


Characteristics of Non-Punitive Employee Safety Reporting Systems for Public Transportation as Abridged from TCRP Report 218

Transportation Research Record
2021, Vol. 2675(6) 254–264
© National Academy of Sciences:
Transportation Research Board 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0361198121992075
journals.sagepub.com/home/trr


Lisa Staes¹ and Jodi Godfrey¹

Abstract

The objective of this research is to produce a compilation of best practices used in non-punitive employee safety reporting (ESR) systems at transit agencies, including examples of how ESR systems benefit transit agencies and their employees. This report will support the public transportation industry's efforts to institute non-punitive ESR as a critical element in safety management systems implementation. The literature review and background research framed the subsequent narrative and findings from interviews with public transportation agencies. For the purposes of this report, the agency that implemented the ESR system determined successful elements. The researchers did not perform a statistical modeling or evaluation method to determine elemental success; rather, success determination stemmed from the implementing agencies. This report also identifies challenges faced through the implementation phases of ESR system deployment, as presented through the literature review and transit agency case studies. Report findings identify benefits associated with wide dissemination of commonly reported hazards and methods to address them, such as the Aviation Safety Reporting System, or the Confidential Close Call Reporting System. There are also recognized benefits in third-party administration and management of ESR systems through reduced likelihoods of associated punitive or retaliatory consequences. Therefore, researchers determined the public transportation industry could benefit from central repository reporting options for hazards and near-miss information aggregation to further support data-driven decision-making. Additionally, industry evidentiary protections would ensure greater reporting. Finally, the public transportation industry would benefit from a non-punitive ESR toolkit or online resource repository that includes samples for agency customization.

The Federal Transit Administration (FTA) framed the basis of their National Public Transportation Safety Program (49 U.S.C. Section 5329) around safety management system (SMS) principles. The establishment of a proactive employee safety reporting (ESR) system is one aspect of the safety assurance function elemental in the implementation of an effective SMS, and explicitly required in the Public Transportation Agency Safety Plan (PTASP) rule 49 C.F.R. §673.23(b):

A transit agency must establish and implement a process that allows employees to report safety conditions to senior management, protections for employees who report safety conditions to senior management, and a description of employee behaviors that may result in disciplinary action. (1)

The objective of this research is to produce a compilation of ESR system best practices, including examples of how ESR systems benefit transit agencies and their employees, to

assist transit agencies with ESR system development. In accordance with this objective, this report presents the characteristics and elements of ESR systems to facilitate improved safety performance for transit agencies.

The literature review documented the benefits of ESR systems, including the role of safety culture in the efficacy of an ESR system and relevant aspects of a program, and provided the framework on which to base the review of each agency's ESR system. The research included case studies of 19 geographically dispersed public transportation agencies that have implemented an ESR system. The transit agencies vary in size, operating characteristics, and the complexity of the ESR system instituted. ESR

¹Center for Urban Transportation Research at the University of South Florida, Tampa, FL

Corresponding Author:
Jodi Godfrey, jodis@cutr.usf.edu

system successes, for the purposes of this research, were determined by the transit agencies, and were not determined successful through a statistical modeling or evaluation by the researchers.

Literature Review and Background Research Summary

The National Transportation Safety Board (NTSB) investigated catastrophic collision events that resulted in loss of life, injuries, and costly damage and deduced that many of these events could have been avoided had an effective non-punitive ESR system been in place to report hazards. One of those events, the 2009 Washington Metropolitan Area Transit Authority (WMATA) train-on-train collision near Fort Totten Station, resulted in nine fatalities, 52 injuries, and an estimated \$12 million in damages. This event led to NTSB recommendation R-10-004 to FTA:

Facilitate the development of non-punitive safety reporting programs at all transit agencies to collect reports from employees in all divisions within their agencies and to have their safety departments; representatives of their operations, maintenance and engineering departments; and representatives of labor organizations regularly review these reports and share the results of those reviews across all divisions of their agencies. (2)

An ESR system is only one element of SMS, but its role in the overall safety culture within the public transportation industry cannot be overstated. Literature review findings revealed many benefits associated with non-punitive ESR systems throughout the transportation industry, which will be presented through examples and leading practices.

Benefits

Significant research addresses the benefits of ESR systems across the transportation industry. The American Public Transportation Association (APTA) cites a non-punitive near-miss policy as one of the indicators for an effective SMS (3); and the Federal Aviation Administration's (FAA's) well-defined and long-standing Aviation Safety Reporting System (ASRS), demonstrates that non-punitive ESR systems that identify hazards and close calls benefit the industries and entities that adopt them. Specifically, the ASRS led to the identification of airspace traffic conflicts, and subsequent timely alerts and mitigation, avoiding potentially catastrophic collisions (4).

Based on recognized benefits described in research activities and through improved safety records for those industries, the Federal Railroad Administration (FRA)

established its Confidential Close Call Reporting System (C³RS), through an implemented pilot program. Because of its success, FRA's pilot program expanded from four original sites to nine sites (two original sites and seven passenger rail agencies) as of August 2019. In its most recent lessons learned publication, FRA stated:

C³RS can be beneficial and sustainable in the railroad industry with both good implementation by individual carriers and continued support from FRA and national labor. FRA has taken steps to support sustainability in the railroad industry. Those steps have included continued funding for the C³RS program's third party to collect close call reports and the allocation of dedicated staff. (5)

The *C³ RS Lessons Learned Evaluation—Final Report* found derailments reduced 20%–40% across three sites, transportation-related injuries fell by 18% at one site, and two sites saw 39%–90% fewer disciplinary hearings, since implementing a confidential close call reporting system (specific pilot locations were not disclosed) (5).

A companion study documented in TRACS Report 11-01, *Establishing a Confidential, NonPunitive, Close Call Safety Reporting System for the Rail Transit Industry*, found that a non-punitive close call reporting system can potentially build trust between labor and management, knowing the information will be acknowledged and not be used against the employee who reported it (6, 7).

Benefits of ESR systems expand beyond the transportation industry, as ESR systems have been touted as a tool to strengthen the safety culture of the offshore oil and gas industry. The U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE), one of the regulatory and oversight bodies for the offshore oil and gas industry, made it compulsory to comply with the Safety and Environmental Management Systems rule (8), which requires the industry submit near-misses and incident reports and share them with the industry. The 2018 *Annual Report* documented the successes of both equipment failures and blowout prevention components of the program, reflected in increased reporting and utilization of data collected through the reporting that the industry can use to correct existing safety concerns (9).

Examples

The Occupational Safety and Health Act (OSHA) of 1970 (29 U.S.C. § 651 and 29 C.F.R. Parts 1900 to 2400) grants employees and representatives the right to file a complaint and request an OSHA inspection of their workplace if they believe there is a serious hazard. The act also establishes the employee's or other complainant's right to request their name not be revealed to their

employer. If an employee feels their employer has retaliated or taken punitive action against them, OSHA provides instructions on how to file a whistleblower complaint (10).

In 1976, the FAA established the ASRS, which included a Memorandum of Understanding (MOU) with NASA as the third-party administrator of the safety reporting system. The ASRS is a voluntary reporting system in the aviation industry available to pilots, air traffic controllers, dispatchers, cabin crews, maintenance technicians, and others. NASA includes initial and subsequent documentation in the final event record after all personally identifiable information has been removed from the report. ASRS uses this information as the source for Alert Messages (alert bulletins or information notices) and for information included in its monthly safety newsletter *CALLBACK*, the *ASRS Directline* journal, aviation safety research, and so forth. A category of review called “Quick Response” initiates a rapid data analysis process for reports of immediate operational importance (11).

The 1996 *Freedom of Employees in the Nuclear Industry to Raise Safety Concerns without Fear of Retaliation* (12) led to the establishment of the Nuclear Regulatory Commission’s (NRC’s) Allegation Program. The Allegation Program allows employees and the public to report potential or actual safety issues associated with the NRC’s jurisdiction. Safety issues can be reported using email or a safety hotline. Allegation Coordinators investigate and evaluate reports, to determine if feedback or other immediate industry notification is necessary. Although NRC makes all “reasonable efforts” to protect the identity of a reporter, it does not provide the same protections to employees as those found in the programs managed through NASA or the Bureau of Transportation Statistics (BTS) (13).

The National Air Traffic Controllers Association’s (NATCA’s) Air Traffic Safety Action Program (ATSAP), established in 2008, is modeled after FAA’s Aviation Safety Action Program (ASAP) and includes a voluntary non-punitive safety reporting system for air traffic controllers and other employees. The program provides employee protections from punitive or disciplinary action for those personally involved in the safety events. Safety areas reported are tracked to identifying any systemic industry trends (14). The program provides a feedback loop to the reporter. The NATCA considers the safety reporting system a success and feels reporters are comfortable submitting information because they know all information submitted is confidential and non-punitive (15).

In 2010, FRA and NASA signed an interagency agreement assigning NASA as the third-party administrator

for Amtrak; since that time, FRA has transitioned the administration of all C³RS locations, which now includes nine passenger rail carriers, to NASA. FRA and labor and management representatives negotiated an MOU for the C³RS locations, as described earlier, defining those close call events included within the program scope, requirements for confidentiality, and the obligations and commitments of all parties. NASA determines if the report meets the review qualifications and, if so, follows up with the reporter to inform them of the outcome of any corrective actions or mitigation measures. All identifying information is redacted before provided to the agency (5).

In 2013, the BSEE and BTS entered into an interagency agreement to implement and operate a voluntary confidential near-miss ESR system for the offshore industry, the Safe Outer Continental Shelf (SafeOCS). BSEE established this system to provide an environment for operators and employees to raise concerns and report equipment and other safety-related events. In November 2016, an MOU between BSEE and BTS expanded the program to include the reporting of safety and pollution prevention equipment (SPPE) failure reports (16). Employees or other industry representatives can create an account and register through the reporting system. Those with accounts can report near-misses through the program website at www.safeocs.gov. Once BTS receives the reports, information is evaluated, analyzed, and presented as aggregate results to stakeholders.

In 2019, the FTA PTASP rule 49 C.F.R. §673.23(b) final rule was enacted requiring transit agencies establish and implement a process that allows employees to report safety conditions to senior management, protections for employees who report safety conditions, and a description of employee behaviors that may result in disciplinary action (1). Safety assurance and safety promotion elements are included in subsequent sections of the final rule, requiring transit agencies to monitor the reported information and inform employees of safety actions taken in response to reported safety concerns. FTA developed guidance to assist agencies in meeting the requirements, with characteristics of a good ESR system inclusive of management commitment, empowered employees with clearly defined individualized safety roles that clarify safety as the responsibility of everyone, and a culture of learning from past mistakes. Additionally, FTA characterizes good safety culture as a flexible and adaptable culture of learning that fosters essential trust between informed operators and managers (17).

Leading Practices

The literature review and background research established data-supported leading practices that are central

Table 1. Transit Agencies Included in the Study

Transit agency	Location
Big Blue Bus (BBB)	Santa Monica, California
Capital Metro Transportation Authority	Austin, Texas
Central Florida Regional Transportation Authority, DBA LYNX	Orlando, Florida
Chicago Transit Authority (CTA)	Chicago, Illinois
Greater Cleveland Regional Transit Authority (GCRTA)	Cleveland, Ohio
Jacksonville Transportation Authority (JTA)	Jacksonville, Florida
King County Metro	Seattle, Washington
Lane Transit District (LTD)	Springfield, Oregon
Lee County Transit (Lee Tran)	Fort Myers, Florida
Los Angeles County Metropolitan Transportation Authority (LA Metro)	Los Angeles, California
Maryland Transit Administration (MTA)	Maryland
Massachusetts Bay Transportation Authority (MBTA)	Boston, Massachusetts
Metropolitan Atlanta Rapid Transit Authority (MARTA)	Atlanta, Georgia
Miami Dade Department of Transportation and Public Works (MDT)	Miami, Florida
Sacramento Regional Transit District (SacRT)	Sacramento, California
Sarasota County Area Transit (SCAT)	Sarasota, Florida
Southeastern Pennsylvania Transportation Authority (SEPTA)	Philadelphia, Pennsylvania
Tri-County Metropolitan Transportation District of Oregon (TriMet)	Portland, Oregon
Washington Metropolitan Area Transportation Authority (WMATA)	Washington, DC

to each of the example ESR systems that were examined for this report (18).

- Research indicates that online ESR systems provide greater access to affected employees and provide both perceived and, in some cases, real anonymity.
- The literature documents the successes achieved when employees are protected from punitive actions. This success is reflected in significant growth in employee reporting in several national ESR systems.
- Structured and comprehensive examination of reported hazards or near-misses based on defined reporting parameters is central to ESR systems.
- A formal approach to dissemination of reported hazards, close call events, and mitigation strategies is another key element of ESR systems.

Case Study Findings

Process and Participants

The research team developed and disseminated a 22-question survey, receiving complete responses from 19 transit agencies; the aim was to gain an understanding of the ESR systems in place at those transit agencies. Once the transit agencies completed the survey, the research team conducted phone interviews with each respondent to obtain more details about their systems. The 19 transit agencies included in the analysis performed for this report are shown in Table 1.

ESR Characteristics

The 19 transit agencies included in the study have ESR systems of varying maturity levels, ranging from less than 1 year to over 20 years. The methods by which safety hazard reporting can occur include hard copy forms, online submissions through apps, intranet, or email, and through the phone via hotlines, texts, or voicemail. Figure 1 displays characteristics of ESR systems, showing the share of respondents that offer anonymity, confidentiality, third-party ESR system management, and inclusion of collective bargaining union involvement in the initial ESR system design.

Anonymity and confidentiality are two characteristics of ESR systems that allow employees to report hazards or close call events that they may not otherwise feel comfortable sharing because of fears of retribution, punishment, or embarrassment. One of the most prominent benefits of using a third party to manage an ESR system is the ability to emphasize the anonymity or confidentiality of the reporters. Anonymous data is recorded so the information shared can never be linked to the subject who supplied it. On the other hand, confidential data is recorded in such a way that the information is not immediately identified with the subject who supplied it, but such a link is possible through record assignment. The biggest benefit to confidentiality, as opposed to anonymity, is the ability to garner follow-up information if it is necessary to understand the reported hazard from a holistic perspective.

Policy and Reporting Practices. Of the 19 respondents, 53% indicated they have a policy in place that explicitly

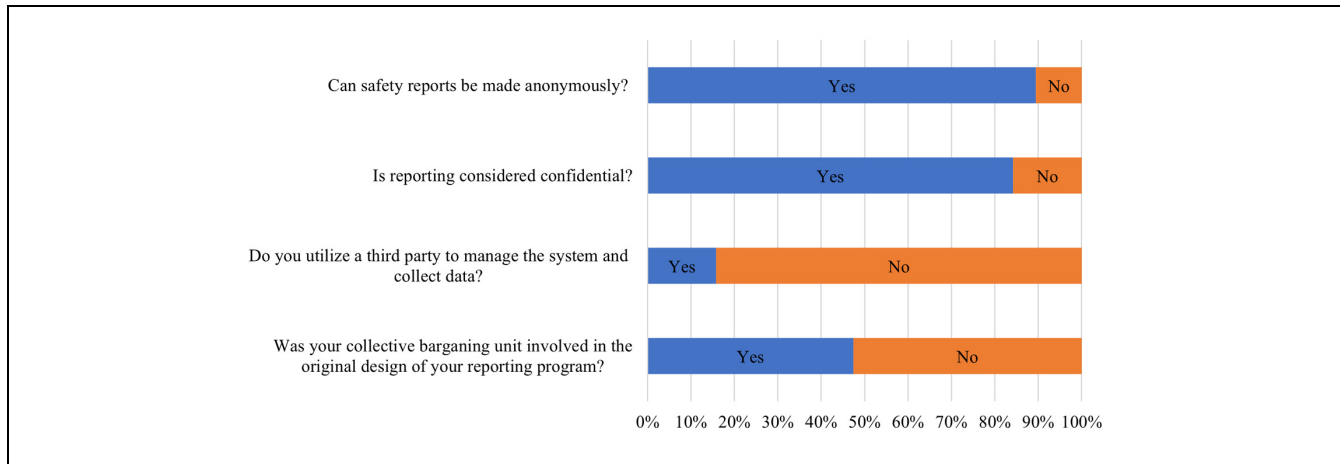


Figure 1. Characteristics of employee safety reporting systems.

distinguishes between what type of event is reportable through the non-punitive ESR system and what type of event is considered to imply negligent or illegal actions that may result in discipline. The remaining respondent agencies do not have a formal policy instituted or their policy does not distinguish between reportable non-punitive and punishable events.

A pre-established review team is in place at nine of the 19 respondent transit agencies. The other 10 that have non-punitive ESR systems in place have review teams with members that vary by location, department, or area of expertise.

Ten of the 19 transit agencies developed their ESR system without the use of guidance documents, local regulations, or recommended practices. The other nine transit agencies used SMS implementation guidelines or guidance from FRA or the California Public Utilities Commission (CPUC).

Stakeholder Input. Another characteristic of a non-punitive ESR system that is imperative to consider is the role of stakeholder input in the design and implementation phases of a reporting program. Stakeholders include accountable executives, managers and supervisors, operations and safety representatives, and labor union representation. As Figure 1 shows, the collective bargaining unit played a role in the original design, implementation, or both, of nine of the 19 responding transit agencies' ESR systems.

The transit agencies were asked if they have solicited input from frontline employees on the subject of reporting program improvements. The majority (79%) indicated they have solicited feedback from employees through methods that include a place on the hazard report form itself, at meetings, in person, via a survey, or through email. While four of the 19 indicated they had

not yet solicited feedback on their non-punitive ESR system, all indicated their intent to solicit feedback in the future. When asked specifically about safety culture surveys within their organization, Jacksonville Transportation Authority (JTA), Los Angeles County Metropolitan Transportation Authority (LA Metro), Maryland Transit Administration (MTA), Miami Dade Department of Transportation and Public Works (MDT), and WMATA all indicated that they have disseminated safety culture surveys to their employees to gauge safety culture perceptions.

Performance Measures. Surveyed agencies were asked if they currently track performance measures to determine the efficacy of their non-punitive ESR system. Ten of the 19 transit agencies responded that they do not track performance measures related to their non-punitive ESR system. Two were in the process of identifying the performance measures to track and trend to determine program efficacy. The other seven transit agencies track and trend various performance measures related to their ESR system, including metrics related to the volume and status of hazard reports, the hazard or event description, contributing factors, and results.

The performance metrics related to report volume and status include:

- Number of reports per month
- Customer complaints
- Open versus closed report status
- Average days to closure
- Target closure date

There are also performance metrics related to the description of the hazard or event and possible contributing factors that are reported through the survey, including:

- Hazard/event classification
- Reports by area (facility, equipment, system, security)
- Mode
- Date of hazard/event reported
- Party responsible
- Root cause

Finally, the surveyed transit agencies track and trend the following performance metrics as indicators of program efficacy:

- Workers' compensation claims and costs
- Lost time and non-lost time injury rates per 200,000 work hours
- Vehicle accident rates per 100,000 mi
- The experience modifier determined by the workers' compensation insurance system

Common Elements

Program Design Framework

Through the background research, several representative ESR frameworks were identified which delineate critical elements of the ESR system design. The research indicates public transportation agencies should develop policies, procedures, and programs based on a clearly defined framework implementation strategy and standard operating practice. The framework elements are shown in Figure 2.

Definitions. The seminal point in the development and execution of any formal close call reporting system is defining the terms that will be used to identify qualifying events. The terms “close call” and “near-miss” are often used interchangeably, as demonstrated by case study sites and in the literature review. As presented in FTA’s Close Call Reporting System Implementation Plan, a close call would likely include the following:

- An incident with potential to result in serious injury or death
- A potential safety incident caused by an operator error
- A rule violation or other abnormal operating event that did not result in an accident
- A safety hazard that could have resulted in an accident
- A near-miss event that could lead to an unsafe operating environment (19)

Delineation of Reportable Events. From the transit agency definition of what is considered a close call or near-miss



Figure 2. Program design framework.

event, the next step is delineating what specific events are considered reportable and communicating that delineation across the transit agency. This delineation may also provide steps reporters must take to report events that may pose immediate threats versus those that may not. The agency may design the reporting framework to collect reports on events that vary in the level of risk, with corresponding processes for each of those levels.

Reporting Procedure/Process. The background research and the case studies illustrate the benefits of providing employees multiple platforms for reporting. Online web-based reporting was consistently referenced, along with telephone hotlines, and, in some cases, the ability to submit hard copies of reporting forms. Transit agencies may consider an electronic reporting method if they are concerned with their ability to maintain confidentiality and provide a platform for anonymous reporting. While other methods can ensure confidentiality and anonymity, data control and custody practices must be thoughtfully developed.

Investigation and Follow-Up. Public transportation agencies should have a structured process in place to ensure employees who report safety hazards to an ESR system know their reports were submitted and the transit agency is taking action to address the reported hazard. The case studies, and long-standing ESR systems highlighted in the literature review, provide multiple examples of follow-up activity. Follow-up takes many forms,

including email correspondence, electronic tracking of applications, postings in transit agency common areas, verbal/written reports provided during safety meetings, and in updates provided to agency management.

An ESR system is not solely about reporting an event. The case studies recognize the criticality of the process, but offer that the most important element is how the agency manages the associated safety risks once identified. The reporter should be notified that the agency has received their report, investigated and processed it in accordance with agency policies, and action has been taken.

Mitigation Strategies. Data collection and analysis goes beyond the contents of an ESR. Background research and case studies identify that collecting, analyzing, and monitoring safety trends is a central point of SMS's safety risk management and safety assurance processes. ESR systems promote data-driven mitigation strategies to eliminate or reduce risk identified by any employee. Mitigation strategy effectiveness should be determined with specific performance measures identified and tracked against employee reports, accident/incident investigation findings and reports, and other public transportation agency data.

The background research and case studies illustrate that ESR systems will become more prevalent in the public transportation industry, primarily because of the industry-wide adoption of the SMS framework and the implementation of locally developed PTASPs. In anticipation of the associated greater data collection and analysis needed, public transportation agencies will have to internally develop or purchase technologies and information management system platforms to effectively log reports (or have them generated directly to these ESR systems), analyze trends over time (including those that may be systemic in nature), generate reports, and monitor corrective actions, at a minimum.

Outcome Notification. As reports are submitted, employees and contractors operating within that unit should be made aware of the reported hazard or concern. Notification often takes the form of bulletin board postings (including electronic message boards) or communication during regularly scheduled safety meetings or between unit employees and supervisors. For hazards or concerns that would have the potential to affect the employees or other personnel at other operating bases (as an example) or all employees and contractors, the notification should be directed agency-wide from management.

There will be hazards or concerns that involve external partners, such as local government public works departments, that may require communication with

those outside entities and corrective action on their part. This could include hazards associated with specific intersections, bus stop locations, signals and signage, or tree limbs that limit the field of view, as examples. It is important that all stakeholders recognize that safety is important and that hazards or other unsafe conditions or actions are being addressed and mitigated.

Evaluating the Strategy/Process. All the non-punitive ESR systems and processes examined in this research provide employees and other stakeholders clearly defined processes or opportunities to provide input to the program. This ongoing process for change should have a well-documented process for gaining input from any stakeholder. At a minimum, a transit agency should conduct surveys during the design period, following beta testing that might occur, after training or promotion has occurred, after initial implementation, and then routinely after its full implementation.

To inform frontline workers of program benefits and the need for their input, transit agencies should routinely report program successes. If employees recognize the agency is listening to them, that actions have been taken that have improved the overall safety of the agency, and that the agency also values their input on the ESR system, they may be more likely to present their observations of the ESR system and recommend improvements.

Even though a system is non-punitive, it may not establish that all reported behavior is acceptable (20). Every non-punitive ESR system should establish a formal policy and corresponding procedure that defines the types of protections that are afforded by reporting and how identifiable information will be used (21). "Fair treatment of employees also requires fairness and consistency in dealing with rule violations. When rule violations occur, there should be a fair appeals system in place to dispute them in case of a disagreement" (20). Employees must be made aware of what is punishable when there appears to be a blatant disregard for any rules, when it is determined to be intentional or caused by negligence (22).

Case Study Common Characteristics

The 19 public transportation agencies in this study found varying degrees of success in the design, implementation, and ongoing management of their ESR systems. The researchers identified common practices from these case study participants, which are reflected within eight overarching themes described below and illustrated in Figure 3 in alphabetical order.

Access. LA Metro has a single online submittal method, the SAFE-7 form. To accommodate its employees and

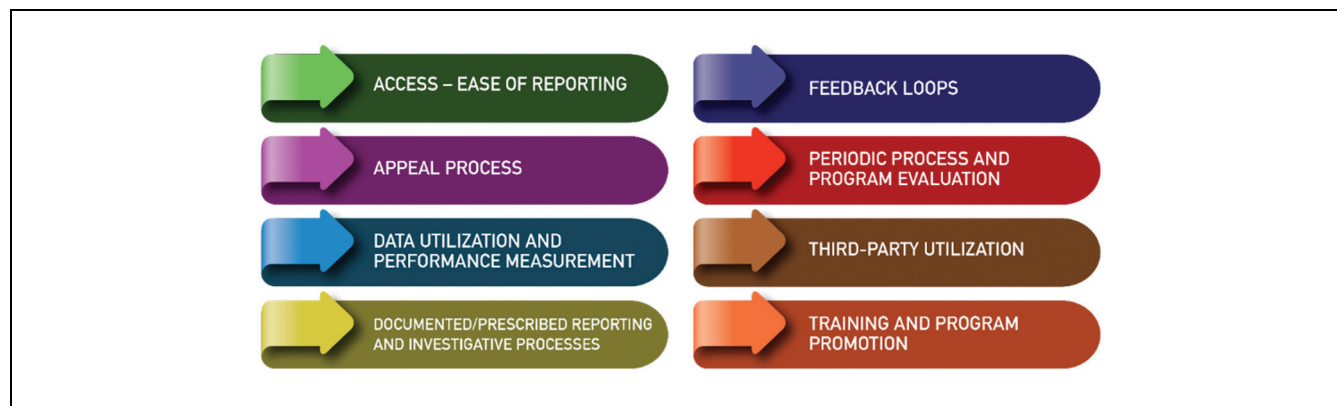


Figure 3. Case study common characteristics.

ensure their ability to report, LA Metro installed desktop computers at each division and provides access to every employee. Conversely, MDT provides multiple reporting options to its employees, including a hard copy form, online, or via the agency's smartphone application—the MDT Tracker, which they developed internally. Anonymity is ensured through both the online reporting portal and the MDT Tracker, used by both employees and the public. The Transport Workers Union (TWU) shop steward or officers may also bring safety concerns forward on behalf of their employees. Of all public transportation agencies included as case study sites for this project, Southeastern Pennsylvania Transportation Authority (SEPTA) has the most reporting options available to employees, including paper forms, an online employee portal, email, a hotline, and third-party reporting for their commuter rail.

In these examples, the transit agencies indicate a consistent level of reporting and significant ESR system improvements that were made as a result of the reporting. The success of varying ESR systems leads to a key takeaway that the ideal number of reporting options will not be consistently uniform across transit agencies. Rather the number of options should optimize employee access along with the agency's ability to document and follow up with reported hazards.

Appeal Process. An appeal process is important for employees who do not feel a reported safety hazard was reasonably mitigated. Several respondent case study transit agencies have appeal processes in place for employees.

Capital Metro, Greater Cleveland Regional Transit Authority (GCRTA), Massachusetts Bay Transportation Authority (MBTA), SEPTA, and WMATA have instituted the Good Faith Challenge program at their transit agencies, in accordance with the FRA procedures defined

in 49 CFR 218.97 (23) for their commuter rail operations, which afford right-of-way employees the right to challenge procedures that violate FRA regulations or railroad operating rules in good faith.

The Safety Hazard Notification and Escalation Process of the Metropolitan Atlanta Rapid Transit Authority (MARTA) establishes the steps required to gather, investigate, and correct the reported hazard. It also delineates an appeals process in the event the reporter is dissatisfied with action taken or the response. MARTA's Safety Hotline Procedure provides the scope and purpose of the hotline, the definitions used, various responsibilities of MARTA personnel, and the details of the Safety Hotline notification and investigation process.

At MDT, if an employee is not satisfied with the evaluation and associated resolution of their reported concern, they may request a Transit Safety Review. In Maryland, MTA employees who are not satisfied with the hazard mitigation may bring that concern to the safety officer assigned to resolve that concern. At TriMet (Tri-County Metropolitan Transportation District of Oregon), employees that feel their concern was not fully answered or adequately resolved may request the safety assessment be re-opened.

The variation in the use of appeal processes for safety hazard mitigation among case studies reveals that not one particular type of appeal process will work for every transit agency. Rather, transit agencies should consider the types of resolution process that will work best at their agency based on transit agency size, resources, ESR system frequency of use, and appeals.

Data Utilization. All public transportation agency case study participants are champions of SMS and recognize the value of data-driven priorities in risk abatement and process improvement. Transit agencies understand that ESR systems are central to the effectiveness of the SMS

framework and are using the data gathered from these reports to identify both lagging and leading risk indicators for their agencies.

Data collection and analysis brings concerns about access to data, from an individual reporter's and the agency's perspective. The third parties that oversee FAA's and FRA's ESR systems have evidentiary protections granted to them in Federal law. As of the writing of this report, Congress had not yet granted these evidentiary protections to public transportation agencies collecting ESR and accident/incident specific data in support of SMS implementation. During the interviews with case study transit agencies, the majority also indicated State law does not protect the data currently collected.

Documented Reporting and Investigative Processes. An important element of reporting and investigative processes is establishing timelines. Public transportation agencies establishing ESR systems should define the process and clearly state the steps from receipt of the initial report, through resolution, to the ongoing monitoring of associated hazards and mitigation strategies. Process/procedure documents should include specific timelines for:

- Notifying reporters the report was received
- Reviewing reports and determining the validity of the hazard
- Assigning the investigator (investigating department)
- Completing the investigation, including necessary follow-up
- Developing corrective action plans
- Performing corrective actions
- Notifying the reporter, and agency personnel, of the hazard reported and the steps taken to correct the hazard
- Revisiting mitigations to ensure no unintended consequences were introduced

Feedback Loops. Every case study participant established processes to ensure reporters are notified of report receipt, investigation outcomes, steps taken to correct the reported event or hazard, and any additional follow-up actions taken in response to the reported concern. Transit agencies with electronic report submittals include an autogenerated confirmation to the reporter.

Communication between reporters and those responsible for implementing the hazard elimination or mitigation measures is critical. This feedback loop fosters an environment where employees feel empowered to improve the safety of their working environment through ESR. Feedback is also important even when the hazard is reported anonymously or confidentially, and many transit agencies have found ways of sharing safety

improvements in safety meetings and using bulletins or other information dissemination methods.

Program Evaluation. The findings from the literature review and the case studies corroborate the importance of iteratively evaluating ESR systems to ensure intended performance. One evaluation method garners feedback on suggested improvements through employee surveys. Providing employees an opportunity for input on the process may foster increased reporting as well. These evaluations are also related to feedback loops noted previously, which build morale and improve overall safety culture.

Third-Party Utilization. With the exception of public transportation agency case studies that have C³RS embedded in their ESR options (MBTA and SEPTA), WMATA's use of BTS, and the use of Navex Global for anonymous reporters through TriMet's ESR system, other case study sites are not using a third party to collect, analyze, report, or maintain safety data. However, with the implementation of SMS and the adoption of PTASPs, a national safety reporting platform would be valuable and would ensure greater employee safety reporting. There are benefits to the confidentiality and data protection characteristics of an ESR system managed by a third party.

Training and Program Promotion. Training is an important element in the successful implementation of ESR systems. All interviewed transit agencies introduce employee hazard reporting opportunities during new-hire training. Several transit agencies also remind their employees of the safety reporting opportunities at committee meetings, refresher training, and other safety outreach events. Most agencies interviewed do not tailor their training by employment position and do not provide training to contracted employees.

Challenges

Some of the challenges echoed by transit agencies included the inability to estimate a return on investment because of limitations in estimations of both costs and benefits. Case study transit agencies established ESR systems as part of their SMS program and, therefore, were unable to segment the personnel efforts specifically for ESR system activities. Estimations of ESR system benefits should include quantitative measures supported by performance data, which presents additional challenges.

Three respondent transit agencies, LA Metro, MTA, and MBTA, indicated that their contracted employees typically report safety concerns to their respective employers, who then share the details with the transit

agency when necessary. However, transit agency representatives indicated challenges with access to data in this type of scenario. MTA representatives mentioned that the agency is working with various contracted services providers to transition to MTA's reporting tools to ensure the maintenance of a centralized all-encompassing hazard log.

Transit agencies are also working to promote the use of ESR systems to increase reporting. Some agencies report success with obtaining hazard reports, but lack near-miss reports that are intended to be collected for data analysis as well.

Elements of Success

The surveyed transit agencies also identified ESR system successes. A mature safety culture is an environment where ESR systems find best success.

Big Blue Bus (BBB) experienced a decrease in fixed-object strikes attributable to the ESR system, where a data analysis revealed multiple collisions at one location where overgrown trees were reported to be a hazard. Capital Metro eliminated/mitigated identified risks through tracking and trending of safety concerns reported through Metro's ESR system including overgrown vegetation, tripping hazards, and fencing installation to restrict unwanted access. GCRTA's ESR system reports have led to improved maintenance procedures, and updated asset trees and condition tabs to ensure optimal maintenance attention. WMATA implemented many documented preventive safety actions to improve system safety, which resulted from ESR system reports, including improved new-hire training, improved bulkhead door seals, updates to the Controller Handbook, intersection improvements for maneuverability, and more.

While the surveyed transit agencies are all working toward improved safety cultures, many have displayed elements of success through implemented ESR systems. These elements of success should be used as examples of benefits that other transit agencies may obtain through ESR system implementation at their agency.

Conclusion

In the background research, benefits associated with wide dissemination of commonly reported hazards and methods to address them were identified. In each example, reports are collected, trends and concerns are identified, safety risks that present systemic industry concerns are established, and potential causal factors are presented. Aggregated statistical reports are made available to the industry and the public. A central repository of public transportation industry reported hazards, close calls, and

near-miss information may present an opportunity to improve the safety of the nation's public transportation industry and establish the effectiveness of the PTASP and SMS framework.

Research recognizes benefits of using an external party to administer and manage ESR systems, which increases the likelihood that employees will report safety events, and reduces the likelihood of associated punitive or retaliatory consequences. When reflecting on the quantity and flow of report submittals in response to SMS implementation, case study sites favorably viewed the use of a third party. However, there was concern voiced about the costs of instituting the program through a third party.

Employees who report, and public transportation agencies collecting, analyzing, and maintaining safety data in support of SMS, must be assured that the data can remain confidential. Without evidentiary protections, the ability of an agency to protect employee-submitted data or accident/incident data is limited. Protections granted to employees, including industry evidentiary protections, will ensure greater reporting and, in turn, safer public transportation agencies.

Author Contributions

The authors confirm contribution to the paper as follows: study conception and design: L. Staes, J. Godfrey; data collection: L. Staes, J. Godfrey; analysis and interpretation of results: L. Staes, J. Godfrey; draft manuscript preparation: L. Staes, J. Godfrey. All authors reviewed the results and approved the final version of the manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. eCFR. Title 49 C.F.R. Part 673—Public Transportation Agency Safety Plans §673.23(b). <https://ecfr.io/Title-49/pt49.7.673>.
2. National Transportation Safety Board. Railroad Accident Report: Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains near Fort Totten Station Washington, D.C., June 22, 2009. National Transportation Safety Board, 2010, pp. 125–127. <https://www.nts.gov/investigations/AccidentReports/Reports/RA R1002.pdf>.
3. APTA. *Safety Management System Manual—Public Passenger Transportation Systems*. American Public Transportation Association, Washington, D.C., 2016, pp. 8–19.

4. NASA. ASRS Program Briefing. Aviation Safety Reporting System, 2019, p. 27. https://asrs.arc.nasa.gov/docs/ASRS_ProgramBriefing.pdf.
5. Davey, M., S. Kidda, J. Morrell, J. M. Ranney, and M. Zuschlag. *Confidential Close Call Reporting System (C³RS) Lessons Learned Evaluation—Final Report*. Federal Railroad Administration, U. S. Department of Transportation, Washington, D.C., 2019, pp. 54–55, 124–141.
6. *Establishing a Confidential, Non-Punitive, Close Call Safety Reporting System for the Rail Transit Industry*. TRACS Working Group 11-01 Report, July 2012, 2–16, B-5-B-19, C3-C4.
7. Dekker, S. W. A. *Just Culture: Balancing Safety and Accountability*. Ashgate Publishing, Lund University, Sweden, 2007, pp. 43–44, 53–56, 76.
8. National Academies of Sciences, Engineering, and Medicine. *Strengthening the Safety Culture of the Offshore Oil and Gas Industry*. Transportation Research Board, Marine Board, Board on Human-Systems Integration, Division of Human Behavioral and Social Sciences and Education, Washington, D.C., 2016.
9. Bureau of Safety and Environmental Enforcement. BSEE SAFECOM Summary. <https://www.bsee.gov/sites/bsee.gov/files/reports//bsee-safecom-summary-fy-18-a.pdf>.
10. United States Department of Labor. Occupational Safety & Health Administration. https://www.osha.gov/sites/default/files/enforcement/directives/CPL_02-03-007.pdf.
11. ASRS. Program Briefing. *Aviation Safety Reporting System*, NASA, 2019. https://asrs.arc.nasa.gov/docs/ASRS_ProgramBriefing.pdf.
12. US Nuclear Regulatory Commission. *Freedom of Employees in the Nuclear Industry to Raise Safety Concerns without Fear of Retaliation; Policy Statement*. Federal Register: May 14, 1996 (Volume 61, Number 94). U.S. NRC, Washington, D.C., 1996, pp. 24336–24340. https://www.dol.gov/agencies/oalj/PUBLIC/WHISTLEBLOWER/REFERENCES/FEDERAL_REGISTER/61_24336.
13. US Nuclear Regulatory Commission. Reporting Safety Concerns to the NRC. <https://www.nrc.gov/docs/ML1720/ML17208A272.pdf>.
14. Air Traffic Safety Action Program. <https://www.atsapsafety.com/atsap-home/#>.
15. FTA Office of Safety and Oversight. *Transit Safety and Oversight Spotlight*. Federal Transit Administration, Washington, D.C., Vol. 3, No. 2, 2018, pp. 5–6.
16. U.S. Department of Transportation. Bureau of Transportation Statistics. Oil and Gas Production Safety System Events—2017 *Annual Report*. https://near-miss.bts.gov/2017_SPPE_Annual_Report_Updated_05292018.pdf, accessed August 10, 2019.
17. FTA. 2019 Joint SSO and RTA Workshop. Employee Safety Reporting Programs. *Federal Transit Administration*, 2019. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/regulations-and-guidance/safety/133846/2019-joint-sso-and-rta-workshop-tso-employee-safety-reporting_2.pdf.
18. National Academies of Sciences, Engineering, and Medicine. Characteristics and Elements of Non-Punitive Employee Safety Reporting Systems for Public Transportation. Washington, D.C., 2020. <https://doi.org/10.17226/25852>.
19. Federal Transit Administration. *Close Call Reporting System Program Implementation Plan*. FTA BPA Number: DTFT60-10-A-0009. U. S. Department of Transportation, Washington, D.C., 2012.
20. *Building toward a Strong Safety Culture Within the Bus and Rail Transit Industry*. TRACS Working Group 16-01 Final Report, February 2017, 15–26.
21. Hanssen, C., J. A. Morell, D. Thompson, R. Wallace, and B. Wygant. *Confidential Close Call Reporting in the Railroad Industry: A Literature Review to Inform Evaluation*. New Vectors, LLC, Altarum, Ann Arbor, MI, 2006, i-28, D-3.
22. National Academies of Sciences, Engineering, and Medicine. *Safety Management Systems for Airports, Volume 2: Guidebook*. Transportation Research Board, Washington, D.C., 2009, pp. 23–92.
23. Electronic Code of Federal Regulations. Title 49 CFR 2185.97. *Good Faith Challenge Procedures*. https://www.ecfr.gov/cgi-bin/text-idx?SID=096e6c919391f49c2e71c19e5c78c819&mc=true&node=se49.4.218_197&rgn=div8.