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Rail Industry Job Analysis: Passenger Conductor

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This document describes the results of a job analysis that was conducted for the position of railroad Passenger Conductor. Key aspects of the position were identified, including main tasks and knowledge, skills, abilities, and other characteristics (KSAOs) required to perform the job successfully. The job analysis process is described in detail, including meeting agendas, survey questionnaires, and a finalized list of job tasks and KSAOs identified by subject matter experts (SMEs). Conclusions report the specific results of the job analysis, including information from SME focus group discussions regarding demands and strains of the job. Implications for training and development are also discussed.

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	1 kilometer (km) = 0.6 mile (mi)
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1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)	1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)	10,000 square meters (m^2) = 1 hectare (ha) = 2.5 acres
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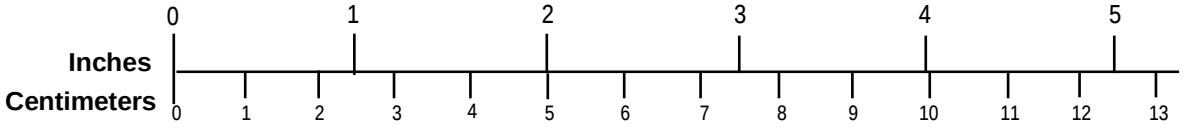

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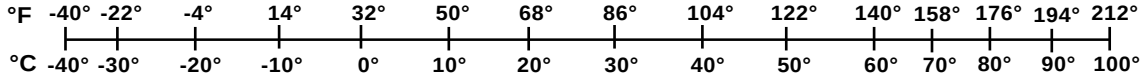

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Executive Summary

This document describes an analysis of the passenger conductor job for yard and over-the-road operations in the U. S. railroad industry. The purpose of this analysis was to identify key aspects of the passenger train conductor job, including the main responsibilities of the job, and the kinds of knowledge, skills, abilities, and other characteristics (KSAOs) required to perform it successfully. More specifically, the goal was to identify key KSAOs that are appropriate to target in the training and development of the passenger conductor workforce. The results of the analysis can be utilized to build (a) training programs that address relevant and measurable KSAOs, (b) performance appraisal systems that are legally defensible and evaluate employees based on KSAOs that have been identified as related to the respective job, and (c) personnel selection procedures that are legally defensible and measure critical, job-related skills to help ensure that a hiring organization will appropriately screen new talent.

The subject matter experts (SMEs) who participated in this comprehensive analysis indicated that passenger conductors are responsible for 55 tasks, clustered around 7 functional categories: (a) passenger interaction, (b) crew communication, (c) crew supervision, (d) form and record management, (e) train inspection, troubleshooting, and repair, (f) train makeup and handling, and (g) emergency situations. Passenger conductors need a wide variety of KSAOs to perform job tasks successfully. Examples include knowledge of operating and safety rules, skill in working on and around moving equipment, judgment and decisionmaking ability, and a commitment to safety. Conductors use a number of different tools and types of equipment, and work with a variety of railroad personnel such as locomotive engineers, dispatchers, and foremen. The job is also physically and psychologically demanding for workers because of the prevalence of irregular work hours, out-of-doors work, and the need to lift and move heavy equipment.

The current job analysis is based on design considerations described in a previous document prepared by Walsh, Golay, Barnes-Farrell, & Morrow (2010). The aforementioned report includes a detailed design and example resources for conducting a comprehensive job analysis. Excerpts from the current passenger conductor job analysis are included as a reference to illustrate how the job analysis design is used in practice. That report, titled “A Job Analysis Design for the Rail Industry: Description and Model Analysis of the Job of Freight Conductor,” is available through the Federal Railroad Administration (FRA).

1. Introduction

This document outlines a framework for conducting systematic job analyses for the job of passenger conductor. This project used a job analysis method grounded in the Combination Job Analysis Method (C-JAM; Brannick, Levine, & Morgeson, 2007; Levine, 1983), which uses multiple methodologies and sources to acquire information about the position.

For the job of passenger conductor, a variety of types of KSAOs are required. To fully understand the extent of these characteristics, we conducted a thorough job analysis, gathering information from a number of SMEs. This report describes the results of that analysis.

2. Passenger Conductor Job Analysis

A job analysis of passenger conductors for AMTRAK and commuter rail operations was conducted between November and December 2011. A job analysis is a formal process to document the work-related tasks, job environment (e.g., tools or working conditions), and human attributes needed for a specific position. A job analysis can be a valuable tool for a number of human resource processes including personnel selection testing, determining content for training and development programs, and providing input on content for performance evaluations. The goal of the current job analysis was to identify key KSAOs that are trainable for the purpose of developing the passenger conductor workforce.

The job analysis was carried out using a methodology grounded in the Combination Job Analysis Method (C-JAM; Brannick, Levine, & Morgeson, 2007; Levine, 1983). C-JAM utilizes panels of SMEs to (a) generate task statements for tasks performed on the job and determine their relative importance, (b) identify KSAOs needed to perform the job effectively and determine their relative importance, and (c) link the two sets of information together to demonstrate that the KSAOs are job related. The analysts chose the C-JAM methodology because of its unique focus on *the job* in the identification of job tasks, *the worker* in the identification of KSAOs, and the relationships between the job tasks and KSAOs. The additional focus on quantifying the relative importance of job tasks and KSAOs also makes C-JAM appropriate as a means of determining training needs. This design also allows for supplemental information to be collected about the job, including the machines, tools, and equipment used, physical and psychological demands, and the job context. For additional information on topics described in this design, or on job analysis in general, consult Brannick et al. (2007).

The analysts began by reviewing available materials describing the passenger conductor job and developing preliminary lists of task statements and KSAOs. After the lists were developed, four face-to-face meetings ranging from 1 to 3 hours in length were held with SMEs to (a) edit the task and KSAOs lists, (b) link the KSAOs to task categories, and (c) obtain information regarding the job context, demands, and tools used. Findings from the job analysis are described in detail in the following sections of this report.

2.1 Preliminary Work

Preliminary research was carried out between August and October 2011 to develop draft lists of task statements and KSAOs for passenger train conductors. The following sources were reviewed for relevant information:

- The O*NET report for railroad conductors and yardmasters (O*Net, 2009)
- An existing task analysis of conductors (Sanders, Jankovich, and Goodpaster, 1974)
- The eighth edition of the operating rules of the Northeast Operating Rules Advisory Committee (2003)
- Conversations with rail experts from the United Transportation Union, FRA, and the John A. Volpe National Transportation Systems Center
- Background information used to prepare a job analysis of freight conductors (Walsh, Golay, Barnes-Farrell & Morrow, 2010), which included information drawn from the

following additional resources: A cognitive task analysis of locomotive engineers which included a discussion of the roles and responsibilities of freight conductors (Roth & Multer, 2009), and the fifth edition of the General Code of Operating Rules (2005)

Additionally, a finalized task list for freight conductors was used as groundwork for the development of task lists for passenger conductors. The task list of freight conductors was reviewed by two SMEs with railroad experience between June and September 2009. The SMEs had, on average, 8 years of experience in their current job and 22 years of experience in the railroad industry. These lists were then vetted through additional SMEs via a series of three focus group meetings. Given the high level of similarity between freight and passenger conductors, the finalized freight conductor task list was used as a tool to develop the passenger conductor task list.

2.2 SME Panel Meetings 1 and 2: Task List Editing and Survey Participation

The first SME meeting was held on September 1, 2011, in Boston, MA, with five passenger conductors for commuter rail. The five experts had an average of 12 years experience working for their organization in various railroad positions (e.g., freight, engineer) and had worked as passenger conductors for an average of 21.4 years. The first half of the meeting was devoted to reviewing and editing the preliminary task list. Following an introduction to the project, the SMEs reviewed the method for constructing task statements, and then worked as a group to edit the preliminary task list and develop functional categories. The second half of the meeting was focused on quantifying the relative importance ratings for each task. This task was completed by collecting SME assessments of how difficult the task is to complete correctly and what the consequences are to job performance if the task is completed incorrectly.

The second SME meeting was held on September 2, 2011, in Boston with five passenger conductors from AMTRAK. The five experts had an average of 8.3 years experience working for their organization in various railroad positions (e.g., freight, engineer). The SMEs were given copies of the edited task list from meeting 1 and a description of how to construct task statements. The SMEs were then instructed to make any edits to the task list that they felt were necessary, and to pay extra attention to the tasks that had been identified as problematic. Following individual review, the SMEs reconvened as a group and were instructed to come to a consensus regarding the edits to the task list and the assignment of each task to a functional category. The second half of the meeting focused on quantifying the relative importance ratings for each task. As in the first meeting, this task was completed by collecting SME assessments of how difficult the task is to complete correctly and what the consequences are to job performance if the task is completed incorrectly.

During the second half of both meetings, the following questions were posed to the SMEs:

1. Are the categories meaningful?
2. Are additional categories needed?
3. Are the tasks situated under the appropriate category?
4. Are there any rare tasks that would not necessarily be done regularly but that might be done during a particular week or month or at certain times of the year?
5. Are there any critical emergency-related tasks that are missing?

6. Is the task list complete and accurate?

An explicit attempt was made to have SMEs consider tasks that were not done frequently but that could be carried out in emergency situations. As a final check to ensure the task list was complete and accurate, the edited task list resulting from meetings 1 and 2 was presented in meeting 3 with the same SMEs from commuter rail. The SMEs reviewed the task list and confirmed that, to their knowledge, the list was complete and accurate. No additional changes were suggested.

2.3 Final Task List for Passenger Conductors

The final task list consists of 55 tasks arranged in seven functional categories that represent the general duties of passenger conductors. The functional categories and tasks are as follows:

- *Passenger Interaction* – tasks related to interaction and communication with passengers on board (7 tasks)
    - Collect fares and sell tickets to passengers, as needed.
    - Announce all necessary information to keep passengers informed (e.g., arrival and departure times, number of stops, and fares).
    - Walk the train back and forth to address passengers' questions, comments or concerns.
    - Ensure safety and comfort for passengers with disabilities by complying with Americans with Disabilities Act (ADA) regulations.
    - Assume responsibility for minors traveling alone until claimed by legal guardian.
    - Assist passengers on and off the train to ensure passenger safety.
    - Mediate passenger disputes when necessary.

- *Crew Communication* – tasks related to communication with the train crew and other personnel (8 tasks)
    - Advise the engineer of any restrictions placed on equipment being handled.
    - Advise the dispatcher of any restrictions placed on equipment being handled.
    - Advise the proper authority when the train clears the main track or territory.
    - Remind the engineer that the train is approaching an area by restricted limits of authority, track warrants, track bulletins, or speed restriction.
    - Call out signals as they are encountered when operating in signal territory and as job activities change.
    - Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
    - Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
    - Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.

- *Crew Supervision* – tasks associated with oversight of railroad personnel (4 tasks)
    - Conduct pretrip planning briefings with train crew members, yard master, and other authorities.
    - Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
    - Ensure crew members comply with applicable rules, special instructions, signals, and track authority.

- Direct other crew members during switching or train operations.

- *Form and Record Management* – tasks having to do with the organization and management of forms and records (12 tasks)
  - Update required rule books and bulletins for all territories that are operated on.
  - Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
  - Update the signal awareness form.
  - Report car defects.
  - Update train list information per operating rules.
  - Complete delay reports for each trip noting any delays.
  - Complete a work train report, if applicable, when called for work train service.
  - Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
  - Complete required FRA tie-up documentation.
  - Record train times during which trains are given permission to enter the work area when assigned as flagmen.

- *Train Inspection, Troubleshooting, and Repair* – tasks related to train inspection and maintenance (10 tasks)
  - Perform required air brake tests or verify that they have been properly performed.
  - Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
  - Inspect other trains en route (i.e., roll by inspection).
  - Locate, inspect, and report defects identified by a defect detector.
  - Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
  - Replace faulty air hoses when necessary.
  - Replace broken knuckles when necessary.
  - Secure dragging equipment when necessary.
  - Inspect train prior to passengers boarding and report any suspicious objects to ensure passenger safety.

- *Train Makeup and Handling* – tasks pertaining to preparing the train for a trip and general handling of the train (9 tasks)
  - Join air hoses during train makeup.
  - Couple and uncouple train cars.
  - Call to have derailing equipment removed and replaced.
  - Inspect and line switches as required.
  - Switch train cars in accordance with work order instructions.
  - Install and remove end-of-train devices.
  - Provide protection when shoving cars.
  - Provide protection to other trains in accordance with rules during emergency brake application.
  - Apply the emergency brake to stop the train in extreme circumstances.

- *Emergency Situations* – tasks pertaining to emergency circumstances (5 tasks)
  - Provide radio communication to the dispatcher to report the incident.
  - Secure the train.
  - Walk the train to ensure safety and notify passengers of the emergency.

- Relay emergency information to all personnel working on the train.
- Evaluate the train if necessary.

2.4 Task Rating Survey and Analysis

The next step in the job analysis was to quantify the relative importance of each of the job tasks by collecting SME assessments of how difficult the task is to complete correctly and if there are significant consequences to job performance if the task is completed incorrectly. As suggested by the C-JAM methodology (Brannick et al., 2007), SMEs were asked to evaluate each task on two scales: consequences of error and task difficulty. The wording of the scales and response options are presented below:

- *Consequences of Error* – How important (i.e., significant) are the consequences of performing the task incorrectly?

  1 – Consequences of error are not at all important

  2 – Consequences of error are somewhat important

  3 – Consequences of error are moderately important

  4 – Consequences of error are very important

  5 – Consequences of error are extremely important

- *Task Difficulty* – How easy or difficult is it to complete the task correctly relative to all other tasks?

  1 – Very easy

  2 – Somewhat easy

  3 – Not easy or difficult

  4 – Somewhat difficult

  5 – Very difficult

Responses were received from a total of 10 passenger conductors from commuter rail and AMTRAK. Respondents had an average job tenure of 16 years and organizational tenure of 10 years.

Task importance was calculated as suggested by Brannick et al. (2007). Specifically, ratings on consequences of error and task difficulty scales were summed for each task. Then, the mean task importance value was calculated for each task across all SMEs. Figures 1–7 present the task list with the mean ratings of consequences of error, difficulty, and importance. All but four tasks had mean ratings on the consequences of error scale greater than or equal to four, thus verifying that the list includes only those tasks that are critically important. The greatest variability across SMEs was observed for the ratings of task difficulty.

Figures 1–7: Task List with Mean Ratings of Consequences of Error, Difficulty, and Importance

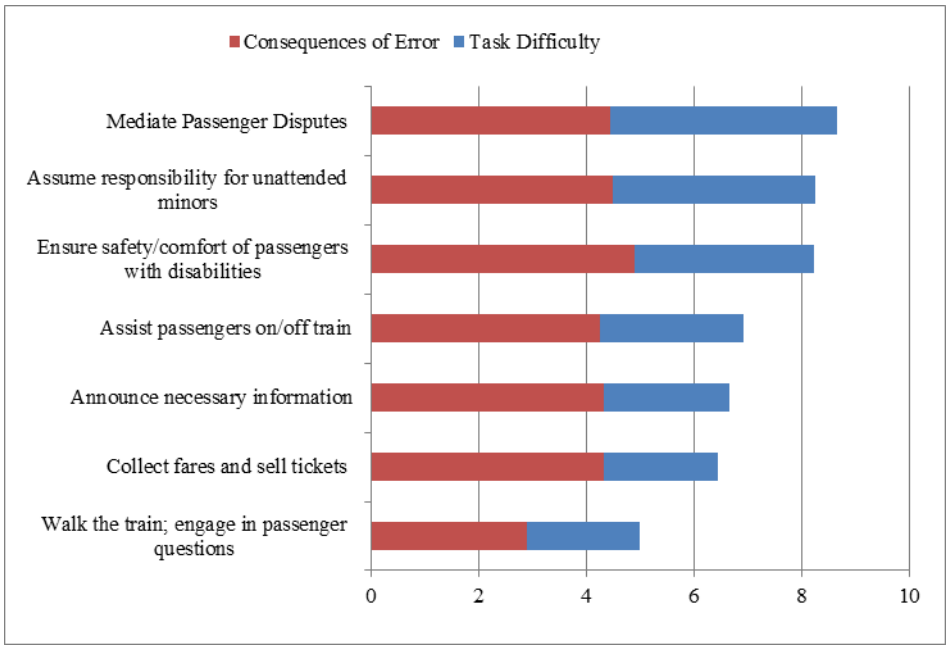

Figure 1. Passenger Interaction

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

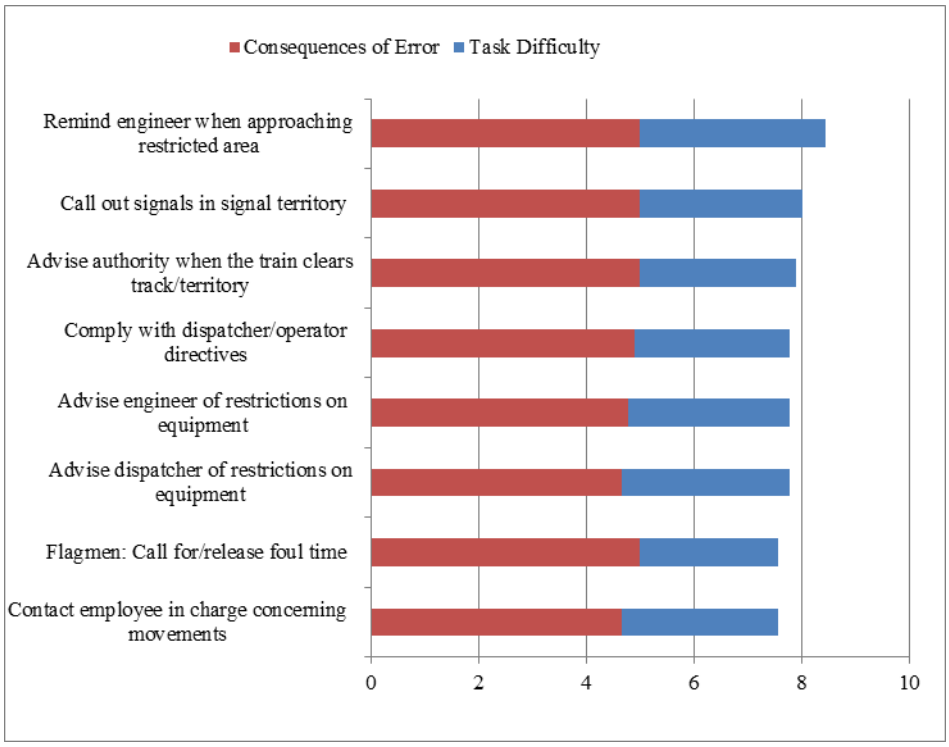

Figure 2. Crew Communication

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

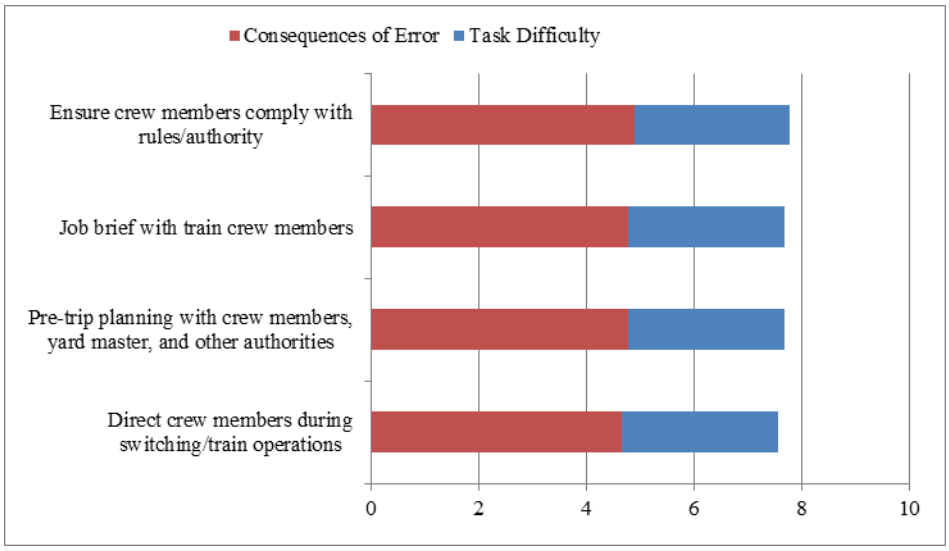

Figure 3. Crew Supervision

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

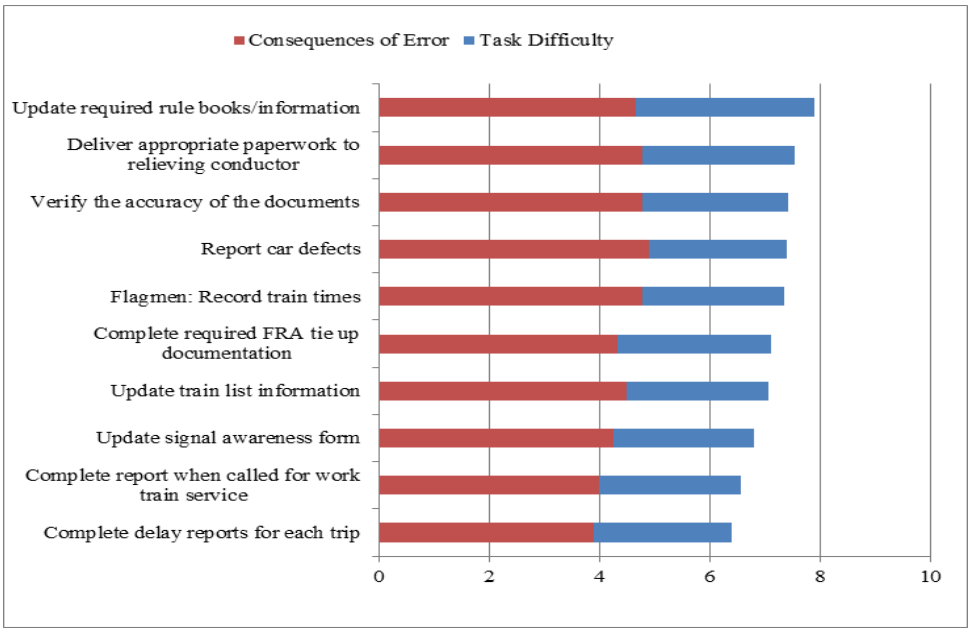

Figure 4. Form and Record Management

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

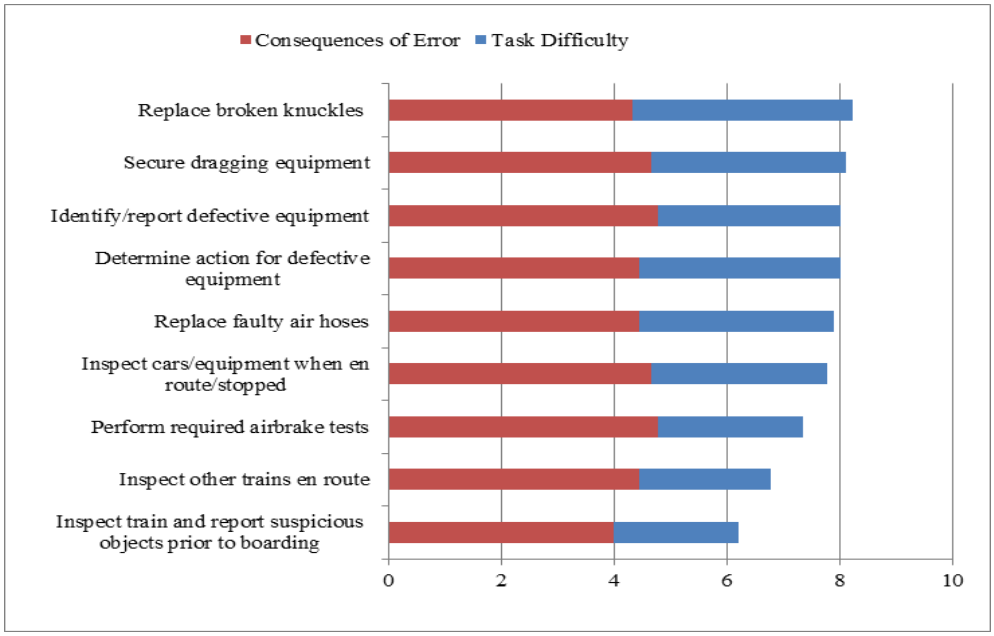

Figure 5. Train Inspection, Troubleshooting, and Repair

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1 – 5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1 – 5). The overall length of the bar signifies the level of task importance (range = 1 – 10). It is the sum of ratings of Task Difficulty and Consequences of Error.

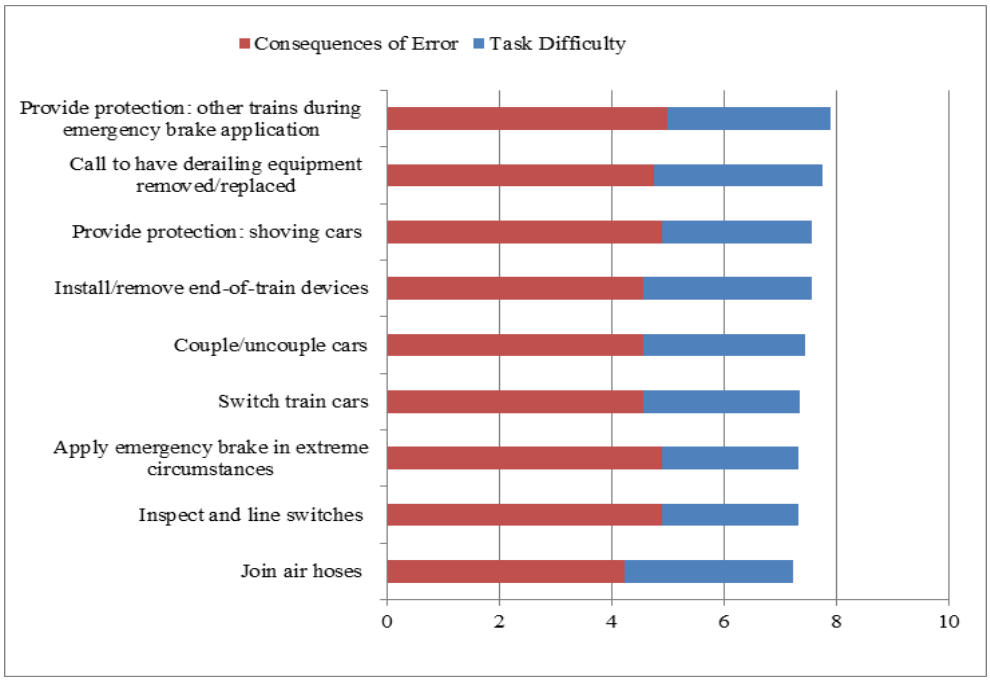

Figure 6. Train Makeup and Handling

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

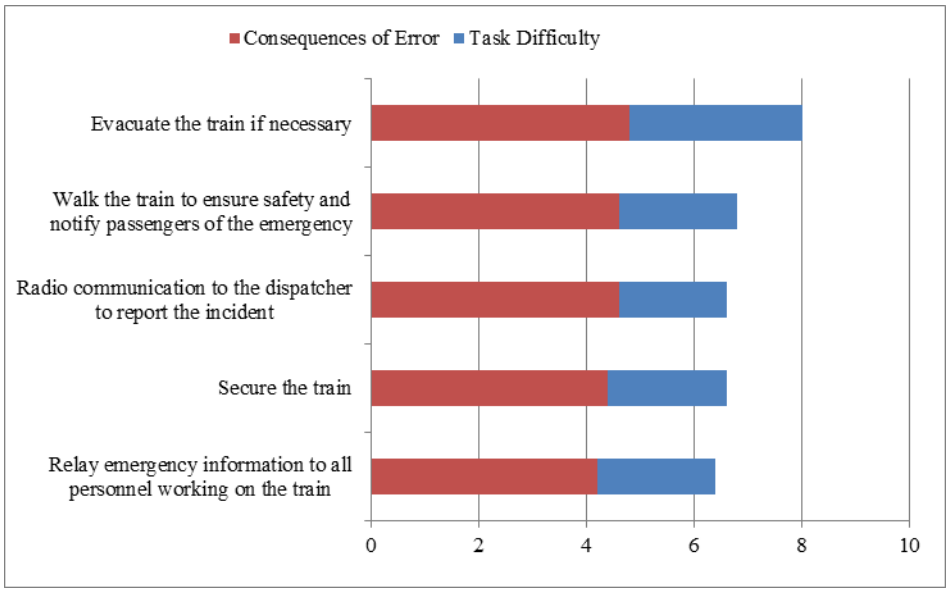

Figure 7. Emergency Situations

Note. "Consequences of Error" is the mean of the SMEs' ratings of the consequences of error if the task is not appropriately performed (range = 1–5). "Task Difficulty" is the mean of the SMEs' ratings for the difficulty of the tasks (range = 1–5). The overall length of the bar signifies the level of task importance (range = 1–10). It is the sum of ratings of Task Difficulty and Consequences of Error.

2.5 SME Panel Meeting 3: KSAO Linkages to Functional Categories

The third SME meeting was held in November 2011 in Boston with the same five passenger conductors that had attended the first SME meeting. The SMEs for the third meeting had an average job tenure of 23 years and organizational tenure of 12 years. The SMEs had worked as passenger conductors for an average of 21 years. The purpose of this meeting was to determine the KSAOs needed to perform the job tasks in each of the functional categories developed during the editing of the job task list.

In the third meeting, SMEs were given copies of the task list with their calculated importance values. Each SME reviewed the list individually and then divided into groups to complete the linking activity. Group 1 was asked to link KSAOs to the *Passenger Interaction (PI), Crew Communication (CC), and Crew Supervision (CS) categories*. Group 2 was tasked with linking KSAOs to the functional categories of *Form and Record Management (FRM), Train Inspection, Troubleshooting, and Repair (TITR), Train Makeup and Handling (TMH), and Emergency Situations (ES).* Once the SME groups had separate work spaces, they were handed copies of the task list which only included their specific functional category, associated tasks, and importance values. Each group was also given one copy of the KSAO list. The SMEs were encouraged to discuss the KSAOs amongst themselves and to assign the KSAO to the functional category only if there was a consensus that the KSAO was needed to perform the tasks.

Results of linking KSAOs with functional task categories are presented in Table 1. SMEs identified 28 knowledge areas, 32 skills, 18 abilities, and 7 other characteristics. All KSAOs were linked to at least one of the functional categories and many KSAOs were generalized across multiple categories. For example, "proper procedures for handling and reporting emergency situations" was identified as needed to perform tasks in each of the five functional categories.

Table 1. KSAOs, Linked to Functional Task Categories

KNOWLEDGE	PI	TITR	TMH	CC	CS	FRM	ES
Train schedules	X			X	X		X
Proper operation of each coach		X	X	X	X		X
Contact information of dispatcher and trouble desk for each territory		X	X	X	X	X	X
Train entrance and exit locations	X			X	X		X
Rules and procedures for radio operation	X	X	X	X	X		X
Location of all emergency safety equipment	X	X		X	X		X
Purpose and function of a rail yard		X	X	X	X		X
Function of track components and rail equipment		X	X	X	X		X
Operation of classification yards		X	X	X	X		X
General railroad terminology		X	X	X	X		X
Terminology used in the classifying, blocking, and switching of rail cars		X	X	X	X		X
Terminology and rules associated with restricted		X	X	X	X		X

equipment							
Basic duties of other railroad personnel that passenger conductors interact with during normal performance of duties		X	X	X	X		X
Various types of rolling stock		X	X	X	X	X	X
Operating and safety rules	X	X	X	X	X	X	X
Rules and procedures for switching of railcars and equipment		X	X	X	X		X
Proper procedures for handling and reporting emergency situations	X	X	X	X	X	X	X
The types and functions of defect detectors		X	X	X	X	X	X
Temporary and permanent speed restrictions		X	X	X	X	X	X
Required air brake tests and when they apply		X	X	X	X	X	X
Timetable information, special instructions, and track bulletins		X	X	X	X	X	X
Switch lists, track lists, and work orders		X	X	X	X	X	
The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)		X	X	X	X	X	X
Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)		X	X	X	X	X	X
The types of track authority required for the movement of a train on main tracks		X	X	X	X	X	X
Rule of train movement on tracks other than main tracks		X	X	X	X	X	X

Note. X indicates that the KSAO was linked to the functional category. PI = Passenger Interaction. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management,. ES = Emergency Situations.

Table 1, continued

SKILLS	**PI**	**TITR**	**TMH**	**CC**	**CS**	**FRM**	**ES**
Using appropriate language to effectively communicate with passengers	X			X	X	X	X
Computing fares	X				X	X	
Assigning tasks to crew members based on their abilities		X	X	X	X	X	X
Operating safety equipment	X	X	X	X	X	X	X
Determining qualifying train and engine speeds		X	X	X	X	X	X
Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual		X	X	X	X	X	X

Identifying block signal aspects		X	X	X	X	X	X
Identifying whistle signals		X	X	X	X	X	X
Troubleshooting basic malfunctions in equipment		X	X	X	X	X	X
Testing and inspecting equipment		X	X	X	X	X	
Working on and about moving equipment	X	X	X	X	X	X	X
Securing trains and equipment		X	X	X	X	X	
Removing and installing air hoses		X	X	X	X	X	X
Removing and installing knuckles		X	X	X	X	X	X
Cutting out air brakes		X	X	X	X	X	
Securing dragging equipment		X	X	X	X	X	X
Applying and releasing hand brakes		X	X	X	X	X	X
Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)		X	X	X	X	X	X
Operating the various kinds of switches (e.g., hand operated, power switches)		X	X	X	X	X	X
Determining the position of switch points		X	X	X	X	X	X
Operating the various kinds of derails		X	X	X	X	X	
Installing and removing an end-of-train device		X	X	X	X		
Coupling and uncoupling air hoses		X	X	X	X	X	
Understanding defect detector messages		X	X	X	X	X	X
Aligning drawbars		X	X	X	X	X	X
Making up trains		X	X	X	X	X	X
Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment		X	X	X	X		X
Interpreting and using timetable information		X	X	X	X		X
Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal		X	X	X	X	X	X
Using telecommunication devices		X	X	X	X	X	X
Locating equipment restrictions in special instructions		X	X	X	X	X	X

Note. X indicates that the KSAO was linked to the functional category. PC = Passenger Interaction, TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management, ES = Emergency Situations.

ABILITIES	PI	TITR	TMH	CC	CS	FRM	ES
Maintain politeness with passengers	X			X	X		X
Physically board and detrain passengers with disabilities	X	X	X	X	X		X
General physical abilities (e.g., open doors, crawl under train, lift heavy objects, etc.)	X	X		X	X	X	X
Situational awareness	X	X	X	X	X	X	X
Actively listen	X	X	X	X	X		X
Judgment and decisionmaking	X	X	X	X	X	X	X
Comply with operating and safety rules while performing job tasks		X	X	X	X	X	X
Ascend and descend ladders when necessary		X	X	X	X		X
Lift heavy objects (e.g., 75 pounds or more)	X	X	X	X	X		X
Communicate information orally and in writing	X	X	X	X	X	X	X
Accurately judge car counts and distances when switching, shoving, or coupling		X	X	X	X		
See details accurately from a distance	X	X	X	X	X	X	X
Recognize and distinguish between the colors of railroad signs and signals		X	X	X	X	X	X
Hearing/auditory acuity	X			X	X		X
Sense and resolve problems as they arise	X	X	X	X	X	X	X
Coordinate and plan various movements safely and efficiently (e.g., set out and pick up cars en route, place cars at various industrial plants, classify cars)		X	X	X	X	X	X
Carry out tasks in harsh environmental conditions	X	X	X	X	X	X	X
Work nontraditional schedules (e.g., night shifts)				X	X		X

Note. X indicates that the KSAO was linked to the functional category. PC = Passenger Interaction. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management. ES = Emergency Situations.

Table 1, continued

OTHER CHARACTERISTICS	PI	TITR	TMH	CC	CS	FRM	ES
Patience	X	X	X	X	X	X	X
Teamwork	X	X	X	X	X		X
Leadership	X	X	X	X	X		X
Passion for safety	X	X	X	X	X		X
Conscientious	X	X	X	X	X	X	X
Dependable	X	X	X	X	X		X
Cooperative	X	X	X	X	X		X

Note. X indicates that the KSAO was linked to the functional category. PC = Passenger Interaction. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management. ES = Emergency Situations.

2.6 SME Panel Meeting 4: KSAO Rating Survey and Analysis

The fourth SME meeting was held in December 2011 in Boston with the same five passenger conductors that attended the third SME meeting. The purpose of this meeting was to assess (a) the relative importance of possessing the KSAO to perform the job duties of a passenger conductor, and (b) whether the KSAO should be used to develop conductor training programs and/or as a selection factor for hiring new conductors.

Participants were asked to rate all KSAOs on two of the four scales recommended by C-JAM (Brannick et al., 2007), KSAO importance, and KSAO trainability. The two scales that were selected are related to the training aspects of the job analysis and are designed to provide information that can be used for designing and evaluating training programs. These scales were chosen because the stated purpose of the current job analysis was to identify critical areas for conductor training. Similar scales have been used in previous job analyses (e.g., Morrow et al., 2009). A description of each scale and the associated response options are presented below.

- *KSAO Importance* – How important is it that passenger conductors possess this KSAO?

  1 – Not at all important
  2 – Somewhat important
  3 – Moderately important
  4 – Very important
  5 – Extremely important

- *KSAO Trainability* – Can this KSAO be taught using a formal training program (e.g., classroom training, simulation training, field training)?

  0 – No
  1 – Yes

The percentage of SMEs who indicated that a KSAO was trainable was used to evaluate whether the KSAO should be used in training versus selection. If greater than 50 percent of SMEs reported that the KSAO was trainable, then the KSAO was considered a candidate for training. Conversely, KSAOs that did not meet this criterion were judged to be useful for purposes of employee selection. Furthermore, the importance ratings aid in prioritizing which KSAOs should be emphasized for each purpose, with priority given to more important KSAOs. The KSAOs that were assessed as trainable by the majority of SMEs are listed in Table 2.

Table 2. Trainable KSAOs, Ranked by Importance

KSAO	Mean Imp.	SD Imp.	Trainable
Knowledge: Terminology and rules associated with restricted equipment	5.00	0.00	100.00%
Knowledge: Proper procedures for handling and reporting emergency situations	5.00	0.00	100.00%
Knowledge: Temporary and permanent speed restrictions	5.00	0.00	100.00%
Knowledge: Timetable information, special instructions, and track bulletins	5.00	0.00	80.00%
Knowledge: The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)	5.00	0.00	60.00%
Knowledge: The types of track authority required for the movement of a train on main tracks	5.00	0.00	100.00%
Knowledge: The rule for movement of trains on tracks other than main tracks	5.00	0.00	100.00%
Skill: Determining qualifying train and engine speeds	5.00	0.00	60.00%
Skill: Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual	5.00	0.00	100.00%
Skill: Identifying block signal aspects	5.00	0.00	100.00%
Skill: Identifying whistle signals	5.00	0.00	100.00%
Skill: Securing trains and equipment	5.00	0.00	100.00%
Skill: Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment	5.00	0.00	100.00%
Skill: Interpreting and using timetable information	5.00	0.00	100.00%
Skill: Locating equipment restrictions in special instructions	5.00	0.00	100.00%
Ability: Comply with operating and safety rules while performing job tasks	5.00	0.00	100.00%
Ability: Accurately judge car counts and distances when switching, shoving, or coupling	5.00	0.00	60.00%
Ability: Recognize and distinguish between the colors of railroad signs and signals	5.00	0.00	80.00%
Ability: Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)	5.00	0.00	80.00%
Skill: Determining the position of switch points	5.00	0.50	75.00%
Skill: Operating the various kinds of derails	5.00	0.50	75.00%
Knowledge: Contact information of dispatcher and trouble desk for each territory	4.80	0.45	100.00%
Knowledge: Rules and procedures for radio operation	4.80	0.45	100.00%
Knowledge: Location of all emergency safety equipment	4.80	0.45	100.00%
Knowledge: General railroad terminology	4.80	0.45	100.00%
Knowledge: Operating and safety rules	4.80	0.45	100.00%
Knowledge: Rules and procedures for switching of railcars and equipment	4.80	0.45	100.00%

Knowledge: Required air brake tests and when they apply	4.80	0.45	100.00%
Skill: Operating safety equipment	4.80	0.45	100.00%
Skill: Testing and inspecting equipment	4.80	0.45	80.00%
Skill: Applying and releasing hand brakes	4.80	0.45	100.00%
Skill: Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)	4.80	0.45	60.00%
Skill: Coupling and uncoupling air hoses	4.80	0.45	60.00%
Skill: Understanding defect detector messages	4.80	0.45	100.00%
Skill: Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal	4.80	0.45	80.00%
Skill: Working on and around moving equipment	4.75	0.50	60.00%
Knowledge: Proper operation of each coach	4.60	0.55	100.00%
Knowledge: Purpose and function of a rail yard	4.60	0.55	80.00%
Knowledge: Function of track components and rail equipment	4.60	0.55	80.00%
Knowledge: Terminology used in the classifying, blocking, and switching of rail cars	4.60	0.55	100.00%
Knowledge: The types and functions of defect detectors	4.60	0.55	100.00%
Knowledge: Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)	4.60	0.55	100.00%
Skill: Cutting out air brakes	4.60	0.55	100.00%
Skill: Securing dragging equipment	4.60	0.55	60.00%
Skill: Aligning drawbars	4.60	0.55	60.00%
Ability: Communicate information orally and in writing	4.60	0.55	80.00%
Knowledge: Train entrance and exit locations	4.40	0.55	100.00%
Knowledge: Basic duties of other railroad personnel that passenger conductors interact with during normal performance of duties	4.40	0.55	80.00%
Knowledge: Switch lists, track lists, and work orders	4.40	0.55	60.00%
Skill: Troubleshooting basic malfunctions in equipment	4.40	0.55	80.00%
Skill: Removing and installing air hoses	4.40	0.55	80.00%
Skill: Removing and installing knuckles	4.40	0.55	60.00%
Skill: Installing and removing an end-of-train device	4.40	0.55	100.00%
Ability: Ascend and descend ladders when necessary	4.40	0.55	60.00%
Knowledge: Train schedules	4.20	0.84	60.00%
Knowledge: Operation of classification yards	4.20	0.84	80.00%
Skill: Computing fares	4.20	0.84	100.00%
Knowledge: Various types of rolling stock	4.00	0.71	100.00%
Skill: Using telecommunication devices	3.40	1.34	80.00%

Note. Mean Imp. = Mean importance rating on a scale ranging from 1 (not at all important) to 5 (extremely important). SD Imp. = Standard deviation of importance ratings. Trainable = the percentage of SMEs who indicated the KSAO could be trained using a formal training program.

SME responses indicate that the majority (62) of the KSAOs are trainable, whereas 23 of the KSAOs would be more appropriate as selection factors in the hiring of passenger conductors, given the lack of trainability. The trainability percentages for 12 of the KSAOs (i.e., recognize and distinguish between the colors of railroad signs and signals, situational awareness) were relatively low, but still greater than 50 percent. It is also important to note that, among these relatively low trainable KSAOs, three (the physical characteristics of territory over which the conductor operates; determining qualifying train and engine speeds; and accurately judge car counts and distances when switching, showing, or coupling) were ranked as highly important. These particular KSAOs may also be appropriate to use as selection factors, rather than in training. The KSAOs that are more appropriate to use in employee selection are shown in Table 3.

Table 3. KSAOs to be Utilized in Employee Selection, Ranked by Importance

KSAO	Mean Imp.	SD Imp.	Trainable
Skill: Operating the various kinds of switches (e.g., hand operated, power switches)	5.00	0.00	50.00%
Skill: Making up trains	5.00	0.00	40.00%
Ability: Situational awareness	5.00	0.00	50.00%
Ability: Judgment and decisionmaking	5.00	0.00	40.00%
Ability: Sense and resolve problems as they arise	5.00	0.00	20.50%
Other Characteristic: Passion for safety	5.00	0.00	20.00%
Other Characteristic: Cooperative	5.00	0.00	25.00%
Other Characteristic: Dependable	5.00	0.00	00.00%
Skill: Assigning tasks to crew members based on their abilities	4.80	0.45	20.00%
Ability: Actively listen	4.80	0.45	40.00%
Ability: See details accurately from a distance	4.80	0.45	20.00%
Ability: Carry out tasks in harsh environmental conditions	4.80	0.45	40.00%
Other Characteristic: Conscientious	4.80	0.45	20.00%
Ability: Physically board and detrain passengers with disabilities	4.60	0.55	40.00%
Other Characteristic: Teamwork	4.60	0.55	40.00%
Skill: Using appropriate language to effectively communicate with passengers	4.40	0.55	50.00%
Other Characteristic: Patience	4.40	0.55	00.00%
Other Characteristic: Leadership	4.40	0.55	40.00%
Ability: Hearing/auditory acuity	4.20	0.45	20.00%
Ability: General physical abilities (e.g., open doors, crawl under train, lift heavy objects, etc.)	4.20	1.30	20.00%
Ability: Work nontraditional schedules (e.g., night shifts, on-call, long hours)	4.00	0.00	20.00%
Ability: Maintain politeness with passengers	3.40	0.89	20.00%

Note. Mean Imp. = Mean importance rating on a scale ranging from 1 (not at all important) to 5 (extremely important). SD Imp. = Standard deviation of importance ratings. Trainable = the percentage of SMEs who indicated the KSAO could be trained using a formal training program.

2.7 Job Context, Tools, Demands, and Experience to Acquire KSAOs

During the meeting in November 2011, additional information regarding the job context, tools used, and the demands of the job were discussed with the SMEs. Additionally, in May 2012, one of the SMEs was contacted to solidify some additional information. During the meetings, questions were also posed to SMEs regarding the experience needed to obtain the minimum acceptable level on two important KSAOs. The questions asked of SMEs and their responses are summarized below.

2.7.1 Job Context

A single question was posed to SMEs regarding the people that passenger conductors work with to perform the job successfully. SMEs indicated that passenger conductors work with a range of personnel to perform job tasks successfully, including the following:

- Brakemen
- Dispatchers
- Engineers
- Maintainers
- Other emergency response personnel
- Track foremen
- Trainmasters
- Road Foreman

These findings correspond with results presented earlier regarding the KSAOs needed to perform the job. This concurrence is due to the fact that a number of the KSAOs pertained to interpersonal interactions in one way or another. For example, skill in giving and interpreting communications signals with or without signaling equipment was identified as a very important KSAOs. These KSAOs are necessary because they facilitate work-related interactions with the personnel that passenger conductors must associate with on the job.

2.7.2 Tools Used

The SMEs were asked to identify examples of the kinds of tools and equipment used on the job. The types of tools and equipment discussed were consistent with results from the analysis of conductor tasks reported earlier. One of the primary categories of passenger conductor tasks relates to train inspection, troubleshooting, and repair, which require skill in using multiple tools and pieces of equipment. The types of tools and equipment used by passenger conductors include the following:

- Derails
- Flags
- Fusees/Flares
- Hand switches
- Lanterns
- Personal protective equipment (e.g., hard hats, safety glasses)
- Radio communication devices

2.7.3 Physical and Psychological Demands

Several questions focused on the demands of the job of passenger conductor, including both physical and psychological demands. Physical demands identified by SMEs include the following:

- Climbing
- Maneuvering over steep terrain
- Sacrificing sleep/enduring fatigue
- Throwing switches
- Walking
- Working in different climates

The SMEs interviewed suggested that one of the most demanding aspects of working as a passenger conductor is working nontraditional and unpredictable work schedules. Passenger conductors' work schedules often include night and weekend work. Passenger conductors are also subject to working on-call schedules, which can be unpredictable and involve very little notice before the start of a work shift. The SMEs suggested that, from their experience, the irregular work scheduling can lead to sleep deprivation and fatigue on the job. Moreover, SMEs remarked that lack of control over their work scheduling, and the ambiguity associated with working on call, can be problematic for getting adequate sleep and managing stress. Work scheduling was also identified as a driver of nonwork demands, including restricted time to meet personal and family obligations. This observation should be considered in light of ratings on one KSAO in particular. The ability to work nontraditional schedules (e.g., night shifts, on-call, long hours) was identified as an important KSAO, but was also seen as not trainable. It is probable that some personnel will not be able to effectively adapt to the demands of working such nontraditional schedules.

When SMEs were asked to describe the psychological demands associated with the job, the discussion primarily concerned the possibility of inadvertently hitting and/or killing bystanders while the train is in operation. SMEs noted that they feel helpless on the train in these and similar situations.

2.7.4 Experience Needed to Acquire KSAOs

An additional set of questions was used to investigate SME perceptions of the amount and type of on-the-job training (OJT) needed to acquire the minimum acceptable level of performance on two KSAOs: 1) the physical characteristics of the territory over which the conductor operates (e.g. tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings), and 2) ability to coordinate and plan various movements safely and efficiently (e.g. setting out and picking up cars en route, placing cars at various industrial plants, classifying cars). These KSAOs were drawn from the results of the KSAO rating survey that suggested they were very important for passenger conductors. SMEs remarked that the first KSAO, physical characteristics of the territory over which the conductor operates, required at least one week of OJT, depending on the amount of territory the passenger conductor is covering. The experts also

suggested that the OJT be supervised, and that the supervision be reduced over time as the relevant knowledge is acquired.

The second important KSAO discussed was the ability to coordinate and plan various movements safely and efficiently. Again, SMEs were in agreement that OJT is needed to acquire this ability. Specifically, the SMEs noted that approximately 1 to 2 months of supervised OJT is needed to acquire the minimum acceptable level of the ability. SMEs emphasized that the experience needs to be supervised experience such that the trainee is close to the trainer throughout the beginning phase of OJT.

3. Conclusion

The purpose of this investigation was to conduct a systematic analysis of the job of a passenger conductor and to identify key knowledge areas, skills, abilities, and other characteristics that are appropriate to target in the training and development of the passenger conductor workforce. However, it is important to note that although the initiative for conducting job analyses was specifically aimed at assisting in the development of effective training programs, the results of job analyses can be applied toward the development of other infrastructures such as performance appraisals and personnel selection systems within organizations. Findings from the analysis indicate that passenger conductors carry out tasks involving (a) passenger interaction; (b) crew communication; (c) crew supervision; (d) form and record management; (e) train inspection, troubleshooting, and repair; (f) train makeup and handling; and (g) emergency situations. Some of the most important KSAOs needed by passenger conductors to perform those job tasks are knowledge of the proper procedures for handling and reporting emergency situations, skill in identifying block signal aspects, ability to comply with operating and safety rules while performing job tasks, and a passion for safety (other characteristic). Results from SME interviews suggest that many of the KSAOs are trainable (e.g., terminology and rules associated with restricted equipment), and such KSAOs can and should be the focus of employee education in formal training programs. Conversely, other KSAOs (e.g., ability to work nontraditional schedules, ability to carry out tasks in harsh environmental conditions) should be considered when selecting and hiring new passenger conductors because SMEs perceived such KSAOs as less appropriate for training.

In addition, conductors use a variety of tools and equipment on the job; for example, personal protective equipment and radio communication devices. Conductors also work with a variety of railroad personnel including locomotive engineers, dispatchers, and foremen. The job is physically and psychologically demanding for workers—demands related to work scheduling and fatigue being among the most prominent.

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Appendix

Task List with Mean Ratings of Consequences of Error, Difficulty, and Importance

Passenger Interaction	Con	Dif	Imp
Ensure safety and comfort for passengers with disabilities by complying with ADA regulations.	4.89	3.33	8.22
Assume responsibility for minors traveling alone until claimed by legal guardian.	4.50	3.75	8.25
Mediate passenger disputes when necessary.	4.44	4.22	8.66
Collect fares and sell tickets to passengers, as needed.	4.33	2.11	6.44
Announce all necessary information to keep passengers informed (e.g. arrival and departure times, number of stops, and fares).	4.33	2.33	6.66
Assist passengers on and off the train to ensure passenger safety.	4.25	2.67	6.92
Walk the train back and forth to address passengers' questions, comments, or concerns.	2.89	2.11	5.00
Train Inspection, Troubleshooting, & Repair	**Con**	**Dif**	**Imp**
Locate, inspect, and report defects identified by a defect detector.	4.78	3.22	8.00
Perform required air brake tests or verify that they have been properly performed.	4.78	2.56	7.34
Secure dragging equipment when necessary.	4.67	3.44	8.11
Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.	4.67	3.11	7.78
Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.	4.44	3.56	8.00
Replace faulty air hoses when necessary.	4.44	3.44	7.88
Inspect other trains en route (i.e., roll by inspection).	4.44	2.33	6.77
Replace broken knuckles when necessary.	4.33	3.89	8.22
Inspect train prior to passengers boarding and report any suspicious objects to ensure passenger safety.	4.00	2.20	6.20
Train Makeup & Handling	**Con**	**Dif**	**Imp**
Provide protection to other trains in accordance with rules during emergency brake application.	5.00	2.89	7.89
Provide protection when shoving cars.	4.89	2.67	7.56
Apply the emergency brake to stop the train in extreme circumstances.	4.89	2.44	7.33
Inspect and line switches as required.	4.89	2.44	7.33
Call to have derailing equipment removed and replaced.	4.75	3.00	7.75
Install and remove end-of-train devices.	4.56	3.00	7.56
Couple and uncouple train cars.	4.56	2.89	7.45
Switch train cars in accordance with work order instructions.	4.56	2.78	7.34
Join air hoses during train makeup.	4.22	3.00	7.22

Note. Dif = Mean difficulty ratings. Con = Mean consequences of error ratings. Imp = Mean importance ratings. Task Importance ranges from 1 to 10 with 10 corresponding to greatest task importance. It is the sum of ratings of Task Difficulty (1–5) and Consequences of Error (1–5).

Crew Communication	Con	Dif	Imp
Remind the engineer that the train is approaching an area regulated by limits of authority, track warrants, track bulletins, or speed restriction.	5.00	3.44	8.44
Call out signals as they are encountered when operating in signal territory and as job activities change.	5.00	3.00	8.00
Advise the proper authority when the train clears the main track or territory.	5.00	2.89	7.89
Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.	5.00	2.56	7.56
Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).	4.89	2.89	7.78
Advise the engineer of any restrictions placed on equipment being handled.	4.78	3.00	7.78
Advise the dispatcher of any restrictions placed on equipment being handled.	4.67	3.11	7.78
Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).	4.67	2.89	7.56
Crew Supervision	**Con**	**Dif**	**Imp**
Ensure crew members comply with applicable rules, special instructions, signals, and track authority.	4.89	2.89	7.78
Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.	4.78	2.89	7.67
Conduct pretrip planning briefings with train crew members, yard master, and other authorities.	4.78	2.89	7.67
Direct other crew members during switching or train operations.	4.67	2.89	7.56
Form and Record Management	**Con**	**Dif**	**Imp**
Report car defects.	4.89	2.50	7.39
Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.	4.78	2.75	7.53
Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.	4.78	2.63	7.41
Record train times when trains are given permission to enter the work area when assigned as flagmen.	4.78	2.56	7.34
Update required rule books and bulletins for all territories that are operated on.	4.67	3.22	7.89
Update train list information per operating rules.	4.50	2.56	7.06
Complete required FRA tie up documentation.	4.33	2.78	7.11
Update the signal awareness form.	4.25	2.56	6.81
Complete a work train report, if applicable, when called for work train service.	4.00	2.56	6.56
Complete delay reports for each trip noting any delays.	3.89	2.50	6.39

Emergency Situations	Con	Dif	Imp
Evaluate the train if necessary.	4.80	3.20	8.00
Walk the train to ensure safety and notify passengers of the emergency.	4.60	2.20	6.80
Radio communication to the dispatcher to report the incident.	4.60	2.00	6.60
Secure the train.	4.40	2.20	6.60
Relay emergency information to all personnel working on the train.	4.20	2.20	6.40

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