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## Safety Management System Implementation Planning

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## Chapter 3

# Safety Management System Implementation Planning

David Thirtyacre

This chapter is intended to outline the process for SMS implementation. The concepts and processes ingrained within SMS are relatively straightforward, right up to the implementation phase. Turning SMS into practice can be a challenging endeavor and will differ in every application. Some organizations may have mature safety protocols in place that just need to be repackaged, while others are starting from scratch. As Stolzer and Goglia (2015) eloquently point out, “Expecting any organization to transition to a mature SMS within a short period of time is both unrealistic and self-defeating . . . . It is, and should be, a slow, methodical effort” (p. 218). Additionally, the lynchpin in SMS implementation is unwavering support from leadership, as the introduction of SMS should not begin without this support.

While SMS concepts apply to any organization, the aviation profession has embraced SMS, and many of the examples in this chapter will reference the aviation industry (see Appendix A for sample SMS outline for a small operation). Regardless of the industry, the foundational plan for implementation will *resemble* that of the aviation profession. This chapter will cover the planning required to define roles, assigned responsibilities, and establish accountability. The chapter will present theoretical and practical examples of SMS implementation in aviation and industry.

### DEFINING AN IMPLEMENTATION PLAN

The implementation plan differs for every application of SMS and should be tailored with respect to each organization. Several published implementation plans are available for reference, and this section compares/contrasts their attributes. Each organization should customize their plan, but the

procedures here are an excellent starting point. This chapter will highlight examples including Yu and Hunt (2004), the FAA (2015), and the ICAO (2013); although, other examples are available from organizations such as the American National Standards Institute (ANSI/AIHA Z10-2012), British Standards Institute (OHSAS 18001:2007), and the Occupational Safety and Health Administration (Voluntary Protection Program). While Yu and Hunt (2004) provide guidance toward a more general plan, the FAA (2015) plan is focused on compliance with AC 120-92B, and the ICAO (2013) plan is for implementation at the sovereign state level. Although the specifics of each plan will differ, they all introduce a phased approach to implementation, which defines a reasonable timeline and serves as guidance for SMS implementation. A common thread in all the examples is that of the four components of SMS: safety policy, safety risk management, safety assurance, and safety promotion. The key components also include a thorough understanding of the organization's current safety protocols and the desired objectives of the SMS.

## YU AND HUNT

Yu and Hunt (2004) describe a systematic implementation plan based on total quality management (TQM) principles which consists of the following six phases:

- Phase 1. Review of safety policy and safety plan.
- Phase 2. Examine hazard identification and control plans.
- Phase 3. Evaluate safety management practices.
- Phase 4. Appraise incident investigation and emergency plans.
- Phase 5. Analyze safety communication and documentation.
- Phase 6. Review safety program evaluation and audits. (pp. 212–214)

Yu and Hunt (2004) further surmise that “the integration of TQM with SMS is perhaps easier to say than it is to do” (p. 214) and recommend four strategies for SMS implementation. These strategies, or overarching principles, should often be referenced during SMS implementation. They should be seen as the foundation of any SMS regardless of the selected implementation method or industry. The four strategies are as follows:

1. Organizational and cultural changes.
2. Full commitment and participation from staff.
3. Clarity of roles and expectations.
4. Long-term focus (pp. 214–215).

## THE FEDERAL AVIATION ADMINISTRATION

The FAA identifies four broad areas for creating an SMS implementation plan. While these areas, listed below, are specific to a flying organization's compliance with FAA SMS regulations, they point out the importance of understanding the current safety policies and culture of the organization implementing the SMS. Note that the first two areas are similar to Yu and Hunt's (2004) Phases 1 and 3, highlighting the importance of understanding the current state of the organization.

- Mapping and analyzing your existing organization.
- Determining the extent to which your organization already complies with the requirements of 14 CFR part five.
- Developing a plan to comply with the requirements of part 5 with which your organization does not already comply.
- Submitting a plan to the FAA for approval (p. 47).

The FAA (2015) further breaks down the implementation plan into four levels and they highlight important ideas. Level 1 begins when the organization's leadership commits to providing necessary resources to support SMS implementation. Level 2 includes the implementation of safety risk management (SRM) and safety assurance (SA) and is referred to as the "reactive phase." Level 3 applies SRM and SA in a proactive or predictive manner, and Level 4 allows for continuous improvement.

## INTERNATIONAL CIVIL AVIATION ORGANIZATION

The ICAO Safety Management Manual (SMM, 2013) provides a detailed implementation plan that contains many aspects applicable to all organizations. ICAO, similar to the FAA, proposes SMS implementation in a four-phase approach. These phases are broken down into significant detail and will be further discussed later in this chapter. The major contributions of each phase are listed here:

- Phase 1: Assign responsibilities, perform a gap analysis, and develop the SMS implementation plan.
- Phase 2: Implement essential safety processes, correct deficiencies, consolidate existing safety activities, and develop new safety processes.
- Phase 3: Establish a risk management process to include collection and analysis of safety-related data.

Phase 4: Fully implement risk management and safety assurance through monitoring, feedback, and corrective action.

## PREPARING TO PLAN

The precursor to successful SMS implementation is total commitment from leadership. Chen and Chen (2012) note the importance of leadership commitment, “Based on this concept, as policy maker, top managers are obligated to demonstrate their appreciation of SMS and commitment to its execution” (p. 177). The commitment may come from past safety losses, concern for the bottom line, or governmental regulations. Regardless of the motivation, the commitment must be genuine and complete, or the safety plan is destined to become a paper tiger—a safety program based on filing paperwork versus improving safety.

The main resistance to full commitment is often resource allocation. While leadership may agree that safety must be improved, if implementing SMS will negatively affect the bottom line or the report to shareholders, garnering support can be difficult. In the aviation industry, some businesses chose to invest in SMS while others did not. Federal regulations were required to motivate all aviation organizations to embrace SMS. This highlights the continued battle between the bottom line and safety.

The complexity of the organization and its mission will dictate the level of required planning. However, the plan, regardless of complexity, should always be mapped out with an overall flow of SMS implementation and started soon after deciding to incorporate SMS into the organization. These timeline products will serve as a guide to implementing SMS, by providing a blueprint for the process, establishing accountable timelines, and monitoring the implementation process. These steps may be adapted into checklists. The timelines should be thought of as part of a living document, anticipating numerous changes and additions as the process unfolds. There are several options to document the plan, and the FAA (2015) offers a sample, a portion of which is depicted in figure 3.1.

The FAA (2015) example identifies the task in enough detail to understand, sets an expected duration to complete the task, details when the task should begin and end, and provides a waterfall-type visual depiction of the timeline. As mentioned, this is a living document and should be routinely updated by the SMS implementation team. It is also an excellent tool to keep key leadership updated on implementation progress.

The sections that follow highlight critical areas of implementing the SMS plan. The depth and order of these areas will change, depending on the size



and scope of the specific SMS and goals; however, each of these areas is critical to effective SMS implementation.

## MAPPING AND ANALYZING THE ORGANIZATION

A thorough understanding of the organization's departments, functions, management personnel, unions, and external inputs is the goal of mapping the organization. For complex organizations, this can be an arduous task. After the mapping is complete, the analysis begins and should, "describe and document what each department does, identify responsible and/or accountable personnel, and record who has the authority to modify its processes and procedures and accept risk for each department" (FAA, 2015, p. 48). The timeframe to accomplish mapping and analyzing the organization range from a few days for small businesses to a month or more for large organizations (FAA, 2015). The insight gained from mapping and analyzing the organization will begin to identify areas of interest for the gap analysis.

With the organization fully mapped, the safety gap analysis should begin to determine what safety policies and processes already exist, and more importantly, bring to light areas where the safety policy could be improved (ICAO, 2013). The safety compliance standard for the industry (e.g., FAA Part 5, OSHA) is an excellent starting point for the gap analysis. If an industry standard does not already exist, general standards can be created .

Most organizations already have some safety policies and procedures in place that will be identified during the gap analysis. The objective is to compare these policies, procedures, programs, systems, and activities to the SMS industry standards and determine where the deficiencies exist. Once the deficiencies are identified and the level of effort is determined, resources can be allocated, and personnel can be assigned to develop and implement solutions.

## DEFINING ROLES AND ASSIGNING RESPONSIBILITIES

The SMS practitioner must balance the cost of SMS implementation with savings in life, equipment, hospital bills, lawsuits, and reputation. This is a delicate balance that must be considered early in implementation. Too little an investment and the program will never mature, and too much investment leads to inflated expectations and scrutiny. Another consideration is the scope of effort involved in implementation and the residual resources required to maintain the system after implementation. In any case, SMS calls for a relatively significant investment that will require research and planning to

discover the correct mix for each organization and garner buy-in from the leadership element.

The required resources will not only include funding and personnel, but office space and equipment, access to personnel and processes at all levels of the organization, access to safety-related data, and authority to interact and communicate throughout the organization. For these reasons, it is highly recommended that the SMS is aligned to report directly to a high-ranking, accountable executive—often the president, CEO, or chief operating officer (COO) of the company. FAA AC 120-92B offers a flowchart to ensure the selected accountable executive is at the appropriate level in the organization (FAA, 2015). After the accountable executive is identified, the rest of the implementation team can be formed.

The composition of the implementation team should include representation from each *applicable* department. Determining which departments are relevant may take a few iterations. Often, seemingly insignificant departments are left off the team, but during the gap analysis, their input becomes important. While some positions on the team will be permanent and full-time, others will be temporary and part-time. In all cases, the team lead should be a person in a permanent position dedicated to SMS full-time. Once the team is established and an accountability chain-of-command is in place, the next immediate step is to develop the implementation plan.

With the senior accountable executive identified, the roles and responsibilities of the safety officials who will implement the program are determined. Regardless of the safety footprint in an organization, the responsibilities, duties, and authorities must be clearly delineated and formalized (Stolzer & Goglia, 2015). The authority delegated by the accountable executive will allow access to the organization's departments and personnel. While this requirement may seem ancillary to the larger SMS implementation, it is essential in order to properly articulate authorities and accountabilities and ensure they are known throughout the organization.

The size and makeup of the safety office is scalable but should always identify a single individual as the chief of safety. Ownership of the safety program is essential, whether as an additional duty or a full-time position, as it is the cornerstone of TQM. The chief of safety must be fully committed to SMS implementation and serve as the SMS champion. Lu and Yang (2010) concluded that genuine leadership influenced safety compliance and self-reporting significantly more than safety policy; the choice for chief of safety is critical. Other positions in the safety office can be divided along functional lines such as flight safety, ground safety, surgical safety, or explosive safety. Each safety representative should have extensive experience and knowledge in their respective areas. In larger organizations, there will be a need for positions such as data analysts, policy experts/advisors, accident/

incident investigators, risk analysts, safety assurance personnel, and safety training/education experts. Smaller organizations still require these functions, but they may be filled as part of additional duties or in multi-functional positions.

### **SAFETY POLICY, ACCOUNTABILITY, AND EMERGENCY RESPONSE**

The formulation of safety policy is an important in SMS implementation. Many policies will be crafted throughout the process. However, producing a general policy that addresses the organization's overall guiding safety principles, establishes accountability, and highlights top management's commitment to the safety program aids in forming a solid foundation for implementation. The FAA (2015) provides a simple, one-page sample policy in Appendix 3 of AC 120-92B. While this sample policy is specifically written for air carrier application, it is an excellent example and can be easily adapted for use in any industry:

The Executive Management of [Certificate Holder's name] recognizes that an effective SMS is vital to the success and longevity of the Company. Therefore, the executive management is committed to implementing and maintaining a fully functional SMS and to the continuous improvement of the level of safety throughout [Certificate Holder's name].

- Executive management of [Certificate Holder's name] will establish specific safety-related objectives and will periodically publish and distribute to all employees those objectives and plans.
- These safety objectives will be monitored, measured, and tracked to ensure overall corporate safety objectives are met. All employees and individuals in the company have the responsibility to perform their duties and activities in the safest practical manner.
- [Certificate Holder's name] executive management is committed to providing the necessary financial, personnel, and other resources to establish and maintain a fully functional SMS.
- [Certificate Holder's name] executive management is dedicated to establishing a confidential employee reporting system to report all hazards, accidents, incidents, and safety issues without fear of reprisal.
- Activities involving intentional disregard for FAA regulations, company policies and procedures, illegal activities, and/or drugs or alcohol may be subject to disciplinary action.
- As a component of the SMS, [Certificate Holder's name] executive management is committed to establishing, maintaining, and periodically

exercising an emergency response procedure and plan that provides for the safe transition from normal to emergency operations.

Executive management will convey this expectation to all employees through postings, intranet site, company newsletter, and any other means to ensure all employees are aware of the company's SMS, their duties and responsibilities, and our safety policy (FAA, 2015, Appendix 3).

Along with the overall safety policy, formalization of an emergency response plan (ERP) is required early in SMS implementation. Emphasizing the importance of an ERP, ICAO (2013) concludes that many organizations do not have effective plans in place to manage events during or following an emergency or crisis. How an organization fares in the aftermath of an accident or other emergency can depend on how well it handles the first few hours and days following a major safety event (Appendix 3).

Parts of the ERP may already exist in many organizations, whether formal or informal. However, the formal ERP should include procedures, responsibilities, coordination, and documentation, while identifying internal and external parties and their actions. ICAO (2013) Appendix 3 to chapter 5 identifies several specific considerations which an ERP should address. Depending on the SMS scope and application, many of these areas will expand into multipage documents and checklists and should be practiced through exercises:

- governing policies
- responding organizations
- notifications
- initial response
- additional assistance
- an emergency management center
- documentation and records
- accident site
- news media
- formal investigations
- family assistance
- post-occurrence review.

## **SAFETY DATA COLLECTION AND ANALYSIS**

The ability to collect safety data and properly analyze it is a cornerstone of SMS. While this process will continue throughout the use of SMS, the implementation plan should begin to discover how and what data are already

collected, what needs to be collected, what methods should be used, and how it can be analyzed. The FAA (2015) identifies several steps to begin collecting and analyzing data early in SMS implementation. Below is a partial list from the FAA (2015) edited for applicability to all organizations.

1. Establish the context: Understand the safety performance objectives of the system, operations, or SMS.
2. Identify the objective of the analysis: Determine whether the analysis is for analyzing the safety performance of a system, of an operation, or the SMS itself.
3. Secure appropriate data: The data needed may be already on hand, or additional data-gathering may be needed, such as conducting a special audit with focus on a specific problem.
4. Select an appropriate data analysis method: For routine reporting, analysis may consist of tracking such things as dispatch reliability per month; system or part failure rates; crew utilization/duty time; and events such as minor incidents, diversions, and precautionary engine shutdowns.
5. Recommend: At this point, the person conducting the analysis may compare performance against relevant company safety objectives.
6. Document: Prepare reports and records in a format appropriate to your operation (p. 38).

An important part of data collection is creating an environment for honest, timely, self-reporting of safety-related issues. The foundational work for this process will be required during SMS implementation. To be effective, Leape (2002), in his research on safety reporting in the medical field, points out that the reporting system must be safe (anonymous and no threat of reprisal), simple (preferably one page), and worthwhile (taken seriously and analyzed). The FAA and ICAO echo this sentiment. The FAA (2015) specifically writes:

In order to be effective, the organization needs to establish and maintain an environment in which employees feel comfortable to report hazards, issues, and concerns, as well as occurrences, incidents, etc., and propose safety solutions and improvements. The accountable executive and management team need to encourage employees to report safety issues and not fear reprisals from management. Policies that assure employees of fair treatment and clear standards of behavior are an essential part of the reporting process. (p. 36)

There may be other sources of data that already exists such as audit reports, employee reports, production efficiency, safety reports, and investigations. These sources can be an excellent starting point for analysis, since they are normally looked at in isolation instead of from an SMS-process point of view.

Data mining, statistical methods can be especially useful in cases where large amounts of seeming unrelated data are available.

## RISK MANAGEMENT AND SAFETY ASSURANCE

The risk management process includes analyzing tasks and systems, identifying hazards, analyzing the risk, and applying controls to reduce risk (Stolzer & Goglia, 2015). While a comprehensive risk management process is an end goal of SMS, it can take several years to mature (FAA, 2015). During implementation, the safety experts should focus on designing the process of risk management and educating all levels of the organization.

Stolzer and Goglia (2015) propose sixteen components required in a process-based, safety risk management/safety assurance program. While the full description of each component is beyond the scope of this implementation chapter, the list sets forth a logical process flow ideal for early integration into a new SMS. Systems and tasks are broken down using this process, yielding mitigation and assessment strategies.

1. purpose
2. scope
3. interfaces
4. stakeholders
5. responsibility
6. authority
7. procedure description/flowchart
8. material/equipment/supplies
9. hazards
10. controls (production and protection)
11. process measures (production and protection)
12. targets (production and protection)
13. assessment (production and protection)
14. change management
15. qualifications required for participants in process
16. documentation/record-keeping (Stolzer & Goglia, 2015, p. 202)

In some cases, this is a quick, one-person process that can be accomplished in short order, while other cases require the coordination of several departments. During the implementation phase, the safety officer can identify (often from the gap analysis) a few tasks ripe for analysis and use them as an example during internal education and training.

## EDUCATION AND TRAINING

Chen and Chen (2012) discuss the complications of turning a theoretical SMS into practice and note that, “It is thus essential to internalize the requirements of SMS into the organizational culture and the daily routines of individual employees, so that staff will know how to integrate the system with their own duties” (p. 177). The emphasis on “internalizing” the SMS is key to an effective SMS and can only be produced through strong policy backed by thorough, applicable education and training. The overall objective of education and training is to establish a long-term, just safety culture. The approach to education must be well planned, since it will most likely be the first exposure the practicing employee will have to SMS. While a majority of the training and education effort is spent while implementing SMS, it should be viewed as a continuing process with follow-on training and continuous improvement. Ironically, there is very little guidance for developing training and education from the FAA, ICAO, or OSHA.

The options for education and training include developing organic training material, fully outsourcing the training, or a using a mixture of both. The selected method will be based on resources and internal expertise. There are many companies and educational institutions specializing in SMS training with extensive, tailored options. A common solution is to outsource general SMS training (definitions and foundations, concepts, best practices, etc.) and create internal academics to cover company-specific policies and processes. Whatever the solution, a detailed plan, specifying the required training for each stage of SMS development, is required. Additionally, the training for the various levels of SMS oversight and position-specific training is required. The education and training plan should be integrated into the overall SMS implementation plan and tracked for quality and completion.

## CONCLUSION

This chapter outlined several options and considerations for SMS implementation. While the concepts behind SMS are straightforward, incorporating SMS into a specific organization may be a complex and time-consuming endeavor. However, through careful planning and utilization of a phased approach to implementation, a fully functioning SMS will emerge. Scaling the implementation plan to fit the size, complexity, and mission of the organization, along with clear and unambiguous support from senior leadership, is required for success. This, along with continuous improvement and a willingness to accept change, can transform an organization into one that predicts and controls unacceptable risk instead of reacts to unanticipated accidents.

## REFERENCES

- Chen, S., & Chen, C. (2012). Scale development of safety management system evaluation for the airline industry. *Accident Analysis and Prevention, 47*, 177–181. doi:10.1016/j.aap.2012.01.012.
- Federal Aviation Administration [FAA]. (2015). Safety management systems for aviation service providers. *Advisory Circular 120–92B*. Retrieved from [http://www.faa.gov/documentLibrary/media/Advisory\\_Circular/AC\\_120-92B.pdf](http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-92B.pdf).
- International civil aviation organization [ICAO]. (2013). *Safety Management Manual* (3rd ed.). Retrieved from <https://www.icao.int/safety/SafetyManagement/Documents/Doc.9859.3rd%20Edition.alltext.en.pdf>.
- Leape, L. L. (2002). Reporting of adverse events. *The New England Journal of Medicine, 347*(20), 1633–1638. doi:10.1056/NEJMNEJMp011493.
- Lu, C.-S., & Yang, C.-S. (2010). Safety leadership and safety behavior in container terminal operations. *Safety Science, 48*(2), 123–134. doi:10.1016/j.ssci.2009.05.003.
- Stolzer, A. J., & Goglia, J. J. (2015). *Safety Management Systems in Aviation* (2nd ed.). Burlington, VT: Ashgate.
- Yu, S., & Hunt, B. (2004). A fresh approach to safety management systems in Hong Kong. *The TQM Magazine, 16*(3), 210–215. doi:10.1108/09544780410532945.