrowed many of the principles from the ASIAS program as guiding principles. Table 1 shows the principles that the group agreed to adopt. Appendix A documents these principles in a charter. For the demonstration project, the stakeholders agreed that there would be only one body, comprised of the entire group, to decide governance issues as well as to determine and analyze the study topic. This kept the pilot project streamlined and minimized the level of effort and coordination required from the stakeholders.

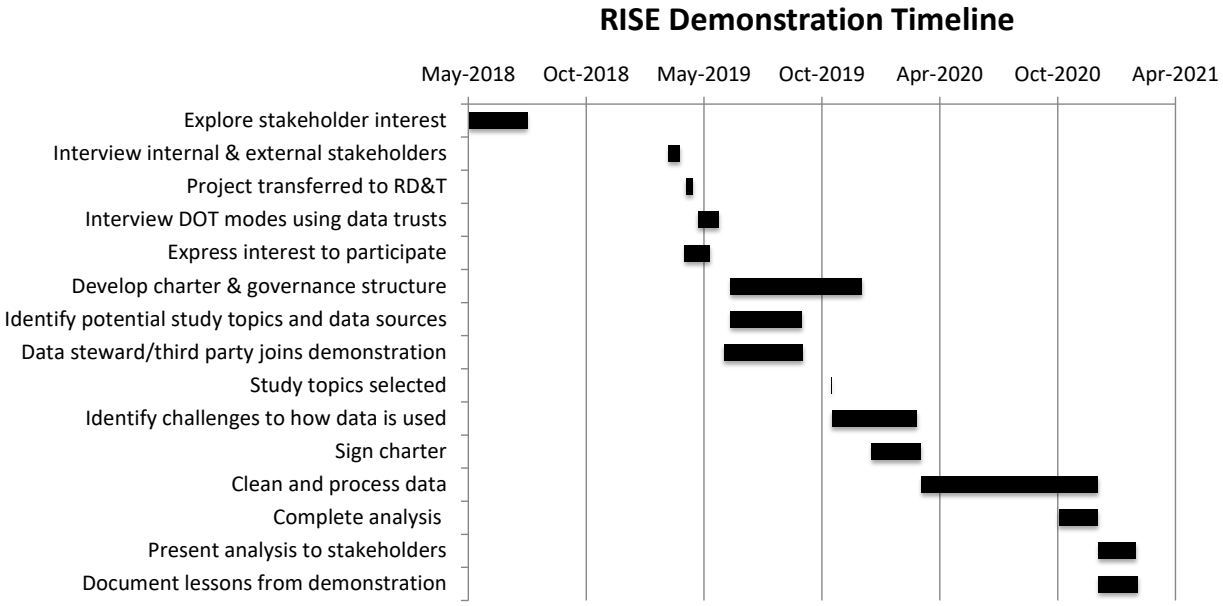

Figure 6. RISE pilot timeline

Table 1. RISE pilot guiding principles

	Guiding Principle	Description
1	Systemic Assessment	Analyses undertaken by RISE stakeholders shall have the potential to benefit all the participating stakeholders and advance railroad safety.
2	Stakeholder Commitment	Stakeholder organizations are committed to participating in the RISE pilot project.
3	Articulated Roles and Responsibilities	Each organization participating in the RISE pilot project will identify a primary and alternate representative to participate in meetings and to coordinate within their organizations to ensure that agreed upon responsibilities are met.
4	Consensus-Based Decision Making	Participating organizations will make key decisions that impact all stakeholders about RISE pilot project procedures and operations by consensus.
5	Voluntary Participation	Participation in the RISE pilot project is entirely voluntary. Stakeholders may suspend or end their participation in the RISE pilot project at any time.
6	Transparent Data Sharing	Each stakeholder will work internally to ensure that relevant employee groups within their organization are aware of the data being shared in the RISE pilot project.
7	Non-Punitive Data Use	Data provided for use in the RISE pilot project and the results of any analyses will not be used for punitive actions.
8	Data De-Identification	RISE pilot project data, information, and results of analyses will be de-identified in a manner that protects the identity and privacy of individuals and stakeholder organizations.
9	Ensure Data Quality	Stakeholders will work collaboratively to maintain high standards for data quality in the RISE pilot project.
10	Transparency of Processes	RISE pilot project processes will be transparent to stakeholder organizations.

The participants developed a draft charter and identified potential study topics and data that could be shared. Next, UMD CATT Lab joined the RISE pilot project and led the final steps in selection of the study topics. Stakeholders chose two topics to address: personal injuries and operating rules violations to enable individual stakeholders to benchmark their data against aggregated data. UMD CATT Lab worked with each of the stakeholders to identify the sources of data they would share. After receiving the data, UMD CATT Lab prepared the data for analysis and created visualizations in the form of dashboard showing a variety of charts presenting the aggregated information. UMD CATT Lab displayed these visualizations using Tableau, a software program designed for visualizing data for exploration and presentation. UMD CATT Lab staff shared the charts created for exploration and presentation to review and conducted interviews with Volpe staff to gather opinions about the value of the shared data.

In the final step, the results of the interviews were documented in a report for FRA (Franz & Tous, 2021).

3.1.3 Continuity of Stakeholder Participation and Impact of COVID-19

A common challenge in FRA sponsored research projects that take place over several years is the change in the membership of the people representing a particular stakeholder. These changes may occur from job changes, retirements, or other normal employment shifts over time. In this demonstration, these changes were accelerated by the impact of COVID-19 which severely impacted the operations of all participating railroads. While all stakeholders participated for the duration of the demonstration, several representatives left their railroads due to job changes or furloughs from the COVID-19 related declines in operations. The severe reductions in revenue service led to reductions in staff and made it more difficult for the representatives to participate. Setting up meetings and engaging with the stakeholders was more difficult given their stress induced from COVID-19 related responsibilities.

FRA sponsors and Volpe researchers regularly reached out to renew and build relationships with the participating stakeholders, who were somewhat unable to participate at the expected levels of involvement. Soliciting buy-in at the top of the organization to continue in these demonstrations and gauging the stakeholder engagement over time can help in deciding how best to support this kind of demonstration.

3.2 Trust and Stakeholder Engagement

The participating stakeholders are public agencies, many of whom interact with each other on a regular basis because they operated over each other's territory. This helped create a positive environment where the stakeholders felt comfortable sharing information for the two topics selected. Of the five participating railroads, only one requested a formal memorandum of understanding before they would share data. The four remaining railroads were comfortable sharing data following the development of the charter and the data anonymization procedures developed by UMD CATT Lab. Ultimately, the group decided to pursue two study topics for the initial pilot effort (see more detail in Section 3.4) both of which included data that were already required by FRA. This familiarity with the data and potential for data consistency across carriers may have helped to build comfort in the sharing of data for this initial effort.

As the independent steward, UMD CATT Lab protected the data using a variety of mechanisms and de-identified the data. Each stakeholder only had access to its own data and the aggregated data. Stakeholders could not access information for other individual stakeholders. Each stakeholder retained ownership of their data. They could ask UMD CATT Lab to remove the data at any time. Data fields that were available for only a single stakeholder were not used in the aggregated data set to avoid identifying the stakeholder that owned that data. All these data uses were clearly articulated to and agreed upon by the stakeholders.

Stakeholders proposed topics for study and provided data as well as expertise to consider how to select the study topics. The stakeholders expressed an interest in learning whether this process of combining their data would enable them to learn and act on common safety concerns that they might not address as effectively by themselves.

To maintain and foster stakeholder engagement going forward will require showing value to the stakeholders.

3.3 Trade-offs Between Data Sharing and Data Protection

The interest in sharing safety data is balanced by the concern from individuals and organizations for how the information may be used by others and who can access that data. Some data owners may worry that their data may be used to cause harm in addition to the benefits that this sharing affords. Exposure of this data to others may have the potential to contribute to legal jeopardy, financial harm and harm to their reputation. The perception of potential harm to the organization can be managed by developing strategies to minimize the potential for harm. These strategies range from avoiding collecting some types of safety data to a mechanism for data protection and limiting data access. The desire to share safety data involves a trade-off between the benefits of sharing this information and the costs this creates.

Over time, if the benefits of RISE are great enough and the potential for harm is effectively minimized, stakeholders may choose to adjust their willingness to share more sensitive data. As this effort is being established and as the demonstration phase is underway, the stakeholders may wish to provide less sensitive data. This stage of establishing trust in the process and in one another will help to build the structure necessary for future data sharing.

3.4 Selecting the Initial Topic

Selecting a topic to study is a challenging task in that a successful outcome depends on identifying a topic that the stakeholders care about while also ensuring that sufficient relevant data exists and can be obtained, processed, and analyzed to address that need. Figure 7 shows a Venn diagram that depicts a prerequisite for successful outcome that involves the intersection of a topic for which there is data.

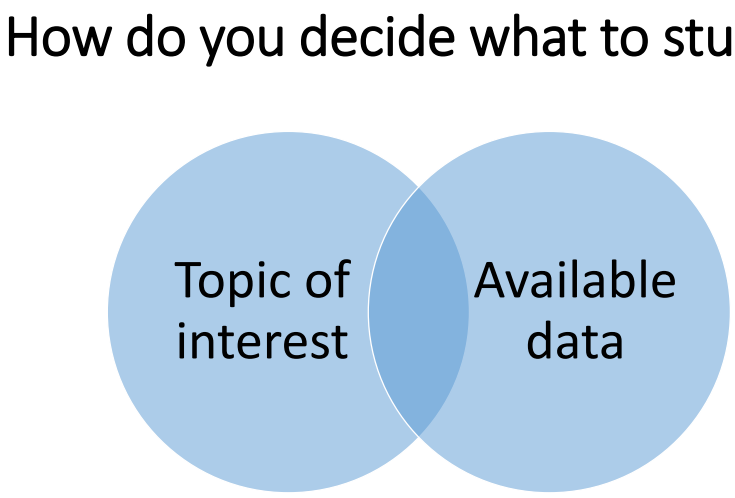

Figure 7. Identifying the topic to study

To identify one or more topics, the stakeholders were asked to provide topics they were interested in exploring through the RISE pilot project as well as a list of data they might be able to share. This process resulted in a list of 35 topics to consider and identified 34 types of data that may be available to provide to the effort. To make the selection process easier, the 35 the topics were categorized according to the overlap or similarity of the topic areas. This activity reduced the number of topics to nine study topics as shown in Table 2. For each study topic,

stakeholders ranked their preferred topics in order of preference on a scale from 1 to 5 with 1 representing lowest interest and 5 as highest interest. Each stakeholder also indicated the availability of the data sources addressing the quality, volume, and other factors that were identified and the topic they could address.

Table 2. Nine study topics identified

	Topics
1	Employee Injuries
2	Rules Violations
3	Passenger Station Misses/Off Platform
4	Technology Overreliance
5	PTC System Status
6	Equipment Safety
7	Employee Training
8	Operator Errors
9	Post-Incident Actions

The topics were rated according to three criteria: value, feasibility, and duration. Value represented the benefits that might accrue from addressing a particular study topic. Feasibility addressed whether the data that stakeholders indicated they could share would be sufficient to address the topic. Duration addressed how long the stakeholders believed it would take to address the topic. The stakeholders agreed that to make the demonstration practical, it should be completed in 12–18 months.

The scores for each topic along with availability and relevance of the data were combined in a weighted score. Following the ranking of these topics and data, the stakeholders discussed these ranked preference scores. At this meeting the consensus among the stakeholders was in favor of selecting one or more topics that would maximize their chance for a successful outcome. Three topics emerged as the top contenders for the stakeholders to pursue:

1. Personal injuries
2. Operating rule violations
3. Passenger station misses/off platform

UMD CATT Lab reviewed and offered recommendations for which study topics/use cases to pursue. Following its review, UMD CATT Lab held another meeting to discuss their recommendations. At this meeting UMD CATT Lab recommended addressing the top two study topics/use cases: personal injuries and operating rules violations. Additionally, during that meeting the group decided to look at grade crossing incidents and the potential for safety improvement as a topic of interest. Grade crossing safety was not initially identified as a potential study topic during the data-driven exercise, but the group decided that this was a topic worth further exploring.

UMD CATT Lab staff spent several months working with each of the stakeholders getting agreements to obtain the data for each of the three study topics and understanding what the different data fields represented and developing a secure platform for sharing and presenting the data for the study topics/use cases. This coordination was conducted across many different video conferences to allow the stakeholders to discuss with UMD CATT Lab the nuances of the data they were providing. While the type of data being provided from each stakeholder was similar, the format and specifics of the data were unique for each carrier. This time spent understanding the data were critical for ensuring that data were able to be aggregated accurately.

For one stakeholder, the UMD CATT Lab was unable to work out an agreement to share the data in time for the pilot project. In another case, the stakeholder was unable to share all the data requested because reductions to staffing from COVID-19 prohibited them from making the data available. There were still a sufficient number of railroads participating in the effort to anonymously and confidentially present aggregated data.

3.5 Data Wrangling and Presentation

The NHTSA's PARTS demonstration selected a specific question that they believed would showcase the value of such a data trust and set out to answer that question. In contrast, the RISE pilot project sought to identify broader topic areas that may consist of additional opportunities for analysis. With this broader approach in mind, the UMD CATT Lab did not initiate conversations with stakeholders to discuss how to analyze the data and instead focused on identifying suitable data sources.

UMD CATT Lab spent the early part of its work talking with stakeholders to better understand the data fields that the stakeholders would share, how stakeholders used these data and determining how best to standardize the data for aggregation. Early in this process, it was determined that the grade crossing safety effort was unlikely to yield valuable insight based on the available data and variability between stakeholders; the topic was not further pursued in the pilot project. UMD CATT Lab's goal was to present the aggregated data for the two study topics/use cases in charts grouped together in dashboards that the stakeholders could use to explore the aggregated data or their own data. UMD CATT Lab used Tableau to display this data. Prior to developing the dashboards, UMD CATT Lab removed duplicates, corrected missing and inaccurate data, and transformed the raw data's format into a format suitable for data exploration.

The approach selected by UMD CATT Lab is one potential use of data collected through RISE. An approach that is more similar to those used by ASIAS and PARTS, where the goal is more focused on answering a single question rather than exploring a topic, would also be a reasonable approach. Both of these approaches, as well as others, are possible within the RISE Charter and the stakeholders may select to modify shift between these approaches to best suit their needs as RISE moves forward.

3.6 Lessons Learned from the RISE Pilot Project

The selection of the two study topics/use cases personal injuries and operating rules led to several predictable outcomes. Both study topics/use cases addressed safety concerns found in regulations (either FRA or Occupational Safety and Health Administration [OSHA]). As a result, some of the data fields that the railroads collect were in a standardized format required by FRA data reporting requirements. Not all the fields were standardized, as some stakeholders collected

additional information beyond what was required by the regulations. However, if a field was collected by only one stakeholder, it was removed from the aggregated data to prevent users from identifying data associated with a specific stakeholder.

Despite the standardization of some type of data collected by the railroads there were significant differences among the fields that were not standardized. For operating rules data, the railroads varied significantly in the number of fields that each railroad collected. The number of fields varied from 18 to 44. Stakeholders varied in the level of detail that they collected for fields that document factors like date, time, location, employee characteristics, and equipment type. Some stakeholders collected additional data beyond what was typically collected by rail carriers across the country. Though these data may have provided additional safety benefits or afforded a more detailed understanding of the data, some could not be included because data from a limited number of stakeholders may compromise the anonymity of the data.

For personal injury data, the number of data fields ranged from 25 to 51. For operating rules, the number of data fields ranged from 18 to 44. Some railroads collected much more information than others.

The disparate number of data fields for both topics was partly a function of the ability of the department within the railroad that collected that information. For this demonstration, the participating stakeholders within each of the railroads came from the safety departments. Some of the data involving personal injuries were held by other departments. Human resource departments collected data on employee demographics and the operating rules departments usually held data on operating rules violations. Obtaining and sharing this data from the other departments varied by the railroad. Some railroads shared data across their organizations more easily than others.

For both topics, the decision to ask stakeholders for 18 months of data was made to ease the data collection efforts for the stakeholders. Data was collected for the period from January 2019 to June 2020. Collecting data for a longer period could have provided the stakeholders with more information to inform their understanding and exploration of the data.

During the demonstration, the COVID-19 pandemic struck and contributed to several challenges. Each participating stakeholder operated a passenger railroad; the reduction in people traveling and therefore the number of employees at every stakeholder organization made it increasingly challenging for stakeholders to actively participate in meetings. Several stakeholder representatives lost their jobs or left their organizations and those that remained were less available to participate due to the increased workload at their organizations. Despite these challenges, an initial pilot was completed, though it took longer than initially anticipated.

The pandemic also resulted in meetings that took place virtually instead of in person. While many of these meetings proceeded smoothly and were unnecessary to hold in person, creating a new process for information sharing based on trusted relationships, in-person meetings can still be an important way to build and maintain these relationships. In-person meetings create the opportunity for informal networking and communication and the reading of body language that fosters trust and effective communication.

A key challenge for UMD CATT Lab was collecting the same types of data across the stakeholders. In working with railroad stakeholders, the primary part of the stakeholder organization involved the safety department staff. Safety departments across the stakeholders

varied in the access to the information requested by UMD CATT Lab. The operating rules department, human resources department, or another department may have owned some of the data. These departments varied in their willingness or ability to share this data. The data may have been stored on a variety of information systems increasing the challenge to coordinate the sharing of this information. These data silos created organizational barriers to the sharing of this data that varied by stakeholder.

A significant part of the effort by UMD CATT Lab involved data wrangling described in Section 3.6, identifying fields that addressed the same type of data (i.e., day of the week) but used different labels to describe this data, cataloging the data using a common format, and addressing missing data. UMD CATT Lab staff reached out to each stakeholder and walked through each of the fields they provided to understand how the data fields were represented. UMD CATT Lab relied on FRA and Volpe, in addition to the railroad stakeholders themselves, to help understand railroad specific terminology, as they have limited experience in the railroad domain.

When UMD CATT Lab began collaborating with stakeholders in completing the topic selection process, the pilot project's focus changed from the stakeholders collaborating on the analysis of a specific safety question to the process for obtaining the data and making it available for analysis by the stakeholders, themselves. This focus provided valuable insights for moving forward with new topics and considerations for obtaining and managing data.

The current pilot project showed the opportunities for aggregating data across passenger railroads with a common set of interests.

3.6.1 Feedback from Stakeholders

Following the completion of the Tableau dashboards, UMD CATT Lab set up a meeting to demonstrate the use of the dashboards prior to providing the stakeholders access to them. During the meeting UMD CATT Lab explained what each chart displayed and how to manipulate the charts to display different types of information. They answered questions from the stakeholders on how to manage the Tableau interface and what the capabilities and limitations were of the dashboard at this time.

Following this meeting, each stakeholder could access the dashboard to explore on their own. Once the stakeholders had access to the dashboards, Volpe and UMD CATT Lab staff provided the stakeholders with a list of questions to answer about their use of the Tableau dashboards and the value of this RISE pilot thus far. After giving the stakeholders 1 to 2 weeks to explore the Tableau dashboards, the stakeholders returned the responses to the questions. UMD CATT Lab and Volpe met with each of the stakeholders to seek additional information on the use of the Tableau dashboards and the RISE pilot. Section 3.6.2 describes the feedback offered by the stakeholders.

3.6.2 Value of RISE and Use of the Tableau Dashboards

Overall, all the stakeholders agreed that the RISE pilot project showed the value of sharing and aggregating data across stakeholders. The stakeholders unanimously agreed that this initiative was worth continuing and expressed interest in expanding the program. They also indicated that they felt confident in the process by which their data were obtained and stored by UMD CATT Lab. The information in the dashboards provided insights that they otherwise would not have observed, and the Tableau dashboards provided both valuable methods for data exploration and

understanding as well as effective displays for presenting information to support decision-making.

While the stakeholders were very positive about the progress of the pilot project, they did offer some feedback about the current dashboards as well as considerations for the future of RISE. Of the two topics addressed in this initial demonstration, personal injuries provided a richer source of information than the data from operating rules. The amount of data was considerably smaller for operating rules violations (183 records) compared to the personal injuries (1,726 records) and one stakeholder was unable to provide any data related to rules violations. In addition to the larger number of data fields upon which to draw for analysis, the UMD CATT Lab created four dashboards addressing personal injuries and one dashboard addressing operating rule violations. The railroad stakeholders unanimously reported more value in reviewing the personal injury data compared to the operating rules. The charts created by UMD CATT Lab for personal injuries enabled the stakeholders to view the data in ways that they had not seen before.

The operating rules data were used to create charts that were familiar to the stakeholders, limiting the opportunity for the stakeholders to gain new insights. This result may be a function of the kind of data that is collected and stored in stakeholder information systems. The data collected indicates what operating rule was violated, but lacks information that could inform why it occurred. Current railroad investigation methods fail to document information that could inform why these events occurred. FRA sponsored research on stop signal overruns and switching operations suggests that it is possible to collect this data to inform new insights (Multer, J., Safar, H. & Roth, E. M, 2019) (Safer, H. Roth, E. M., Multer, J., & France, M., 2019). The challenge is to identify the data to collect and developing uniform practices for their collection. Should industry stakeholders demonstrate interest in pursuing this challenge, it may be valuable to form a working group to facilitate the identification and uniform collection of this information across the industry.

In this pilot, the analysis of both topics afforded the stakeholders an opportunity to benchmark their own data against their peers. For both topics, some of the data provided to UMD CATT Lab by stakeholders was already being reported to FRA as required by regulations. All the participating railroads, except one that did not provide data,[2] appreciated the ability to compare their data to those of their peers. The data provided to UMD CATT Lab contained both reportable data as well as non-reportable data; the non-reportable data provided additional insights that would not normally be available, since stakeholders did not provide that data to FRA. FRA recently began to provide some of the personal injury data on its website using Tableau, however, the displays developed by UMD CATT Lab provided greater flexibility to compare their data to aggregated data in ways that were unavailable on FRA website. Stakeholders reported difficulty in using FRA created Tableau charts in ways that were useful. The UMD CATT Lab dashboards provided charts that were also unavailable on FRA website and enabled them to explore the data in new ways. The ability to explore weather data as well as to investigate incident severity and cost were noted by several carriers as particularly helpful.

Several stakeholders expressed interest in collecting additional data to support the use of these dashboards going forward. The dashboards for the pilot project contained only 18 months of data

[2] The carrier that did not provide data was still interested in providing data for this effort, but was unable to do so prior to the initial launch of the dashboards.

and stakeholders expressed interest in seeing up to 5 years' worth of data and continuing to submit current data so that they could see how trends were changing over time. It was also noted that it may be easier for many stakeholders to start to collect data in a specified format going forward as opposed to relying on historic data that may need to be reworked. Such a task, however, would not have fit within the expectations of RISE's initial pilot which expected an end product within 18 months. Stakeholders generally sought a consistent process to gather data in a specified format as a goal for RISE as it continues. Additionally, stakeholders suggested that UMD CATT Lab work to automatically ingest data that is already publicly available from FRA to reduce the burden on the stakeholders in collecting and organizing their data for submission into RISE.

These stakeholders also saw value in inviting additional commuter railroads so that the aggregate data would better reflect the population of commuter railroads. It would also provide a larger set of data from which to understand and explore the impacts of personal injuries. Some stakeholders indicated that the operating rules dashboard provided less value for data exploration and understanding because there was much less data on which to base any inferences. With additional commuter railroads participating it may be possible to overcome this challenge. Stakeholders also noted that as participation expands, some benchmarking may differ by location, making it ideal to be able to select certain types of stakeholders against which to compare.

The long-term success of the RISE pilot program will be dependent on the stakeholders obtaining value out of the program. There is a cost to participation that will need to be justified by the outcomes that the program achieves. In the RISE pilot project, stakeholders invested time and energy to achieve the results described above and indicated that they were satisfied with this pilot effort. As the RISE effort continues it will be critical to ensure that the costs associated with participating in RISE are justified by the outcomes of the research questions that are pursued.

3.7 Opportunities Moving Forward

In this section, the authors offer opportunities to learn from the RISE pilot project. The opportunities are activities that can help to direct RISE as the program continues and a new topic is selected to measure the value of this initiative in the railroad domain.

1. **Reinforce and clarify what RISE's purpose is and how it is different from similar programs**.

   The RISE program shares characteristics with other voluntary safety initiatives sponsored by FRA. Some stakeholders are familiar with other FRA voluntary non-punitive partnerships. While leveraging this familiarity may be helpful, it will be important to make clear how RISE adds value beyond what is already gained through these other efforts.

   The goal of the RISE pilot project was to identify the feasibility of creating a data trust for collaborating on safety concerns of common interest to the stakeholders that they could not easily do themselves. A second goal was to identify the steps for successfully moving the initiative forward to benefit the participating stakeholders and to expand the initiative to include more stakeholders and new topic areas. The commonality with similar programs that FRA has sponsored and developed has led to confusion among stakeholders about how this initiative differs from other safety initiatives that FRA has

created and how stakeholders benefit from participation. Establishing a clear distinction about what RISE is intended to accomplish and how it differs from other programs is important to establish and maintain stakeholder engagement.

2. **The keys for success are enshrined in the principles that were adopted during the initial roll-out of the demonstration. Keep them front and center as the demonstration moves forward.**

   RISE's guiding principles were based on past research on data trusts and programs like successful ASIAS program. These principles provide guidelines for how stakeholders should conduct themselves and provides mechanisms for building trust among the stakeholders for sharing safety sensitive data. The principles serve as a foundation upon which to build and minimize the potential for challenges that slow the progress of RISE program development. As the stakeholders encounter challenges in addressing specific issues, remind stakeholders how the principles provide a process for addressing the challenges.

3. **Appoint an individual or a group to serve in the role of governing the process that the stakeholders have established**.

   FRA's Office of Research, Development and Technology led the coordination of stakeholders during the initial RISE pilot project. During the next phase, if the pilot project expands to include additional stakeholders, FRA should decide whether the current informal governance structure is adequate or whether a more formal structure is needed. FRA may want to consult with the stakeholders to determine when a more formal governance structure is needed.

   It will take time to adapt RISE as it changes from a pilot project to a formal program to suit the needs of the stakeholders and achieve the goals set out for RISE. FRA's Office of Railroad Safety will lead RISE when FRA is ready to move beyond RISE as a research effort. Consider developing an executive committee to functioning this role, as was done in the FAA's ASIAS system. The executive committee, consisting of multiple stakeholders would take on a more prominent role in directing the work of the RISE stakeholders. As a decision-making body, an executive committee would represent the diverse interests of the stakeholders.

4. **Create a roadmap for the development of RISE. Identify the milestones and goals of each step and communicate those goals to stakeholders. Keep the goals for each step front and center so that stakeholder organizations (and not only individuals, who may change over time) are clear about the purpose of the initiative**.

   As the RISE pilot project progressed, staffing changes occurred both within the project and external to the project. New organizations were brought in to support the project (Volpe and the UMD CATT Lab) and some stakeholder representatives left their respective organizations. These changes contributed to changes in the project's implementation and the level of stakeholder engagement. The COVID-19 pandemic may have exacerbated some of these challenges by increasing staffing changes and reducing the resources available to support this effort. While the pandemic accelerated these challenges, these are not entirely new challenges. Efforts to clarify goals and milestones

for RISE will help to minimize these disruptions and help to advance efforts in the face of these challenges.

5. **Identify ways to address the challenges associated with collecting and managing data**.

   This opportunity goes beyond RISE. Collecting and managing safety data in an effective way is critical for conducting successful research and in accurately assessing risk for managing safety oversight. The quality of the data (i.e., can we trust it to measure what we think we are measuring?) and the ability to use the data to make sense of safety concerns relies on several factors listed below.

   a. First, the process by which data is collected matters. While data may appear to be useful for understanding safety issues, if it is not obtained using sound data collection practices, subsequent use of that data may lead to erroneous conclusions about why safety related events occur and the solutions to address them. For example, does the data represent a sample of the population or describe the whole population? For narrative data, were established interview practices conducted by trained interviewers? For objective data, such as event recordings, signal data, etc., what is the process for interpreting this data and how much experience do the interpreters have in making sense of this data?

   b. Second, a uniform format by which the data is collected will make it easier to aggregate the data. Collaboration among railroads, vendors, and other interested stakeholders to standardize and make uniform the data could reduce the time and effort to make it accessible for analysis in aggregate form. Standardizing data formats would allow users to compare data within and across railroads. Given that the organization and standardization of data formats was such a significant source of effort in this demonstration, putting in effort early in the process may yield large dividends later. Railroads may find it in their interest to adopt uniform formats to foster information sharing when operating over each other's territories and to facilitate analysis.

      With uniform standards for data collection and storage, software developers can more easily create applications that would serve the interests of a broad segment of the railroad industry. For smaller railroads and the passenger railroads, which are more resource constrained, software applications may be less expensive to purchase when the developer can apply the same process across the industry.

      For example, a date field that varies by whether the information is reported hourly, daily, weekly, or monthly has implications for the level of analysis. The lowest common denominator by which the data is collected determines the level at which the data can be aggregated.

      A question to be answered by the stakeholders is at what level of analysis for which particular data fields will lead to meaningful results. A part of this process may involve suggesting that stakeholders reconsider how they are collecting and organizing data. A data trust like RISE may bring some of these issues to the forefront for those who have not considered these types of changes and yield positive safety benefits.

c. Third, it is important to identify what kind of data needs to be collected to understand a safety concern. In many cases, data which is easy to collect (e.g., date, time, location, etc.) is relied upon for analysis rather than the data associated with underlying operations that contribute to the safety event(s) in question. Identifying what kinds of data need to be collected and finding ways to collect them without imposing undue burden is an important challenge to overcome. Railroads are also adding sensors in their equipment for condition monitoring.

   These sensors will create vast quantities of data that railroads may be able to use to improve safety. How will this data be stored to facilitate different uses across the railroad? Different data structures serve different purposes. Data warehouses provide a process for storing structured data while data lakes provide a way to store unstructured data for which the use may not be immediately apparent or may change over time.

d. Fourth, as the complexity of railroad operations increases with new technologies and changes in business operations (e.g., Precision Scheduled Railroading and using software to manage how trains are put together), more opportunities will arise for using these data to inform decisions about improving safety. To maximize these opportunities, multiple sources of data will need to be collected in a central location to explore the relationships between these data sources. The RISE pilot project represents an opportunity to explore the challenges to the collection, management, and analysis of these sources. Future RISE analyses should consider multiple sources of data to address safety concerns.

e. Fifth, these new sources of data are likely to contain very large data sets (e.g., event recordings, video, and other sensor-based data) that will be challenging to analyze using traditional methods. The vast quantities of data suggest that methods such as artificial intelligence (AI) and machine learning algorithms will be needed to make the analysis process manageable. It will take time to develop the AI and machine learning algorithms to make sense of these large data sets.

6. **Set realistic expectations about how long it will take to create a RISE program that is useful to the stakeholders and to achieve the level of engagement needed to support this initiative**.

   The significant steps to stand up RISE and make it useful to stakeholders require patience among the stakeholders. Overcoming the challenges associated with the collection and management of the safety sensitive data will take time. It is important to create realistic expectations among stakeholders. The specific path to a successful data trust will depend on the stakeholder's interests and patience. Given the time required, one strategy to build buy-in may be to identify topics for which there is the potential for a high level of return on the investment required to make RISE successful. An alternative may be to identify topics that will provide small, incremental safety improvements that create continued support for the program while some of the bigger challenges are addressed. For whichever path is identified, it will be important to remind stakeholders of the value that has been realized through each step and how that helps to move towards the longer-term goals.

Some topics may take a substantial amount of time to yield meaningful, actionable results. While a long turnaround may be seen as a negative by some, these topics may be a valuable part of a data trust as individual carriers may lack the ability or patience to study these topics on their own. If the stakeholders pursue such an effort it will be important to identify interim milestones as signs of success rather than to pin determinations of success only on the end product. Meaningful progress towards a goal may be hard to see on longer term efforts if attempts are not made to identify these interim goals.

7. **Continue to build trust among the stakeholders through a consensus-based approach to topic identification and collaboration in data collection and analysis**.

   Trust among stakeholders is critical for the success of the RISE program. They must trust in one another, in FRA's role, and in the third party collecting, managing, and analyzing their safety sensitive data. The first RISE pilot project represents an initial effort in building and maintaining this trust. As RISE continues, it will be important to maintain this trust and to build upon it for RISE to grow and thrive. By maintaining focus on the program's core values and using a consensus-based decision process, RISE can continue to grow while helping stakeholders remain confident in the process.

8. **Consider topics that involve more stakeholders and are not easily addressed by individual stakeholders alone.**

   While the current pilot identified some challenges and solutions for integrating data from multiple carriers, a future pilot involving the railroad stakeholders to select and address a specific problem would show the value of the stakeholders working together towards a more specific goal. The two topics selected by the stakeholders both fell under the regulatory authority of either FRA or OSHA and specified the reporting of certain kinds of data to the regulator. As a result, the railroads were required to collect certain data fields. This may have contributed to more uniform formatting of data fields than would have otherwise occurred. This may have contributed to the stakeholders feeling comfortable with sharing these data during an early phase when trust was still being earned.

   As RISE moves forward, consider addressing a topic which is currently a problem across the industry, and for which the reporting requirements are minimal, such as trespassing. The causal factors are also poorly understood and the reported data bears little on these causal factors. Railroads and FRA have a common interest in improving their understanding of why trespassing occurs and identifying effective strategies to address this growing problem. It is a problem that is not likely to be solved by one railroad alone and could benefit from a collaboration among many stakeholders. While trespassing risk and cause may be specific to a location, there are likely common factors that increase trespass risk that may be broadly applicable to many stakeholders. Because it is a common problem, it may be easier to add new members to the group. The addition of data from more railroads as well as increasing amounts of data may enable the RISE process to analyze a large amount of data in ways that inform how to solve this complex issue.

9. **For data that railroads report to FRA as required by regulation, consider forming working groups to identify how data presented on the FRA website can better meet the needs of the stakeholders that can benefit from using this data. Identify ways that data can be standardized to facilitate information sharing.**

   Findings from the demonstration suggest an opportunity for FRA to collaborate with stakeholders to provide information in more meaningful ways that require less effort to support analysis and decision-making.

   Railroad stakeholders expressed frustration with using the safety data on the FRA website to meet their needs and indicated that UMD CATT Lab's dashboards helped to alleviate these challenges. FRA could adopt some of the same practices for making FRA safety data more accessible to people who make use of this data. Creating working groups of railroad industry stakeholders to identify how industry stakeholders want this FRA supplied information could provide FRA with an understanding of the industry needs and enable FRA to better meet these needs.

   As part of working with these stakeholders, FRA and the industry stakeholders can propose ways to standardize the identification of data fields of interest and the formats in which that data be most useful. These efforts can facilitate the sharing of safety data across stakeholders. This activity could occur outside of the RISE pilot project. However, this process may reveal insights that cannot be gained from the data as it is collected through FRA reporting and may point RISE in a direction where they may add value to the FRA data process.

10. **Identify the barriers to sharing information within railroads that can support more effective organizational learning and improve safety.**

    Information silos are common within railroads and they can create barriers to improving safety. The inability of railroads to share data easily across organizational boundaries impairs organizational learning about safety. Identifying the barriers and finding ways to overcome these barriers could enable railroads to make better use of the data they currently collect.

3.8 Next Steps

As next steps, the authors recommend presenting the findings documented in this report along with those of UMD CATT Lab to the stakeholders and discussing how to apply these lessons going forward. The railroad stakeholders expressed interest in continuing to participate in RISE. The stakeholders can identify how to move forward. They can include: identifying new topics and inviting additional stakeholders into a second demonstration.

As the sponsor for this research, FRA should think about the need to create a more formal charter and governance structure for RISE. This is an activity that can wait until a decision is made to move from research to deployment of an FRA program. Finally, FRA may want to identify the criteria for making the decision to transition from research to a program housed within the Office of Railroad Safety and what resources will be needed to involve in this effort.

4. Conclusion

The current report documents the lessons learned from the RISE pilot project; a pilot of a data trust designed to address safety sensitive topics that are more suitable to solving with multiple stakeholder organizations working together to solve problems of mutual interest. RISE offers the opportunity to bring together large sets of data that stakeholders would not normally have access to on their own.

The first pilot project showed that the stakeholders were willing and able to share data and overcome, with the help of an independent steward, the challenges of integrating data on common safety concerns for which the data may be stored in different formats. The presentation of this information provided stakeholders with new views of the data.

A challenge going forward will be for the stakeholders to identify what RISE means to them and how it can be used to benefit the stakeholders. Table 3 displays the questions this demonstration was designed to answer and a summary of the answers to these questions.

Table 3. Summary of responses to demonstration questions

	Demonstration Question	Answer
1	Did the stakeholders trust the third party to share, store, and analyze data?	Yes. Effective communication and coordination will be an important factor in building and maintaining trust among the stakeholders along with an effective governance structure.
2	Could the independent steward establish a common platform for sharing and managing data?	Yes. The independent steward was able to build a platform for the aggregation of stakeholder data.
3	Did the study topics of interest to stakeholders intersect with the available data?	Yes. This pilot addressed data that railroads already share with FRA in some form. A challenge going forward will be sharing data that they do not share with FRA and each other.
4	Did the analysis and presentation of the safety data provide a perspective that stakeholders would otherwise not have observed?	Yes. Stakeholders appreciated the ability to benchmark their performance against their peers. They also appreciated several charts that displayed information in ways that enabled them to drill down easily to better understand the relationships between different factors.
5	What are the challenges to the collection, analysis, interpretation, and presentation of the pooled safety data?	Developing a uniform or standardized format for the storage and display of common data fields would facilitate data aggregation and management.
6	Did the stakeholders find value in the results?	Yes.

	Demonstration Question	Answer
7	Did the demonstration inform decisions and actions to address safety concerns?	No. The data selected for this study covered an 18 month period that ended in June 2020 and was insufficient to inform decision-making and actions.
8	What are the challenges and next steps to moving this concept forward?	Identify what RISE means to them and how it can be used to benefit the stakeholders. Expand RISE to include more stakeholders and identify new topics.

The answers to the questions above indicate that the RISE pilot project demonstrated that such a program is possible for the railroad industry. Stakeholders involved with the RISE pilot project saw value and hope that the program continues. If the RISE program is expanded, the FRA and RISE stakeholders may consider the following high-level recommendations based on observations from the pilot phase:

Finding/Observation	Recommendation
The long-term success of the RISE program is dependent upon the stakeholders obtaining value that justifies their participation.	Future analyses should enrich the data with information that is relevant to the study, but not available in the raw data of the individual railroads. This may be through novel methods (e.g., machine learning techniques), additional data sources, or other ways to enhance the raw data.
Significant effort is required to integrate some data that are collected by railroads in the same context.	Account for sufficient time to integrate and clean data.
	Coordinate with FRA to streamline integration of FRA-mandated data.
	Pursue research into the development of data standards.
Participation is likely to change for stakeholders throughout the lifecycle of the program.	Maintain consistent communication with stakeholders to ensure replacements can be onboarded if the current point of contact is unable to continue.
	Clearly define expectations for participation in the RISE program.
As RISE grows into a more fully formed program, stakeholder roles may need to be defined differently.	Define governance structure accounting for planned growth.
	Define sub-groups within RISE with clearly defined roles, such as determining policy changes or issue identification.

Finding/Observation	Recommendation
More challenging research questions may take a significant amount of time to yield actionable results.	Clearly articulate timeline expectations within the FRA and to RISE stakeholders. Identify interim milestones along the path to completion which can serve as evidence of meaningful progress towards the longer-term goal.
Satisfaction with the initial pilot effort may narrow the group's vision about the broad value of RISE as a program.	Remind stakeholders of the broad potential for RISE and encourage the group to pursue a more aggressive or challenging research question during the next phase.
Information sharing barriers are present within the railroads themselves and these barriers can hamper the goals of RISE if the correct departments are not involved.	Ensure that the right individuals from each railroad stakeholder are involved in discussions; this may depend on the research question being asked. Facilitate open discussion with stakeholders about internal barriers to data access and how these barriers may be overcome.
For RISE to grow into a program for the entire railroad industry, membership will need to expand to incorporate more varied points of view.	Engage a broader set of stakeholders including freight railroads and labor representatives. Ensure that the governance structure considers the potential for topics which are relevant to only a subset of the stakeholders.

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Appendix A.
Rail Information Sharing Environment (RISE) Pilot Project Charter

Introduction

The goal of the RISE pilot project is to develop a platform through which railroad stakeholders can confidently share safety data to identify railroad safety risks or safety improvements.

Collecting data across multiple stakeholders has the potential to provide insights that could not be identified by a single stakeholder and offers the potential to advance rail safety.

This charter documents the guiding principles that will govern the RISE pilot project. A new charter will be drafted should the stakeholders wish to continue and expand upon this initiative beyond the pilot project.

Guiding Principles

The following principles will guide the governance of the RISE pilot project towards its stated goal.

Guiding Principle 1: Systemic Assessment

> Analyses undertaken by RISE stakeholders shall have the potential to benefit all the participating stakeholders and advance railroad safety.

Guiding Principle 2: Stakeholder Organization Commitment

> Stakeholder organizations are committed to participating in the RISE pilot project.

Guiding Principle 3: Articulated Roles and Responsibilities

> Each organization participating in the RISE pilot project will identify a primary and alternate representative to participate in meetings and to coordinate within their organizations to ensure that agreed upon responsibilities are met.

Guiding Principle 4: Consensus-Based Decision Making

> Participating organizations will make key decisions that impact all stakeholders about RISE pilot project procedures and operations by consensus.

Guiding Principle 5: Voluntary Participation

> Participation in the RISE pilot project is entirely voluntary. Stakeholders may suspend or end their participation in the RISE pilot project at any time.

Guiding Principle 6: Transparency of Data Sharing

> Each stakeholder will work internally to ensure that relevant employee groups within their organization are aware of the data being shared in the RISE pilot project.

Guiding Principle 7: Non-Punitive Data Use

> Data provided for use in the RISE pilot project and the results of any analyses will not be used for punitive actions.

Guiding Principle 8: Data De-Identification

RISE pilot project data, information, and results of analyses will be de-identified in a manner that protects the identity and privacy of individuals and stakeholder organizations.

Guiding Principle 9: Ensure Data Quality

Stakeholders will work collaboratively to maintain high standards for data quality in the RISE pilot project.

Guiding Principle 10: Transparency of Processes

RISE pilot project processes will be transparent to stakeholder organizations.

Roles and Responsibilities

The RISE pilot project consists of FRA, participating members of the railroad industry, UMD CATT Lab, and Volpe.

The roles and responsibilities of each stakeholder are to:

- Commit to the Guiding Principles
- Maintain the confidentiality of RISE pilot project data
- Act, as appropriate, on the results and recommendations for safety enhancements
- Provide staff resources to support RISE activities
- Identify two points of contact for each organization to serve as a primary and alternate point of contact

Stakeholders will identify at least one topic for study during the pilot project, including the scope, objectives, timeline, constraints, and anticipated outcomes.

Confidentiality of RISE Pilot Project Data

RISE pilot project data will be kept confidential and de-identified as described below. Data are de-identified through a process mutually agreed upon by the RISE stakeholders and the pilot project's third-party vendor, UMD CATT Lab.

- Before any results are reported to the RISE pilot project participants, all output will be filtered to ensure nothing can be uniquely identified.
- RISE pilot project stakeholders will be subject to the provisions of a non-disclosure agreement.
- FRA, UMD CATT Lab, and RISE stakeholders will work together to establish a mutually agreed upon understanding of FOIA discoverability.

Data and Information Access, Usage and Retention

Access, use, and disclosure of aggregate information obtained through the RISE pilot project by any RISE stakeholder is governed by the Guiding Principles. In addition:

- Access to RISE project data or information for analysis is entirely controlled by the RISE stakeholders. All data provided by stakeholders will remain under their ownership and not the ownership of the third party data storage/analysis organization.
- RISE stakeholders will retain all final analysis results (i.e., work products) indefinitely or as authorized by group decision.
- Any algorithms developed by stakeholder organizations, UMD CATT Lab, or contractors supporting RISE and used for analysis of RISE safety information will remain the property of the stakeholder that developed the algorithm, unless otherwise stipulated in a contractual agreement.
- UMD CATT Lab will work with RISE stakeholder organizations to develop a mutually agreed upon disaster recovery plan with RISE stakeholders.
- Access to data and/or analyses of RISE data will only be provided to individuals that have been identified by RISE stakeholder organizations. UMD CATT Lab will work with RISE stakeholder organizations to develop a strategy to restrict or remove access to any individual at any time per the request of the RISE stakeholder organization.

Signature Page

Signing this document means that the stakeholder organization agrees to abide by the principles, roles and responsibilities laid out in this document.

_____ _____

Name (printed) Organization

_____

Signature

Abbreviations and Acronyms

ACRONYMS	EXPLANATION
AI	Artificial Intelligence
AAR	Association of American Railroads
AEB	Automatic Emergency Braking
ASAP	Aviation Safety Action Program
ASIAS	Aviation Safety Information Analysis and Sharing
ASRS	Aviation Safety Reporting System
BTS	Bureau of Transportation Statistics
CFR	Code of Federal Regulations
CAST	Commercial Aviation Safety Team
C^3RS	Confidential Close Call Reporting System
EB	Executive Board
FAMES	Fatality Analysis of Maintenance-of-way Employees and Signalmen
FAA	Federal Aviation Administration
FRA	Federal Railroad Administration
FOQA	Flight Operational Quality Assurance
FOIA	Freedom of Information Act
FFRDC	Funded Research and Development Centers
IEP	Internal Evaluation Program
IAT	Issues Analysis Team
LOSA	Line Operational Safety Audit
MSRI	Mariner Safety Research Initiative
MOU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NHTSA	National Highway Transportation Safety Administration
OSHA	Occupational Safety and Health Administration
OEM	Original Equipment Manufacturer
PARTS	Partnership for Analytics Research in Traffic Safety
PHMSA	Pipeline and Hazardous Material Safety Administration
RISE	Railroad Information Sharing Environment
RSAC	Railroad Safety Advisory Committee

ACRONYMS	EXPLANATION
SafeOCS	Safe Outer Continental Shelf Reporting System
SLSI	Short Line Safety Institute
SOFA	Switching Operations Fatalities Analysis
UMD CATT Lab	University of Maryland's Center for Advanced Transportation Technology Laboratory
Volpe	Volpe National Transportation Systems Center
VDRP	Voluntary Disclosure Reporting Program
VIS	Voluntary Information-Sharing System