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SafeOCS Industry Safety Data: The Value Proposition for the Oil & Gas Industry

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Abstract

This paper summarizes efforts by the U.S. Department of Transportation, Bureau of Transportation Statistics (BTS) to develop and manage an industry-wide safety data framework under an agreement with the U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE). The Industry Safety Data (ISD) program provides a trusted, proactive means for the oil and gas industry to voluntarily and securely report safety information to identify early warnings of safety problems by uncovering hidden at-risk conditions not previously exposed from analysis of reportable accidents and incidents. Besides agency-reportable incidents, this program captures near miss and other significant safety event information that is maintained by individual companies as part of their internal safety programs. Phase I of this program was completed in June 2019, and plans are progressing to expand industry participation.

Companies have long realized the benefits of collecting and analyzing data around safety and environmental incidents to identify risk, then develop systems and processes to prevent recurrence. These activities have been supported and supplemented by industry associations that collect and share event information and develop recommended practices to aid in performance improvement. In high-reliability industries, such as aviation and nuclear, it is common practice to report and share events among companies and regulators to identify hidden trends and create or update existing recommended practices or regulations.

The challenge for the oil and gas industry operating within the U.S. Gulf of Mexico Outer Continental Shelf (OCS) was that, while industry associations and the regulator were collecting data on significant incidents, lesser safety events or observed unsafe conditions/behaviors are not required to be reported and therefore may go unnoticed as a trend until a major event occurs. This represented an opportunity for industry, BSEE, and BTS to collaborate on a means of gathering incident data that would allow for analysis and identification of trends or events of significance enabling appropriate interventions to prevent major incidents. The value proposition of this effort is development of a comprehensive safety data repository that facilitates the continual

improvement in safety and environmental performance from the implementation of learnings shared from trends or lesser incidents and events occurring within industry.

Keywords: Incident Investigation; Metrics; Near Miss Reporting; Lessons Learned; Data Collection and Sorting; Incident Recording, Reporting, and Analysis; Incident Classification

1 Introduction

In the aftermath of the Deepwater Horizon oil spill, the oil and gas industry, regulators, and other stakeholders recognized the need for increased collaboration and data sharing to augment their ability to identify safety risks and address them before an accident occurs. The SafeOCS Program is one such collaboration between industry and government. It is a voluntary confidential reporting program that collects and analyzes data to advance safety in oil and gas operations on the Outer Continental Shelf (OCS). BSEE established the program with input from industry, and then entered into an agreement with BTS to develop, implement, and operate the program.

As a statistical agency, BTS has considerable data collection and analysis expertise and the statutory authority to protect the confidentiality of the reported information and the reporters. BTS has also developed and operated confidential near miss reporting systems for the railroad and metro transit industries and has a detailed working knowledge of data management systems utilized by other industry sectors. Although the SafeOCS program is supported by BSEE and maintained by BTS, input from industry has been instrumental and this safety data framework is intended to benefit *all* stakeholders.

These companies volunteered their staff time and resources over the course of almost two years to assist BTS in the ground work required to design the SafeOCS ISD database. An important outcome of these efforts was identification of the core data fields that became part of the initial SafeOCS ISD program. The latter involved a detailed discussion of each proposed data field to ensure that the information captured would enable industry to have meaningful discussions of the results and prospective mitigative measures that could be taken to enhance safety in the field.

1.1 Solving for the Gap

Across industries, companies have long realized the benefits of collecting and analyzing data around safety and environmental events to identify risks and take actions to prevent reoccurrence. These activities have been aided by industry associations that collect and share event information and develop recommended practices to improve performance. In high-reliability industries such as aviation and nuclear, it is common practice to report and share events between companies and for the regulators to identify hidden trends and create or update existing recommended practices, regulations, or other controls.

The challenge for the offshore oil and gas industry was that industry associations and the regulator were collecting data on agency-reportable incidents, but other high-learning value events or observed conditions/behaviors could go unnoticed as a trend until a major event occurred. This represented an opportunity for the industry and the offshore regulator (BSEE) to collaborate on a means of gathering safety event data that would allow for analysis and identification of trends,

thereby enabling appropriate interventions to prevent major incidents and foster continuous improvement.

Supplementing existing systems and processes for reporting events would allow all stakeholders the ability to gain insight from a broader range of safety events. Key aspects of SafeOCS ISD include:

- Providing a central repository for safety-related data collection, analysis, and sharing of learnings;
- Identifying the type of data that will provide valuable information;
- Gaining alignment on event data definitions and associated metadata;
- Utilizing a secure process for collection of data where adverse legal actions cannot be taken against data submitters nor can raw data be used for regulatory development purposes;
- Implementing a robust methodology for identifying systemic issues;
- Disseminating the findings to stakeholders who can then take actions to reduce or eliminate process and personal safety risks; and
- Providing opportunities for participating companies to compare internal data with aggregated results.

> "The opportunity for the next step change in safety performance appears to be in a substantial increase in the sharing of data across industry. Leading practices in other industries (i.e. transportation) may be adopted in the oil and gas industry to similar effect…"
>
> International Regulator's Forum on Global Offshore Safety, June 2018

The concept of sharing lessons learned from safety events aligns with BSEE's Safety Culture Policy Statement[1] wherein BSEE encourages companies to seek out and implement "continuous improvement opportunities to learn about ways to ensure safety and environmental stewardship." Other elements of BSEE's safety culture policy that directly support the SafeOCS ISD Program include:

- Focusing on hazard identification and risk management to flag issues potentially impacting safety;
- Encouraging inquiring attitudes by continuously considering and reviewing existing conditions and activities to identify discrepancies that might result in inappropriate action; and
- Maintaining an open and effective safety communication environment.

1.2 The Importance of Capturing and Sharing Safety Event Data

Major incidents, although rare, serve to underscore the need for collecting information on precursor events that can anticipate the potential for a major incident. It is important to understand precursor events (including near-misses), barrier integrity as it relates to incident prevention and mitigation, and high-value learning events. Barriers are systems, processes, or engineering

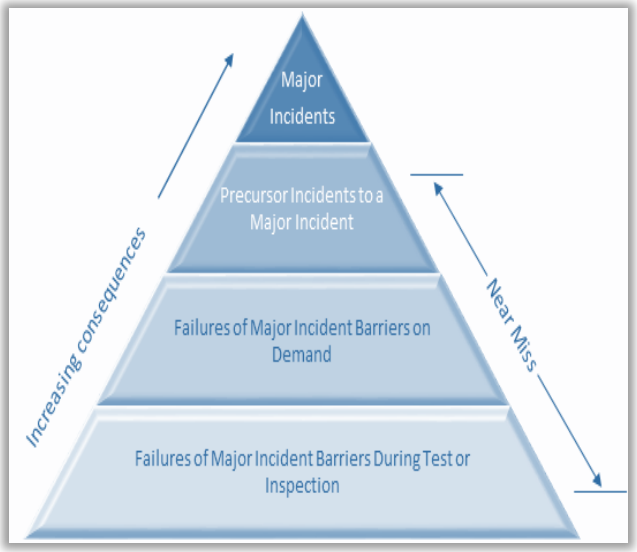
[1] BSEE Final Safety Culture Policy Statement, May 2013.

solutions that are designed to prevent incidents from occurring.

The scope of the data with potential learning opportunities ranges from major incidents that result in personnel injuries or fatalities to near-miss events and significant observations of unsafe conditions and/or actions, as depicted in the safety triangle in Figure 1. Various studies have corroborated a many to one relationship between lesser and more significant incidents.

It is critical to understand the types of events, conditions, or behaviors that are noted prior to a more significant event occurring and work to strengthen the controls that are intended to reduce or eliminate the chance of an incident.

Figure 1: Safety Triangle



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Therefore, the objective of the SafeOCS ISD Program is to capture this data so they can be analyzed for trends and learnings can be implemented with the goal of preventing more serious events. This approach allows all companies working on the OCS to prioritize resources to ensure that they have controls in place to minimize the risk of a significant event.

1.3 Data Protection and Confidentiality

SafeOCS operates under a Federal law, the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA), which requires that the program protect any identifying, sensitive or proprietary information it collects and prohibits its release to unauthorized persons or organizations. Information submitted under CIPSEA can be used only for statistical purposes.

1.3.1 CIPSEA Protections

- No government agency may require, for any reason, a copy of a respondent's report
- Courts cannot require a copy of any respondent's report
- Reports are immune from the legal process and cannot be admitted as evidence
- Reports are **exempt** from Freedom of Information Act (FOIA) requests
- Information may not be disclosed in identifiable form for any non-statistical purpose without the informed consent of a respondent

CIPSEA protected data cannot be used for enforcement or regulatory purposes.

1.3.2 *Protected Information*

- Original SafeOCS reports provided directly to BTS

- Any SafeOCS working documents
- Supplemental reports resulting from incident investigations that are submitted to BTS as part of the event record
- Sections of root cause analysis reports developed by designated subject matter experts (SMEs)
- All of the above whether paper or electronic

1.3.3 Non-Disclosure Agreements (NDAs)

Anyone working on a SafeOCS data collection is subject to a non-disclosure agreement as mandated by CIPSEA. Willful disclosure of confidential information by federal employees, agents, and contractors is subject to strict criminal and civil penalties for noncompliance.

CIPSEA protections do not apply to non-confidential information, including preventative safety actions recommended for implementation by SMEs or stakeholders, and any documents developed for public dissemination using confidential data.

2 Development of ISD Phase I

2.1 Development Timeline

In 2013, BSEE approached BTS expressing interest in establishing a near miss reporting program for the offshore oil and gas industry whereby company employees could individually submit on a voluntary basis safety event data at the time of occurrence. BSEE hosted a series of public meetings in 2014 to introduce this new initiative to industry. While offshore oil and gas companies recognized the benefits to this approach, they preferred not placing this reporting burden on individual employees and suggested instead that it would be more effective for companies to provide the requested information after the event details had been verified.

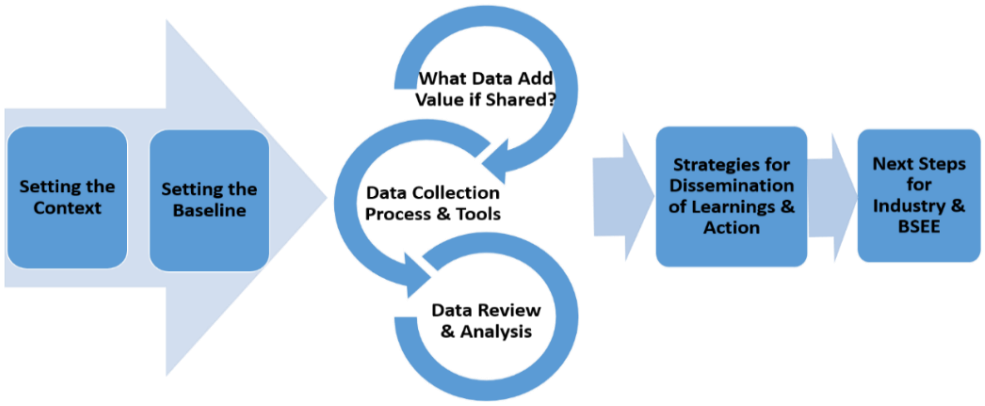
In 2014, BSEE approached the Society of Petroleum Engineers (SPE) regarding a proposed opportunity for industry and government to collaborate on development of a voluntary industry-wide near miss data collection framework and management database. The goal of this effort was intended as a resource to provide guidance to industry and enhance its ability to capture and share key learnings from safety and environmental events that were not currently being captured. In the spirit of continuous improvement, a related objective was to bring government and industry together to make a safe industry even safer through open data sharing, to enhance public confidence in the industry.

2.2 Laying the Groundwork: SPE/BSEE Summit

From 2014-2016, BSEE and SPE worked with a team of industry representatives, as well as BTS, aviation, and shipping experts to identify potential best practices for the capture and sharing of key learnings from safety and environmental events that were not currently being captured. The collaboration culminated in BSEE and SPE co-sponsoring a summit in April 2016 that included 62 representatives from 47 companies, both within and external to the oil and gas industry, to engage in a dialogue on what it would take to develop an industry-wide safety data management database. The high-level agenda for the summit is shown in Figure 2. The summit Technical

Report[2] included an action item to create and pilot a process and database for aggregating and analyzing industry safety data as part of a centralized framework.

Figure 2: 2016 SPE/BSEE Summit Agenda



SOURCE: SPE Technical Report: Assessing the Processes, Tools, and Value of Sharing and Learning from Offshore E&P Safety Related Data," September 2016

Although the scope of the summit initially focused on near-misses, the summit participants expanded the scope to include a broader range of safety data with learning value. The change in scope was intended to better position the effort to aid industry in achieving improved safety performance. The summit also clearly framed an additional goal of the effort: to avoid creating an additional layer of reporting expectations over and above the current requirements by regulators and industry associations.

2.3 Initiating ISD Phase I

Following issuance of the SPE Technical Report, BTS initiated efforts to form a team of companies interested in participating in ISD Phase I. Invitations were sent to individual companies asking them to participate in the Phase I effort as early implementers and to assist BTS in designing the safety data management framework. Once nine (9) companies expressed interest, the Phase I effort commenced. The nine companies represented a cross-section of companies operating in the Gulf of Mexico (GOM) as it included a mix of operators, service and drilling contractors.

As noted in the Introduction, BTS had already been designated as the repository to collect and analyze mandatory Well Control Rule (WCR) and Safety and Pollution Prevention Equipment (SPPE) data reports submitted by companies working in the OCS as required by regulation. BTS was therefore the logical choice to collect and analyze safety data reports submitted voluntarily by companies participating in the program.

In January 2018, BTS formed the Phase I Planning Team consisting of SMEs from each of the nine companies. The team agreed that the primary objective of Phase I was to develop a *proof of*

[2] "SPE Technical Report: Assessing the Processes, Tools, and Value of Sharing and Learning from Offshore E&P Safety Related Data," September 2016

concept for a proposed industry-wide safety event database, and the team also recognized the importance of industry input to maximize benefits of the end products. The Planning Team members further agreed on the following scope of their responsibilities:

- Discuss the type of data that should be submitted to ensure that the data captured has appropriate learning value, which may include, but is not limited to reportable and non-reportable events, near-misses, observations, unsafe conditions, stop work events, and associated metadata.
- Coordinate with BTS on the effectiveness of the SafeOCS ISD Program design and process, including potential enhancements to consider for the data aggregation and review processes.
- Review the SafeOCS ISD draft report and provide feedback prior to BTS approval and release.
- Participate (if desired) in one or more Data Review Teams, as appropriate, or suggest alternative representatives from their respective companies to be Data Review Team members.

It was important to set realistic and achievable goals for the desired outcomes of Phase I recognizing that such an effort to collect and analyze data across the industry had not been undertaken before. As such, the key objectives for Phase I were as follows:

1. Develop a process that overcomes the challenges of collecting and aggregating safety data from disparate company-specific databases, without requiring those companies to reformat their data;
2. Test the data aggregation process to identify and merge (as appropriate) potential duplicate records for the same event;
3. Analyze the aggregated data set and present findings on trends or events of significance; and
4. Provide recommendations on how the industry might utilize and benefit from SafeOCS ISD reports.

Meetings between BTS and the Planning Team members were held from July 2018 through April 2019 to review and discuss the aggregated data, as well as to brainstorm program enhancements that should be considered. These meetings also addressed how best to characterize the aggregated data to provide optimum sharing and learning opportunities for industry.

3 SafeOCS ISD Process Overview

The ISD Phase I effort resulted in the development of a process for data collection, analysis, and dissemination. Since Phase I was a pilot, its governance process was fully developed over the course of the effort. Moving forward, the ISD Program will follow a substantially similar governance process; where differences exist, they are noted below. The overall process that governed ISD Phase I is described in the subsections below.

3.1 Agreement with BTS

Each of the nine companies executed an agreement with BTS that detailed the scope of engagement between the company and BTS:

- Type of data to be submitted (i.e., safety and environmental events, near-misses, etc.);
- Event date ranges (i.e., number of years) of submitted data;
- Format of the data set to be provided to BTS;

- Company's expectations regarding data review and analysis of its own data; and
- Company's rights to its own data.

Moving forward after Phase I, new ISD participants will execute a Memorandum of Understanding (MOA) with BTS when they decide to participate. The MOA addresses the same information as the agreements used for ISD Phase I participants.

3.2 Data Collection

Upon signing the agreement, each company provided data to BTS for inclusion in the ISD Phase I database via an online portal. Online portal users created a profile through the SafeOCS website which employs a two-factor authentication method for logging in. This process ensures that data files are subject to the confidentiality protections of CIPSEA.

3.3 Data Review and Processing

BTS staff, with assistance from independent industry SMEs, processed and prepared the data for further review and analysis. BTS mapped all submitted data to the core data fields in SafeOCS ISD to allow for effective and meaningful aggregation and analysis. Part of the review was to identify reports that may be redundant due to submittal from more than one source (e.g., operator, service provider, drilling contractor, construction contractor). To avoid duplication, BTS used data matching and data mining techniques to consolidate information from multiple reports on the same event.

3.4 Statistical Analysis

After the initial data preparation, BTS analysts conducted exploratory data analysis to ensure data quality. Assisted by independent industry SMEs, BTS conducted analyses of the aggregated core data to identify trends and specific high-value learnings.

3.5 Data Review Team

BTS established a Data Review Team to assess, review, and analyze data to identify trends and specific high-level learnings. The Data Review Team comprised representatives from the nine participating companies, as well as BTS staff and the independent industry SMEs. Each team member received confidentiality training, signed a Non-Disclosure Agreement (NDA), and were designated as agents under CIPSEA. Unlike the independent industry SMEs who assisted BTS staff, industry SMEs assessed and analyzed only aggregated data, but they could also access and analyze their own company data.

The Data Review Team also assisted BTS with preparation of the draft report capturing the results of the aggregated data analyses and observations. All work performed by Data Review Team members took place in designated secure work spaces.

3.6 Disclosure Review Board

BTS also established a Disclosure Review Board to review the draft report in accordance with CIPSEA disclosure requirements and expected compliance with principles and practices of a

statistical agency. For Phase I, the Data Review Team served as the Disclosure Review Board. The Disclosure Review Team responsibilities included ensuring that the identity of individuals and data contributors are protected from direct and indirect disclosure. Moving forward, the Data Review Team(s) and the Disclosure Review Board will differ in membership.

3.7 BTS Internal Review Process

Based on recommendations from the Disclosure Review Team, all final determinations of whether to disclose a final document rest solely with the BTS Confidentiality Officer. Within BTS, the report was reviewed by the ISD Program Director prior to review and approval by the BTS Director.

3.8 Report Publication

Upon publication of this report, industry may engage with other stakeholders and industry organizations to address the report findings. BTS may also act as the technical representative on statistical issues and data quality issues.

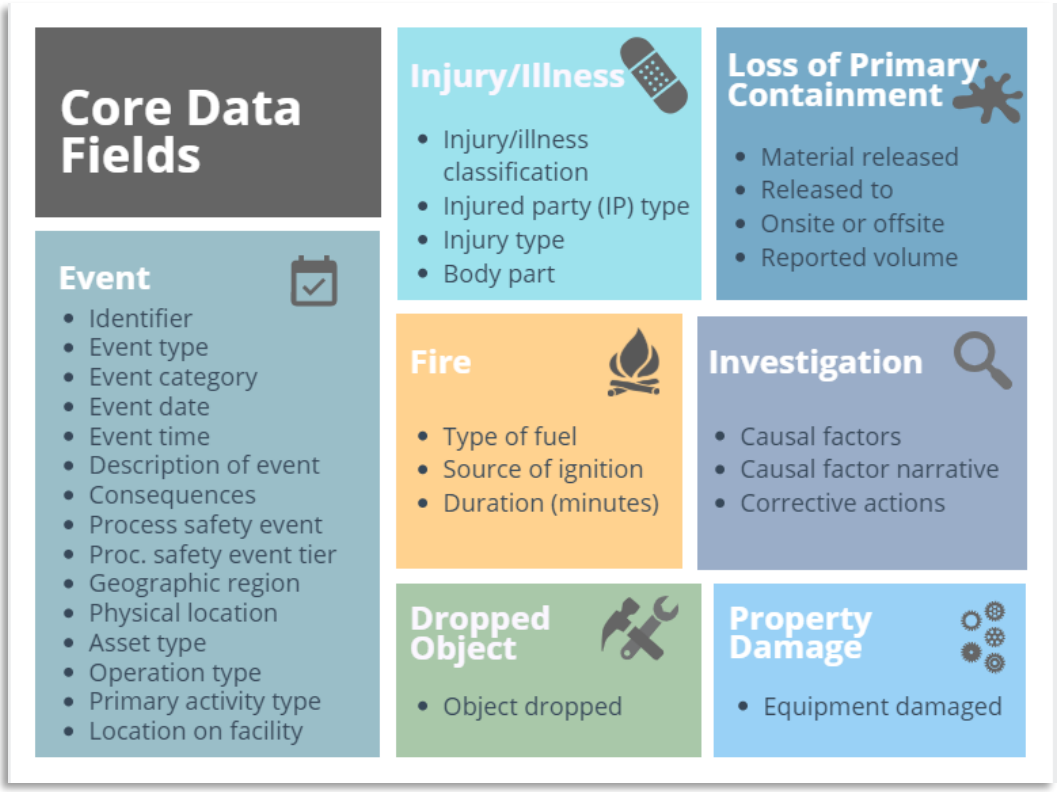
4 Phase I Study Protocol

With input from the ISD Phase I Planning team, BTS developed a study protocol, including the *scope of core data* fields to be included and the *data mapping* - the process for conforming data to the standardized template.

4.1 Scope of Core Data

A key focus area for the Phase I Planning Team was to identify the core data fields that should be considered for SafeOCS ISD. After comparing what each company was capturing, the group agreed that collecting the core data fields listed in Figure 3 would deliver the most value to industry and enhance industry's ability to learn from safety-events and mitigate future occurrences.

Figure 3: ISD Database Core Data Fields



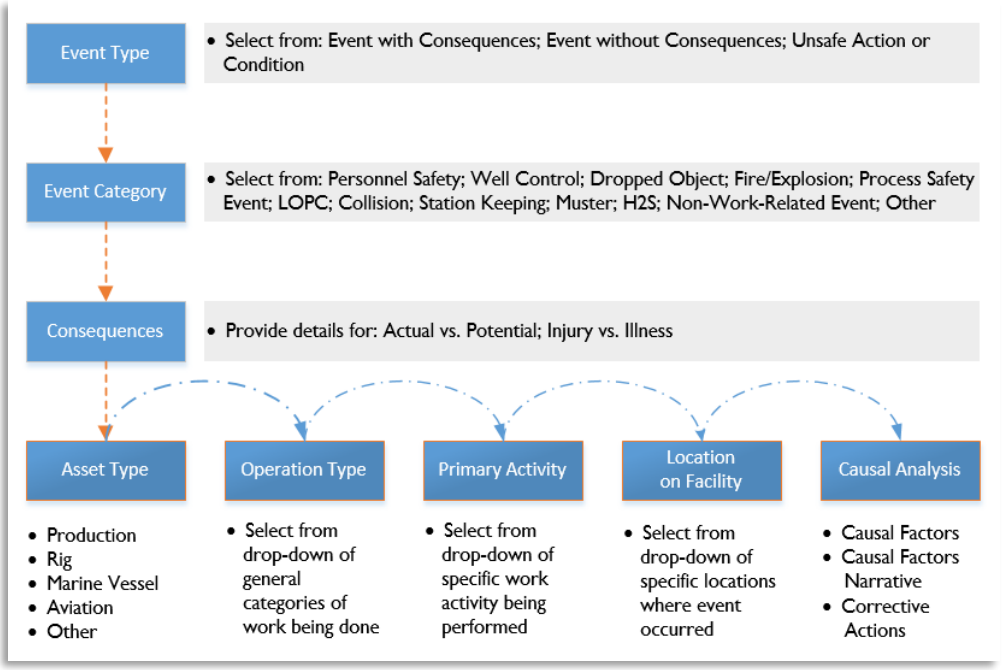
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

4.2 Data Mapping Process

Working with SMEs, BTS then mapped all data submissions to a standardized format to allow the data to be aggregated and completed a detailed analysis of the aggregated data to demonstrate what can be accomplished on an industry-wide basis to analyze the causal factors and identify trends. All data reviewers were subject to non-disclosure requirements mandated by CIPSEA.

The data mapping process entailed matching the company's data to the SafeOCS ISD core data fields to provide consistency in how data are captured and allow for a more meaningful analysis. Each company's datasets were first limited to events that occurred in the Gulf of Mexico OCS. A SafeOCS ISD *codebook* was then developed to aid BTS staff (assisted by internal SMEs) with consistently mapping company-specific data submissions to the SafeOCS ISD database.

Figure 4: Data Mapping Process for ISD Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019

Each event was reviewed in the following manner (Figure 4):

1. the event type was categorized as either an event with or without consequence or an unsafe condition or act (e.g., safety observation)
2. each event was then flagged to the overarching characteristics involved. Note that any single event could trigger multiple characteristics, so more than one characteristic may apply (e.g., a Loss of Primary Containment Event (LOPC) event might also be classified as a process safety event depending on event circumstances)
3. consequences of the event, if any, were identified, such as whether the event resulted in an actual injury or illness
4. once the event characteristics were mapped, the focus then shifted to where the event occurred and what specific activity was happening at the time

5. the last step in the data mapping process focused on investigation of the incident and any identified causal factors, as this is likely where most of the key learnings will be identified; if a company submitted more than one causal factor, all of the those provided were entered into the database

For the causal analysis (step 5 above), Phase I members agreed to use a list of fifteen (15) Areas for Improvement (AFI) developed by the Center for Offshore Safety as a starting point, with the addition of three supplementary causal factors (leadership, human factors, and human performance) based on the data submitted, as well as BTS' experience in analyzing data from other industries. The eighteen (18) causal factors are listed in Figure 5 below.

Figure 5: ISD Event Causal Factors

GENERAL CATEGORY	CAUSAL FACTOR
PHYSICAL FACILITY, EQUIPMENT, AND PROCESS	• Process equipment and design • Process or equipment material selection, fabrication, and construction • Process or equipment reliability • Instrument, analyzer, and controls reliability
ADMINISTRATIVE PROCESSES	• Risk assessment and management • Operating procedures or safe work practices • Management of change • Work direction of management • Emergency response
PEOPLE	• Personnel skills or knowledge • Quality of task planning and preparation • Individual or group decision-making • Quality of task execution • Quality of hazard mitigation • Communication • Human factors • Human performance • Leadership

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

5 Phase I Data Review and Analysis

The results of the data review and analysis process described here are illustrative of what could be implemented for the SafeOCS ISD Program as the database grows. It is important to note that the results, trends, and observations presented in this section are representative of only the nine (9) companies participating as early implementers and should not be interpreted as being representative of the entire offshore industry sector.

5.1 Data Description

For Phase I, nine companies submitted industry safety data for 2014-2017. The submitted data was in different formats, spanned across different years, and included different geographic regions. Though all nine companies submitted data, not all submitted data for each reporting year and some companies included events that were outside of OCS Gulf of Mexico (GOM).

To allow focus on offshore activities, the data analyzed excludes events occurring on land-based support facilities, such as shore bases, fabrication yards, and shipping terminals. Also excluded were events that occurred at the terminal or heliport unless the marine vessel or helicopter was *en route* to or from an offshore location.

Of the offshore events, 4.2 percent were considered *non-work-related* as defined by OSHA 1904.5(b)(2). For example, a non-work-related event could be an illness or injury that occurred off property but continued or worsened while offshore. Other examples of non-work-related events excluded were security violations; drug and alcohol violations; personal illnesses or health conditions; and injuries identified by the submitting company as non-work-related because they occurred while the employee was off duty. Of the non-work related events, nearly three-quarters involved an injury or illness that happened *off property* (e.g., cold/flu related symptoms or a back injury doing home yard work that caused pain while the employee was offshore); approximately one-fifth involved *off duty* injuries occurring in or near the crew accommodations (e.g., getting in/out of bunk beds, slipping in the shower, tripping on stairs, etc.); and a few events involved *possession of banned items* (alcohol, drugs, etc.).

5.2 Analysis Structure

The data analysis section starts by examining overall information about the 8631 events. Results are then grouped into three focus areas: *process safety*, *personal safety*, and *environmental stewardship*.

Process safety hazards in the oil and gas industry generally involve the potential release of harmful substances arising from operations of a drilling rig or production platform (e.g., well or production operations). Process safety hazards have the potential for serious consequences, such as loss of the facility, fatalities, damage to the environment, or harm to the company's reputation and financial health. Significant process safety incidents are typically low-frequency high-consequence events. Because these types of incidents are relatively infrequent, an important source of data is potential

leading indicators found among incidents in the bottom portion of the safety triangle.[3]

Personal safety hazards involve the potential for harm to personnel due to injury or illness. Most injuries and fatalities arise from personal safety hazards rather than process safety hazards, and many companies employ mature data collection processes for personal safety incidents at all levels of the safety triangle. As with process safety, an opportunity exists to seek additional learnings from personal safety events that are often viewed as less significant but given different circumstances could result in injury. The SafeOCS ISD Program is seeking to capture personal safety data to support the identification and development of appropriate controls such as training, operating procedures and practices, or competency assessments.

Environmental stewardship hazards have the potential to harm ecosystems by polluting waters, killing wildlife, and/or contaminating habitats. Given the sensitivity of the environment where offshore activities occur, companies working in the GOM must exercise appropriate practices to protect the environment. The SafeOCS ISD Program seeks to capture events involving environmental hazards to support the development and/or improvement of appropriate controls.

This analytical structure is intended to present results in a way that facilitates use by industry and other stakeholders to advance safety and environmental protection. With increased industry participation in SafeOCS ISD, a similar analysis of a larger and more representative dataset could highlight potential problem areas and best practices that could apply more broadly.

6 Data Analysis

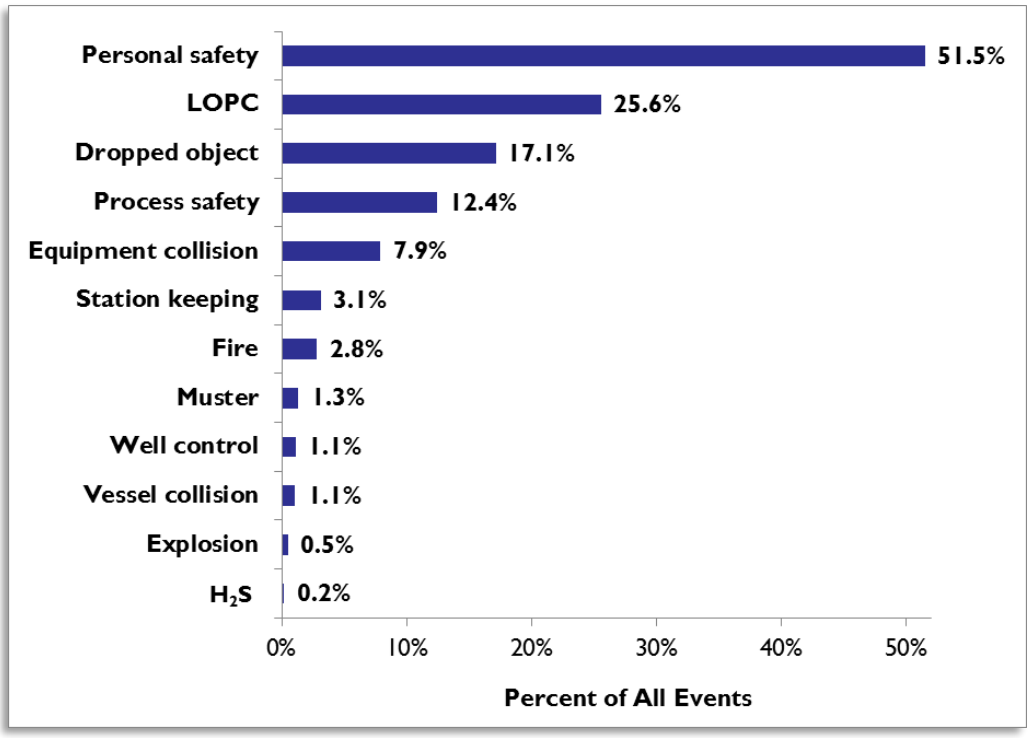
6.1 All Event Summaries

The Data Analysis section begins with a summary description of all safety events using core data fields, categories and characteristics. Of the total events, about 80 percent were e*vents with consequences* and the remainder were *events without consequences*. For "*events without consequences*," behavior-based events and safety observations were excluded from the scope of the pilot.

[3] See also, Int'l Assoc. of Oil & Gas Producers, Process safety – Recommended practice on Key Performance Indicators, Report No. 456, Nov. 2018 ("[Because process safety failures are relatively infrequent, it is] necessary to broaden these analyses to learn from events with less serious outcomes.")

Figure 6 illustrates the types of events reported using the *event category* field. SafeOCS allowed companies to make multiple selections to describe events as appropriate since multiple safety categories can be involved in a single event. The *personal safety* category was selected over 50 percent of the time to describe safety events. As a result, the total of the individual categories exceeds the total number of events.

Figure 6: Submitted Events by Category

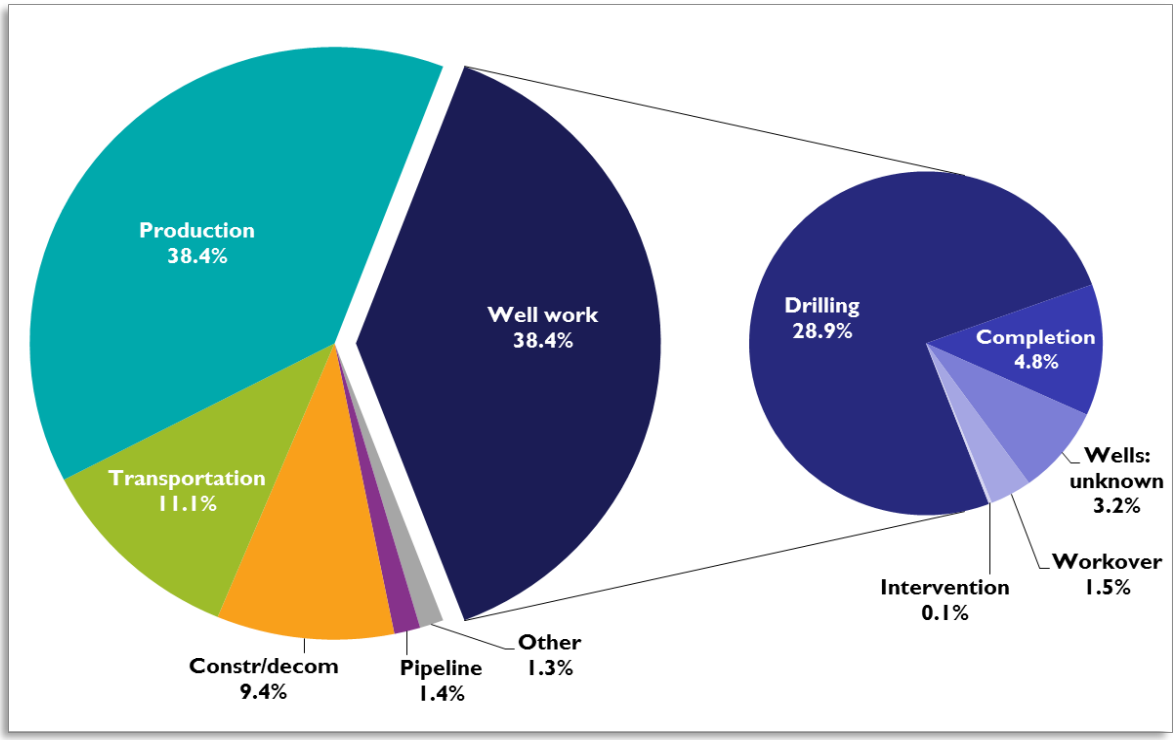


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Events involving *collisions* were separated into two categories: 1) *vessel collision* for those involving marine or aviation vessels and 2) *equipment collision* for events involving objects striking equipment (e.g., a suspended load striking a handrail). It is important to note that dropped objects that land on the deck or strike equipment are not considered equipment collisions.

Figure 7 shows the reported events by groups of related *operations* that were ongoing when events occurred. Some operations were combined for ease of display. For example, *drilling*, *completion*, *workover*, *intervention*, and *plugging and abandonment* were combined into *well work*. Most of the reported events happened during *well work* and *production* operations.

Figure 7: Ongoing Operation When Event Occurred

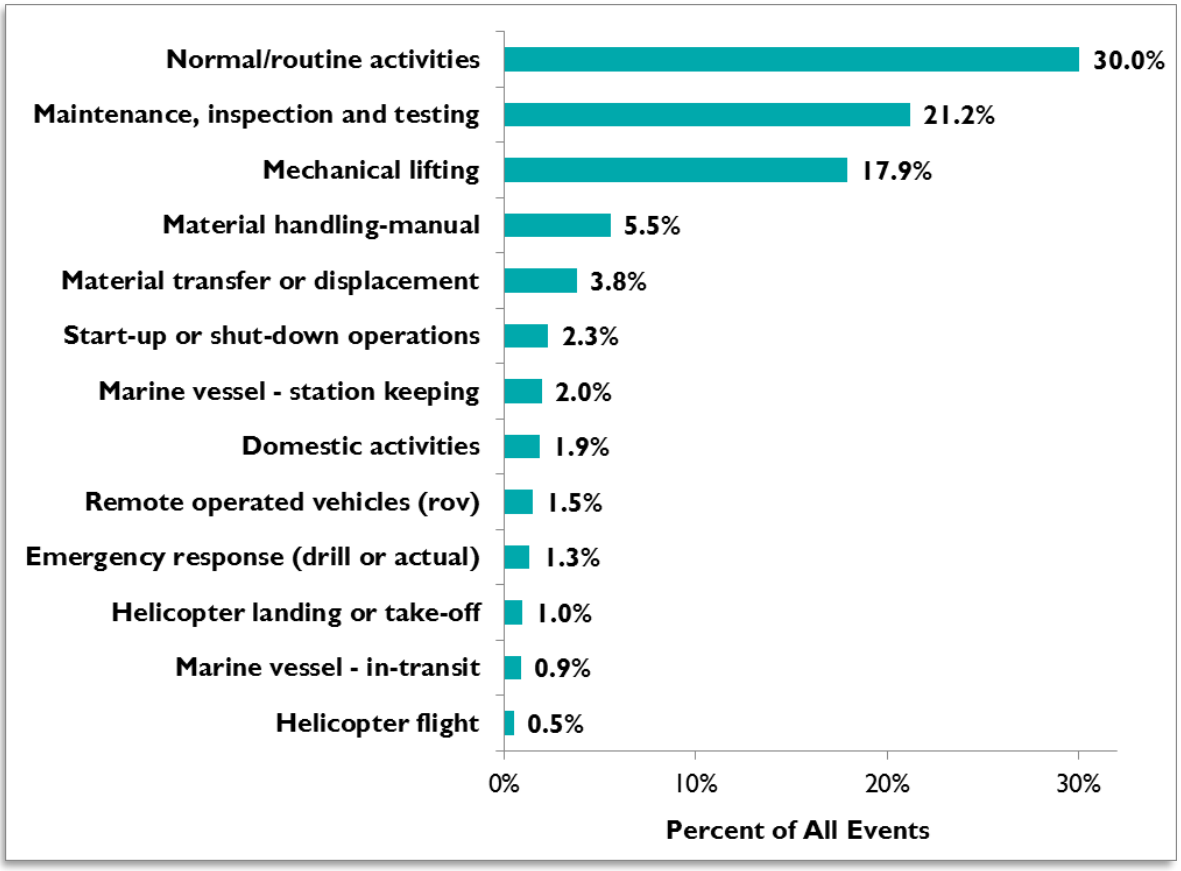


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 8 shows the breakdown of events by the *primary activity* being performed at the time of the event. Events occurred, most frequently, during these activities: *normal/routine activities*; *maintenance, inspection, testing*; and *mechanical lifting*. Most events occurred during *normal/routine activities*; however, there isn't a standard definition of this activity, which makes it difficult to classify events accurately.

For example, some companies may designate *mechanical lifting* as a *normal/routine activity*, rather than mechanical lifting. *Maintenance, inspection and testing, as well as mechanical lifting* activities are common across both *well* and *production* operations, which explains the high percentage of events in those primary activities.

Figure 8: Primary Activity Underway When Event Occurred

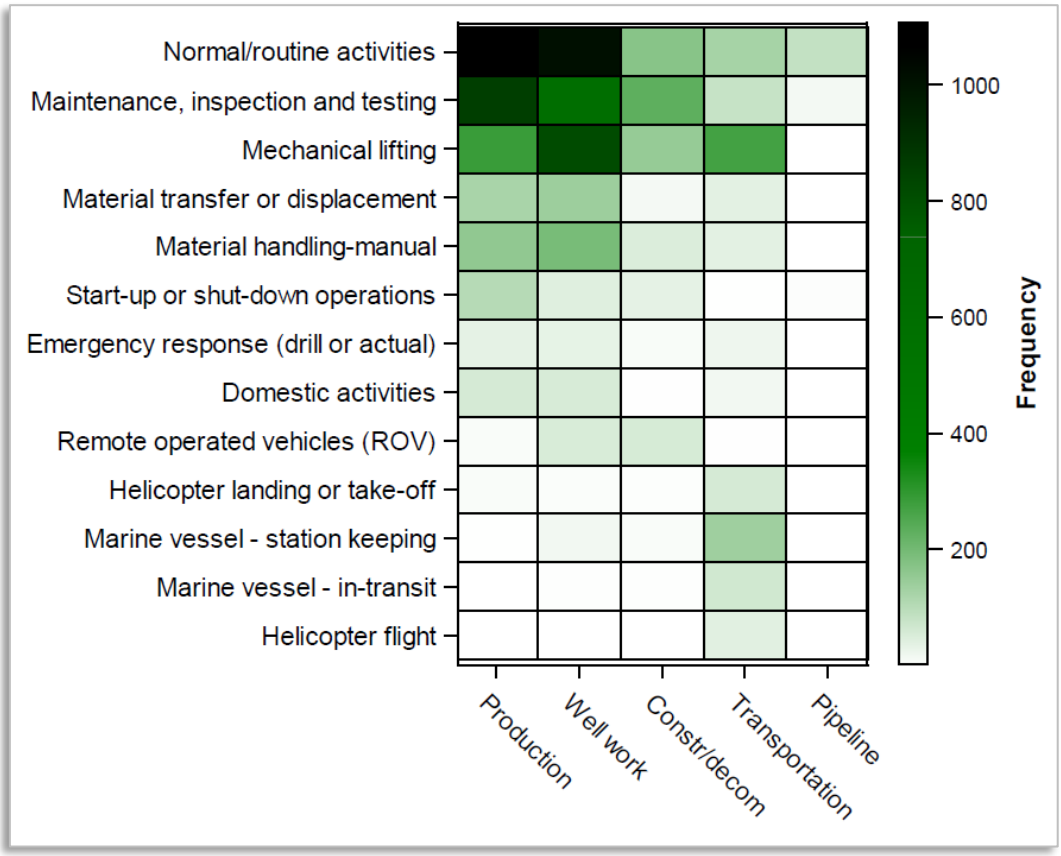


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 9 is a heat map diagram that shows the relative frequency of events given the combination of two parameters: *primary activity type* and *operation group*. Heat maps can be useful in making observations about unexpected combinations of parameters. The higher the frequency, the more intense the color in the box that represents that combination.

For example, events happening during *normal/routine activities* occurred most often during either *production* or *well work.*

Figure 9: Primary Activity Type by Operation Type

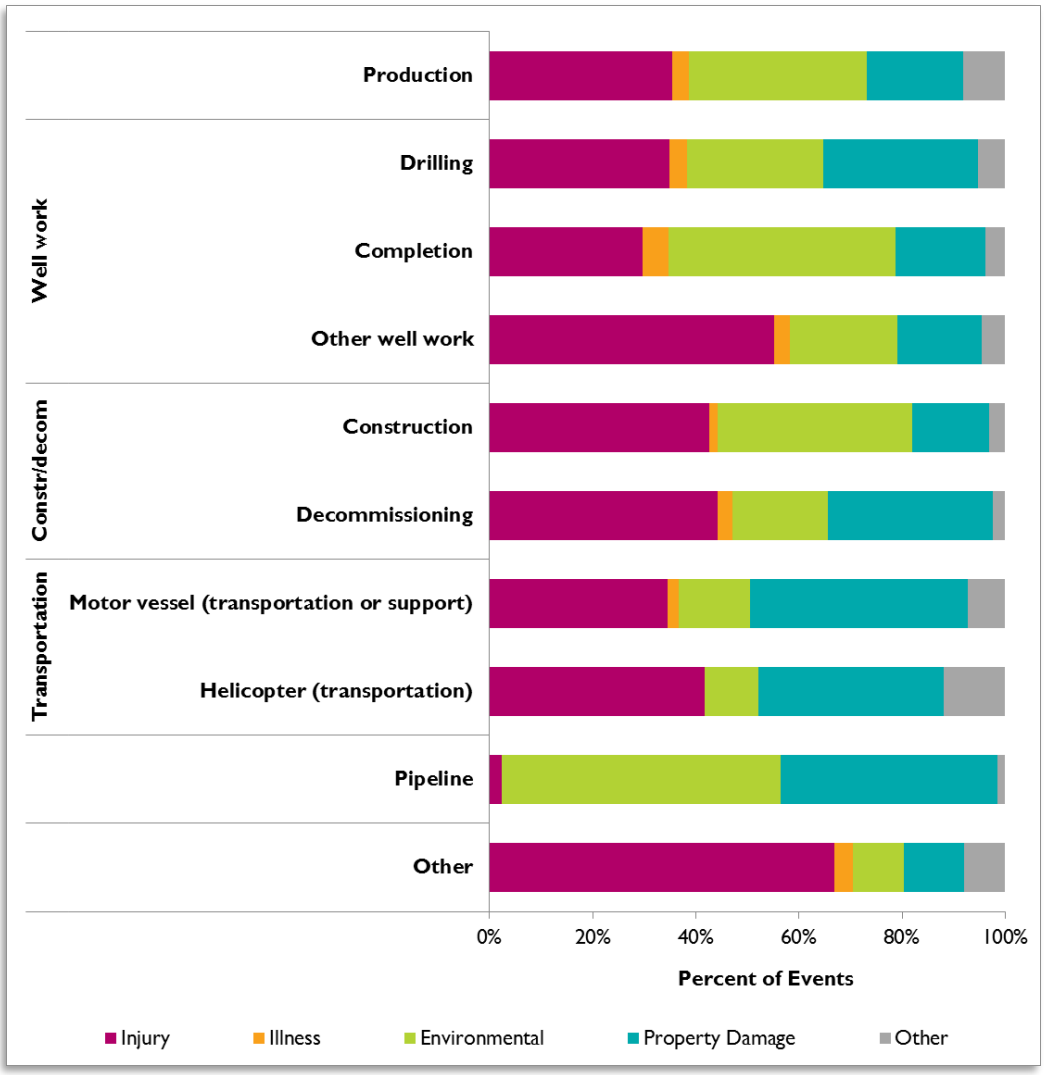


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 10 illustrates the *consequences* of events by *operation group*. Each row shows the percent of events for the listed *operation* whose consequences were *injury*, *illness*, *environmental*, *property damage* or *other*. For this data field, submitters could assign multiple *consequences* to one event. Almost all operation types had a similar breakdown of the consequences. *Pipeline* operations had very few injuries in this data set, as pipeline operations may involve less human interaction, compared to other operation types.

The *other well work* subcategory includes *workovers*, *interventions*, *abandonments*, *wireline work*, and *coil tubing work*. The *other* category primarily represents events for which the asset type and operation type were both unknown. It also includes a few cases from seismic and commissioning operations.

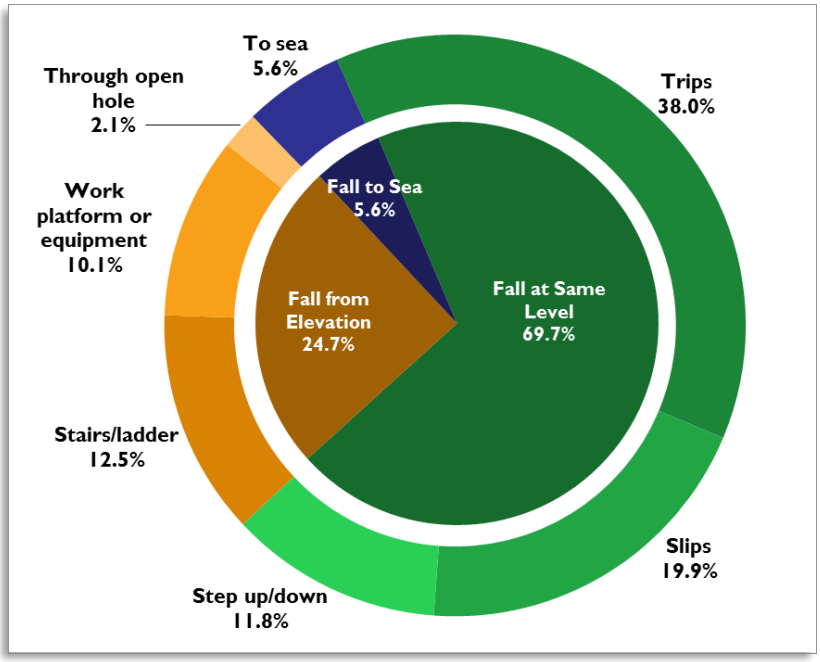
Figure 10: Consequences by Operation



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Finally, Figure 11 shows the frequency of the types of falling events reported. *Slips* and *trips* were the main cause, accounting for 57.9 percent of falls. *Falls from elevation* accounted for 24.7 percent of the total falls; however, falls from elevation resulted in more serious injuries. A closer review of the 2014 – 2017 data revealed many falls resulting from deficiencies in platform grating, and this may be an area for improvement in future data collection and analysis.

Figure 11: Types of Falling Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

As noted earlier, similar analyses were completed for more specific areas such as process safety, personal safety, and environmental impacts. A more detailed discussion of these additional analyses can be found in the BTS report "Industry Safety Data Program for the Oil and Gas Industry – Phase I Report" which can be found at www.safeocs.gov .

7 Learnings from Phase I

7.1 Key Learnings

BTS and representatives from the nine participating companies believe that ISD Phase I was successful in demonstrating the feasibility of the ISD Program. They were able to prove that it was possible for companies to submit data to BTS in different formats and for BTS to then map the data to a common SafeOCS structure to allow for effective and meaningful data aggregation, review, and analysis. The key learnings from Phase I are summarized as follows:

- ISD Phase I participating companies agreed on the value of sharing data for both consequential and lesser events with the potential to lead to a major event.
- Legal and confidentiality concerns expressed by participating companies were satisfied with the protections afforded under CIPSEA and with the signing of an agreement between BTS and each company.
- BTS developed a process to successfully map data from separate companies to a single database thereby addressing the technical challenge associated with collecting, mapping, and aggregating data from different company-specific databases.
- The Phase I Planning Team identified core data fields that all participating companies should be expected to share to generate meaningful data analyses that provides learning opportunities for industry to further improve safety.
- Despite the limited data sample (nine companies), which was not representative of the entire industry, it was possible to complete meaningful analyses of the aggregated data.

7.2 Recommendation for Facilitation and Enhancement of Data Analysis

A key aspect of the SafeOCS ISD Phase 1 Program is that BTS was willing to accept data in whatever format would make it easiest for companies to submit. BTS data analysts and independent industry SMEs were then responsible for *mapping* the company-specific data to the SafeOCS database. As the SafeOCS ISD Program progresses, it will be important to consider the following enhancements to both the program itself and the company-specific data submissions, to facilitate data mapping and enhance data analysis:

- To enhance the depth of analysis, companies should consider submitting additional information about unsafe actions or conditions (e.g., safety observations) that may be precursors to events if circumstances at the time of the event would have been different.
- Participants are encouraged to consider how they may improve integration of their company's data management systems. A challenge faced by some companies when submitting data was the lack of integration across separate data management systems that may exist within a company, which can make data submission of the requested core data fields more cumbersome.
- BTS may consider expanding the use of drop-down menus to harmonize entries and address the challenges encountered around data field inconsistencies and misspellings.

- Given that a key premise of the SafeOCS ISD program is to capture more than what is currently required by regulation, all participants are encouraged to provided data related to safety events that may occur while off-shift.

- Some of the property damage information provided was aligned with the regulatory dollar threshold for those events, and information about lesser property damage events may not be consistent across companies. Therefore, all companies are encouraged to provide property damage information regardless of dollar impact.
- All companies are encouraged to consider quantifying the seriousness (potential injury consequences) of dropped objects using an industry recognized dropped objects calculator based on the mass of the dropped object and the distance it fell.
- To further assist with identifying and merging multiple records submitted for the same event either by the same company or their contractors, it would be helpful if company-specific data files highlighted which operator the work was being performed for, or which contractor was conducting the work.
- Participants should consider the following recommendations regarding causal factors, which are important in identifying potential patterns and trends in the types of events that may be of concern on an industry-wide basis and warrant further analysis.
    - Participants should either provide more information about causal factors and/or more detailed text descriptions of the event.
    - To the extent practicable, companies submitting data should strive to provide additional event details (such as incident investigation reports, photos, etc.) as this will allow for more meaningful analyses. Examples include:
        - Avoiding redacting information that could otherwise prove beneficial during the data mapping and aggregation processes.
        - Avoiding merged or hidden cells.
        - Clarifying expectations on how to manage events attributed to *third parties*.

8 Next Steps

8.1 Outreach to Grow Participation

- As the number of SafeOCS participating companies grows, more data can be captured, analyzed for trends, and actioned with the goal of preventing more serious events. BSEE and BTS will continue outreach efforts to inform additional companies about the SafeOCS ISD Program and encourage participation.
- As SafeOCS ISD progresses beyond Phase I with an increased number of participants, BTS will consider hosting a detailed orientation that discusses the following:
    - Minimum data submission expectations, including supporting event narratives
    - Specific BTS activities involved with data processing
    - BTS secure data room setups
    - Timing for submissions

8.2 Use of Learnings from SafeOCS ISD Reports

- Industry may consider using the knowledge gained through this program to:
    - Develop new or modified risk controls and support systems, such as training or awareness programs
    - Host workshops and other similar events to discuss causal factors and develop actions to prevent reoccurrence

- BSEE and BTS will work with industry to plan workshops or other sharing/lessons learned sessions to review aggregated results, network, and discuss potential actions to prevent recurrence and thereby improve safety.

8.3 Enhancements to SafeOCS ISD Program

BTS will:

- Continue to engage in informed discussions with industry stakeholders, including oil and gas operators, drilling contractors, service companies, original equipment manufacturers (OEMs), and BSEE, to ensure the SafeOCS ISD Program provides value to stakeholders.
- Focus on system upgrades and capabilities, including a possible dashboard, to allow companies to view their own data online for purposes of comparing their performance against the aggregated results.
- Consider, as appropriate, developing white papers on specific safety issues, such as transportation-related or other safety events.
- Continue to plan for cross-linking the SafeOCS ISD database with the databases of the other SafeOCS programs (i.e., SafeOCS Well Control Equipment (WCR) Failure Reporting Program, and the SafeOCS Safety and Pollution Prevention Equipment (SPPE) Failure Reporting Program), as well as other data sources to provide more complete event details and evaluate potential correlations.
- Work toward developing analytical tools to identify low frequency events that could indicate the potential for a significant event (e.g., predictive modeling).
- Continue engaging with BSEE to discuss trends seen in both SafeOCS ISD data as well as BSEE data

8.4 Program Governance

With completion of the pilot effort and looking forward to broadening the SafeOCS ISD program to include more participants, BTS established a Steering Committee. It is composed of company representatives, each of whom must be designated as *agents* under CIPSEA, and the team is led by BTS. The team consists of 9-12 participants - BTS staff members, BTS independent industry SMEs, company SMEs, and others as deemed appropriate by BTS. It is charged with providing input to BTS on the SafeOCS ISD program effectiveness and enhancement opportunities. Company SMEs are selected from companies that are actively submitting data to the SafeOCS ISD program. BTS will ensure that the Steering Committee represents a cross-section of industry companies. Members will serve a three-year renewable term, with one-third of the members turning over each year.

Roles and responsibilities of the Steering Committee include:

- providing feedback and suggestions on ways to increase awareness of the SafeOCS ISD program among industry organizations,
- discussing plans for workshops or other sharing/lessons learned sessions to review aggregated results,
- promoting industry networking to address potential actions to prevent recurrence and thereby improve safety, and

- focus on development of a dashboard to allow companies to view their own data online for purposes of comparing their own performance against the aggregated results.