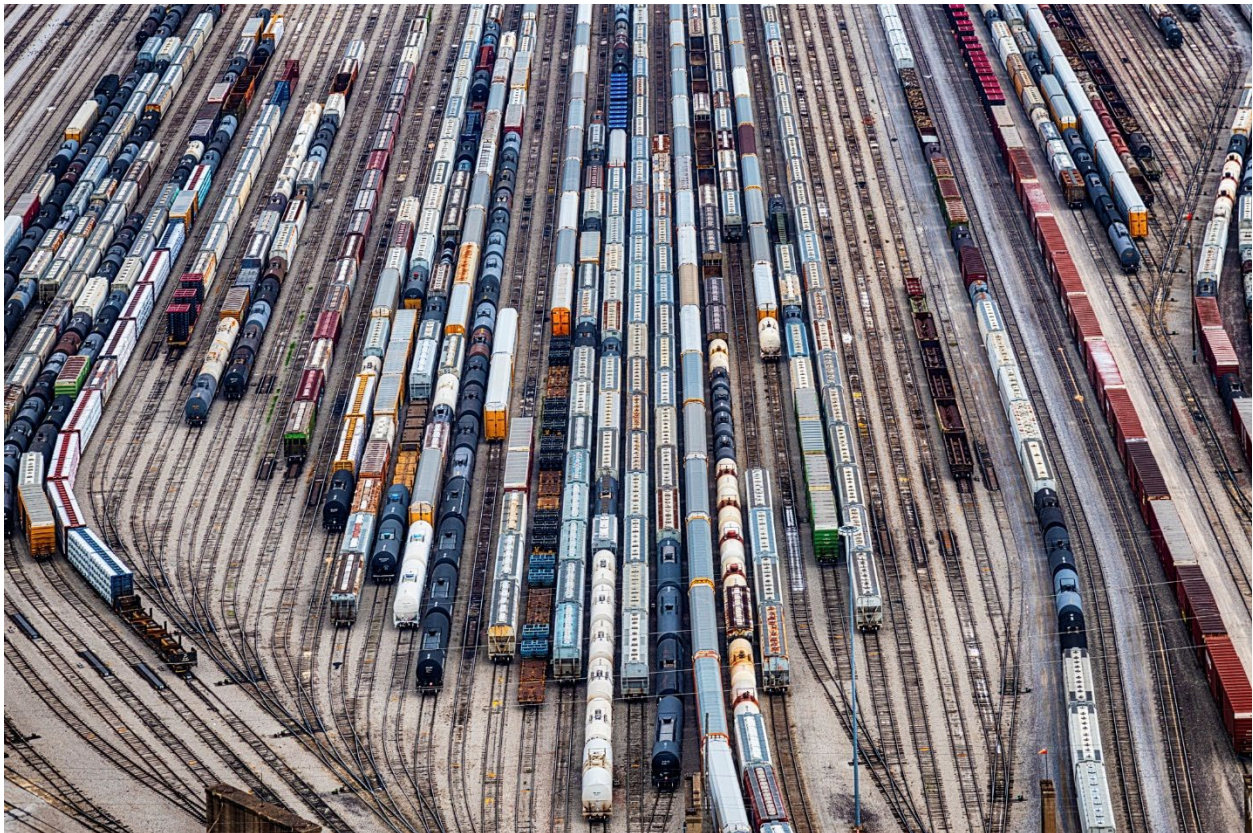




U.S. Department
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**Federal Railroad
Administration**

Office of Research,
Development and Technology
Washington, DC 20590

Exploration of Training to Address Human Factor Risks in Railroad Switching and Shoving



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Executive Summary

Freight railroad switching operations remain one of the most hazardous activities in the rail industry, with shoving movements representing a substantial share, almost 80%, of human-factor–related injuries and fatalities. To address persistent safety challenges in this domain, ENSCO, Inc. and TrueSafety Evaluation, LLC (TSE), under sponsorship of the Federal Railroad Administration (FRA), conducted a research study from July 2024 through December 2025. The study examined safety risks, training gaps, and opportunities to strengthen workforce preparation for switching and shoving tasks, particularly among new and early-career employees. As part of this study, the team developed and pilot-tested a supplemental two-day switching-operations training course at FRA’s Transportation Technology Center (TTC) in Pueblo, Colorado.

The objective of the study was to create a structured, evidence-informed framework to guide FRA and industry initiatives related to switching-operations training, with emphasis on high-risk shove movements. The research focused on: (1) identifying safety risks and training gaps; (2) developing supplemental human-factors-aligned training course; (3) designing a pilot curriculum targeting new-hire and early-career employees; (4) delivering the course at TTC; and (5) gathering structured stakeholder feedback to inform future development.

A mixed-methods approach was used. The quantitative component analyzed FRA accident and incident data from 2016 through May 2024 and reviewed National Transportation Safety Board (NTSB) railroad investigation findings. The qualitative component included interviews with labor, management, and regulatory stakeholders; a literature review of FRA-published research since 2000; and Cognitive Task Analysis (CTA) interviews with experienced Class I trainers. Insights from these activities informed the development of a course integrating classroom instruction, Crew Resource Management (CRM), situational-awareness techniques, interactive decision games, and TTC field exercises.

Analysis of FRA data confirmed that switching rules and operations account for 59% of human-factor incidents. This underscores the need for supplemental, scenario-based training emphasizing switching fundamentals, communication, and hazard recognition.

Three primary gaps emerged across stakeholder interviews, literature review, and CTA results. First, On-the-Job Training (OJT) practices vary widely across carriers, with inconsistent mentor preparation and oversight. Second, situational awareness and communication deficiencies, particularly during shove moves, remain persistent contributors to incidents. Third, stakeholders identified the need for innovative instructional approaches, including scenario-based learning, and decision-making exercises.

The pilot course, delivered at TTC on July 29–30, 2025, included 9 participants representing FRA, Class I and short line railroads, and labor organizations. Five key findings emerged:

- Strong demand for supplemental switching-operations training, especially on shove moves, close clearances, and error-based situations.
- Scenario-based materials, SOFA case examples, and video-assisted instruction increase engagement and realism.
- Early-career employees (6–12 months post-qualification) identified as the most appropriate target audience for the supplemental training.

- CRM content requires updating to reflect current operating practices and safety needs.
- TTC's field environment offers unique capability to safely demonstrate hazardous scenarios that cannot be replicated in live operations.

Participants supported additional opportunities to expand TTC's field-scenario capabilities and develop structured training to advance switching-operations safety. Recommended actions include:

- Creating TTC field scenarios for training based on SOFA cases to support rule application and CRM skill development.
- Convening a Shove Summit with labor, carriers, rules specialists, and data analysts.
- Developing focused TTC workshops on shove movements, close clearances, error-based "don't" scenarios, situational awareness, and communications.
- Modernizing CRM curriculum to better align with contemporary safety-critical tasks.
- Forming a stakeholder review panel in collaboration with the SOFA Working Group.
- Conducting a systematic review of industry training programs.

1. Introduction

This technical report presents the results of a research project conducted jointly by ENSCO, Inc. and TrueSafety Evaluation, LLC (TSE) under sponsorship of the Federal Railroad Administration (FRA). The research began in July 2024, concluded in December 2025, and was undertaken to examine safety risks, training gaps, and opportunities for improving railroad switching operations, with particular emphasis on high-risk shove movements.

1.1 Background

Freight railroad switching operations remain one of the most risk-intensive activities in the rail industry, with shoving movements representing a substantial proportion of human-factor-related incidents and injuries. Prior FRA research and industry analyses indicate persistent challenges in communication protocols, situational awareness, and variability in on-the-job training (OJT). The importance of this work is underscored by a 2022 research needs statement (TRB Committee AR070, 2022) that highlighted the critical need for improved safety research in switching rail yard operations, specifically shove movements.

As railroads continue to modernize yard operations and technologies, there is an increasing need for structured, evidence-based approaches to training and human-performance support for safety-critical switching tasks. These efforts support FRA's mission to advance railroad worker safety, particularly in the complex and high-risk environment of switching yards.

1.2 Objectives

The objective of the research project was to establish a structured framework for advancing research and training related to switching and shoving tasks in rail yard operations. To achieve this, the project focused on the following elements:

- Identify current training gaps, safety risks, and operational challenges associated with switching and shove movements.
- Develop a supplemental, evidence-informed training approach that enhances consistency, realism, and human-factors alignment across the industry.
- Design a pilot training course for switching and shoving tasks, intended to function as a supplemental and complementary resource alongside existing industry training programs
- Deliver the pilot two-day switching-operations training course at FRA's Transportation Technology Center (TTC) and gather structured stakeholder feedback.
- Generate recommendations to guide future FRA training, research, and collaborative industry safety initiatives.

1.3 Overall Approach

This study employed a mixed-methods research design, incorporating both quantitative and qualitative approaches to examine safety issues associated with switching and shoving tasks in rail yard operations.

The quantitative component analyzed FRA accident and incident data from 2016 to May 2024 and reviewed relevant National Transportation Safety Board (NTSB) safety datasets to identify trends and contributing factors. To establish the state of knowledge, a systematic review of FRA-published literature (2000–present) was conducted, with emphasis on standard operating procedures and gaps in shoving movement safety.

The qualitative component included semi-structured interviews with railroad labor, training managers, and regulatory stakeholders to capture their perspectives on safety practices and training needs. Finally, a supplemental two-day training curriculum was developed, focusing on high-risk switching tasks, communication, and situational awareness, incorporating human-factors principles. The pilot course was delivered at TTC, combining classroom and field exercises. Post-training participant feedback was collected to inform recommendations for future FRA research and training initiatives.

1.4 Scope

The scope of this research centered on freight railroad switching operations safety and training, with particular focus on shove movements and early-career employee development. The intent of the training was to serve as supplemental and complementary resource, not as replacement or duplication of existing industry training and workforce development programs. The study was exploratory in nature, using convenience and snowball sampling to recruit industry participants. Analyses covered incident and injury data from 2016 through May 2024, and the literature review focused on FRA-published research since 2000. Reviews of existing railroad internal training curricula, considered grey literature, were outside the scope of the review

1.5 Organization of the Report

The remainder of this report is divided into sections. Section 2 includes the multiple methods used in this project. Section 3 summarizes the findings from the accident data analysis, literature review, stakeholder interviews and the pilot course feedback. Section 4 presents recommended next steps and areas to explore for possible future research. [Appendix A](#) and [Appendix B](#) contain the pilot course materials.

2. Method

This section outlines the primary components of the research. Section 2.1 details the initial activities, including the analysis of the available datasets, a comprehensive literature review, and a series of stakeholder interviews. Section 2.2 presents the development of the course framework and curriculum, as well as the implementation of a pilot course demonstration.

2.1 Identification of Switching Operations Training Topics

The initial phase of this effort identified issues, key trends, patterns, and contributing factors in switching operations, particularly shoving-related incidents, providing evidence-based topics to develop for the training course curriculum.

2.1.1 Secondary Dataset Analysis

The research team conducted review of the FRA train accident and incident database (<https://railroads.dot.gov/safety-data/new-safety-data-site>) from 2016 through May 2024, complemented by the review of NTSB Railroad Accident Investigations Database (<https://carol.nts.gov>). The consolidated datasets were organized to generate descriptive analyses, including incident counts by year, cause codes, incident types, and the top human-factor-related causes relevant to switching operations. Narrative summaries were examined to identify situational factors, operational breakdowns, and contextual elements not readily available in coded datasets

2.1.2 Literature Review

To establish the state of knowledge, the project team conducted a systematic review of FRA-published literature dated no earlier than January 1, 2000, identified current standard operating procedures (SOP), methods, issues, and gaps related to the training of switching operations, particularly shoving movements. The findings highlighted both established safety measures and areas requiring further investigation.

2.1.3 Stakeholder Interviews

Through coordination with key representatives from railroad labor, industry, and regulatory stakeholder organizations, the project team conducted individual and group interviews to understand the current SOPs, potential gaps, and needs in training related to switching operations from their perspectives

Using a two-tiered approach to recruiting participants, the project team first contacted key leaders of industry associations and labor unions (Tier 1), who would have both an understanding of the current switching operations training practices and ability to refer specific training leaders (Tier 2) from across Class I, short line and regional railroads. The Tier 1 or “gatekeeper” leaders engaged in 60–90 minutes of individual interview discussions with a two project-member team. The participant pool grew over the duration of the project, as the pool was utilized during curriculum development and pilot course delivery. The recruiting and progression of the participant pool is shown in Figure 1.

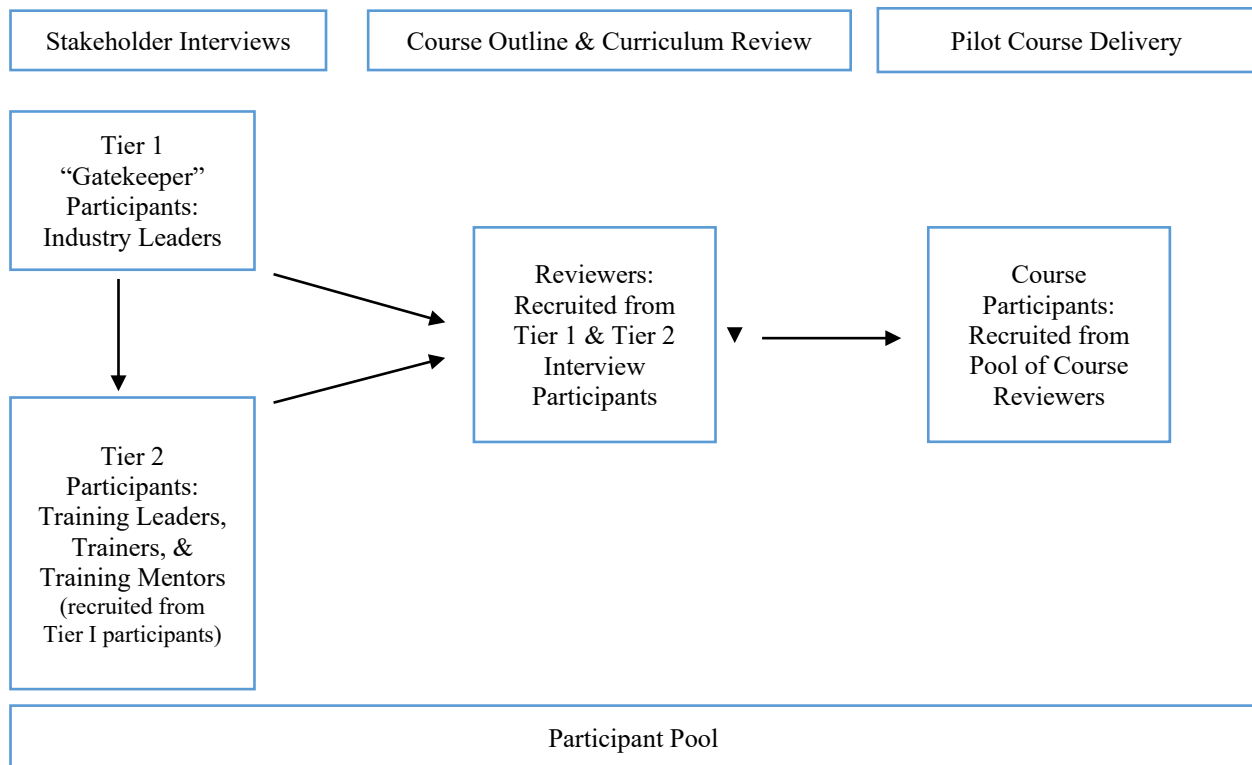


Figure 1. Recruitment and Progression of Participant Pool

The project team interviewed two Class I employees who held different training roles using Cognitive Task Analysis (CTA), a set of techniques for eliciting, analyzing, and representing the cognitive work inherent in domain tasks (Hoffman & Militello, 2008), (Crandall, Klein, & Hoffman, 2006). CTA methods have been developed, applied, and refined over the past four decades across numerous domains. The purpose of using CTA methods is to capture and articulate the internalized mental models, critical decision paths, and core information sources used by industry experts for safety critical decisions to help identify and guide potential product development that can be infused back into the organization through training. This approach was used for understanding job-specific tasks concerning switching operations.

A Tier 1 interviewee referred two trainers for the CTA interviews. Each CTA interview consisted of two parts, each lasting two hours. The first part of the interview focused on the participant's experiences, background, and decision-making processes in switching operations, particularly shove moves. The second part of the interview focused on their individual role as a trainer or training mentor and their individual experience working with new-hire employees engaged in switching operations.

The project team conducted one 90-minute group interview with eight participants, trainers and training leaders, from Class I and Class II railroads. The interview purpose was two-fold: (1) identify the SOP for training on switching operations, and (2) understand how best to innovate or supplement existing training programs to improve safety of switching operations.

2.2 Pilot Training Course at the TTC

The project team designed and then pilot-tested a course intended to supplement existing, switching-operations training programs across the railroad industry. Following delivery, a post-training focus group was conducted to capture participant feedback.

2.2.1 Course Outline

First, a course outline based on the high-need topics identified in the initial phase was developed. The outline included topics that could be addressed in a two-day training course: switching operations, situational awareness, communications, and innovative approaches to supplemental training such as attention awareness techniques. The outline topics became course modules, with lesson plans for classroom- and field-based exercises.

For each module, the course outline included a brief description with key topics to be covered, the estimated time for instruction, learning objectives, materials needed, and a note about the method of instruction (e.g., classroom lecture, group discussion, field exercises). For each module, the outline also included the number of trainers needed, minimum and maximum class size for a manageable pilot course administration, and anticipated training materials (e.g., PowerPoint slides, handouts) for the pilot course demonstration.

Once a draft of the course outline was developed, the second task was to gather feedback from stakeholders. The same industry experts who were recruited for the qualitative interviews participated as course reviewers. Stakeholders offered suggestions about the content, modifications to the overall flow of the course, and feedback about the time allotted for instruction.

Seven stakeholders from Class I, II and III railroads reviewed the course outline. They were provided with a copy of the outline and directions for providing feedback shown in [Table 1](#).

Table 1. Course Outline Feedback Questions

Feedback Questions: Please read the following questions and type your responses below. <i>Please provide details/an explanation for your responses to help us understand your perspective.</i>
1. Do you consider these <u>topics</u> and related content appropriate for a supplemental switching operations training? Why or why not? a. Are they of high importance to industry? b. Do you find them to be innovative? c. What, if any, topics are missing/should be added?
2. What are your comments about the blended approach of learning experiences including in-class, fieldwork, and attention awareness techniques?
3. The pilot course will be delivered at the FRA's Transportation Technology Center (TTC) in Pueblo, Colorado, which is managed by ENSCO, Inc., and allows for real-world scenarios

with railroad equipment for training exercises. What specific activities would you suggest for the fieldwork?

4. What would enhance a two-day switching operations course like this?

5. Anything else you would like us to know to help in our development of this course?

After adjusting the course outline based on feedback from the stakeholders, the project team submitted the outline to FRA for review and incorporated its feedback.

2.2.2 Course Materials

After the course outline was finalized and approved, the project team took several steps to develop the outline into the pilot course curriculum.

The first step in developing the course curriculum was to expand the sub-topics and create lesson plans with detailed content, activities, and proposed delivery methods. This was an iterative process consisting of several internal review sessions among the project team, each of whom held a specific role in designing lesson plans according to their background and expertise.

The first internal review sessions included members of the TSE project team who worked through the details of the content, identified resources that would support the development of the lesson plans, reviewed the delivery methods for a balance of classroom and field-based exercise, and identified the most relevant placements for the field exercises.

A portion of lesson plan development included creating activities. The project team created two interactive decision games, which turned CTA interview scenarios into role-based training. The decision games revealed decision-making, situational awareness, and safety risk issues. They were used in the pilot Crew Resource Management course to place learners in realistic decision contexts. The project team also developed short attention awareness exercises and embedded them throughout the curriculum to boost focus, situational awareness, communication, and conflict management.

Once the detailed lesson plans were developed, the project team held review sessions with the lead facilitator of the pilot course. The lead facilitator tailored the proposed field exercises for implementation at TTC.

Reviewers from the American Short Line and Regional Railroad Association (ASLRRA) and the Association of American Railroads (AAR) provided feedback for curriculum modules focused on switching and shoving operations.

Training curriculum materials included:

- A PowerPoint presentation for each module with group discussion questions, visual resources, and embedded activities such as the Decision Game.
- A participant guide with a two-day agenda (see Appendix A), the Ten Core Elements of a Strong Safety Culture, the Key Impact® framework, the SOFA Five Operating Recommendations, and Job Safety Briefing Guidelines.

2.2.3 Course Execution and Feedback

The pilot course's primary facilitator had experience as a Class I and transit agency trainer and as a switchman and conductor. The lead facilitator provided the majority of technical instruction related to Modules II and III, including leading the TTC site safety briefings and field-based exercises. Three TSE team members acted as co-facilitators.

During the course development and pilot preparation, several modifications to the course outline and curriculum were made prior to course delivery:

- **Course Background Information.** To set the stage for the course delivery, important contextual information was added to the curriculum about the project's purpose, scope, and background to more adequately inform participants about its relevance to industry needs. Specifically, the addition of cost analysis data from a deeper dive into the secondary dataset analysis offered participants a clearer understanding of the financial impact of shoving incidents and fatalities.
- **Pre/Post-Assessment.** Participants recruited were expert trainers and industry leaders who understand the needs of new-hire employees and the applicability of the content. The pre-/post-assessment was intended to measure curriculum knowledge gain. However, the assessment was not administered to the pilot participants because they already held the target knowledge gains and would not show change.

In preparation for the course delivery, the project team developed a group interview protocol for eliciting participant thoughts and suggestions about the course delivery, content, materials, and pedagogy. This protocol was modified in real-time during the pilot to reflect project team observations and informal feedback from participants

The pool of stakeholders recruited for the interviews, course outline review, and curriculum module review was invited to participate in the pilot course delivery. Recruitment was conducted via email and phone calls. Substitute participants were recruited if a participant withdrew from the study. In total, 11 stakeholders attended the pilot course with representation from FRA, Class I railroads, short line railroads, and labor organizations.

The in-person pilot course was held at TTC in Pueblo, Colorado, on July 29-30, 2025. The pilot course was 16 hours over two days, including breaks and one hour for lunch each day. The final Agenda and Training materials are provided in [Appendix A](#).

3. Findings

The results of the analysis of the secondary datasets, literature review and stakeholder interviews are provided in Section 3.1. Section 3.2 provides lessons learned during the delivery of pilot training course at TTC.

3.0 Identification of Switching Operations Training Topics

Overall, the initial research activities highlight three main findings: (1) current classroom training and on-the-job training (OJT) for new hires would benefit from an extension in the length of time for both types of training; (2) the craft mentor role in OJT would benefit from more consistent selection criteria, mentor training, and performance assessment for the position; and (3) craft representation throughout the entire new-hire training process would allow the craft perspective and experience to be reflected in the training program more consistently.

3.0.1 Secondary Dataset Analysis

Incidents caused by human factors comprise the majority of all U.S. railroad incidents from 2016 through mid-May of 2024 as shown in Figure 2.

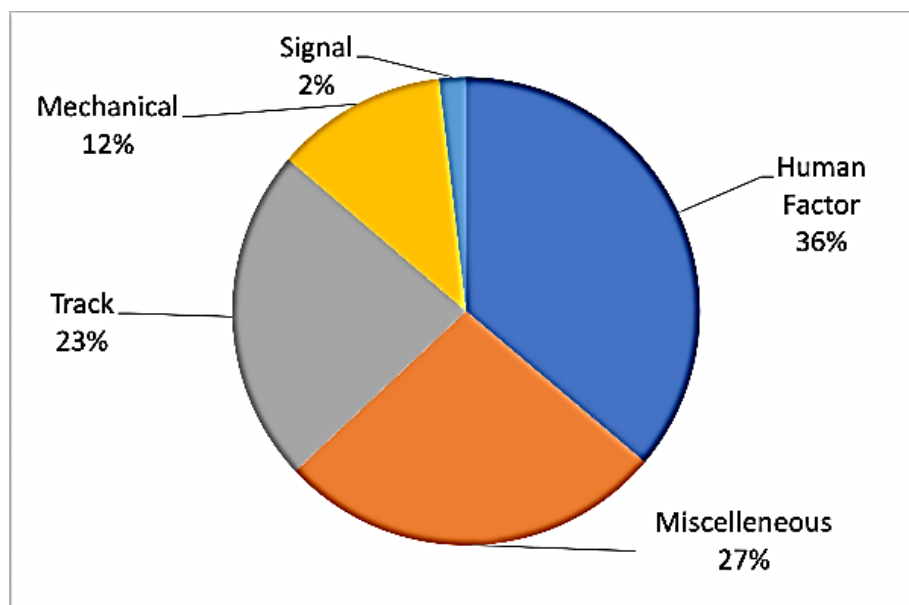


Figure 2. FRA Reportable Incidents by Cause Category, 2016–May 2024

Within human factor incidents, more than half (59%) are related to switching rules or switching operations as presented in Figure 3.

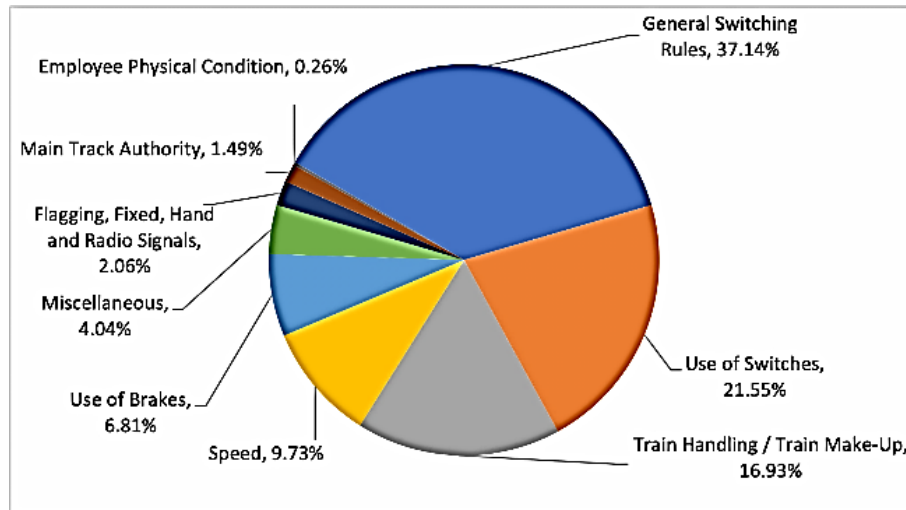


Figure 3. Human Factors Incidents by Cause Category, 2016–May 2024

Figure 4 shows Switching Operations Fatalities Analysis (SOFA) working group results for the 10-year period of 2011–2021, illustrating shove movements have emerged as a concern area to target through educational efforts.

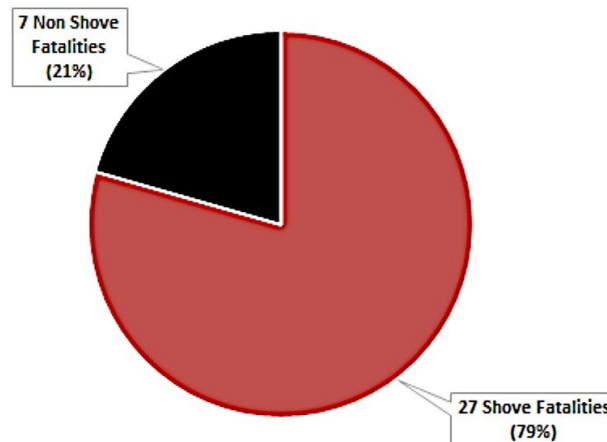


Figure 4. Distribution of SOFA Fatalities in the Last 10 Years

3.0.2 Literature Review

OJT is usually terminal-specific; the length of the training and craft mentorship experience can vary which can necessitate supplemental training. For example, an FRA audit of a Class I certification training program determined that the OJT was deficient in structure, consistency, and oversight (FRA, 2023). Moreover, the OJT instructors were designated without the concurrence from the designated employee representative (FRA, 2023).

The SOFA working group has published three reports (1999, 2004, 2011) and multiple safety bulletins and safety briefs to the industry. These resources provide the core topics for the pilot course.

3.0.3 Stakeholder Interviews

While federal regulations require approved certification programs for locomotive engineers and conductors, the carrier training programs vary across the industry for these positions involved in switching operations. The variability of the training is related to the specific characteristics of carriers, such as railroad class, location, or freight material/goods.

New-hire training delivery modes include classroom learning, field/hands-on training, and OJT, which is terminal-specific. Classroom learning can involve lectures, scenarios, computer-based instruction, games, simulators, virtual learning, and proficiency exams. Carriers tend to standardize the classroom learning content. On some large systems, classroom learning can have centralized delivery, such as at a training center or headquarters location.

Gaps were identified in both the content and delivery of training. The most critical content gaps were those that emerged between standardized training curricula regarding regulatory requirements and the locational, equipment, situational, and environmental knowledge necessary to operate safely. Experienced operators became aware of these factors only after considerable time on the job; sometimes only after safety incidents have occurred. Other content gaps included the lack of opportunity to practice critical processes, such as executing proper radio communications during, and recovering from, high-risk situations.

Such gaps can be partially bridged through structured OJT. However, given operational pace, organizing for high-quality OJT often becomes a secondary concern. As a result, mentors often may be unprepared to provide the level and quality of guidance necessary.

The interviews with labor, management, and FRA leaders elicited themes including classroom-based training and OJT. Other themes also were highlighted including training needs and suggestions for and/or a willingness to support the development of the switching operations pilot course. The interview themes and findings informed course topics that were developed into the course curriculum that was pilot tested. The themes and key findings from the semi-structured interviews are provided below in [Table 2](#).

Table 2. List of Interview Topics to Inform Training Course Topics

Topic/Need	Finding	Steps Taken for Course Development
Switching Operations	• Return to fundamentals/simplicity when training on switching operations, such as the stick test for identifying properly aligned switches. • Maintain and emphasize knowledge of switching rules after OJT. • Evaluate safe locations for riding and getting on/off equipment.	• SOFA Five Operating Recommendations, Lifesavers, Safety Advisories, and Special Switching Hazards as topics • Selected fatality cases to illustrate and discuss real-world switching operations scenarios. • Created switching operations field exercises.

	• Emphasize proper procedures for conducting safe shove movements.	
Situational Awareness (SA)	• Is a persistent concern across the railroad industry particularly knowledge of the yard and positioning oneself safely.	• Included lesson plans about recognizing, maintaining, and regaining situational awareness as part of the CRM curriculum. • Created scenario-based activities. • Incorporated SA field experiences.
Communications	• Emphasize proper communication as a critical component for safety. • Build new-hire confidence in radio communications (psychological safety).	• Included lesson plans about active listening, assertive and effective communications (written/oral) as part of the CRM curriculum.
Innovative Instruction and Content	• Utilize multiple instructional approaches. • Increase craft employee involvement in planning for new-hire training. • Interest in innovative content. •	• Included lecture, scenario-based field exercises, games, and group discussions. • Prioritized subject matter expert with craft and training/mentorship experience to be lead trainer/facilitator. • Developed a Decision Game Activity based on the lived experience of “old head” railroaders. • Leveraged the capabilities of the TTC field site for field-based exercises.
Assessment	• Administer classroom testing throughout new-hire training.	• Included an example of a pre/post assessment for the pilot course content.

The findings from background research literature reviews suggested a supplemental training course that focused on switching-related incidents that utilized novel approaches to developing and maintaining situational awareness techniques. The interviews provided insightful information for the development of the outline and training materials for the pilot course.

3.1 Pilot Training Course at the TTC

3.1.1 Course Outline

A brief description of each module presented in the course outline is included below. (See [Appendix B](#) for the full course outline deliverable.)

- I. *Welcome & Introduction* – Review of railroader work, specifically switching-related jobs, key terminology, safety culture, as well as the research behind and frameworks related to attention awareness practices).
- II. *Switching Operations Fundamentals* – The topics included the Five Operating Recommendations, the SOFA Lifesavers and Advisories, and the SOFA Special Switching Hazards.
- III. *Train Crew Resource Management (CRM) for Safety Critical Positions* – focused on the four topic areas of CRM including crew member proficiency, situational awareness, communication and teamwork, attention awareness, and conflict resolution techniques.
- IV. *Techniques for Mitigating Distractions* – reviewed the corresponding frameworks, and provided information about how these techniques can be applied to switching operations and to different levels (e.g., individual, team, organizational, and societal).
- V. *Wrap-up & Participant Feedback* – was structured as a wrap-up session and group interview for eliciting feedback about the course delivery, content, pedagogy, and materials.

3.1.2 Course Materials

The final agenda and course materials, reviewed by the project stakeholders, are presented in Appendix A. An example pre-/post-course assessment form, provided in Appendix B, was developed as part of the materials for the concluding module that included a wrap-up and feedback session.

3.1.3 Course Execution and Feedback

The research team collected feedback from pilot course participants to determine how useful the course is to supplement their existing programs, make recommendations for improving the course curriculum, and what other topics should be considered for future training at TTC.

The two-day pilot course was successfully executed. Participants' feedback and suggestions related to the supplemental training course produced five findings spanning course relevance, target audience, instructional design, field-based learning needs, collaboration opportunities, and future industry initiatives.

Finding 1. Switching Operations — Especially Shove Moves — Are a Critical Industry Need.

Participants affirmed the value of a supplemental course centered on switching operations. Feedback emphasized that both Class I and short line railroads continue to experience avoidable incidents, reinforcing the value of SOFA content, real-world narratives, and scenario-based examples for deepening new-hire understanding. Several participants recommended expanding the use of videos, incident narratives, and case studies to enhance realism and instructional impact.

Finding 2. TTC Field Exercises Staging Error-Based Scenarios Offer Unique Value

Participants viewed the TTC facility as a significant asset, particularly for recreating hazardous or error-based scenarios that cannot be replicated. They recommended developing structured field exercises that mirror actual SOFA cases, close-clearance risks, and other shove-related hazards.

Finding 3. Early-Career New Hires Are the Most Appropriate Target Audience

Participants consistently recommended reframing the course as a refresher program delivered 6–12 months after initial qualification, rather than as an entry-level training. They noted that early-career railroaders—having gained some field exposure but still developing critical judgment—would benefit most from supplemental instruction focused on switching fundamentals, fouling tracks, communications, and high-consequence decision-making.

Finding 4. Innovative Instructional Approaches Show Promise but Require Refinement

Participants expressed interest in interactive components such as the Decision Game, scenario-based discussions, and practical activities tied to SOFA cases. However, they recommended repackaging these activities with clearer visuals, more detailed narratives, and explicit alignment to switching tasks. They also highlighted the need to update and modernize CRM content to reflect current operating realities and to better support new-hire skill development.

Finding 5. Support Exists for Ongoing Collaboration

Participants praised the collaborative atmosphere of the pilot course and encouraged expanding these discussions into a structured, ongoing forum. They endorsed the idea of additional opportunities for representatives from carriers, labor, rules departments, safety organizations, and data analysts to share data, identify high-risk patterns, and collectively develop supplemental training materials and safety practices.

In summary, these findings demonstrate industry support for a refined, data-driven, and human-factors-informed supplemental training program for switching and shove operations. Participants underscored the need for modernized CRM content, scenario-rich instruction, and rule-compliant field simulations. They also highlighted the unique convening power of TTC to stage error based or hazardous scenarios and situations and the importance of cross-industry collaboration to meaningfully reduce switching-related injuries and fatalities.

4. Recommendations and Conclusions

Based on the findings from the pilot training course participant feedback, the project team recommends continued research into the collaborative training initiatives endorsed by participants focused on high-risk activities research and safety practices. The following are additional recommendation based on the feedback from the study.

The pilot course curriculum showed promising results, with participants reporting value in utilizing the SOFA topics and incident cases for training new-hire employees and for ongoing or recurrency training. CRM was also reflected on as worth revisiting. Feedback indicated an interest in utilizing the TTC site for continued education and field experiences.

Given the inherent risks associated with switching operations, and the increasing number of incidents related to shove moves, there is a need for ongoing training and research to address safety concerns identified in incidents. Continued collaborative work can foster a community of practice among railroad personnel, promoting knowledge-sharing, collaboration, and the adoption of best practices across the industry.

Longitudinal studies on switching operations may help researchers develop and refine training programs. Workshops and certification courses that incorporate lessons learned from the pilot test, SOFA findings, and industry best practices could be used in training.

4.1 Recommended Immediate and Short-Term Activities

The following activities emerged from the pilot course participants' feedback:

- **Create field experiences at TTC based on actual incidents**, such as SOFA cases focusing on shove movements. These “incident study” field experiences would be immersive, re-enact incident events for studying root cause, error chain, rules application, and incorporating CRM. Additionally, these field scenarios could be video-recorded for use by industry trainers. TTC offers the opportunity to safely demonstrate rules violations related to actual events in a switching-operation scenarios (i.e., “don’t” scenarios).
- **Organize a “Shove Summit”** to bring together the trainers, data analysts, rules specialists from railroad carriers across the industry with labor leaders and regulators to address the high number of incidents involving shove moves. Pilot participants were willing to be a liaison to their carrier/organization to share incident data, training practices, and rules-making in a cross-industry forum.
- **Adapt pilot course modules into workshops** by focusing the pilot course curriculum modules into a set of workshops as short (2–3 days) yet intensive sessions, for instance focused solely on close clearances, shove movements, situational awareness, or communications. Detailed facilitator guides would be developed for each workshop to foster fidelity when delivered at TTC.
- **Modernize existing CRM curriculum and videos** to reflect the current railroad context.

In summary, this study recommends developing an education program at TTC to align training programs to specific carrier needs with focus on “don’t” scenarios supplementing regular industry training. Those scenarios would be driven by replicating SOFA incident cases that lead

to injuries and fatalities. The team also recommends organizing recurrent meetings with industry trainers to discuss ideas, issues, scenarios, that can be used to continual improvement and adjustment of the TTC training programs.

4.2 Recommended Long-Term Activities

The following longer-term initiatives require more extensive planning and resources, aimed at addressing suggestions from participant feedback and lessons learned from this project.

- **Conduct a systematic review of existing training programs**, classroom-based and OJT programs, specifically related to switching operations. The scope of this project did not allow for soliciting industry samples of existing new-hire employee switching operations training curricula. A review of these curricula would help FRA address gaps identified by participants. During the structured interviews in the initial phase of this study the team learned that OJT is variable across the industry and attends to terminal attributes.
- **Conduct a job analysis for the trainer** position to ensure a common set of job knowledge, skills, and abilities for fidelity of implementation of the training program.

4.3 Conclusion

This research demonstrated a need for enhanced, human-factors-aligned training to address safety risks associated with switching and shoving operations. The TTC pilot course validated the value of realistic field exercises, scenario-based instruction, updated CRM content, and emerging attention-and-awareness methods. Stakeholder feedback supports ongoing collaboration and structured knowledge-sharing.

5. References

- Crandall, B., Klein, G., & Hoffman, R. (2006). *Working Minds: A Practitioner's Guide to Cognitive Task Analysis*. Cambridge, MA: The MIT Press.
- FRA. (2023). *Section 22410 Operating Crew Member Training, Qualification, and Certification Summary of Audit Activities 2022-2023*. Washington, DC: USDOT.
- Hoffman, R., & Militello, L. (2008). *Perspectives on Cognitive Task Analysis*. New York: Psychology Press.
- Lott, S., Coplen, M., Ghodratighalati, M., & Bruzek, R. (2025). *Yardmasters and Yard Safety in the U.S. Railroad Industry: 2025 Current Trends*. Washington, DC: Federal Railroad Administration.
- TRB Committee AR070, T. R. (2022, 11 22). *Research Needs Statement*. Retrieved from <https://www.mytrb.org/RNS/Details/1691>

Appendix A. Pilot Course Materials

DAY 1 AGENDA: Tuesday, July 29, 8:00 a.m. – 4:00 p.m. (Lunch: ~12–1 p.m.)

Session Title	Key Topics	Length (hours)	Session Leader/s	Materials Needed
Welcome & Introduction	• Safety Briefing • FRA & ENSCO Welcome • Project Background • Mind the Gap • Participant Roles • Introductions • Safety Culture Definition • Attention & Awareness Training	2.0	Greg Donnie Eric Radim Mike Juna Stephanie	• Module I PPT^ • Project Quad Chart • Ten Core Elements of a Strong Safety Culture • Key Impact Skills/AAIM Model
Break				
Switching Operations Fundamentals Part I	• SOFA's <i>Five Operating Recommendations</i> • <i>The Five Lifesavers</i> • Case Examples • Attention & Awareness Activity	1.0	Greg Mike	• Module II PPT^ • Five Operating Recommendations • The Five Lifesavers
TTC Tour	• Escorted Tour of the Indoor Facility	1.0	Greg	
Lunch				
Switching Operations Fundamentals Part II	• SOFA's <i>Five Operating Recommendations</i> (con.) • <i>The Five Lifesavers</i> (con.) • Special Switching Hazards • Case Examples • Attention & Awareness Activity	1.5	Greg Mike	• Module II PPT^ • Five Operating Recommendations • The Five Lifesavers • Job Safety Briefing Guidelines
Break				
Switching Operations Fundamentals Fieldwork Part I	• Climbing On/Off Equipment • Tracks & Cars • Switches & Derails • Basic Air Brake & Handbrake Procedures	1.5	Greg Mike	• PPE

^ For Facilitators

DAY 2 AGENDA: Wednesday, July 30, 8:00 a.m. – 4:00 p.m. (Lunch: ~12–1 p.m.)

Session Title	Key Topics	Length (hours)	Session Leader/s	Materials Needed
Switching Operations Fundamentals Fieldwork Part II	• Safety Briefing • Attention & Awareness Activity • Shove Movements • SOFA Safety Advisories • Close/No Clearances • Industrial Track Hazards	1.5	Greg Mike	• PPE • SOFA Safety Advisories
Break				
Train Crew Resource Management (CRM) in Safety Critical Positions Part I	• CRM Definition • Crew Member Proficiency • Situational Awareness • Communications • Attention & Awareness Activity	2.5	Greg Mike	• Module III PPT^
Lunch				
CRM in Safety Critical Positions Part II	• Teamwork • Decision Game Group Activity • Attention & Awareness Activity	1.5	Greg Mike	• Module III PPT^ • Decision Game Worksheet
Break				
Techniques for Mitigating Distractions	• Recap Attention & Awareness Techniques from this Course • Discuss the Techniques as Mitigation Strategies	0.5	Mike Stephanie	• Module IV PPT^ • List of Attention and Awareness Techniques
Feedback & Wrap-up	• Group Feedback Discussions • Thank You to Participants	1.0	Mike Stephanie Juna	• Group Assignments^

^ For Facilitators

Switching Operations Two-Day Course Outline

Topic	Description	Est. Hrs.	Instruction Method(s)	Learning Objectives
I. Welcome & Introduction	A. Review railroader work, specifically switching-related jobs (brakeman, switchman, conductor, locomotive engineer, yardmaster, trainmaster), and key terminology. B. Explain the concept of safety culture by describing the Ten Core Elements of a Strong Safety Culture. C. Set the stage: Attentional awareness in safety-critical positions, and in this training. 1. Introduce evidence-based research related to attention, awareness, and reducing distraction in the workplace. 2. Introduce Key Impact Skills[®], a unique framework for integrating attention and awareness techniques into switching operations training. 3. Introduce attention and awareness techniques (1-5 min.) as part of course content.	1.5	● PPT ● Lecture ● Discussion ● Demonstration	● Relate railroad work to lifestyle considerations, such as fatigue and overall safety. ● Describe why safety culture is important to safety-critical positions. ● Describe the attention and awareness research. ● Identify the five levels of attention and awareness training for improving safety and wellbeing. ● Practice one or more attention/ awareness techniques.
II. Switching Operations Fundamentals¹	A. Introduce the <i>Five Operating Recommendations</i>: SOFA-1: Adjusting knuckles, adjusting drawbars, or installing EOT. SOFA-2: Struck by equipment other than their own on yard or industry track. SOFA-3: Lack of or inadequate job safety briefing. SOFA-4: Move controlled by a combination of hand and radio signals or specific distances were not given. SOFA-5: FE had 1.5 years of experience or less or had inadequate training. The SOFA Working Group developed shortened versions of the Five Operating Recommendations. The Five Lifesavers serve as reminders to employees engaged in switching operations of the Operating Recommendations that will reduce their risk - and that of crew members. The Five Lifesavers are not meant as substitutes for the more comprehensive Recommendations that represent a series of safe actions that employees can take in reducing their risks in switching operations. B. Relate <i>The Five Lifesavers</i>:	1.0	● PPT ● Lecture ● Discussion ● Case examples ● Scenarios ● Field work ● Demonstration	● Describe rail cars as they relate to railroad operations. ● Explain the importance of the Operating Recommendations. ● Relate the Five Operating Recommendations and the Five Lifesavers. ● Explain the procedures to safely entrain, ride rail cars, crossover, and detrain. ● Discuss the requirements and procedures for securing cars and locomotives to prevent unintended movement as well as the procedures to apply and

¹ Assumes prior rules and regulations coursework that this course will build on and reinforce safety rules and practices to prevent or mitigate the specific hazards of switching operations.

	G. Special Switching Hazards 1. Introduce the SOFA Special Switching Hazards (SSH)² SSH-CC: Close Clearance SSH-IH: Industrial Hazard SSH-ST: Struck by Mainline Train SSH-ET: Employee Tripping, Slipping, or Falling SSH-DR: Derailment SSH-UC: Unsecured Cars SSH-MC: Miscellaneous SSH-UM: Unexpected Movement of Railcars SSH-FR: Free-Rolling Railcars SSH-EQ: Equipment SSH-FC: Failure to Confirm Route of Movement SSH-MV: Struck or struck by Motor Vehicle SSH-EV: Environment SSH-DA: Drugs and Alcohol SSH-ED: Electronic Device (e.g., cell phone, MP3 player) 2. Discuss Shove Movements as a Special Switching Hazard: Shove movements clearly create an exposure to greater risk than pulled train movements. Wherever feasible, efforts should be made to avoid shoved movements especially where light engines are involved. Greater use of procedures such as running around cars and changing ends should be utilized. 3. <i>Fieldwork</i>: Track; Handling Switches and Derails; Observe shove movements 4. <i>Attention & Awareness Moment</i>: (for SSH-CC, SSH-ET, SSH-UM, SSH-FR, and SSH-EV) While in the field and upon returning to the classroom, practice a noticing open awareness technique.	0.5	● PPT ● Lecture ● Discussion ● Case examples ● Scenarios ● Field work ● Demonstration	● Describe track as it relates to railroad operations. ● Identify hand switches and derails. ● Describe the special switching hazards, and what they define. ● Explain a shove movement. ● Describe the conditions associated with, and operations related to switching. ● Perform a noticing open awareness technique.
		0.5		
		1.0		
III. Train Crew Resource Management (CRM) in Safety-Critical Positions	A. Define Crew Resource Management (CRM) 1. CRM is: ● A comprehensive system for improving crew performance. ● A process that addresses the entire crew and other related staff, such as yardmaster, dispatcher, utility employee, or a locomotive engineer performing duties as a pilot.	0.5	● PPT ● DVD player ● Video	● Recognize the three types of crew-member proficiency. ● Identify alternate techniques for conflict resolution. ● Connect self-awareness to the awareness of others.

² Special Switching Hazards: Beyond the five categories for SOFA 1–5, the SOFA Working Group uses 15 categories of Special Switching Hazards (SSH) used to classify switching operations fatality cases. SSH applies to hazards that are not covered in the original SOFA 1–5 categories.

	• A heightened awareness of attitudes and behaviors of crew members and their impact on safety. • A forum that allows the individuals to examine their behavior and make individual decisions on how to improve teamwork. • A focus on the function of crew members as teams, not as a collection of technically competent individuals. 2. For the purpose of this course, CRM is divided into four basic sections: - Crew Member Proficiency - Situational Awareness - Communication and Teamwork - Conflict Resolution Techniques <i>B. Crew Member Proficiency</i> - Three types - System Knowledge of Equipment - Procedural Knowledge and Compliance (also Territorial Knowledge) - Execution <i>C. Attention and Awareness Overview for CRM: Connecting self-awareness to awareness of others.</i>		• Discussion (group and/ or pairs) • Scenarios	
	<i>D. Situational Awareness</i> Situational awareness is contributing to a safe work environment by being aware of your surroundings at all times, complying with rules and instructions, and developing a preventative plan(s) that includes several solutions for any emergency situation that could occur in the near future. <i>Recognizing Situational Awareness</i> - Machine and System Cues (Equipment) - Crew Member Cues - Personal Cues (self-awareness) <i>Maintaining Situational Awareness</i> - Planning and preparing. Avoiding distractions. - Dwelling on a problem. - Developing a plan to handle distraction. - Distributing your workload. - Prioritizing your decision-making. - Communicating with your crew members.	1.0	• PPT • DVD player • Video • Scenarios • Discussion (group and/ or pairs)	• Explain the integral role of situational awareness in safety-critical jobs. • Recognize situational awareness cues that could potentially lead to an undesirable outcome. • Describe the approaches to maintaining situational awareness. • Identify external and internal distractions and ways to mitigate. • Practice a noticing (sensory) attention and awareness technique. • Recognize the importance of self-awareness as a tool for mitigating distraction.

	h. Recognizing a deteriorating situation. 3. <i>Regaining Situational Awareness</i> • Communicate • Resolve • Monitor 4. <i>Attention & Awareness Moment</i>: In the classroom, introduce the different internal and external distractions and practice techniques for mitigating these distractions. Take the group to the field to practice a noticing (sensory) activity.			
	E. <i>Communication & Teamwork</i> 1. Communications - Ask Questions - Restate or Paraphrase. - Record Information 2. Effective Communications - Oral vs. Written Communications. - Improving Communications - Tips for Oral and Written Communications 3. Assertive Communications - Assertiveness. - Non-Assertiveness - Aggressiveness - Assertiveness Techniques - Asking Questions - Stating Objections - Controlling Emotions 4. Job Briefings 5. Teamwork - Elements of a Team. - Team Responsibilities. - Team Roles. - Tying it Together in a Team. - Effective Teams. - Making Team Decisions - Advantages of Team Decision Making. - Effectiveness in Team Decision Making. - Steps in Making Team Decisions.	1.0	• PPT • DVD player • Video • Scenarios • Discussion (group and/ or pairs)	• Recognize the elements of communication: one-way vs. two-way, active listening, paraphrasing, restating, or questioning. • Recognize strategies for communicating to others clearly, accurately, and in a timely fashion, in both oral and written forms. • Conduct effective job briefings. • Recognize the roles and responsibilities of team members. • Describe the process for making a team decision. • Practice a listening activity.

	6. <i>Attention & Awareness Moment</i> : Silent Activity.			
	F. <i>Conflict Resolution Techniques</i> 1. Causes of Conflict 2. Conflict Outcome 3. Effects of Conflict 4. Conflict Resolution Techniques 5. <i>Attention & Awareness Moment</i>: While in the classroom, practice the skillful means and the STOP/Pause technique.	0.5	● PPT ● DVD player ● Video ● Scenarios ● Discussion (group and/ or pairs)	● Define conflict resolution. ● Apply conflict resolution techniques to railroad switching operations. ● Practice the skillful means and the STOP/Pause technique. ● Reflect on the three questions from the skillful means technique.
IV. Techniques for Mitigating Distractions	A. Review the attention and awareness evidence-based research and how it is instrumental to switching operations. B. Review the attention and awareness techniques that were used in this course. C. Review the opportunity to instill attention and awareness techniques into the organizational infrastructure. 1. Review the fifth component (societal relations) of the Key Impact Skills™/ AAIM model. D. Reflection Activities 1. Wise Listening Reflection 2. Applying attention and awareness activities in the workplace and in the home/ community.	1.5	● PPT ● Lecture ● Discussion ● Demonstration	● Describe the research behind attention and awareness. ● Develop habitual patterns of thoughts, activities, and behaviors as take-home guidance. ● Explain the fifth component of the Key Impact Skills/AAIM model. ● Practice the listening technique to reflect on how attention and awareness can be applied in the workplace and at home
V. Wrap-up & Feedback	Workshop Feedback Form (and/or brief Feedback group discussion). Appreciation for participation.	0.5		
	Total Content Hours (breaks and lunch times will be added to this number)	12		

Appendix B.

Training Course Assessment Form

Pilot Course Pre-/Post Assessment Example

Not Administered

Evaluation Approach

This document presents an example of a pre/post assessment of the supplementary training course that could be administered to new hires. The assessment is based on the Kirkpatrick 4-level evaluation approach (reaction, learning, behavior, results), a comprehensive model that ensures both immediate and long-term value of the training.

Although questions would be developed to address all levels of the Kirkpatrick approach, the questions below provide an example of an assessment for Level 2 (Learning), capturing knowledge and skill development. These questions are designed to assess what participants have learned for each model—knowledge, skills, and attitudes—as a result of the training and could be used as a pre-post instrument. As the course is implemented and participants are trained in the field, additional questions would be developed that address all levels of the Kirkpatrick Model.

At Level 1 (Reaction), participant feedback can be gathered through surveys and group discussions to evaluate engagement, satisfaction, and perceived relevance of the course content.

- Level 2 (Learning) can be assessed by measuring knowledge and skill acquisition.
- Level 3 (Behavior) focuses on the transfer of learning to the workplace; this could involve follow-up interviews or observations to determine whether participants are applying learning.
- Level 4 (Results) evaluates the broader organizational impact, such as reductions in safety incidents, improved team communication, and/or enhanced situational awareness, ideally tracked through safety metrics or performance indicators over time.

Example: Level 2

The below questions are examples of the scope of the assessment questions that would be developed to address each learning objective of the Switching Operations Course Curriculum. The assessment would include close- and open-ended items and would be administered to participants pre- and post-course to demonstrate knowledge change.

Module 1: Course Introduction & Foundations

1. What key components of a strong safety culture relate to your role?
2. Where in your daily tasks would you apply attention and awareness techniques to improve safety in your job?

Module 2: Switching Operations Fundamentals

1. What are the Five SOFA Operating Recommendations?
2. In your own words, explain how one of the case examples from Lifesaver 5 (Mentor less experienced employees to perform service safely) impacts safety.

Module 3: Train Crew Resource Management (CRM)

1. What are the four core components of CRM?
2. How can situational awareness be maintained and recovered during high-risk operations?

Module 4: Mitigating Distractions

1. What are the five levels of the Key Impact Skills® model?
2. Which Attention and Awareness Micro-practice (e.g., 3 Breaths, Pause & Notice) do you feel most confident using in your role, and why?

Abbreviations and Acronyms

ACRONYM	DEFINITION
CRM	Crew Resource Management
OJT	On-the-Job Training
PPE	Personal Protective Equipment
RDI	Office of Research, Data, and Innovation (within FRA)
SA	Situational Awareness
SME	Subject Matter Expert
SOFA	Switching Operations Fatality Analysis
TRB	Transportation Research Board
TSE	TrueSafety Evaluation, LLC