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Advisory Circular

Subject: Safety Management Systems for Airports	**Date:** 2/16/2023	**AC No:** 150/5200-37A
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1 **Purpose.**

This Advisory Circular (AC) presents the concepts of a Safety Management System (SMS) and provides detailed guidance about developing and implementing SMS for an airport.

An SMS enhances safety, ensures compliance with applicable regulatory standards, and can be integrated into all aspects of airport operations, including business and management practices. This AC explains how SMS will help airports develop an explicit, pro-active, and engaged process for identifying and quantifying potential hazards and risks and for managing them in a systematically coherent, logical, and reasonable way.

2 **Effect of Guidance.**

The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

3 **Cancellation.**

This AC cancels AC 150/5200-37, *Safety Management Systems for Airports,* dated February 28, 2007.

4 **Audience.**

This AC applies to all civil airports, when adapted to the size, activity level, staff level, and resources of each facility. In addition, this AC explains certain regulatory requirements outlined in Title 14 of the Code of Federal Regulations (CFR) part 139, Certification of Airports for the development and implementation of SMS. Part 139 airports should refer to www.FAA.gov/airports/ for more information on SMS regulatory requirements.

The AC focuses on airport operational safety in the airfield environment and the principles apply to all civil airports, when adapted to the size, activity level, staff level, and resources of each facility. Airport operators can apply these principles anywhere on their airports (airside or landside environments) to address safety concerns. Furthermore, while part 139 does not apply to voluntary SMS programs, this AC describes the general SMS framework and serves as a non-binding basis for the development and implementation of voluntary SMS programs for airports. This AC provides guidance to organizations on how to use the SMS principles included in part 139 as basis to develop and implement a voluntary SMS program. If the development of the SMS program is voluntary, this document also encourages organizations to develop and implement SMS as a part of their business processes in a way that is scalable to their unique operation, as there is not a one-size-fits-all SMS.

5 Principal Changes.

This Advisory Circular has been revised to include the regulatory requirements in part 139, to update references, and provide additional examples regarding the development and implementation of SMS for airports.

6 Background.

The United States is a member state of the International Civil Aviation Organization (ICAO). In November 2005, ICAO amended Annex 14, Volume I *(Aerodrome Design and Operations)*, to require member states to have certificated international airports establish SMS. In 2013, ICAO developed Annex 19, *Safety Management*, to transfer or duplicate the original safety provisions contained in 6 different Annexes, including Annex 14. In doing so, ICAO signaled the important role governments play in managing safety at the country level in coordination with individual service providers like airports. The Federal Aviation Administration (FAA) supports harmonization with international standards and has worked to make FAA aviation safety regulations consistent with ICAO standards and recommended practices. Part 139 establishes SMS requirements for certain U.S. airports and the FAA encourages airports not subject to the part 139 SMS requirements to implement an SMS voluntarily. The two-pronged approach supports harmonization with ICAO standard in a way that complements existing part 139 airport safety requirements and standards.

SMS encompasses the activities of every level of airport personnel – from the executive level to those who perform the many daily, routine tasks required to operate the airport. Applying a systematic, proactive, and well-defined safety program (as is inherent in an SMS) allows airports to strike a realistic and efficient balance between safety and service.

The forecast growth in air transportation requires new measures and greater effort from all aviation service providers – including airport operators – to achieve continuing improvements to aviation safety. The use of an SMS at an airport can help this effort by increasing the likelihood that the airport operator will detect and correct safety problems before they result in an accident or incident.

7 **Related Reading Material.**

Appendix A defines terms and acronyms used in this AC. Appendix B lists additional documents that will help airport operators understand SMS.

8 **Feedback on this AC.**

If you have suggestions for improving this AC, you may use the Advisory Circular Feedback form at the end of this AC.

John R. Dermody
Director of Airport Safety and Standards

CONTENTS

Paragraph **Page**

FIGURES

Number **Page**

TABLES

Number **Page**

CHAPTER 1. SAFETY MANAGEMENT SYSTEMS (SMS) OVERVIEW

1.1 Background.

1.1.1 The FAA is committed to improving safety in air transportation. As the demand for air transportation increases, the impacts of additional air traffic and surface operations, changes in air traffic procedures, changes in aircraft fleet mix, and airport construction can increase risks associated with aircraft operations at, or around, airports. Enhanced airport safety management practices can help mitigate those risks.

1.1.2 Airport operators best understand their unique operating environments and are in the best position to address safety issues at their airports. SMS provides a powerful tool for airports to identify hazards and mitigation strategies, communicate safety issues, promote safety, and reduce the potential for accidents and incidents. Notwithstanding the development and implementation of SMS by an airport, the FAA will continue to conduct regular periodic inspections at airports certificated under part 139.

1.2 What is SMS.

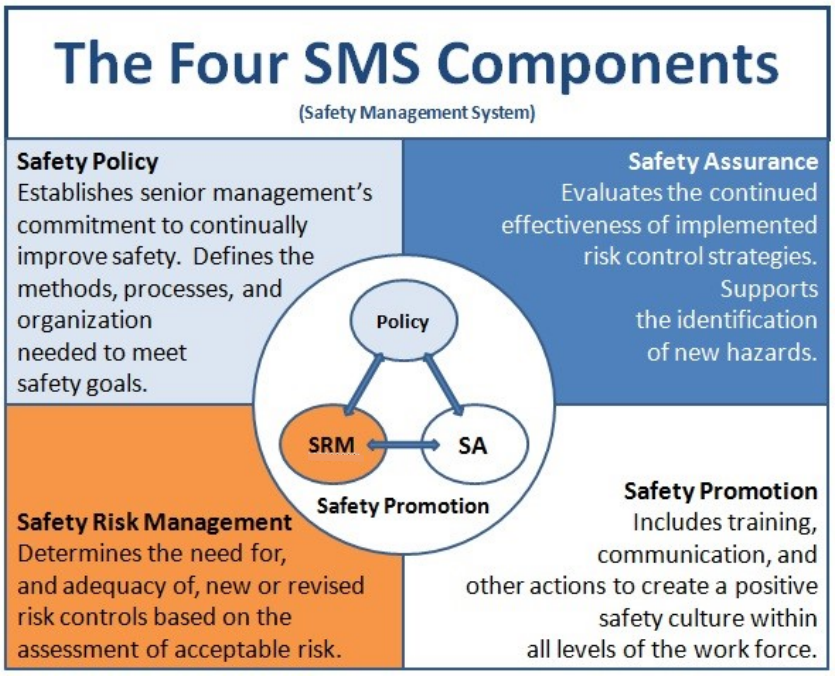
1.2.1 SMS is defined in 14 CFR §139.5 as an "integrated collection of processes and procedures that ensures a formalized and proactive approach to system safety through risk management." SMS is process management and is comprised of four basic components:

- Safety Policy;
- Safety Risk Management;
- Safety Assurance; and
- Safety Promotion.

1.2.2 Figure 1-1 describes the four SMS components and shows how they relate to each other. Safety Policy serves as the foundation of SMS; it documents an airport's means of deploying SMS. Safety Risk Management (SRM) and Safety Assurance (SA) are the two operational components of SMS. SRM and SA determine how risks are identified and mitigated, and the effectiveness of any mitigations, respectively. Safety Promotion uses the SMS components to facilitate training and communication of safety related issues. Additional details on each of the four components are provided in Chapters 3 through 6.

1.2.3 The safety policies and processes of an organization's SMS are meant to be continuously updated based on evolving conditions identified by the safety culture of the organization. The organization's SMS should allow it to proactively recognize safety hazards in its operations and to continuously assess the effectiveness of implemented mitigations.

Figure 1-1. Four SMS Components



1.2.4 The four SMS components are sub-divided into elements. The elements are the sub-processes, policies, or procedures that support each of the four components. Note that Safety Promotion is the common link to the 3 other components and supports cross-communication.

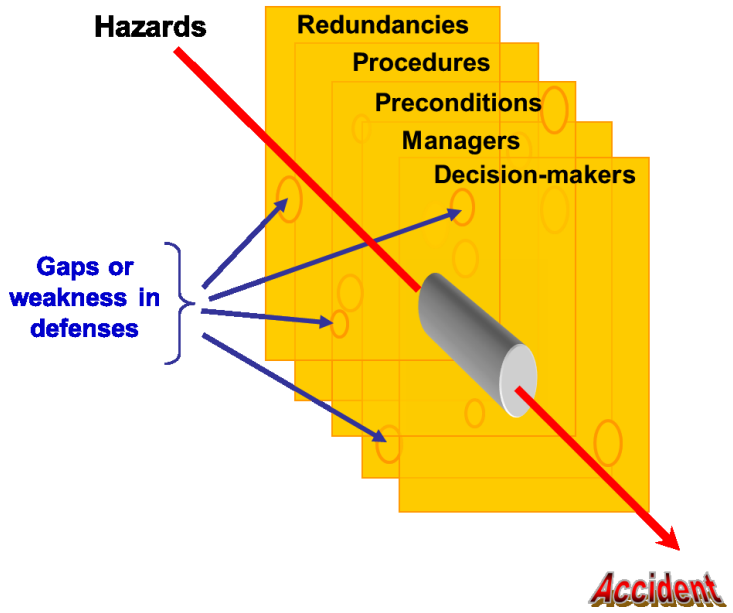
1.3 History.

1.3.1 SMS emerged as a recognized safety methodology over 30 years ago, as investigative inquiries related to accidents or incidents began to focus on prevention rather than reaction. The "reactive approach" often resulted in fixing one series of causal factors related to a single accident or incident, but did not focus on identifying or mitigating other root causes or issues that could have contributed to the accident or incident. The reactive approach focused on who had the accident or incident and what happened, but failed to adequately address how and why it happened.

1.3.2 Over time, industry has recognized that failures, especially human failures at the operational level, can trigger latent conditions that could breach a system's safety defenses. Organizations now understand that by monitoring their internal processes they can identify and address latent conditions to make modifications, corrections, or implement other mitigations to prevent accidents or incidents from occurring.

1.3.3 James Reason's "Accident Causation Model" shown in Figure 1-2, illustrates the "how" and "why" of incidents and accidents.[1] The model helps identify the chain of events leading to an incident or accident. Reason used this model to transform how people thought about safety and accident investigation. Rather than focusing on an isolated event (the “who,” “what,” or “when”), Reason shifted the focus to gaps or weaknesses in organizational layers that can align to result in an incident or accident.

Figure 1-2. Reason’s Accident Causation Model (Adapted)



1.3.4 Reason’s model marked the beginning of safety management. It relied on collecting data, identifying hazards and trends, determining risk severity, mitigating risk to an acceptable level, and establishing a safety culture—the basic components of SMS.

1.4 Applications of SMS.

1.4.1 SMS supports a pro-active approach to safety through a framework of tools and methodologies that address safety issues. It also helps an organization establish a safety-conscious environment and culture. SMS covers all personnel in all operational areas because observation, evaluation, and reporting are integral to achieving effective safety-related outcomes. In short, SMS, when managed and directed accurately, can achieve an improved level of safety and contributes to eliminating or mitigating the conditions that can lead to accidents or incidents. Having an SMS does not mean an airport will be accident-free, but when implemented, it contributes to improving safety at the airport and in the aviation ecosystem.

[1] James Reason, Human Error, Cambridge University Press (1990).

1.4.2 Section 139.401(a) identifies certificate holders or applicants for an Airport Operating Certificate that must develop, implement, maintain, and adhere to an SMS. While the part 139 SMS requirements apply to the airfield environment (including airport movement and non-movement areas), airport operators can apply these principles anywhere on their airports - including the landside environment, to address safety concerns.

1.4.3 Some of the benefits derived from SMS include:[2]

- Reduced likelihood of accidents;
- Reduced costs related to accidents and incidents;
- Assurance that a systematic process is in place to monitor and address safety issues in a transparent and informed way;
- The potential for reduced insurance and liability costs;
- Competitive advantage and the possibility of more business opportunities;
- Improved regulatory compliance;
- Improved employee morale and performance;
- Identification of the best use of limited resources;
- Reduced reliance on a few key personnel;
- Improved control; and
- Consistency.

1.5 **Format of this AC.**

1.5.1 The AC contains six chapters. Chapter 2 explains how to begin developing an SMS and the required documentation. Chapters 3 through 6 address the four components of SMS: Safety Policy, Safety Risk Management, Safety Assurance, and Safety Promotion. Each chapter begins by defining the component and examining how it could be applied on the airport.

1.5.2 Appendices A and B list the Definitions and Acronyms used in this AC and include background reading material. Appendices C, D, and E include a sample Implementation Plan, SMS Manual, and Safety Dashboards.

1.6 **Scalability.**

[2] Transportation Research Board. (2009). Airport Cooperative Research Program Report 1, Safety Management Systems for Airports, Volume 2: Guidebook [Adobe Digital Editions version]. Retrieved from http://www.trb.org/Publications/Blurbs/162491.aspx.

An SMS needs to be tailored to each airport taking into account factors such as the airport size, resources, environment, physical layout, and management. *(Ref 14 CFR section 139.401(c)).* Medium and large airports may require more detailed processes to develop and implement SMS than small airports. For example, an airport manager may handle most of the SMS processes at a small airport with a single manager and minimal support staff. However, at medium and large airports, the complexity and departmentalization of duties on the airport may require that more personnel be involved with the SMS. Regardless of airport size, many airports will find their existing processes and procedures can serve as the foundation for portions of their SMS.

CHAPTER 2. GETTING STARTED

2.1 Introduction.

2.1.1 Shifting from a reactive to a proactive approach to safety management takes time and considerable effort. Therefore, an airport should methodically develop an SMS that utilizes existing policies and procedures as much as possible and document and communicate changes related to SMS development and deployment. Managers, employees, and tenants may resist change, so training and communication will be crucial to gaining initial participation and then sustaining the SMS.

2.1.2 Airports may find it helpful to appoint an individual or team to coordinate the development and deployment of SMS-related processes. This individual or team does not need to be the individual ultimately responsible for daily oversight of the SMS but should have credibility and authority throughout the airport and with its stakeholders. Similarly, if a team approach is used, the team should be comprised of individuals with a variety of backgrounds and authority throughout the airport to facilitate wide-spread buy-in and support for the SMS.

2.1.3 Regardless of the initial approach, it is essential that airports establish certain documentation requirements to build a solid foundation for SMS implementation and operation. SMS implementation parallels the practice of Quality Management with defining objectives, establishing controllable process, training the workforce, and obtaining continuous improvements.

2.2 Documentation.

2.2.1 Typical documentation required for SMS development and deployment include an SMS Implementation Plan and an SMS Manual. Under part 139, certain airport operators are required to submit an SMS Implementation Plan to the FAA for review and approval. These certificated airports must also document how they will comply with the part 139 SMS requirements either in a new section of its Airport Certification Manual (ACM) or in a stand-alone SMS Manual. If the certificate holder chooses to maintain a stand-alone SMS Manual, it must also incorporate the SMS Manual by reference into the ACM. Maintaining a separate SMS Manual allows the certificate holder to make changes without requiring FAA approval prior to implementation *(Ref 14 CFR section 139.401(f)).*

2.2.2 Airports that are not required to develop and implement a part 139 SMS and instead choose to voluntarily implement SMS may find it helpful to create an SMS Implementation Plan and an SMS Manual, or similar documents. The processes and procedures used in a voluntarily implemented SMS can be kept separate from the FAA-approved ACM. However, if the airport chooses to incorporate SMS processes or procedures directly into their FAA approved ACM, then the operator would be forced to comply with such processes and procedures because they would be enforceable by the FAA (*Ref FAA Order 5280.5D, chapter 3*).

2.2.3 The purpose of the FAA reviewing an Airport's SMS is to ensure the certificate holder is following its own processes as documented in the SMS Manual and/or ACM. It is not to analyze the certificate holder's decisions. The FAA's review and approval of the SMS Implementation Plan ensures that a certificate holder is given feedback early and before it may make significant capital improvements as part of its SMS development and implementation.

2.2.4 Other chapters of this AC address documentation related to SMS requirements like Safety Risk Management, which are developed on an on-going basis.

2.3 SMS Implementation Plans.

2.3.1 The SMS Implementation Plan identifies a realistic strategy for developing the SMS through a framework and series of steps. For certificate holders regulated under part 139, the creation of an SMS Implementation Plan is accomplished early in the development of its SMS *(Ref 14 CFR section 139.403(b)).*

Note: Airports may need to consider their current safety culture and account for further cultural development in their implementation plan.

2.3.2 The development of the Implementation Plan can be broken into 5 steps:

1. Assess the current safety organization and its resources. For a small airport, this may be a single individual; whereas at larger airports, this may be a department.
2. Inventory existing safety processes, review existing SMS programs in place by the airport and airport tenants (e.g., voluntary implemented programs), and understand the current safety culture of the organization. This is the current state or starting point.
3. Identify and mitigate the gaps in the airport's program relative to the requirements of 14 CFR part 139. Understand that the term "goal" is often misinterpreted and implied as an end point; that once met, the task is complete. A successful SMS should be viewed as a continuous journey of refinement.
4. Conduct a GAP Analysis. Develop a map or strategy on how to achieve the part 139 SMS requirements using current identified processes. In other words, how to get to the future state from the current state. During the analysis, it is often revealed that current processes may already satisfy the requirement. The analysis may also show weaknesses in a process, or that the process does not exist at all.
5. Create the Implementation Plan and document how the organization will go from the current state to the required state and will meet all regulatory requirements in part 139. The organization should also assess its resources and determine what is needed. It is recommended that the level of detail included in the plan be sufficient to determine if progress is being made.

2.3.3 Table 2-1 includes examples of existing processes and procedures that can serve as the foundation for SMS components and elements.

Table 2-1. Examples of Existing Processes and Procedures

Existing Policy/Procedure/Practice	Adaptability to SMS
Policy Statement	**Safety Policy.** Many airport governing bodies have policy statements. The preexisting statements may include safety-related initiatives or may be geared solely toward employee safety. Using this policy as a foundation or revising it to address operational safety (and not just employee safety) can help in the development of a Safety Policy Statement.
Daily Self-Inspections	**Safety Risk Management & Safety Assurance.** Daily self-inspections performed to meet part 139 requirements or airport-imposed requirements are good means of identifying safety hazards and ensuring continuous compliance.
Airport Committees	**Safety Promotion & Safety Risk Management.** Many airports have preexisting airport committees made up of airport staff and managers or stakeholders like air carriers, fixed-base operators, and airport tenants. These committees can serve two roles under SMS. They can help communicate important safety issues and initiatives as part of Safety Promotion. Also, they can identify individuals needed for risk assessments as part of Safety Risk Management.
Airport Intranet or Internet Website	**Safety Assurance & Safety Promotion.** Airport internet or intranet websites provide excellent means for distributing safety information to employees and tenants as part of Safety Promotion. These sites can also house portals to the airport's safety reporting system as part of Safety Assurance.
Training	**Safety Promotion & Safety Assurance.** SMS training and safety awareness can be included in preexisting training programs, saving time and reducing implementation costs.

Existing Policy/Procedure/Practice	Adaptability to SMS
Recordkeeping	**Safety Risk Management, Safety Assurance & Safety Promotion.** Preexisting recordkeeping practices can serve as the foundation for documentation and tracking of Safety Risk Management findings for Safety Assurance and training/communication performed under Safety Promotion.

2.3.4 Part 139 certificate holders that are required to implement SMS, must submit an Implementation Plan to the FAA for approval *(Ref 14 CFR section 139.403(a))* that contains the following:

1. A detailed proposal on how the certificate holder will meet the SMS requirements;
2. A schedule for implementing SMS components and elements prescribed. The schedule must include timelines for:
   a. Developing the safety policy statement and when it will be made available to all employees and tenants;
   b. Identifying and communicating the safety organizational structure;
   c. Establishing a system for identifying operational safety issues;
   d. Establishing a safety reporting system;
   e. Developing, providing, and maintaining safety awareness orientation materials;
   f. Providing SMS specific training to employees with responsibilities under the airport operator's SMS; and
   g. Developing, implementing, and maintaining formal means for communicating important safety information.
3. A description of any existing programs, policies, or procedures that the certificate holder intends to use to meet the SMS requirements.

2.3.5 Certificate holders should refer to subpart E of part 139 to familiarize themselves with all applicable Airport SMS requirements.

2.3.6 Appendix C of this AC includes a sample Implementation Plan that meets the minimum requirements of part 139. Airport operators are encouraged to use the sample as the baseline for their plan to expedite FAA review and approval.

2.3.6.1 An SMS Implementation Plan is not a mere checklist or table; it is the mechanism by which the airport explains its approach to implementation, discusses strategies or challenges concerning deployment, and identifies major milestones. The accompanying checklist should be tailored to the airport's needs and unique circumstances.

2.3.6.2 The sample Implementation Plan includes a "Status" column, allowing it to serve not only as a one-time plan, but also as an ongoing tool for communicating implementation status to management.

2.4 SMS Manual.

2.4.1 An SMS Manual details the SMS elements and how they will be established and function. It is a document that may resemble a part 139 Airport Certification Manual (ACM). While the ACM describes how the airport operates, the SMS Manual describes the SMS functions and documents and delineates how the airport operator will implement the four SMS components. An airport operator may choose to develop an SMS Manual separately from the ACM, or may choose to integrate them.

2.4.2 Appendix D provides an example arrangement of an SMS Manual. Not all SMS Manuals will look alike. Manuals will vary in size, specificity, and scope. The airport operator should tailor the manual to meet its unique operational and governance needs.

2.4.3 This AC focuses on airport operational safety in the airfield environment (both movement and non-movement areas). However, airport operators can apply these principles anywhere on their airports (the airside or landside environments) to address safety. The purpose of addressing landside areas in SMS is to address conditions, events, incidents, or accidents that could potentially threaten, or harm, passenger-carrying operations, and to reduce or eliminate the possibility of recurrence of accidents in air transportation.

2.4.4 The SMS Manual can discuss other areas where the airport operator choses to implement SMS, but the landside or terminal discussions should be kept separate from the airside applications. Airport governing bodies that oversee multiple airports may choose to develop one SMS Manual for the entire system instead of individual SMS Manuals for each airport. This method is acceptable as long as all included airports understand how the applicable manual applies to them.

2.4.5 SMS Manuals are intended to be living documents. The airport should review and update the SMS Manual as needed and communicate changes to all individuals with a need to know. While part 139 does not specify how often the SMS Manual is updated, *14 CFR section 139.401(f)* requires the certificate holder to provide copies of any changes made to the SMS Manual to the FAA on an annual basis or upon FAA request. Only the information that has changed should be submitted for FAA acceptance.

2.5 ACM Documentation.

If an airport operator that is not subject to the part 139 SMS requirements chooses to voluntarily implement SMS and to incorporate SMS processes or procedures directly into their FAA-approved ACM, then the operator would be forced to comply with such processes and procedures because they would be enforceable by the FAA. (*Refer to 14 CFR 139.201-203 for the ACM requirements*.) Therefore, the FAA recommends that

such airport operators keep voluntary SMS-related documentation such as SMS Manuals and Implementation Plans separate (e.g., not incorporated by reference) from their part 139 programs and to not incorporate such documents, processes, or procedures into their ACM.

2.6 Data Sharing and Reporting.

2.6.1 A successful SMS requires an open culture of communication. Some airport tenants may have an SMS of their own (e.g., one that is mandatory in accordance with FAA regulations or one that is voluntarily implemented to improve their operations in general). In order to maximize the effectiveness of hazard identification, airport operators and airport tenants and users should coordinate SMS efforts to the fullest extent possible and should understand how their SMS interacts with other SMS's in the same environment (e.g., how the airport's SMS can work in tandem with an air carrier's SMS under part 5 and how collaboration amongst both SMS's may improve safety).

2.6.2 If an airport has a tenant that is required to maintain an SMS subject to the requirements of Part 5, then the airport may develop a data sharing and reporting plan to address the reporting and sharing of hazard and safety data with the tenant. *(Ref 14 CFR section 139.401(e)).* Since a hazard to one party may be a hazard to another, the FAA encourages airports to enter into such. These data sharing and reporting agreements improve communications, share hazard identification reporting and information, and enhance the mitigations put in place to address safety. Such a data sharing relationship could also be used by the certificate holder to reduce duplicate requirements for providing safety training and safety awareness orientation to the tenants or their employees *(Ref 14 CFR section 139.402(d)(1)).* As referenced in Table 2.1, an option to enhance communication is the creation of an airport SMS committee that includes representatives from all stakeholders (e.g., airport, air carriers, airport tenants) that fosters communications streams, transparency, and agreements between tenants, users, and airport operators to address safety in the airport environment and of related operations. Further information regarding the confidentiality of data is discussed in Chapter 5, Safety Assurance.

CHAPTER 3. SAFETY POLICY

3.1 Introduction.

3.1.1 Safety Policy, the first of the four SMS components, provides the foundation or framework for SMS. Safety Policy is the airport's documented commitment to safety, which defines its safety objectives and the accountabilities and responsibilities of its employees in regards to safety. Airport management develops, documents, and communicates a Safety Policy that demonstrates its commitment to providing a safe and secure environment for the passengers, employees, and users of the airport's services *(Ref 14 CFR sections 139.402(a)(6) & (7), and 139.402(c)(1)).*

3.1.2 Figure 3-1 shows the numerous elements that make up Safety Policy:

Figure 3-1. Safety Policy

3.2 Developing and Implementing the Safety Policy.

3.2.1 Identify the Accountable Executive.

3.2.1.1 The Accountable Executive is the person designated by the airport to act on its behalf for the implementation and maintenance of the airport's SMS. The support of a senior executive is essential; otherwise, there is little incentive for employees and tenants to actively participate in the airport's SMS activities and initiatives. The Accountable Executive should

have sufficient control over human and financial resources for the airport to ensure that sufficient personnel and adequate funding are available to develop and implement the SMS. A key point of SMS is ensuring that top management within the airport is aware of the safety issues and hazards identified on the airport. In many cases, the Accountable Executive will have minimal daily hands-on management of the SMS. However, at times this person may need to make decisions related to particular safety issues and hazards.

3.2.1.2 Part 139 certificate holders required to comply with *14 CFR section 139.402(a)(1)* must identify their Accountable Executive. The term is defined in *14 CFR section 139.5* as:

> "[The] individual designated by the certificate holder to act on its behalf for the implementation and maintenance of the Airport Safety Management System. The Accountable Executive has control of the certificate holder's human and financial resources for operations conducted under an Airport Operating Certificate. The Accountable Executive has ultimate responsibility to the FAA, on behalf of the certificate holder, for the safety performance of operations conducted under the certificate holder's Airport Operating Certificate."

3.2.1.3 Airports that are governed by larger entities such as city councils, airport authorities, or governing boards may find it challenging to identify a single individual to act in the role of an Accountable Executive. However, an airport should identify a single individual in a senior executive leadership position within the airport management structure. Ideally, this individual would be one of the following: the Airport Director, the Airport Manager, or the Chief Executive Officer.

3.2.1.4 The airport's Accountable Executive cannot delegate overall responsibility for SMS oversight. However, the individual can delegate responsibility for daily oversight and the administration of SMS-related processes or initiatives. While not required, many airports have found it helpful to identify an SMS Manager, SMS Coordinator, or SMS Administrator. The FAA discourages airport operators from labelling this supporting position as the Safety Manager because it could imply that managing safety is the responsibility of that division or manager alone and not of any other airport department. The ICAO Safety Management Manual (2013) and ACRP's SMS for Airports Volume 2: Guidebook (2009) provide characteristics, job descriptions, and tasks for these supporting positions.

3.2.1.5 Smaller airport organizations may choose to identify only an Accountable Executive. Larger airports with more complex organizational structures may choose to identify an Accountable Executive and support staff, including an SMS Manager, for the daily implementation and oversight of the SMS. Either method is acceptable as long as the Accountable Executive is regularly apprised of:

- Pertinent safety information, including the airport's performance toward its safety objectives (see Section 3.3.10 below);
- Critical safety information communicated to employees and tenants;
- The status of ongoing mitigations required under the airport's SRM policies (see Chapter 4); and
- The status of SMS implementation.

3.2.1.6 The Accountable Executive should be identified by name and title in either the airport's SMS Manual or ACM. The certificate holder should certify or confirm that the identified individual complies with the roles, responsibilities, and authority required under part 139 for an Accountable Executive.

3.2.2 Identify and communicate the safety organizational structure.

3.2.2.1 It is important to identify the positions and offices within the airport organization that have responsibility for, or play a role in, the safety of airport operations. This includes the "chain of command" and the means by which airport employees report their safety concerns, hazards, and other safety-related information.

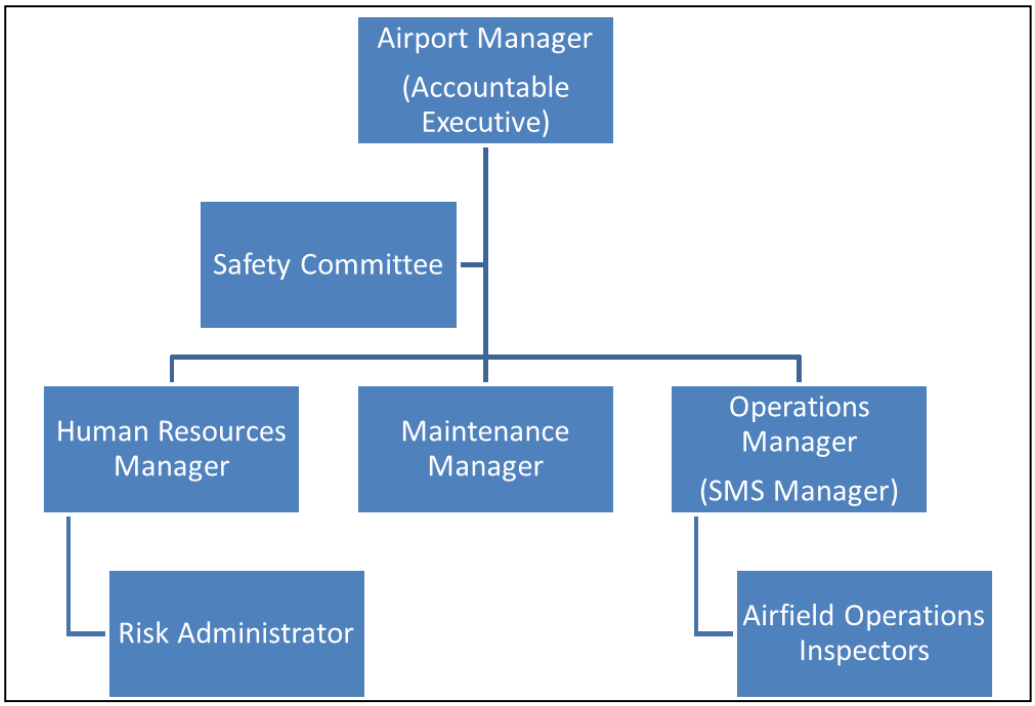
3.2.2.2 Identifying the safety organizational structure begins with the Accountable Executive and flows from there through the organization. Typically, this structure includes airport operations departments as well as Maintenance and Public Safety. It may also include any Human Resources divisions responsible for employee safety issues.

3.2.2.3 At a small airport, with a flattened management structure and few employees, there may be a straight-line reporting to the Accountable Executive. At medium and large airports, there will usually be an expanded reporting structure, whereby department supervisors or line managers are first in line to receive and act on information about safety concerns, hazard reports, and other safety-related items.

3.2.2.4 Each manager that is accountable for safety and that has responsibilities for aspects of SMS should be identified, and each employee should know the point of contact for particular safety issues. The identification ensures that senior management is aware of the daily activities of the various departments and can play an active role in airport safety or the management or direction of SMS initiatives. An organizational chart can provide the simplest means of communicating the safety organizational structure.

3.2.2.5 Figure 3-2 provides a sample organizational chart for safety oversight.

Figure 3-2. Sample Organizational Chart for Safety Oversight



3.2.2.6 A Safety Committee, which is different from an SMS Committee, is usually comprised of members of airport departments, tenant organizations, and airport stakeholders, and is often a group that would conduct the system analysis and would identify a hazard. An SMS Committee may include Safety Committee members, but has the additional responsibility of implementing SMS and is often chaired by the Accountable Executive or the SMS Manager. The composition of the two groups may often overlap. If the airport establishes a stand-alone SMS Committee to help promote SMS initiatives, make decisions, or perform other SMS activities, the organizational chart should include the SMS Committee. Depending on the complexity of the committee's structure, the airport may find it useful to include a separate chart identifying committee members and showing how the committee interacts with airport management.

3.2.3 Identify the lines of safety responsibility and accountability.

3.2.3.1 Once the airport identifies the positions and divisions with roles in ensuring safe operations, it should ensure their responsibilities and accountabilities are clearly defined and documented. The airport should create descriptions for each position and division with safety oversight. For example, employees with airfield access play a role in safety; they report hazards and identify safety issues to the proper point of contact or the airport's hazard reporting system. Additionally, airfield operations

specialists or inspectors conducting daily self-inspections play a role; they identify safety issues through the course of their inspections and also contribute to safety oversight.

3.2.3.2 While the safety organizational structure may best be depicted in an organizational chart, safety responsibilities and accountabilities are best described in the SMS Manual. Once these descriptions are developed, the airport should make them available to all identified individuals so they understand their responsibilities under the SMS.

3.2.3.3 When describing responsibilities and accountabilities, the airport should only include those items related to safety and the implementation and oversight of SMS-related initiatives. General job descriptions are best kept in human resource documents, not the SMS Manual. However, if new positions are created to support SMS development and implementation, the airport may incorporate the job descriptions and tasks into this section because they specifically relate to safety oversight and SMS.

3.2.3.4 Part of the Safety Policy should address the airport's safety issue reporting system or process. Fear of reprisal may inhibit the effectiveness of an SMS. Accordingly, the airport should consider under what circumstances an employee would or would not be subject to company discipline for conduct described in a report. A just reporting culture/system and/or process should be declared and supported from the highest levels of management.

3.2.3.5 Figure 3-3 depicts a sample excerpt from a Safety Responsibilities section of an SMS Manual. It includes descriptions for all positions/divisions identified in the organizational chart shown in Figure 3-2. It also contains a broad concluding statement that encompasses the responsibility of every individual with access to the movement and non-movement area for hazard reporting.

Figure 3-3. Sample Safety Responsibilities

Safety Responsibilities

Accountable Executive

The Airport Manager is the Accountable Executive for SMS development and deployment. The Airport Manager will ensure that the necessary assets and financial support are available for successful SMS implementation and continuous safety improvement….

SMS Manager

The Operations manager is designated as the SMS manager for the airport and chair of the Safety Committee. The Operations Manager is responsible for the daily oversight and implementation of the SMS. The Operations Manager will ensure that incidents and accidents on the airport are investigated and the findings are reported to the SMS committee and …..

Safety Committee

The Safety Committee is chaired by the SMS Manager and is comprised of members from the airlines, FAA, TSA, corporate aviation, FBO, Maintenance Manager, and Risk Administrator. The Safety committee meets monthly and is charged with the following responsibilities:

-Review of all incidents and accidents that took place on the airport for the previous month.

-Review the results of all safety audits. Recommend actions.

-Identify participants for Risk Assessments requiring integrated analysis (e.g., a subject matter expert panel format).

-…..

Maintenance Manager

The Maintenance Manager is responsible for ensuring that all maintenance requests are completed in a timely manner and reporting of any ongoing maintenance issues that could impact safety or impact mitigations that are required under the SRM policies or decisions to the SMS Manager and Accountable Executive. The Maintenance Manager will also participate as a member of the Safety Committee, and in Risk Assessments…….

Airport Operations Inspectors

In carrying out their normal duties, the Airport Operations Inspectors will ensure that any hazards identified are properly reported. In cases where immediate action is required to ensure the safety of operations, the Airport Operations Inspector has the authority to…….

Risk Administrator

The Risk Administrator shall work with the SMS Manager to ensure that all employee related incidents and accidents with an impact on operational safety are reported and investigated. The Risk Administrator will participate as a member of the Safety Committee and participate in Risk Assessments…..

Every individual with access to the movement and non-movement areas of the airfield shall report any hazard found in those areas to the Airport's Hazard Reporting System, or to one of the individuals identified in the Safety Responsibilities section above, or to responsible personnel within their organization's SMS.

3.3 Establish and Maintain a Safety Policy Statement.

3.3.1 The creation of the Safety Policy Statement is one of the initial stages of SMS development and documents the airport management's commitment to operate its facility with the highest level of safety. The Safety Policy Statement is just one element of many that encompass the Safety Policy component *(Ref 14 CFR section 139.402(a)(2))* and should not be confused with the overall Safety Policy component.

3.3.2 By developing, accepting, and giving visibility to the Safety Policy Statement early in SMS development, airport management and the Accountable Executive show their commitment to SMS and its development and implementation. This assures airport personnel that management is leading the effort to make safety a priority and assures the travelling public that airport management and airport personnel are striving to improve safety. The Accountable Executive should sign this statement to formally express airport management's commitment to the SMS as well as its processes and initiatives. Note that the Safety Policy component as documented in the SMS Manual, outlines the methods and processes the airport will use to achieve the desired safety outcomes.

3.3.3 The Safety Policy Statement should be easily understood by managers, employees, and tenants and take into account the airport's complexity and structure. When developing the Safety Policy Statement, airports should look to existing Policy Statements, Mission Statements, or other high-level concept documents as models. For example, many airports owned by municipalities may already have Safety Statements from their local governments. The airport may be able to build on or replace these preexisting documents but should consult its legal department before doing so.

3.3.4 Internal policies or regulations may prevent some airports from using the terms "Policy" or "Statement". If so, it is acceptable to call the Safety Policy Statement by another name, as long as it includes the necessary commitments to SMS implementation and operations.

3.3.5 There is no prescribed length for a Safety Policy Statement but will typically range from one paragraph to one page in length. A good Safety Policy Statement would address at least the following items:

- A commitment to make airport safety the highest priority.
- The commitment of senior airport management to implement SMS.
- A commitment to continually improve safety on the airport.
- The encouragement of employees to report safety issues without fear of reprisal.
- A commitment to provide the necessary resources needed for safe operations.
- A commitment to comply with all regulatory requirements related to safety.

3.3.6 It is not recommended to include the airport's safety objectives and goals (see Section 3.3.10 below) in the Safety Policy Statement. Objectives and goals may change

frequently over time, while the Safety Policy Statement should be consistent throughout the life of the SMS.

3.3.7 Figures 3-4 and 3-5 provide examples of Safety Policy Statements. Figure 3-4 shows a statement that would be appropriate for a small airport. It is simple, concise, and expresses the core principles of SMS.

Figure 3-4. Example of Simple Safety Policy Statement

EXCELSIOR AIRPORT

1 Airport Boulevard
Monterey, CA 90293

June 7, 20XX

Excelsior Airport is committed to the implementation of a Safety Management System (SMS) that enables its management, employees, the airlines, tenants, and other business partners to operate in a safe environment. Safety is among the Airport's highest priorities. The Airport is dedicated to creating an environment that minimizes exposure to hazards and risks, expects continuous safety improvement, and encourages confidential reporting of any safety related situation, incident, or accident. We will ensure that necessary policy direction and resources are available to enable the success of the SMS, compliance with standards and regulations, and enhanced operational safety.

John R. Smith

John R. Smith
Excelsior Airport Manager

3.3.8 Figure 3-5 provides an example of a more complex Safety Policy Statement that is better suited for airports where several departments have responsibilities for separate but interdependent functions. Without identifying each department, the statement clarifies that many types of airport personnel have safety-related roles. It also explains that an office charged with safety oversight is necessary to meet the wide-ranging responsibilities of the SMS.

Figure 3-5. Example of Complex Safety Policy Statement

XYZ AUTHORITY

SUPERIOR INTERNATIONAL AIRPORT

100 Lake Shore Blvd.
Minocqua, WI 54548

April 1, 20XX

Superior International Airport employees and tenants shall systematically integrate safety into management and work practices at all levels so that airport operations are accomplished safely. The application of an effective Safety Management System (SMS) is integral to all of our airport activities with the objective of achieving the highest levels of safety standards and performance. Safety is the responsibility of everyone and the participation of airport and tenant employees is paramount to the success of the SMS. Our commitment is to:

- Continuously promote a safety culture across all airport operations that recognizes the importance of safety in our daily activities and the value of an effective SMS. Encourage confidential hazard reporting by all employees and tenants.
- Ensure all staff members are aware of their responsibilities and accountabilities in the execution of and participation in the SMS. Provide adequate and appropriate safety information and training.
- Provide skilled and trained personnel and other resources necessary to ensure the effectiveness of the SMS.
- Analyze and manage risk(s) associated with airport-related operations, incidents, or accidents.
- Comply with local, State, and Federal legislative and regulatory requirements and standards. Continue to improve our safety performance.

Jane L. Doster

Aviation Director,

Superior International Airport

3.3.9 Ensure the Safety Policy Statement is available to all employees.

Making the safety policy statement available to all airport personnel and tenants confirms management's intention to prioritize safety. The airport can issue the statement to each airport employee, make it available online, and/or post it in prominent locations throughout the airport. The airport should also give it to its tenants because their employees should understand their role in reporting hazards and contributing to airport safety. Mentioning the policy statement frequently and periodically adding excerpts of it to bulletins and other documents confirms airport management's continuing commitment and reinforces its safety focus to the entire airport community.

3.3.10 Establish and maintain safety objectives.

3.3.10.1 Under the Safety Policy, the airport establishes and maintains safety objectives. These objectives will help focus employees and management when developing and implementing the various processes and procedures under SMS. Articulating objectives and sharing related metrics allow the airport, its stakeholders, and the FAA to verify achievements or progress toward the airport's safety improvement. The airport should tie its safety objectives to its Safety Assurance activities (see Chapter 5). That is, when the airport conducts its evaluations to verify safety performance, it should do so with these objectives in mind.

Examples of Safety Objectives and Goals

Safety Objective 1: Reduce the number of accidents on the airport by x% in x years.

Safety Objective 2: Reduce the number of foreign object debris (FOD) occurrences by x% in x months.

Safety Objective 3: Reduce the number of vehicle/pedestrian deviations by x% in x years.

- Goal 3.1: Increase the number of driver training sessions by x% in x years.
- Goal 3.2: Develop and promote a driver training promotion program within x months.

3.3.10.2 Safety objectives should be specific to the airport but can be tied to national-level objectives set by the FAA, state aviation organizations, or industry groups (e.g., national effort to reduce the number of vehicle/pedestrian deviations). Additionally, airports may choose to develop more specific goals or targets related to these objectives. "Examples of Safety Objectives and Goals" illustrates the differences between an objective and a goal.

3.3.10.3 The airport should keep the following SMART points in mind when developing the airport's safety objectives:

- **Specific:** The objective should be focused on one thing only.
- **Measurable:** It should be possible to measure whether the airport meets the objective.
- **Achievable:** The objective should be within the airport's capabilities.
- **Relevant:** The objective should be something of importance or significance to safety.
- **Timed:** There should be a defined deadline for meeting the objective.

3.3.10.4 As discussed in Chapter 5, Safety Assurance, the airport should establish processes to report progress on the airport's safety objectives on a regular basis. Once the initial objectives are met, the airport should develop new safety objectives and communicate them throughout the airport community.

3.3.11 Establish methods and processes to meet safety objectives.

The Gap Analysis will disclose what processes currently comply with part 139 SMS requirements, and what areas need to be developed and instituted.

CHAPTER 4. SAFETY RISK MANAGEMENT (SRM)

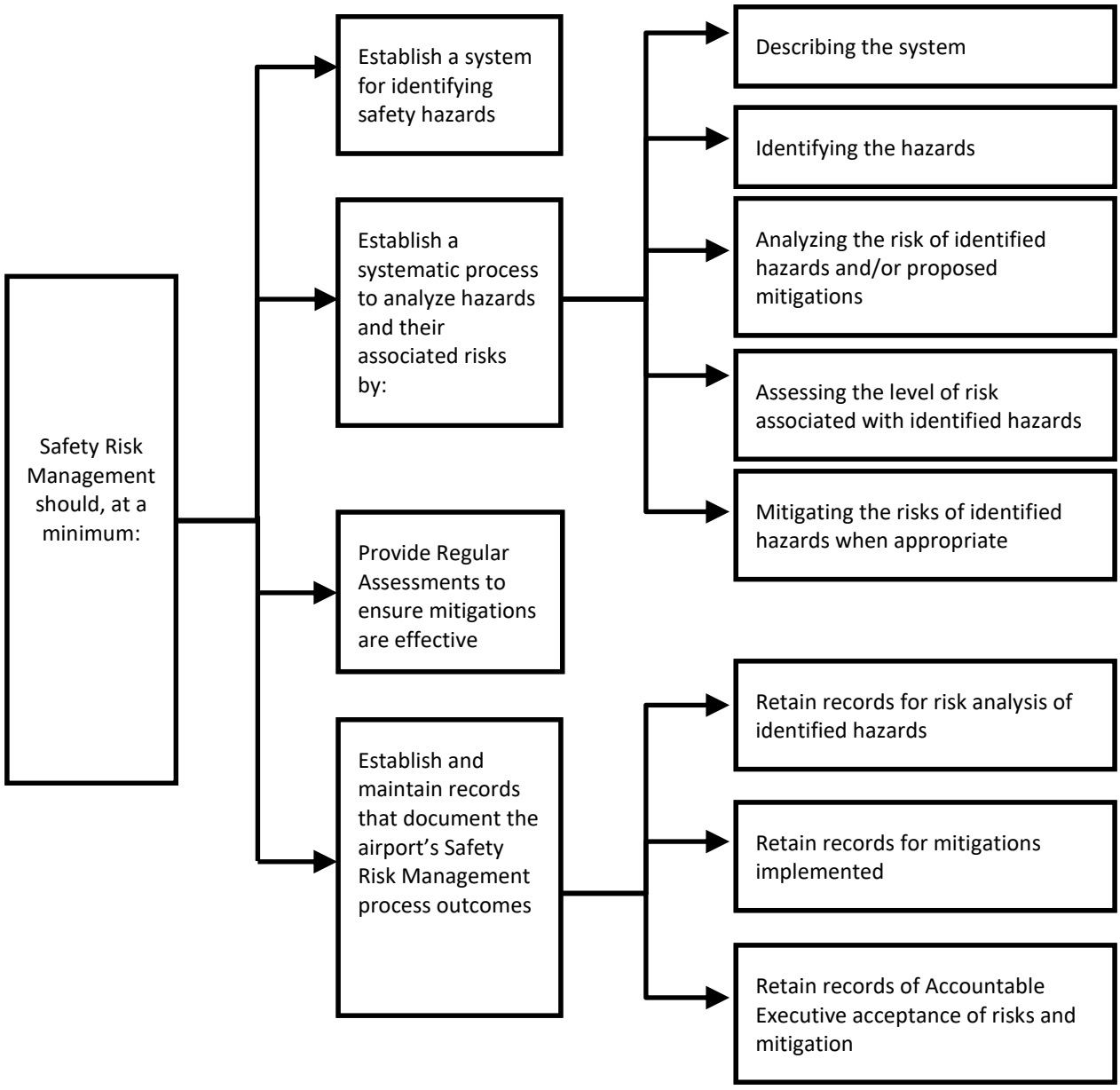
4.1 Introduction.

4.1.1 SRM is the second component of SMS and is considered a core operational component because of its related elements. SRM uses a set of standard processes to identify hazards formally in a proactive manner, analyze and assess their potential risks, and design appropriate risk mitigation strategies *(Ref 14 CFR section 139.402(b)).* Figure 4-1 depicts elements of SRM. When properly implemented, SRM processes also promote productive communication among stakeholders and a positive safety culture within and around the airport environment.

4.1.2 A comprehensive SMS using SRM provides management with a tool for identifying hazards and risks and prioritizing their resolution. While each airport's SRM processes may be unique to the airport's operations, physical geometry, history of incidents, and organizational structure, the airport should develop processes and procedures for hazard identification and analysis appropriate to the airport's operating environment.

4.1.3 When developing the SRM process, one of the first elements is hazard identification. An efficient Hazard Identification program would make great use of the various sources of information available, including other Safety Management Systems that may overlap. For example: an airline employee notices a breach in airport fencing – how is it reported? Or; an airport employee notices a systemic issue with cart parking and firefighting equipment access to aircraft – how is the information communicated? A method of cross-communication or Data Sharing and Reporting (DSR) amongst the separate Safety Management Systems should be included in the SRM process.

Figure 4-1. Elements of SRM



4.1.4 The SRM component is sometimes used synonymously with one of its elements—the systematic process to analyze hazards and their associated risks (i.e., the "5-step process"). While a very important part of SRM, the 5-step process is not the only part of a comprehensive SRM program. For a detailed description regarding the 5-step process, Appendix B contains a link.

4.2 **Developing and Implementing Safety Risk Management.**

4.2.1 Establish a system for identifying safety issues.

4.2.1.1 Identifying safety issues is an essential step in proactive risk management. While the airport may have processes in place that support the identification of safety issues, it should ensure these processes are documented and communicated for further assessment. The airport should implement identification processes and procedures that reflect the management structure and complexity of the airport environment. The process should also take into account other safety programs, if any, for data sharing of identified safety issues.

4.2.1.1.1 A hazard is any existing or potential condition that can lead to injury, illness, or death to people; damage to or loss of a system, equipment, or property; or damage to the environment. A hazard is a condition that is a prerequisite of an accident or incident. For example, a hazard can be a situation as minor as a water leakage in a non-movement area. A hazard can also be a major event or procedural concern such as construction equipment entering a runway safety area. The key to determining whether something is a hazard is that the condition or situation would contribute – directly or indirectly – to the occurrence of an accident or incident.

4.2.1.1.2 SMS should ensure that there are hazard identification and reporting processes in place to address the various levels of immediacy. The level of formal vigor for pursuing a safety issue should be communicated through the safety identification process. The more proactive the safety culture, the "less severe" a safety issue may be before it is pursued and mitigated. A safety issue is a concern of a condition that has an undesirable safety effect or outcome that may not rise to the level of a hazard. The system put in place under this requirement should identify conditions, or safety issues, or changes to the airport's operations or geometry that could create hazards.

4.2.1.2 Safety issues can be identified through the following, amongst others:

- The airport's hazard reporting system (see Chapter 5, Safety Assurance);
- Airport self-inspections;
- Checklists;
- Maintenance activities;
- Manager/tenant meetings;
- Brainstorming;
- Data Sharing with other safety programs; or

- Data Analysis of Safety Performance Indicators.

4.2.1.3 The evaluation of certain activities or events, such as the following, may also help a person identify safety issues:

- Airport accidents or incidents;
- Airfield changes (including geometry, construction, conversion from movement to non-movement areas, airfield procedures, and pavement marking modifications);
- Irregular operations or events;
- Winter weather operations;
- Tenant operational changes (including new servicing equipment and aircraft using airport); or
- Ramp operations (including use of ramp for activities not originally intended).

4.2.1.4 In the course of identification of various hazards, there may be some questions as to what level of analysis should be given. A Risk Assessment (RA) as identified in Section 4.5 may be beneficial. The following Table 4-1 list some examples that may trigger the need for an RA:

Table 4-1. Example of Triggering Events

Trigger	Description
Construction	Airfield improvement; airfield rehabilitation; airfield maintenance; construction of tower; terminal expansion; geometry changes
Standard Operating Procedures	New standard operating procedures; modification of existing standard operating procedures
Airport Organization	Significant changes to airport organizational structure or key personnel
Safety Reports	Safety issues reported by pilots, employees, or tenants; safety issues resulting from daily inspections; accidents or incidents
Special Events	VIP presence on the flight aprons
New Equipment or Software	New passenger boarding bridge; new ramp equipment that requires special consideration; changes to information management systems
Safety Assurance	Trends identified from safety performance indicators; safety evaluations

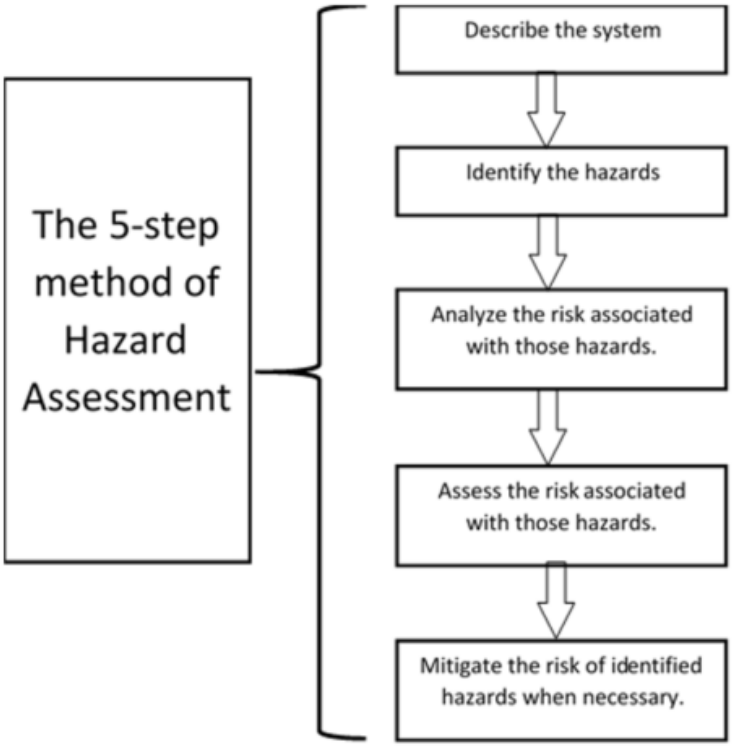
4.2.2 Establish a systematic process to analyze hazards and their associated risks.

4.2.2.1 Using the SRM process, airports can develop an approach appropriate to their operational environment. Any of the items listed above could potentially introduce new hazards in the airfield environment. Therefore, airport management should formally determine whether those hazards create a level of risk that the airport is willing to accept. For those hazards with unacceptable risk, the airport should ensure mitigations are in place or stop the operation. Unacceptable risk is subjective and is based on the risk-tolerance of the given organization. When establishing the SRM process the airport will use to analyze hazards, airport management should define what it considers acceptable and unacceptable risk.

4.2.2.2 It is important to understand that not all identified hazards require using the 5-step SRM Hazard Assessment process. The 5-step process can be used to triage hazards reported through the airport's hazard reporting system (Refer to Section 4.3, *Scalability of SRM,* for more information).

4.2.2.3 The 5-step hazard assessment process provides a framework and guidance that serves all airports, from those whose operational environments are simple and uncomplicated to those whose are complex and extensive. The scalability of this effort is key to making it work because resources are involved. Figure 4-2 illustrates the 5-step process.

Figure 4-2. Five Steps of SRM Hazard Assessment



4.2.2.4 The airport should identify who conducts the 5-step process. Anyone operating on the airfield can identify hazards. However, individuals responsible for conducting or leading the 5-step hazard analysis process should have proper training and oversight to ensure that the process is completed correctly and consistently.

4.2.2.5 In some cases, the airport may want more than one individual completing the 5-step process, usually when more subject-matter expertise is required for adequate analysis. In these cases, the airport may want to ensure that individuals receive proper instruction on how to complete the process, the airport's risk analysis tools, and the airport's risk acceptance procedures. The airport's SMS Manual should clearly explain how the airport will select individuals or organizations to participate in the 5-step process.

4.2.2.5.1 Describe the system.

1. The first step of the 5-step process is to describe the system. The system description depicts the operating environment in which the hazards will be identified. The description of the system sets the boundaries for hazard identification. Questions that help define this description could include the following:
   a. What are the meteorological conditions (e.g., VMC or IMC?)

b. Are seasonal conditions involved and are they abnormal?

c. Are there known defects or deficiencies (e.g., paved area problems, safety area problems, deteriorated marking, missing or deficient signs, or lighting deficiencies)?

d. Is time of day or night a factor?

e. Is traffic volume involved (peak activity or low activity)?

f. Do normal operations prevail or are there abnormal conditions like construction or a closed runway or taxiway?

g. What type of infrastructure or media is involved (e.g., runway, taxiway, apron, or drainage facility)?

2. Airports can choose from several models to help define their operational environments. For example, the 5M Model is used to deconstruct the proposed change or condition for analysis to distinguish elements that are part of, or impacted by, the proposed change or condition. These elements later help identify sources, causes, hazards, and current and proposed hazard mitigations. The 5M Model analyzes five elements for impacts: Mission, Man, Machine, Management, and Media (see Figure 4-3). These elements are defined as follows:

   a. Mission – A clearly defined role of the SRM panel, describing, in detail, the operation or change.

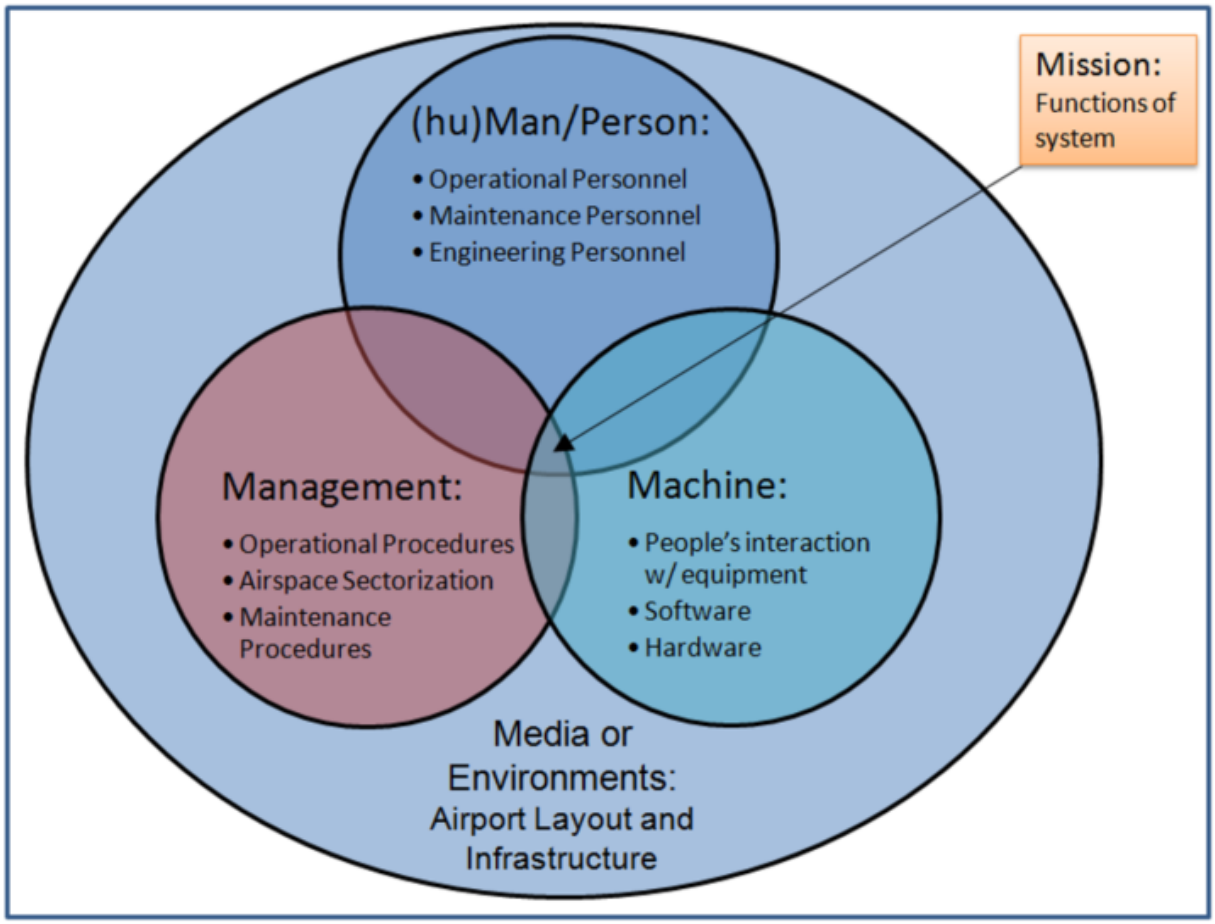
   b. (hu)Man/Person – The person or human component.

   c. Machine – The equipment used in the system, including hardware, firmware, software, human-to-system interface, and avionics.

   d. Management – The procedures and policies that govern the system's behavior.

   e. Media – The environments in which the system is operated and maintained (i.e., the airport).

Figure 4-3. The 5M Model



4.2.2.5.2 Identify the hazards.

1. The second step of the hazard assessment process identifies hazards in a systematic way based on the system described in the first step. A hazard is any condition that could foreseeably cause or contribute to an accident.

2. The term hazard is often misused, so it is important that the airport's training program for those individuals conducting the 5-step process (see Chapter 6, Safety Promotion) clearly defines and provides examples of hazards. A simple example of a hazard is snow or ice on active runways. A hazard could also be a construction vehicle entering an active runway without clearance or a pilot's loss of visibility on final approach due to dust from construction. Hazards should be considered with respect to the original system description. For example, a construction vehicle entering an active runway would only be reasonable if there is ongoing construction and the runway is in use. When identifying hazards, all possible sources of system failure should be considered. Depending on the nature and size of the system under

consideration, as with the construction example, these sources could include:

a. Equipment (e.g., construction equipment operating in or near the movement area);

b. The operating environment (e.g., weather conditions, season, or time of day);

c. Maintenance procedures (e.g., nightly movement area inspections); or

d. External services (e.g., ramp traffic by tenants or law enforcement vehicles).

3. It is best to identify the cause and effect to verify whether the perceived hazard is actually a hazard. For example, if there is snow on an active runway, the cause would be accumulation of freezing precipitation and the likely effect would be limited braking action.

4. The use of a simple but well-defined hazard analysis tool ensures thorough assessment and documentation of SRM. There are many tools available, including the Preliminary Hazard Analysis, Operational Safety Assessment, Comparative Safety Assessment, Fault-Hazard Analysis, What-If Analysis, Scenario Analysis, and the Fault Tree Analysis. Airports may find it useful to use the Preliminary Hazard Analysis, because this is the primary analysis tool used by FAA Airports Division for analyzing hazards.

4.2.2.5.3 Analyze the risk of identified hazards.

1. During the third step of hazard assessment, the airport analyzes the risk associated with each of the hazards identified in the previous step. For each hazard, the airport should consider the worst credible outcome (harm), which is the most unfavorable condition that is believable and possible given the system state described in step one.

2. It is important to remember that in identifying hazards, airports should strive for ***reasonable*** assessments that cite credible outcomes. Not all hazards could technically result in a catastrophic accident. The airport should strive for quantitative or real-life examples of outcomes based on the hazard. Using examples from airports of similar size and operations may help add credibility.

3. Using the previous example of snow on the active runway, the worst credible outcome based on the system description (e.g., daytime versus nighttime operations, or VMC versus IMC operations) is established. The worst credible outcome without consideration to the unique airport environment is likely a runway excursion. Whether that excursion results in significant damage or loss of life will be determined based on the system description. For example, at an airport that lacks standard safety areas or has non-frangible objects in the

safety areas, the end result of a runway excursion could be worse than at an airport with standard safety areas.

4. Based on the worst credible outcome of each hazard, the airport should determine the severity and likelihood of that outcome using qualitative and/or quantitative methods. To do this, the airport should have pre-defined Severity and Likelihood levels. These levels are typically unique to each organization, because they are management's means of defining what constitutes acceptable and unacceptable levels of risk. The airport should develop these levels commensurate with its operational needs and complexity.
5. Severity and Likelihood levels and definitions should reflect both quantitative and qualitative values. In some cases, the airport may have data to draw on to establish a quantitative value for things like likelihood. In others, it may have to rely on the subject-matter expertise of those individuals completing the analysis.
6. Again, the airport should develop its own definitions and categories based on its unique operating environment. However, many airports may find it useful to use a standard five-level or three-level system. Tables 4-1 and 4-2 depict two samples of five-level Severity and Likelihood definitions. Since an SMS is not unique to aviation, the airport operator could research numerous resources (e.g., available on the internet) to assist in the development of a risk matrix. Refer to Appendix B for additional resources for Airport SMS development information.

Table 4-2. Sample Severity and Likelihood Definitions

Severity				
Negligible	**Minor**	**Major**	**Hazardous**	**Catastrophic**
No first aid required injury/illness; no lost work time; none to very limited operational impact (less than 1 hour); none to minimal equipment loss (less than 1 day out of service); no environmental impact; none to minimal budget impact	Injury/illness (first aid required); little to no lost work time (less than 2 days); none to very limited operational impact (less than 4 hours); none to minimal equipment loss (less than 2 days out of service); contained with none to limited impact to environment; minimal budget impact	Injury/illness (1 to 5 persons); death (less than 2 persons); lost work time (less than 1 week); loss of total operations (less than 2 hours); loss of partial operations (less than1 day); equipment loss (less than 1week); non-contained (manageable/ mitigated within 1 day); moderate budget impact	Injury/illness (6 to 49 persons); death (less than 5 persons); lost work time (1 week to 1 month); loss of total operation (2 to 12 hours); partial loss of operation (48 hours or less); equipment loss (less than 30 days); non-contained, resulting in environmental impact (1 to 30 day); serious budget impact	Injury/illness (greater than 50 persons); death (greater than 5 persons); lost work time (greater than 1 month); loss of total operation (greater than 12 hours); loss of partial operations (greater than 48 hours); total loss of equipment; non-contained resulting in long-term environmental impact (greater than 30 days); grave budget impact

Likelihood				
Extremely Improbable	**Extremely Remote**	**Remote**	**Probable**	**Frequent**
Almost impossible; possibly only once in 10 to 100 years	Conceivable but highly unlikely; possibly once in every 5 to less than 10 years	Possibly once a year or multiple times from 1 year to less than 5 years; unlikely but possible to occur	Likely to occur multiple times per year or once per month; regularly expected to occur in the system	Likely to occur once a day or multiple times per week; continuously expected to occur in the system

Table 4-3. Sample Severity and Likelihood Definitions

Severity			
	People	*Assets*	*Reputation*
Catastrophic	Fatality	Loss of an aircraft/or over $1 million in damage/or loss of critical system(s) for an extended period of time	An event or series of events resulting in the community not using the airport for an extended period of time
Hazardous	Severe injury (requiring hospitalization)	Damage to an aircraft taking it out of service for an extended period of time/or damage in excess of $500,000/or disruption of critical services for extended period of time	An event or a series of events resulting in the community lessening the use of the airport causing negative financial or operational impacts
Major	Minor injury (requiring medical treatment)	Damage to an aircraft that is repairable/or damage to equipment or facility that is reparable within a short period of time	An event or a series of events resulting in the community lessening the use of the airport for a short period of time
Minor	Minor injury (not requiring medical treatment)	Minor damage to an aircraft, equipment, or facility not requiring it to be taken out of service	An event or a series of events resulting in the community questioning the reliability of the airport
No Safety Effect	No injury	No damage	No impact

Likelihood	
Frequent	Occurs once every month or 3,000 aircraft operations or 25,000 enplanements
Probable	Occurs once every year or 34,000 aircraft operations or 300,000 enplanements
Remote	Occurs once every 5 years or 170,000 aircraft operations or 1,500,000 enplanements
Extremely Remote	Occurs once every 10 years or 340,000 aircraft operations or 3,000,000 enplanements
Extremely Improbable	Occurs once every 10+ years or 340,000+ aircraft operations or 3,000,000+ enplanements

7. Many of the FAA lines of business, including the Office of Airports and Air Traffic Organization, developed Severity and Likelihood

definitions applicable to their operating environment. Airports do not need to use the FAA definitions when developing their own, but FAA definitions are used when participating in FAA-led hazard assessments. They should ensure that airport participants on FAA-led panels understand any differences (see Section 4.4, *Integrated SRM Efforts*.).

8. Based on these definitions, the airport can determine a Severity and Likelihood of the worst credible effect for each hazard. Generally, Severity is established first for each worst credible outcome because it should be independent of likelihood. Next, the Likelihood, or the expression of how often an event is expected to occur, is established for the worst credible outcome.

4.2.2.5.4 Assess the level of risk associated with identified hazards.

1. In the fourth step of hazard assessment, the airport uses the Severity and Likelihood values assessed in the third step and compares it to the organization's acceptable and unacceptable levels of safety risk. This is considered "initial risk" because it does not consider any potential mitigations. The subtle differences between analyzing risk and assessing risk is determining what all the data means once it is collected and "analyzed".
2. As airport management develops the SMS Manual, it should define what acceptable and unacceptable risk is for the airport. As discussed above, SMS does not mean risk free. Some risk must be accepted or the airport would never operate.
3. The number of levels of risk in every operation is determined by the airport operator. The simplest system will have two levels: acceptable and unacceptable risk. FAA Airports Division typically uses a three-level predictive risk matrix that includes high, medium, and low risk. The airport should document the risk level definitions in its hazard identification process. The airport should train individuals responsible for conducting the 5-step process on the meaning of these levels and ensure individuals who accept risk understand their responsibilities.
4. Use the scalable nature of SMS when determining your matrix structure. Consider a hazard's impact to the safety of the airport, the users, and the airport's total operational environment to establish risk. For example, using a predictive risk matrix, the airport operator can determine whether the hazard presents a low, medium, or high risk of causing damage or compromising safety. A predictive risk matrix (see Figure 4-4) graphically depicts the various levels of Severity and Likelihood as they relate to the levels of risk. On a typical predictive risk matrix, Severity and Likelihood are placed on axes on a graph (i.e., the X- and Y-axes). The severity and likelihood assessed during the third step of hazard assessment can then be plotted on the risk

matrix grid for each of the hazards to be assessed. Figure 4-5 depicts FAA's predictive risk matrix.

5. When developing a risk matrix, the airport should consider the following:
   a. The boundaries for the matrix should be approved by the Accountable Executive.
   b. The matrix should fit the airport's needs based on its size and complexity.
   c. The matrix should be simple and easy to use and understand.
   d. A person should not need extensive knowledge of quantitative risk tools to be able to use it.
   e. The airport should clearly define acceptable and unacceptable risk levels and any procedures required based on those definitions.
6. The important part of this third step is to understand and accurately position on the matrix what kind of threat the hazard is to the safety of the airport, the users, and the airport's total operational environment. The individuals making this determination should use common sense to ensure their judgment prioritizes safety but is not unreasonable.
7. When the Severity and Likelihood of a hazard's effect are plotted on the risk matrix, the airport can see whether the hazard's safety risk is acceptable to the organization. Generally, as the Severity and Likelihood increases, the risk increases. It is important to graph risk appropriately and pay attention not only to those hazards with severe risks, but also to those hazards that are likely to occur more frequently, even though their severity may be low.

Figure 4-4. Sample 4x4 Predictive Risk Matrix with Likelihood and Severity Definition and Two Levels of Risk: Acceptable and Unacceptable

Predictive Risk Matrix				
	Frequent – Likely to occur Repeatedly	**Occasional –** Likely to Occur Sometime	**Remote –** Unlikely, but Possible	**Improbable –** Very Unlikely to Occur
Catastrophic – Multiple Deaths, Critical Damage, Aircraft Destruction				
Serious – Serious Injury or Death, Major Damage to Facility or Aircraft				
Minor – Minor Injury, Minor Damage to Facility or Aircraft				
Negligible – Superficial Injury, Cosmetic Damage or Inconvenience Only				

Acceptable Risk

Unacceptable Risk

Figure 4-5. FAA Office of Airports' Risk Matrix

Severity / Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C					
Extremely Remote D					
Extremely Improbable E					*

* Unacceptable with Single Point and/or Common Cause Failures

High Risk
Medium Risk
Low Risk

8. The individual or persons conducting the analysis should not pre-judge or try to manipulate the analysis to keep the hazard and its outcome from being "unacceptable" or "high risk."

4.2.2.5.5 Mitigate the risks of identified hazards, when appropriate.

1. The fifth step is only used if the initial risk of the hazard's outcome, as determined in step four, is unacceptable or if the airport requires mitigation of certain types of acceptable risk. For example, FAA Airports Division considers high risk unacceptable and requires mitigation. Medium risk is acceptable, but mitigation is preferred when possible.
2. Often there is required understanding and cooperation among the tenants, certificate holder, and other stakeholders as to the mitigation of a hazard. These parties would be identified during the mitigation

phase of the SRM. Where there is a co-responsibility for a mitigation of an identified hazard, a simple understanding should suffice (i.e. no-smoking markings by the new flammable area). For some more complex mitigations, it may require a written agreement among the stakeholders explaining responsibilities and expectations.

3. There are a variety of risk mitigation strategies the airport can use to decrease the severity or likelihood of the hazard's outcome. Some generic approaches include:

   a. **Avoidance** – The operation or activity is cancelled or suspended because the safety risks are intolerable or deemed unacceptable (e.g., cancelling rather than allowing construction during low visibility night operations).

   b. **Reduction** – The frequency of the operation or activity is reduced, or action is taken to reduce the magnitude of the consequences of the accepted risks; some safety risk is accepted (e.g., limiting construction to daytime hours during low-traffic operations).

   c. **Segregation of Exposure** – Action is taken to isolate the impacts of the hazard or redundancy is built in to protect against the impacts (e.g., conducting additional FOD sweeps before operations during periods of construction).

4. Mitigation measures should be appropriate, timely, and cost-effective. Further, an airport should consider mitigations for acceptable risk, not just unacceptable risk. As the James Reason model demonstrates, every serious event had precursors. Mitigation of less hazardous events when resources allow, will help develop a pro-active safety culture in hazard identification.

5. There are a variety of methods of mitigations to reduce Likelihood and Severity. The more severe the hazard effect, the greater the consequence per event. Therefore, to reduce the risk, addressing the likelihood can often be an effective mitigation. The following are ways to reduce the outcome's likelihood:

   a. Raising awareness (e.g., safety campaigns, notices to airmen (NOTAMs), or signage).

   b. Providing training (e.g., on-the-job training, recurrent training, or licensing).

   c. Establishing controls (e.g., avoid operations under certain conditions, develop or modify standard operating procedures, or by installing safety equipment).

   d. Eliminate the hazard (e.g., remove hazard from the airport).

6. Once a mitigation is established, the airport should have processes in place to assign responsibility for ensuring the mitigation is completed (sometimes called verification). Also, the individual or persons

responsible for the 5-step process should re-analyze the hazard based on the mitigation to establish the "residual risk". Residual risk is the risk that remains after all risk mitigations have been implemented and their completion verified. If the residual risk of the hazard's outcome still places it in an unacceptable risk level, then the airport should identify additional mitigations or stop the operation or change causing the hazard.

7. The airport's Safety Assurance are the processes (see Chapter 5) to continuously evaluate if the mitigations put in place are effective. This often takes time as the hazard identified may not be present in order to evaluate if the controls are working. For example: new snow removal procedures, or if an airport put in place a mitigation to decrease the likelihood of a runway incursion. If the safety performance data was not of a significant duration, then any mitigation put in place may not reflect if the mitigation is effective.

4.2.3 Documentation.

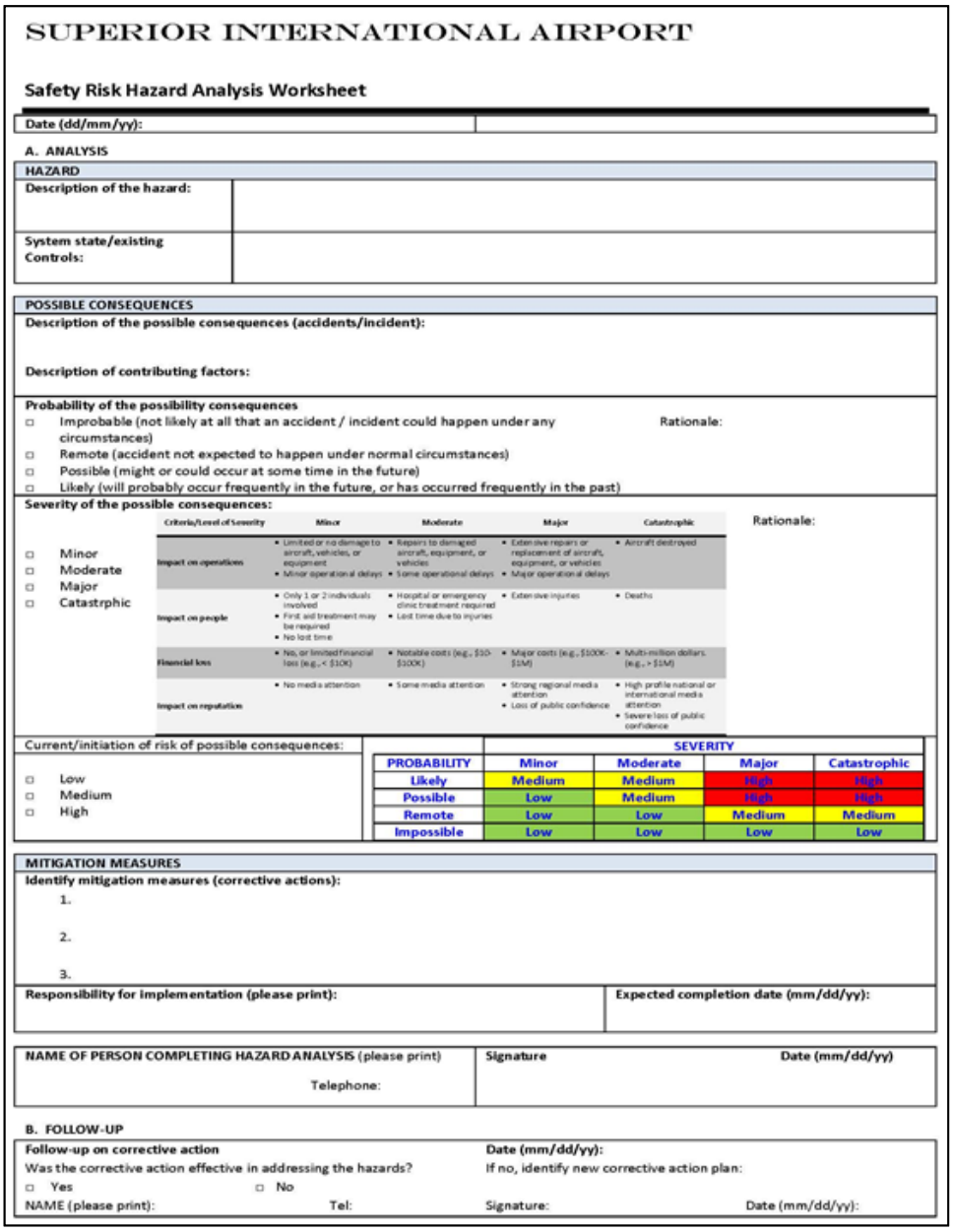
4.2.3.1 The formalized, proactive identification and analysis of hazards, as is found under SRM, provides airport management with a tool to make decisions about safety, but only if the process and hazards are documented. Airport management should establish its documentation process and procedures early in SMS development and include them in the SMS Manual.

4.2.3.2 Documentation also allows meaningful analysis of operational and overall airport system safety. Documentation also provides historical information that can be used when making decisions in the future. Airport operators should become familiar with the part 139 requirements regarding record retention requirements.

4.2.3.3 Airports have a range of options to document SRM. Some larger airports or airports with more complex operations may choose to purchase or create software that guides individuals through the SRM process or even integrates hazard reporting, identification, analysis, and documentation. While this technological approach is not required, it may prove more timely and cost-beneficial for some airports.

4.2.3.4 Other airports may find it easier to establish forms or databases to track mitigations and document the 5-step process. Figure 4-6 depicts a sample hazard assessment form. The airport should establish record retention policies for these documents. However, the documents should be maintained for at least the life cycle of the operation, change, or mitigations. The airport may also want to consult with its legal department to determine the best means for using and retaining these documents.

Figure 4-6. Sample 4x4 Hazard Assessment Form



SUPERIOR INTERNATIONAL AIRPORT

Safety Risk Hazard Analysis Worksheet

Date (dd/mm/yy):	

A. ANALYSIS

HAZARD	
Description of the hazard:	
System state/existing Controls:	

POSSIBLE CONSEQUENCES

Description of the possible consequences (accidents/incident):

Description of contributing factors:

Probability of the possibility consequences

- ☐ Improbable (not likely at all that an accident / incident could happen under any circumstances)
- ☐ Remote (accident not expected to happen under normal circumstances)
- ☐ Possible (might or could occur at some time in the future)
- ☐ Likely (will probably occur frequently in the future, or has occurred frequently in the past)

Rationale:

Severity of the possible consequences:

- ☐ Minor
- ☐ Moderate
- ☐ Major
- ☐ Catastrophic

Rationale:

Criteria/Level of Severity	Minor	Moderate	Major	Catastrophic
Impact on operations	• Limited or no damage to aircraft, vehicles, or equipment • Minor operational delays	• Repairs to damaged aircraft, equipment, or vehicles • Some operational delays	• Extensive repairs or replacement of aircraft, equipment, or vehicles • Major operational delays	• Aircraft destroyed
Impact on people	• Only 1 or 2 individuals involved • First aid treatment may be required • No lost time	• Hospital or emergency clinic treatment required • Lost time due to injuries	• Extensive injuries	• Deaths
Financial loss	• No, or limited financial loss (e.g., < $10K)	• Notable costs (e.g., $10-$100K)	• Major costs (e.g., $100K-$1M)	• Multi-million dollars (e.g., > $1M)
Impact on reputation	• No media attention	• Some media attention	• Strong regional media attention • Loss of public confidence	• High profile national or international media attention • Severe loss of public confidence

Current/initiation of risk of possible consequences:

- ☐ Low
- ☐ Medium
- ☐ High

	SEVERITY			
PROBABILITY	Minor	Moderate	Major	Catastrophic
Likely	Medium	Medium	High	High
Possible	Low	Medium	High	High
Remote	Low	Low	Medium	Medium
Impossible	Low	Low	Low	Low

MITIGATION MEASURES

Identify mitigation measures (corrective actions):

1.

2.

3.

Responsibility for implementation (please print):	Expected completion date (mm/dd/yy):

NAME OF PERSON COMPLETING HAZARD ANALYSIS (please print) Telephone:	Signature	Date (mm/dd/yy)

B. FOLLOW-UP

Follow-up on corrective action	Date (mm/dd/yy):
Was the corrective action effective in addressing the hazards? ☐ Yes ☐ No	If no, identify new corrective action plan:
NAME (please print): Tel:	Signature: Date (mm/dd/yy):

4.2.4 Provide for regular assessment to ensure that mitigations are effective.

Successful mitigations, which are tied to achieving safety objectives, are the incremental steps toward improving the level of safety at an airport. Consequently, the airport should review its mitigations periodically to evaluate their status and ensure their continued effectiveness or recognize a need to modify them in terms of meeting identified safety objectives. While part 139 does not specifically require an airport operator to regularly assess mitigations, the airport should include data collection and analysis specific to verifying mitigations as part of its Safety Assurance activities (see

Chapter 5). If this analysis suggests mitigations are not working, the airport should have processes in place to trigger re-evaluation of the hazard and its mitigations for effectiveness. The airport should also use data from accident or incident investigations on the airport or at airports with similar operations (when this information is made available) to spot ineffective mitigations.

4.3 **Scalability of SRM.**

4.3.1 As with other components of SMS, the airport should establish SRM processes and procedures in a scalable manner. Hazard assessment processes should be understandable and timely and not disrupt the airport's operations. Processes also should be effective in identifying and quickly assessing hazards so that unacceptable changes or operations are stopped quickly.

4.3.2 Larger airports could be well-served by establishing two types of hazard assessment: hazard triage and integrated SRM. Integrated SRM is discussed in the next section.

4.3.3 In hazard triage, the SMS Manager or other Operations staff is sufficiently trained and given autonomy to review identified safety issues or hazards and determine if immediate action should be taken. These individuals can conduct the 5-step process, typically using a form to direct and document their actions. The airport may find that data sharing and reporting with other tenants would expose a common hazard that they may have already addressed. For more complex issues, the triaged hazard could be forwarded to airport management, a safety committee, or other body identified in the SMS. The airport would then conduct a more formal SRM hazard assessment using subject matter experts representing impacted stakeholders such as other airport divisions, tenants, the FAA, or other airport users.

4.3.4 Smaller airports may choose to route all identified hazards through the Accountable Executive, SMS Manager, or Operations department. Again, the hazard assessment process should be streamlined to prevent assessments from getting bogged down. While smaller airports may choose to have an individual conduct much of their hazard assessments, they should ensure that findings and mitigations are discussed and communicated with applicable stakeholders.

4.4 **Integrated SRM Efforts**.

4.4.1 Airports are not the only sector of the aviation industry using SRM or SMS-related initiatives. Many fixed-base operators, aircraft manufacturers, air carriers, and training organizations are also actively developing and implementing proactive, risk management procedures for their organizations. Military tenants have similar programs, such as Operational Risk Management, active on their property. In many ways, airport management can use these developments to help shape and promote their SMS initiatives. Airport management should meet early in the airport's SMS development with tenants, especially those with SMS, to develop procedures for sharing hazard information, conducting integrated hazard assessments, and verifying mitigations.

4.4.2 Similarly, the FAA integrated SMS concepts, processes, and SRM into its operations. In some instances, the airport may choose to collaborate with the FAA in joint SRM efforts instead of conducting its own hazard assessment. In this case, the FAA Airports Division may take the lead on certain SRM activities when approval actions will be required, such as:

- FAA actions on airport development projects (e.g., Airport Layout Plan changes).
- FAA action on of modifications of airport design standards.
- FAA actions on Construction Safety Phasing Plans.

4.5 **The Risk Assessment and the SRM Panel**.

A Safety Risk Management (SRM) Panel is a group of Subject Matter Experts (SMEs) and stakeholders assembled to formalize a proactive approach to system safety, and ensures that applicable hazards are identified and unacceptable risk is mitigated before change is made. An SRM panel provides a framework to ensure that once mitigation is implemented, the change will be tracked throughout its lifecycle. Not all safety issues will require a formal SRM process using a panel. Often a Risk Assessment (RA) – the assessment of the hazard data, is able to justify a mitigation directly. The SRM process is mainly for those issues complex enough that either by its identification, or mitigation, may impact more than one stakeholder. If the need for applying the RA process has been determined, the information collected and assessed needs to be documented. If an SRM panel is warranted, a summary of the data should be circulated among the identified stakeholders prior to the formal SRM panel meeting. In preparation for the meeting, an agenda, attendance list, issue information, meeting documentation, meeting ground rules, etc., should be conveyed. Although not required, some airports may hire experienced consultants/facilitators to facilitate the SRM panel.

4.6 **Example #1 of SRM.**

East Coast Regional Airport in Sandbar, North Carolina, is operated by the Sandbar Airport Authority. The Authority holds a Class I AOC and is Index E. Sandbar is served by a regional carrier that operates 2 daily Beech 1900 roundtrip flights to its hub. Sandbar provides all the services and employees to turn-around the aircraft. The carrier recently notified the Authority that it plans to replace the Beech 1900's with Bombardier CRJs. The change in aircraft operating at the airport triggers the airport's SRM processes and the Operations Manager conducts a hazard assessment. The certificate holder should identify which stakeholders to include for the initial assessment, if necessary.

4.6.1 Describe the system.

A system description is an integrated set of constituent elements that are combined in an operational or support environment to accomplish a defined objective. These elements include people, hardware, software, firmware, information, procedures, facilities, services, and other support facets of the conditions in which the hazard may be present. In this example, the system can be described as:

- The airport has two runways, Runway 12/30, which is a 7,000 foot paved, grooved, and marked for an ILS approach, and Runway 9/27 which is a 3,500 foot rolled grass runway primarily used by experimental and general aviation aircraft.
- There is no active construction on airport at this time.
- The airport's existing facilities including the runways and taxiways meet design specifications for the CRJ. The airport has standard markings in the movement area. However, non-movement area markings are specific to the Beech 1900.
- Other than the regional carrier, the airport is used by general aviation aircraft.
- Apron dimensions and clearance from building and other facilities are within requirements.

4.6.2 Identify the hazards.

The Operations Manager bounds out the movement area from the analysis because the runway and taxiway meet design specifications for the CRJ. Based on the system description, the Operations Manager identifies three hazards

1. Incorrect aircraft parking at gate (caused by old markings),
2. Misalignment of aircraft on ramp (caused by old markings), and
3. Potential impact of CRJ on smaller airplanes on the apron.

4.6.3 Analyze the risk.

Using the airport's Severity and Likelihood definitions (see Figures 4-5 and 4-6), the Operations Manager examines the worst credible outcome of each hazard.

1. Potential for aircraft collision with servicing equipment and/or jetway bridge most likely during nighttime conditions. Based on existing controls, severity is Minor because aircraft is moving at extremely low speed. Based on an analysis of past incidents in the non-movement area, the Operations Manager categorizes the likelihood of this effect as Remote.
2. Potential for aircraft collision with other parked aircraft or vehicles during nighttime conditions. Based on existing controls, severity is Major because taxiing speeds could result in serious damage if aircraft impacts another aircraft or vehicle unexpectedly. Based on an analysis of past incidents in the non-movement area, the Operations Manager categorizes the likelihood of this effect as Probable.

4.6.4 Assess the risks.

Using the airport's risk matrix (see Figure 4-5), the Operations Manager determined the following results:

1. The risk associated with incorrect parking at gate results in Low Risk.
2. The risk associated with misalignment of the aircraft in the gate area results in High Risk.

4.6.5 Mitigate the risks.

All High Risk hazards should be mitigated under the Authority's Safety Policy. Therefore, the Operations Manager develops a risk mitigation strategy that includes short-term and long-term solutions. In the short term, the Authority will establish temporary parking restrictions for aircraft in the non-movement area to ensure clearance for the CRJ as it transits from the movement to the non-movement area. In the long term, the Authority will remove the old non-movement area markings and re-paint to accommodate the CRJ. These mitigations reduce the risk from High to Medium. Additionally, repainting eliminates both hazards, once complete.

4.7 **Example #2 of SRM.**

4.7.1 As the fixed-base operator (FBO) for Timmons Municipal Airport, Flying Flag Incorporated has provided all ramp and fuel services on the airport for years. Flying Flag's responsibilities include servicing general aviation aircraft, the three weekly air carrier flights, and occasional charter flights. The FBO also maintains the on-airport fuel farm.

4.7.2 Recently, the owner of Flying Flag decided to close the FBO after his unsuccessful attempts to find someone to take over the business. The airport is reviewing proposals from two companies to replace Flying Flag but both are relatively new operations. The airport manager is concerned that a new FBO will lack experience in ramp and fuel operations. She decided to proactively identify the hazards associated with the new operator.

4.7.2.1 **Describe the system.**

4.7.2.1.1 The airport holds a Class I Airport Operating Certificate with Index A ARFF services. Air carrier flights only recently picked up and the airport operates on a very tight budget with a relatively small staff. Most services, field maintenance, and aircraft servicing and fueling are provided by the FBO.

4.7.2.1.2 The airport has two runways, 7,250 foot long runway for air carriers and one smaller general aviation runway. Although there are three air carrier flights a week with Beech 1900 aircraft, general aviation operations make up the bulk of Timmons traffic. During yearly events at the local race track and golf course, general aviation traffic increases dramatically and the airport relies on the FBO to also manage ramp and parking operations. These events increase traffic and parking to the point that the airport's ramp is at capacity.

4.7.2.1.3 A contract air traffic control tower operates 14 hours per day from 0600 to 2000 hours, seven days a week. Air carrier flights operate during these times, except for the occasional charter flight. The airport published a

prior permission request requirement (PPR) for air carrier flights outside of normal operating hours.

4.7.2.1.4 Other than the regional carrier, the airport is used by general aviation aircraft.

4.7.2.2 **Identify the hazards.**

To help identify hazards, the airport manager decided to use a panel of subject matter experts that includes local pilots, the air carrier station manager, and members of the airport manager's staff. The panel of experts identified three potential hazards generated by a change of FBO.

1. Reduction in experience levels and potential confusion in ramp operations,
2. Reduction in experience levels and potential confusion in parking/apron management and ground loading of passengers, and
3. Reduction in experience levels and potential confusion in fueling operations.

4.7.2.3 **Analyze, Assess, and Mitigate the Risk.**

Using the airport's own Severity and Likelihood definitions and Predictive Risk Matrix, the panel developed a Risk Assessment Worksheet to assist their analysis and determined the following:

Timmons Municipal Airport

Risk Assessment Worksheet

#	Hazard	Effects	Severity	Likelihood	Initial Risk	Mitigation	Residual Risk
1	Reduced experience and confusion in ramp operations	Collision of ground support equipment with aircraft.	Minor	Remote	Low	Redesign ramp driving training program and require new FBO personnel to complete.	Low
		Aircraft to aircraft collision.	Major	Remote	Medium	Limit number of aircraft on ramp by SOP. Conduct survey of ramp needs and develop new ramp marking plan from that survey. Remark ramp as appropriate.	Low
		FOD damage to aircraft	Minor	Probable	Medium	Perform FOD walks. Develop FOD awareness training course and require new FBO personnel to attend. Develop FOD awareness campaign under the direction of airport manager. Develop FOD log and require FBO to use and maintain.	Low
2	Reduced experience and confusion in fueling operations	Fuel spills	Minor	Probable	Medium	Require training of FBO personnel IAW FAA part 139 to be completed and verified before contract assignment. Require independent safety audit of fuel delivery procedures within 90 days of FBO beginning operations	Medium
		Inadequate grounding/	Major	Extremely remote	Low	Audit FBO	Low

Timmons Municipal Airport Risk Assessment Worksheet							
#	Hazard	Effects	Severity	Likelihood	Initial Risk	Mitigation	Residual Risk
		bonding causes fire.					
3	Reduced experience and confusion in passenger operations & loading	Passenger injury due to jet-blast/prop-wash.	Major	Remote	Medium	Provide ramp agent awareness training Mark ramp and provide cones for movement of personnel. Define by SOP limits of passenger movement on ramp area. Require FBO to provide passenger escort at all times. By written SOP require parked aircraft with turning propeller to have turning prop on side opposite of ramp.	Low
		Passenger injury caused due to contact with turning propeller.	Catastrophic	Extremely improbable	Low		Low

CHAPTER 5. SAFETY ASSURANCE

5.1 Introduction.

5.1.1 Safety Assurance is the third component of SMS and serves as checks and balances for the SMS. Under Safety Assurance, the airport operator should establish processes and procedures to verify and monitor the effectiveness of the SMS. To do this, the airport should develop and implement a method for monitoring safety performance, establish and maintain a confidential hazard reporting system, and develop processes to report pertinent safety information to the Accountable Executive (see Figure 5-1). A key outcome of Safety Assurance is continuous improvement.

5.1.2 Safety Assurance activities also:

- Help the airport evaluate the continued effectiveness of implemented risk mitigation strategies under SRM.
- Support the identification of new hazards.
- Systematically provide confidence that the airport is meeting or exceeding its safety objectives through continuous improvement.
- Provide the foundation for data collection, which help airport management with decision making.

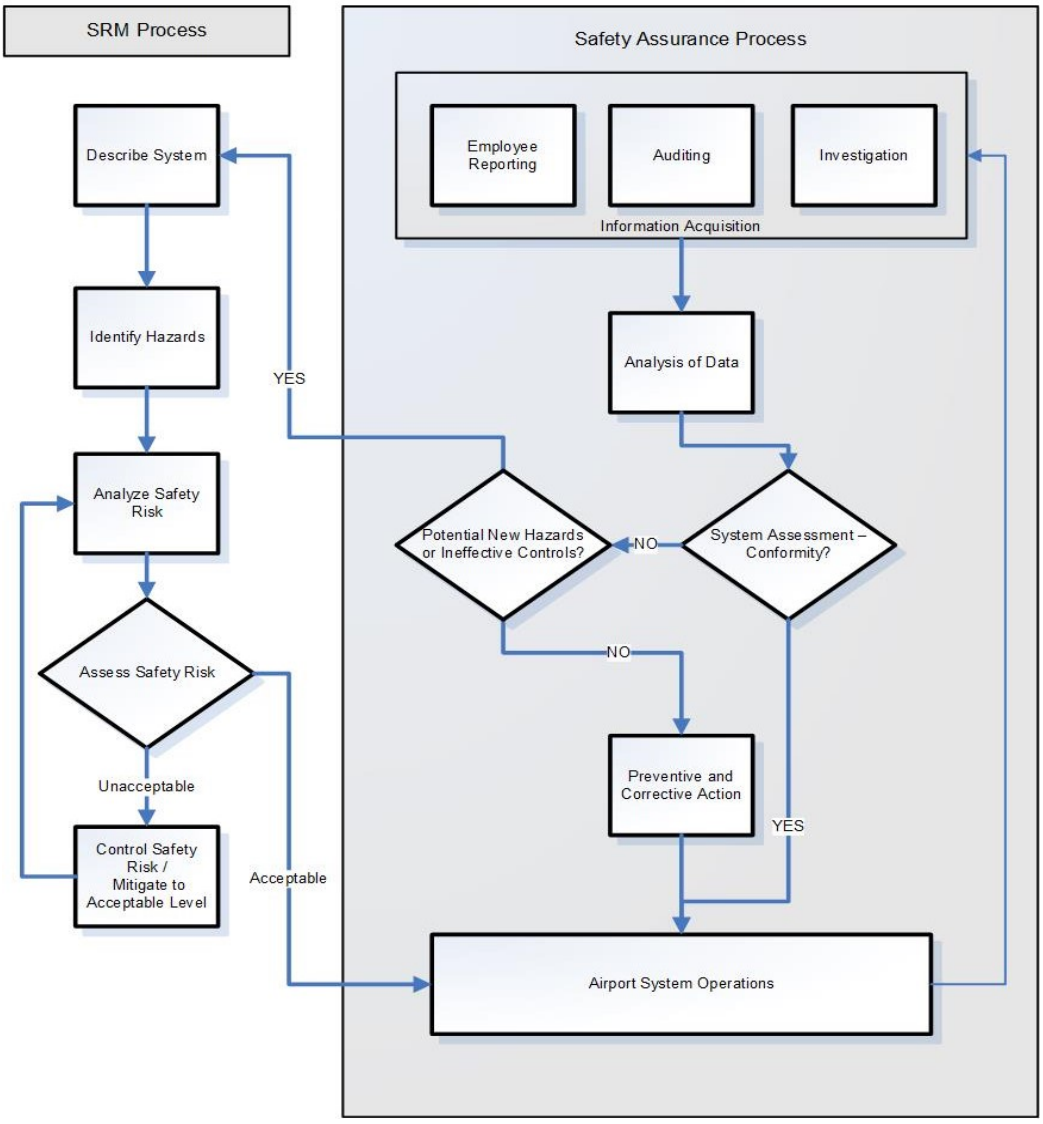
Figure 5-1. Safety Assurance

5.1.3 The Safety Assurance and SRM components are closely linked. As discussed in Chapter 4, SRM ensures hazards and their associated risks are identified, analyzed, and assessed and mitigations are put in place when necessary.

5.1.4 Successful mitigations, which are tied to achieving safety objectives, are the incremental steps toward improving the level of safety at an airport. Consequently, the airport should review its mitigations periodically to evaluate their status and ensure their continued effectiveness or recognize a need to modify them in terms of meeting identified safety objectives. If analysis suggests mitigations are not working, the airport should have processes in place to trigger re-evaluation of the hazard and its mitigations for effectiveness. The airport should also use data from accident or incident investigations on the airport or at airports with similar operations (when this information is made available) to spot ineffective mitigations.

5.1.5 Safety Assurance processes then take over, using data to evaluate whether the mitigations are having the desired effect. Figure 5-2 depicts the SRM/Safety Assurance relationship.

Figure 5-2. SRM/Safety Assurance Relationship



5.2 Developing and Implementing Safety Assurance.

5.2.1 Establish and maintain a safety reporting system that provides a means for reporter confidentiality.

5.2.1.1 A safety reporting system broadens the airport's ability to capture information that airport management might not otherwise observe. Anyone involved with an airport - airport employees, pilots, airfield tenants, airline employees, and other individuals on the airfield may identify safety issues or hazards. To capture this information, the airport should provide a system that allows any of these individuals to report

safety concerns. An airport should develop the kind of system that is best for its operational environment *(Ref 14 CFR section 139.402(c)(2))*.

5.2.1.2 Smaller airports with few employees and less turnover may find formalized hazard reporting difficult to establish. Employees at these airports may be accustomed to directly reporting safety issues to airport management. While direct communication may work, it fails to formally document the issues or provide a means for the airport to track trends and systemic problems. At airports where informal reporting has been the norm, airport management should continually re-affirm its commitment to the new formal reporting system until its use becomes standard practice.

5.2.1.3 An airport can establish a reporting system in a variety of ways. For example, airport management can receive hazards reports via:

- Hardcopy forms and drop boxes throughout the airport;
- Internal and/or public websites with reporting capabilities;
- An airport hotline;
- Manager/tenant meetings; and/or
- Daily inspections.

5.2.1.4 The airport should base its hazard reporting format choice on the size and complexity of the airport's operations. A smaller airport with few employees and tenants may find it cost-beneficial to use drop boxes throughout the airport. Whereas, a larger airport with many employees and tenants may need multiple reporting formats and/or an information technology solution such as an online reporting tool. If a tenant already has an SMS in place, inquire about their experiences with their system or methods.

5.2.1.5 Conducting inspections should not be the only means of receiving hazard reports because there are many more individuals with access to the airfield, beyond the airport's own staff, who can identify hazards.

5.2.1.6 Regardless of the format, a good hazard reporting system should:

- Be voluntary, impartial, and confidential (to the extent practicable).
- Be easily accessed by all airport employees and tenants.
- Provide feedback to individuals reporting the hazard.
- Formally document reports.
- Safeguard confidentiality.
- Provide prompt notification to management.

- Be administered by one individual or department that is responsible for managing the status of a report and investigating the identified hazard(s).
- Provide trust and encourage reporting.
- Be scalable.

5.2.1.7 The airport may use its reporting process to report incidents and accidents as well as safety issues and hazards. The airport should ensure that individuals reporting the hazard understand the definitions of these terms and how to use the report forms. Figure 5-3 includes a sample hazard report form that airports could use for incident and accident reporting.

Figure 5-3. Sample Confidential Hazard Reporting Form

Confidential Hazard/Incident/Accident Reporting Form

This form should be used to report any airside hazard that has caused or could cause an accident or incident. Place in any labeled "Hazard Reporting Drop box" on the airport or send to the airport's SMS Manager as soon as possible.

HAZARD OR EVENT DESCRIPTION

(To be completed by person reporting the event)

DATE: / / Time: AM/PM

LOCATION: _____

DESCRIPTION: _____

_____

_____

_____

WITNESSES: _____

REPORTER NAME (optional): _____

REPORTER POSITION (optional): _____

CONTACT NUMBER/EMAIL ADDRESS: _____

[Airports should consult their legal counsel and may choose to include a statement addressing the disclosure of information and confidential treatment, as applicable.]

5.2.1.7.1 Confidentiality concerns**.**

1. The airport must (reference *14 CFR section 139.402(c)(2)*) establish a confidential hazard reporting system that protects the reporter's identity. Airport management should consult its own legal counsel about data disclosure issues and confidential treatment of information submitted to airport management. For example, airport management may work with their legal counsel to develop privacy protection parameters for the airport.
2. Airport management should also consult with its legal counsel on the applicability of state open records laws commonly known as "sunshine laws". State open records laws are different from the Federal Freedom of Information Act (FOIA). FOIA only applies to records obtained by the Federal government. Therefore, consultation with legal counsel is imperative to ensure the appropriate handling of the records.
3. Due to differences in data protection laws from state to state, some airports may find it difficult to convince tenants to encourage their employees to use the hazard reporting system. In these cases, airports may work with these tenants to educate them on disclosure policies and means of protecting confidentiality.

5.2.1.7.2 Feedback to individual reporting a hazard.

1. Airports should also keep in mind when establishing hazard reporting systems, that individuals reporting a hazard should get feedback on the resolution of their reports. While it may not be possible under a confidential reporting system to provide direct feedback, the airport should establish a process, usually linked to communications under Safety Promotion (see Chapter 6), to provide feedback. For example, an airport could communicate feedback by including it in safety bulletins, posting information on a safety bulletin board, discussing it during management meetings, and/or posting feedback on a dedicated area of the airport's internal website.
2. If the airport chooses a technology-based approach to reporting, it should consider the following best practices when building the reporting tool:
   - Determine whether existing information technology systems used by the airport, such as asset or fleet management software, have reporting capabilities or whether a new system should be developed. In cases where new systems are developed, the airport may want to link existing and new systems.
   - Determine who will report and from whom the airport will accept reports. Will the airport accept reports from the general public? If so, a public reporting interface on the airport's website may be a

viable solution. Ensure the reporter's confidentiality is maintained throughout the reporting process.

- Use pre-defined fields or drop-down menus for data entry to help standardize reporting and analysis. This will also aid in timely review and action.
- Where possible, link hazard location descriptions to an airport layout plan or allow tagging through the airport's Geographical Information System (GIS).
- Ensure the system automatically notifies a designated airport management official, such as the SMS Manager, when a report is submitted.
- Determine who will host the data. Will it be hosted offsite by a third party? If so, does the airport have sufficient rights to retain the data once any contracts with the third party are complete?
- Design scalability into the system to ensure it can be expanded to track more issues, allow reporting from more sources, and be connected to other airport systems.

5.2.2 Develop and maintain a means for monitoring safety performance.

5.2.2.1 To facilitate continuous improvement, an airport should set baselines and measure its performance against those baselines. To do this, the airport should develop and maintain a means for monitoring safety performance to ensure the airport meets the safety objectives identified under the Safety Policy component (see Chapter 3), ensure the airport meets the requirements of its SMS, and verify the effectiveness of the mitigations established under SRM.

5.2.2.2 To accurately monitor safety performance, the airport should:

- Collect data;
- Analyze collected data;
- Evaluate the SMS processes and procedures; and
- Monitor mitigations developed under SRM.

5.2.2.2.1 Data collection.

- While the airport may use processes such as internal evaluations, safety reviews, and similar methods to monitor safety performance, it should measure changes in performance by first collecting and analyzing data. This monitoring goes well beyond self-inspections, as required under part 139, because the airport proactively looks for safety issues, trends, and failures.

- Safety data may come from many sources. Certificated airports already collect it through self-inspection reports, maintenance logs and tracking, and accident/incident investigations. Under SMS, hazard reports and Hazard Assessments will also provide the airport with safety data it can use to track performance. The data collected can and should relate to the airport's safety objectives, but the airport may collect additional data.
- Data collection and analysis can be either simple or complex. ACRP's SMS Guidebook and ICAO's Safety Management Manual both provide in-depth discussions on data collection, analysis, and measurement. Essentially, the airport should use data to determine whether there are safety trends or failures in the system. (See "Example A: Using Safety Assurance to Monitor the Effectiveness of Mitigations.")

Example A: Using Safety Assurance to Monitor the Effectiveness of Mitigations.

Airport XYZ conducts a Hazard Assessment using its SRM requirements for a construction project. In order to accept the risk of the project, the airport puts in place a mitigation to increase the number of FOD sweeps of the taxiways. However, data gathered through self-inspections during the construction project shows an increase in FOD on the taxiways that was supposed to have been removed during the additional FOD sweeps. Through its Safety Assurance process, the airport discovers this mitigation (additional FOD sweeps) is not having its desired effect. It decides to re-evaluate the mitigation and consider additional mitigations or more oversight.

5.2.2.2.2 Safety evaluations.

- Performance monitoring should take into account both short-term and long-term goals and look at both individual safety objectives and bigger systematic issues such as overall SMS implementation and effectiveness. The airport may conduct safety evaluations (also referred to as safety audits) to assess the implementation and effectiveness of SMS components and initiatives, including safety objectives, as well as the SMS as a whole. (See "Example B: Using Safety Evaluations to Track Safety Objectives.")

- The SMS Manager or Accountable Executive may conduct the safety evaluations. However, other levels of airport management or divisions within the airport can also conduct periodic evaluations to assess their operations and implementation of SMS provisions. Some airports may also find it helpful to use third-party evaluators or other airports when evaluating SMS implementation as a whole.

Example B: Using Safety Evaluations to Track Safety Objectives.

Airport XYZ selects a safety objective related to decreased V/PDs. Based on data collected during performance monitoring, the airport finds the number of V/PDs has increased. The airport decides to evaluate the incidents and look for contributing factors, root causes, and ways to meet the safety objective in the future.

- The airport should establish timing and processes appropriate to the complexity and size of the airport. For example, a smaller airport may choose to conduct quarterly or semi-annual evaluations due to resource limitations. Larger airports, with various divisions and layers of management, may wish to conduct multiple levels of evaluations, culminating in a third-party or external evaluation to gain a more objective review of the SMS's effectiveness.
- Regardless of how often the airport chooses to evaluate itself, it should ensure that data including hazard, incident, and accident reports is constantly being reviewed and make adjustments to the program when necessary.

5.2.3 Develop and implement a process for reporting pertinent safety information and data to the Accountable Executive on a regular basis.

5.2.3.1 Since the Accountable Executive is responsible for overall airport safety, this person should receive sufficient safety information to ensure priorities are set appropriately, resources are allocated correctly, and decisions are made on actions that often should be coordinated with several affected parties.

5.2.3.2 The Accountable Executive should receive briefings on the following safety information and data:

- Performance with safety objectives established under the airport's Safety Policy;
- Safety critical information distributed under the airport's Safety Promotion activities;

- Status of ongoing mitigations required under the airport's SRM policies and procedures; and
- Status of the airport's schedule for developing or implementing initiatives under the SMS.

5.2.3.3 Airport management should determine the appropriate length of time between briefings and document this schedule in the SMS Manual. Briefings may range from weekly to monthly. While quarterly reporting alone is not advisable, some systemic reporting may be done on a quarterly basis. Some Accountable Executives may want to be updated more regularly than others. A smaller airport, where the Accountable Executive may be the same individual responsible for overseeing and maintaining this information, may not need to establish a process for regular updates.

5.2.3.4 There are many methods the SMS Manager or others may use to communicate safety information to the Accountable Executive. Some may choose more formalized reports, while others may choose verbal presentations. Airports may find it helpful to use a visual "dashboard" to track progress toward the organization's safety objectives and other pertinent safety information. Appendix E includes a sample dashboard.

CHAPTER 6. SAFETY PROMOTION

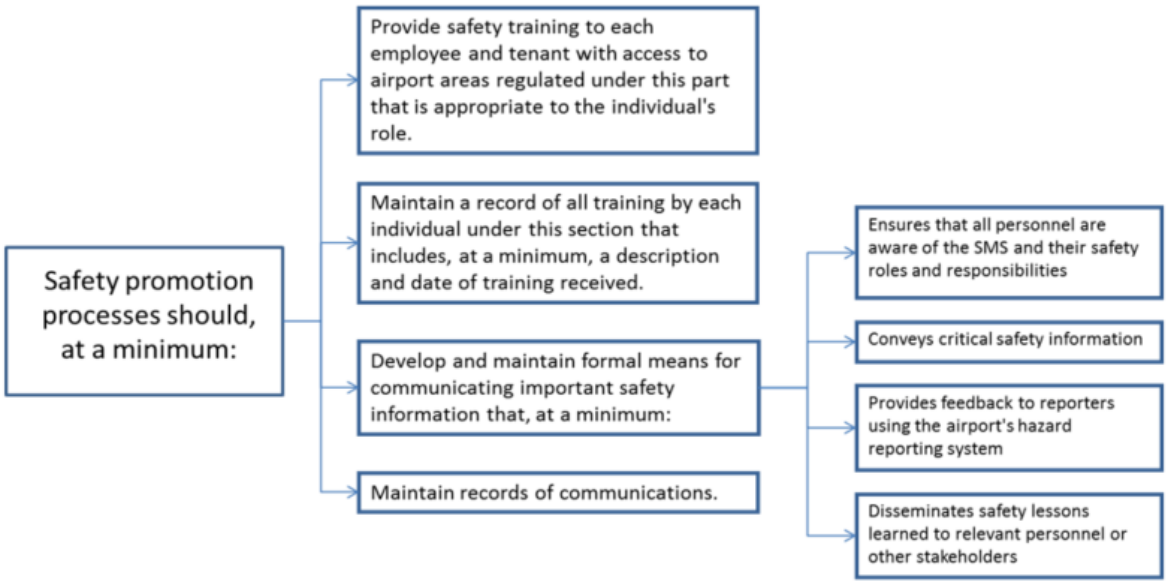
6.1 Introduction.

6.1.1 The fourth component of an SMS, Safety Promotion, establishes processes to foster a positive safety culture. A successful SMS can be characterized as continuous learning safety culture. This includes safety training for all individuals with access to the airfield and communication of important safety information (see Figure 6-1). The Transportation Research Board, Airport Cooperative Research Program (ACRP) defines a safety culture as:

> "[T]he product of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, the organization's management of safety. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventative measures". (Reference ACRP Report 1, Volume 2, Page 5.)

6.1.2 While all SMS components contribute to a strong safety culture, Safety Promotion encourages a positive safety culture and creates an environment that is conducive to the achievement of the service provider's safety objectives. Through communications and training, individuals will understand their responsibilities under the SMS and accept and trust the SMS initiatives. Safety culture is not easy to quantify, but an airport will know it is on the right path when people begin to proactively identify and report hazards. (See ACRP's SMS for Airports Volume 2: Guidebook for more information on the elements of a safety culture.)

Figure 6-1. Safety Promotion



6.1.3 Certificated airports already have numerous training and communications programs and processes in place in accordance with the regulatory requirements in part 139. Existing part 139 programs focus on training those individuals with specific roles in implementing part 139 requirements, such as operations inspectors, firefighters, and individuals with access to the movement areas. Similarly, part 139 communications requirements focus on informing stakeholders, including airlines, about information specific to part 139, such as pavement condition, emergency plans, or operational changes. These existing requirements serve as the foundation for SMS training and communications, but they should also apply to all individuals with access to the movement and non-movement areas. A successful SMS will address more than just the technical requirements of part 139, but also expand on its intent. An SMS assumes everyone has a role in promoting and enhancing operational safety on the airport, and an SMS supports this assumption through role-specific training and communications. Even where tenants may have their own SMS, the host airport's SMS procedures and expectations still apply to the tenants. Familiarization of the airport's SMS to tenants is recommended.

6.2 Developing and Implementing Safety Promotion.

6.2.1 Provide safety training.

6.2.1.1 The success of an SMS initiative depends on individuals understanding their roles and responsibilities. While the Safety Policy component provides for documenting these roles and responsibilities, training provides the essential tools needed to put these roles and responsibilities into practice. The goal of safety training is to ensure that individuals are competent to perform their responsibilities under an SMS.

6.2.1.2 To incentivize employee hazard identification, airports should generally not punish employees for reporting safety issues caused by mistake. A just safety culture approach is essential for the individual to take ownership, if applicable, of a mistake that may have resulted in an incident, and should be part of the training (if it is so declared in the Safety Policy). The FAA loosely defines "learning" as that which results in a change in behavior. The FAA encourages the treatment of all incidents and accidents as learning opportunities so they are not repeated.

6.2.1.3 Similar to the other SMS elements, SMS training should reflect the complexity and needs of the airport. If they lack internal expertise, airports may want to seek the help of consultants, academics, or other external sources when developing these training programs.

6.2.1.4 Airports should have at least two tiers of training: specialized SMS training for individuals and managers with operational roles under SMS and safety awareness/orientation for all other individuals.

6.2.1.4.1 Specialized SMS training.

Specialized SMS training for individuals and managers with operational roles under SMS will typically consist of one or more courses specific to their SMS-related responsibilities. At smaller airports, this may be one course covering all facets of the airport's SMS requirements. Larger airports that spread oversight and implementation responsibilities over numerous staff and management positions may find it helpful to have numerous, role-specific courses (e.g., one multi-day course on hazard analysis and the 5-step SRM process; one high-level, 3-hour course on the airport's SMS requirements; and a short course on developing safety objectives). Regardless of the approach, the airport should ensure it provides the courses to individuals in a logical manner and over a reasonable time period.

6.2.1.4.2 Safety awareness/orientation.

1. Safety awareness/orientation provides all other individuals (besides those requiring specialized SMS training) with access to the airfield an understanding of what constitutes a safety hazard, how to report safety issues and hazards, and where to find safety-related information. Unlike specialized SMS training, safety awareness/orientation can be accomplished through written communication like brochures, which can be handed out during indoctrination training or badging processes, or a PowerPoint presentation viewed during the aforementioned indoctrination activity.
2. Safety awareness training should answer the following questions:
    - What is a hazard?
    - How are hazards reported? Can hazards be reported confidentially?

- What happens to hazard reports and how will the airport provide feedback?
- How will the airport communicate important safety information?

6.2.1.4.3 Training format.

The airport should decide how to deliver SMS training. Airport management should recognize that some courses/topics will demand different approaches for maximum effectiveness. For example, hazard assessment and SRM courses may be best taught using a lecture format and case studies with hands-on applications during the course. Whereas, a high-level course about SMS requirements designed for the Accountable Executive and other top managers may work best as computer-based training.

6.2.1.4.4 Recurrent training.

Recurrent training should also be an important part of the airport's overall SMS training program. This training should incorporate any new processes, procedures, or safety objectives developed through the SMS's continuous improvement efforts. Training is required at least every 24 months (*Ref 14 CFR section 139.402(d)(3)*) on the requirements of SMS and its implementation to each employee with responsibilities under the certificate holder's SMS that is appropriate to the individual's role.

6.2.1.4.5 Review of training materials.

The airport should also periodically review training materials to verify their applicability and currency.

6.2.2 Maintain training records.

6.2.2.1 A key result of SMS is documentation, which can be reviewed to ensure compliance and to monitor safety performance. This documentation includes training records, so the airport should have a process to ensure it records completed training.

6.2.2.2 The records for individuals, including managers, requiring specialized SMS training or recurrent training should include details such as training dates and copies of course documents including quizzes and rosters. It may be cumbersome, however, to keep detailed records for individuals who only need safety awareness/orientation. For these individuals, the airport should just have a process in place to ensure they receive the awareness/orientation.

6.2.2.3 The airport should keep records of all training sessions, attendance rosters, test results (if applicable), and syllabuses for a period of time that provides data for Safety Assurance activities, and complies, at a minimum, with the record retention requirements of 14 CFR part 139.

6.2.2.4 Further, it should periodically verify that its training record process is effective and captures the correct information for all those being trained. An airport may wish to incorporate this review into its safety evaluations under the Safety Assurance component. The airport may also review the SMS's effectiveness with the FAA during Periodic or Surveillance inspections.

6.2.3 Develop and maintain means for communicating important safety information.

6.2.3.1 Communicating safety information is essential to promoting a safety culture. When deciding what information to communicate, the airport should consider the following:

- **Ensure awareness of SMS and its initiatives** – Not all individuals need to be SMS experts, but they should understand its functions and expected outcomes. Safety Promotion should clearly explain processes and procedures for proactive hazard identification and results aimed at continuous improvements in operational safety. It should then reaffirm both through visible actions.
- **Convey safety-critical information –** Airport management determines what constitutes safety-critical information based on the airport's unique operating environment. The airport may want to use information required by regulations such as part 139 as the foundation for its list of safety-critical information.
- **Raise awareness about actions taken** – To support continuous reporting of hazards, the airport should inform reporters of actions taken because of their reports. Such feedback will encourage reports from individuals who may have been initially apprehensive or skeptical about reporting. If the airport's hazard reporting system is not able to communicate directly with confidential reporters, the airport can provide feedback via bulletin boards, safety bulletins and newsletters, or other means. Even when the airport can provide feedback directly to reporters, it should consider sharing the feedback broadly.
- **Reasons for new or revised safety procedures** – If the airport changes procedures or develops new ones based on lessons learned, it should communicate this information to encourage adoption of the safety procedures and support of SMS initiatives.

6.2.3.2 General safety information helps convey and support the airport's safety objectives and goals. However, the airport should use different channels to share "nice-to-know" information and safety-critical information so employees and tenants understand the difference.

6.2.3.3 When establishing the SMS, the airport should evaluate when to use verbal communication instead of written communication. Further, the

airport should determine the specific type of communication for different types of information. For example, the airport may:

- Decide a memorandum or safety bulletin is a better way than a newsletter to communicate safety-critical information to employees and tenants.
- Choose to relay time-sensitive information or information for management at monthly manager or tenant meetings.
- Use its public or internal websites or topic-specific posters to share "nice-to-know" or SMS awareness information, depending on its relevance and sensitivity.

6.2.4 Maintain communications records.

As with other SMS elements, the airport should periodically review communications and evaluate their effectiveness. Over time, this will help the airport identify those methods that work best. The airport must keep communications records for 12 months to support periodic evaluations *(Ref 14 CFR section 139.402(d)(6)).* These records will help with evaluation and compliance as well as trend and historical analysis.

APPENDIX A. DEFINITIONS AND ACRONYMS

A.1 **Accountable Executive** – An individual designated by the certificate holder to act on its behalf for the implementation and maintenance of the airport's Safety Management System. The Accountable Executive has control of the certificate holder's human and financial resources for airport operations conducted under an Airport Operating Certificate. The Accountable Executive has ultimate responsibility to the FAA, on behalf of the certificate holder, for the safety performance of operations conducted under the certificate holder's Airport Operating Certificate.

A.2 **Accident** – An unplanned event or series of events that results in death, injury, damage to, or loss of equipment or property.

A.3 **Airport Safety Management System** – An integrated collection of processes and procedures that ensures a formalized and proactive approach to system safety through risk management.

A.4 **Common Cause Failure** – A failure that occurs when a single fault results in the corresponding failure of multiple system components or functions.

A.5 **Control** – Anything that mitigates the risk of a hazard's effect. Same as a safety requirement. All controls should be written in requirements language. There are three types of controls:

- **Validated:** Unambiguous, correct, complete, and verifiable.
- **Verified:** Objectively determined to meet the design solution.
- **Recommended:** Have the potential to mitigate a hazard or risk but are not yet validated as part of the system or its requirements.

A.6 **Credible** – Refers to a specific system state and sequence of events supported by data and expert opinion that clearly describes the outcome. It implies that it is reasonable to expect the assumed combination of extreme conditions will occur within the operational lifetime of the system.

A.7 **Gap Analysis** – A comparison between existing systems, processes, or procedures and SMS requirements.

A.8 **Hazard** – A condition that could foreseeably cause or contribute to: (1) injury, illness, death, damage to or loss of system, equipment, or property, or (2) an aircraft accident as defined in 49 CFR 830.2.

A.9 **Hazard Assessment** – A systematic, comprehensive evaluation of a change, operation, system, or safety issue.

A.10 **Incident** – An occurrence other than an accident, which affects or could affect the safety of airport operations.

A.11 **Likelihood** – The estimated probability or frequency, in quantitative or qualitative terms, of a hazard's effect.

A.12 **Movement Area** – The runways, taxiways, and other areas of an airport that are used for taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas.

A.13 **Non-movement Area** – The area, other than that described as the movement area, used for the loading, unloading, parking, and movement of aircraft on the airside of the airport (including ramps, apron areas, and on-airport fuel farms).

A.14 **Risk** – The composite of predicted severity and likelihood of the potential effect of a hazard.

A.15 **Risk Analysis** – The process whereby a hazard is characterized for its likelihood and the severity of its effect or harm. Risk analysis can be either quantitative or qualitative analysis; however, the inability to quantify or the lack of historical data on a particular hazard does not preclude the need for analysis.

A.16 **Risk Mitigation** – Any action taken to reduce the risk of a hazard's effect.

A.17 **Safety Assurance** – The process within SMS that functions systematically to ensure that performance and effectiveness of risk controls or mitigations and that the organization meets or exceeds its safety objectives through the collection, analysis, and assessment of information.

A.18 **Safety Evaluation** – Procedures to monitor performance with safety objectives, SMS requirements, or initiatives.

A.19 **Safety Issue –** A concern of a condition that has an undesirable safety effect or outcome that may not rise to the level of a Hazard.

A.20 **Safety Objectives** – A measurable goal or desirable outcome related to safety.

A.21 **Safety Policy** – The certificate holder's documented commitment to safety, which defines its safety objectives and the accountabilities and responsibilities of its employees in regards to safety.

A.22 **Safety Promotion** –The combination of training and communication of safety information to support the implementation and operation of an SMS in an organization.

A.23 **Safety Risk Management (SRM)** – A process within the SMS composed of describing the system, identifying the hazards, and analyzing, assessing, and controlling or mitigating the risk.

A.24 **Severity -** The consequence or impact of a hazard's effect or outcome in terms of degree of loss or harm. Severity is determined by the worst credible outcome.

A.25 **Single Point Failure** – A failure of an item that would result in the failure of the system and is not compensated for by redundancy or an alternative operational procedure.

A.26 **System** – An integrated set of constituent pieces that are combined in an operational or support environment to meet a defined objective. These pieces include people, equipment, information, procedures, facilities, services, and other support services.

A.27 **System State** – An expression of the various conditions, characterized by quantities or qualities, in which a system can exist.

A.28 **Validation** – The process of proving the functions, procedures, controls, and safety standards are correct and the right system is being built (that is, the requirements are unambiguous, correct, complete, and verifiable).

Acronyms

AAS	Airport Safety and Standards
AC	Advisory Circular
ACM	Airport Certification Manual
ACRP	Airport Cooperative Research Program
ARFF	Aircraft Rescue and Fire Fighting
FBO	Fixed-base Operator
FOD	Foreign Object Damage or Foreign Object Debris
FOIA	Freedom of Information Act
GIS	Geographical Information Systems
ICAO	International Civil Aviation Organization
RA	Risk Assessment
SMS	Safety Management System
SRA	Safety Risk Assessment
SRM	Safety Risk Management

APPENDIX B. RELATED READING MATERIAL

Federal Aviation Administration. Office of Airports website https:/www.faa.gov/airports/

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Transportation Research Board. (2016). Airport Cooperative Research Program Synthesis 71, Airport Safety Risk Management Panel Activities and Outcomes [Adobe Digital Editions]. Retrieved from http://www.trb.org/ACRP/Blurbs/174359.aspx.

APPENDIX C. SAMPLE SMS IMPLEMENTATION PLAN TEMPLATE AND CHECKLIST

This appendix contains a sample SMS Implementation Checklist to help aide in the development of an Airport SMS. This sample meets the minimum requirements, and should not be considered a limitation.

[*Insert Airport Name*] Safety Management System
Implementation Plan

[Instructions: Use this Implementation Plan Template to summarize the airport's plans for implementing SMS. The template includes areas for narrative descriptions and a checklist with common implementation steps. Expand the template where necessary to reflect your unique operating environment and programs.]

SMS Development and Deployment Strategy:

[Instructions: In this section, provide a detailed proposal on how the airport will develop its SMS. Use the subsections to guide your description and add subsections where necessary. Each subsection includes lists of items to include in the narrative.]

I. SMS Development

- *How will the airport develop its SMS Manual? Will it procure consultant assistance or develop it in-house?*
- *Will the airport conduct a formal gap analysis? If so, what is the timeline for completion?*
- *Are there any existing programs, policies, or practices that the airport plans to use as a foundation for the SMS elements?*

II. SMS Deployment Strategy

- *Does the airport plan to use a phasing strategy? If so, what will be phased (i.e., phasing the SMS into the movement area first and then into the non-movement area or phasing the components and elements of SMS)?*
- *Will the airport include its landside operations in the SMS? If so, how will landside requirements be kept separate from airside requirements?*

III. Procurement

- *Does the airport plan to acquire any new systems or technology that will require procurement? If so, how long does the airport anticipate that procurement taking?*

Approved by: [*signature*]
Date: [*insert date*]

[*Insert Airport Name*] Safety Management System Implementation Plan

Schedule for SMS Development and Deployment:

[Instructions: In this section, document the major milestones and any potential challenges to implementation.]

I. Major Milestones

[List the major milestones associated with SMS development and deployment. This can be in narrative or tabular format. A sample table is provided below. This section should summarize the airport's major milestones and the target date for completion. Within each milestone, list the known smaller steps required to achieve the milestone. This will help identify any unanticipated obstructions..]

Milestone	Target Date
Develop Implementation Plan	
…	
Conduct Gap Analysis	
…	
Finalize SMS Manual	
…	
Provide SMS Training	
…	
Deploy Hazard Reporting System	
…	
Full Implementation of SMS	
Conduct first evaluation of SMS implementation	

II. Challenges

[List and explain any challenges the airport may face that could impact these target dates (e.g., lease or union negotiations or procurement schedules). Where possible, include a description of the methods the airport will use to mitigate these challenges where possible and track the status of these issues.]

Approved by: [*signature*]
Date: [*insert date*]

[*Insert Airport Name*] Safety Management System Implementation Plan

SMS Implementation Plan Checklist:

[Instructions: The Implementation Plan Checklist provides a guide for airports to use in developing and deploying the essential components and elements of an SMS. For efficiency, airports should look to existing systems, processes, and procedures to determine whether they can be used within the SMS. Additionally, the "status of implementation" column can be updated over time to communicate progress to the Accountable Executive. An airport could use this checklist as a means for updating the Accountable Executive on the progress of SMS implementation.]

Item	*Task*	*Description of Any Existing Systems/Processes Being Used to Meet the Task*	*Status of Implementation*	*Target for Completion*
1. Documentation				
1.1	SMS Manual (optional method)			
2. Safety Policy				
2.1	Identify the Accountable Executive			
2.2	Develop and distribute a Safety Policy Statement			
2.3	Make Safety Policy Statement available to all employees and tenants			
2.4	Identify organizational structure responsible for airport safety issues			
2.5	Communicate safety organizational structure to airport employees and managers			
2.6	Define airport management, including various levels throughout the organization, responsibilities and accountabilities for safety issues			
2.7	Establish a procedure to periodically review management responsibilities and accountabilities for safety issues			
2.8	Establish Safety Objectives			

Approved by: [*signature*]
Date: [*insert date*]

[*Insert Airport Name*] Safety Management System Implementation Plan

2.9	Establish process or procedure to maintain and periodically review the Safety Objectives			
2.10	Define methods, processes, and organizational structure necessary to meet Safety Objectives			
3. Safety Risk Management				
3.1	Establish a system for identifying safety hazards			
3.2	Establish a systematic process to analyze hazards and their associated risks to an acceptable level			
3.3	Establish a system for regular assessment to ensure mitigations are effective			
3.4	Establish processes or procedures to document SRM efforts and retain those documents			
4. Safety Assurance				
4.1	Establish processes or procedures to monitor safety performance and safety objectives identified through Safety Policy			
4.2	Establish a hazard reporting system that provides a means for reporter confidentiality			
4.3	Maintain the hazard reporting system and establish a process for reviewing and analyzing reported hazards			
4.4	Establish a process or procedure for reporting safety information and data on a regular basis to the Accountable Executive			
5.0 Safety Promotion				
5.1	Develop training on airport's SMS requirements specific to the audience's roles and responsibilities			
5.2	Provide initial training to personnel with roles and responsibilities in airport's SMS			

Approved by: [*signature*]
Date: [*insert date*]

[*Insert Airport Name*] Safety Management System Implementation Plan

5.3	Develop processes or procedures to record training			
5.4	Develop informational material about hazard awareness and reporting			
5.5	Develop methods for communicating important safety information			
5.6	Establish a procedure to periodically review and update communication methods			
5.7	Develop processes or procedures to record safety communications			

Approved by: [*signature*]
Date: [*insert date*]

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APPENDIX D. SAMPLE SMS MANUAL

This appendix contains a sample SMS Manual for a small-to-medium-size airport to help aide in the development of an Airport SMS. This sample meets the minimum requirements, and should not be considered a limitation.

Safety Management System Manual

Gambrills Regional Airport
Washington, DC

SXI Safety Management System Manual

June 1, 20XX

SXI Safety Management System Manual

Table of Contents

Section 1: Introduction to Gambrills' Safety Management System (SMS)

1.1 **What is SMS**?
[Include a brief, plain language description of the SMS and what it means.]

A Safety Management System (SMS) is a systematic approach to managing safety, including all necessary organizational structures, accountabilities, statements, processes, and procedures.

SMS provides airport management with a set of tools to make safety related decisions. SMS also helps airport management identify safety risks associated with airport operations, development, and other changes to proactively address those issues before they result in accidents, incidents, injury, or damage.

It materializes itself through a series of complementary processes and procedures which are closely coordinated by a well-defined safety organizational structure, where the safety roles and responsibilities of everyone, including top management, are clearly defined and understood by all. Further, safety objectives and data analysis will facilitate continuous improvement throughout the airport.

….

1.2 Applicability
[Include a statement recognizing SMS process applicability should follow the SMS requirements.]

All individuals with access to the movement and non-movement areas of the airport must follow the policies and procedures identified in this Manual. Every individual with this access has a responsibility for safety. All tenants will ensure that employees with access to the areas identified in Section 1.3 receive proper training or awareness of their roles and responsibilities under the airport's SMS.

1.3 Scope
[Include a statement declaring the physical areas where the SMS initiatives shall apply. It may be helpful to include an ALP or graphical depiction of scope.]

All processes and procedures developed under the SMS apply to the movement and non-movement area. SMS initiatives do not apply to landside operations including inside the terminals.

Section 2: Safety Policy

2.1 Accountable Executive

[Identify the Accountable Executive by Position Title and include any specific responsibilities for the role.]

The [Insert Position] is the designated Accountable Executive for the Gambrills Regional Airport.

2.2 Safety Policy Statement

[Reference the Safety Policy Statement in this section. The document is usually inserted as an Appendix because it will be signed by the Accountable Executive and may need to be updated over time. A summary of that statement can also be included in this section. Also add any procedures for reviewing the Safety Policy Statement for currency.]

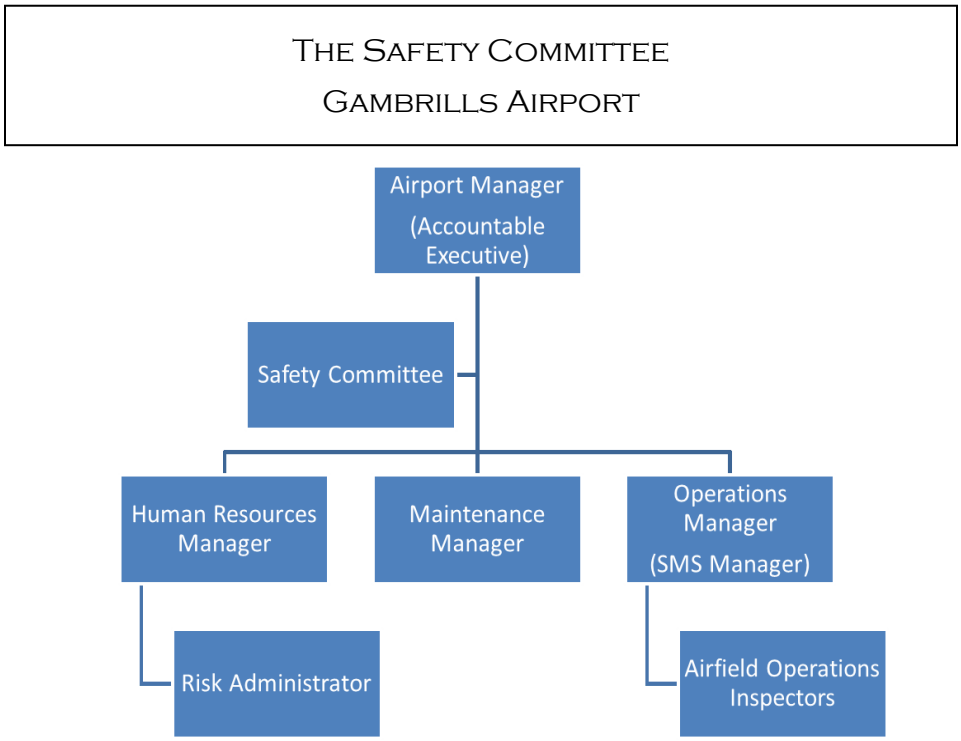
Gambrills Regional Airport is committed to ensuring that safety is a top priority of management. As declared in the airport's Safety Policy Statement (See Appendix 2), the airport encourages confidential hazard reporting and commits itself to communicating safety issues and resolution of reported hazards.

….

The Safety Policy Statement will be reviewed annually to ensure it remains current.

2.3 Safety Organizational Structure

[Identify the organization structure responsible for making safety related decisions on the airport. If a committee format is used for some of these processes, identify that organization.]



[Note: The names/titles are for example only. Other stakeholders (TSA, airlines, FAA, etc.) may be included in the Safety Committee at the airport's discretion.]

The Safety Committee is comprised of *[enter committee members here*]. The SMS Manager chairs the Safety Committee.

2.4 Management Responsibility and Accountability for Safety Issues
[For those positions or committees identified in 2.3, clearly list each position or committee's responsibilities and accountabilities for safety issues. This description should not include items outside the scope of the SMS.]

Accountable Executive

The Accountable Executive ensures that the necessary assets and financial support are available for successful SMS development, implementation, operation, and continuous improvement.

In carrying out those duties, the Accountable Executive is responsible for:

- Accepting and signing the Safety Policy Statement
- Providing adequate resources to ensure implementation and management of the SMS
- Providing leadership in safety related issues by actively participating in safety significant events
- Ensuring that all managers are aware of, and held accountable for their roles and responsibilities under the SMS
- Promoting and encouraging a positive safety culture within the airport
- Ensuring ongoing effectiveness of the SMS by facilitating, participating, or reviewing periodic reviews and evaluations
- Designating the airport's safety objectives
- Reviewing SMS related data provided by the SMS Manager

SMS Manager

The SMS Manager [Operations Manager] is responsible for the daily implementation, operation, and oversight of SMS related activities and initiatives.

In carrying out those duties, the SMS Manager is responsible for:

- Revising and maintaining the SMS Manual
- Chairing the SMS Committee
- ….

Safety Committee

The Gambrills Regional Airport establishes a Safety Committee comprised of *[enter committee members here*] and chaired by the SMS Manager. The Safety Committee meets at least quarterly. The Safety Committee is responsible for:

- Making safety recommendations to the Accountable Executive
- Establishing panel membership for complex Risk Assessments requiring stakeholder subject matter expertise
- Reviewing major accident and incident investigations for the airport because the past meeting
- ….

Maintenance Manager

….

Risk Administrator

….

2.5 Gambrills' Safety Objectives
[Safety objectives should be quantitative. They may be attached as an appendix to allow easier revisions and dissemination. Be sure to include any processes or procedures for review, updating, tracking, and communicating.]

To facilitate continuous emphasis on improving safety, Gambrills Regional Airport establishes safety objectives. These objectives are quantitative and should reflect national and local safety goals.

The current objectives are attached in Appendix 3.

The Accountable Executive approves new safety objectives as recommended by the Safety Committee and the SMS Manager. Any revisions are communicated to airport employees and tenants.

….

Section 3: Safety Risk Management

Gambrills Regional Airport supports the proactive formal analysis of hazards as is key to Safety Risk Management (SRM) and SMS. SRM is defined as a formal process within SMS composed of describing the system, identifying hazards, analyzing, assessing, and mitigating risk.

Gambrills Regional Airport is committed to establishing and maintaining hazard identification and analysis processes as are discussed in this section. No unacceptable risk, otherwise referred to as "High Risk", is tolerated at the airport.

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3.1 Hazard Identification

[Describe the processes and initiatives in place that identify and communicate hazards through the SMS.]

Hazards and safety issues are identified through the following means:

- Daily Self-Inspections
- Maintenance Logs
- Confidential Hazard Reporting System
- Monthly Managers/Tenant Meetings

The SMS Manager is responsible for hazard intake and initial processing and determines whether further action under the airport's SRM processes is required.

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3.2 SRM Process

[Explain what processes will be used to formally assess hazards. What triggers this assessment? Who conducts it? When is a panel of subject matter experts used? Can individuals conduct hazard assessment? What are the airport's definitions and categories for severity and likelihood and is there a predictive risk matrix that should be used?]

Gambrills Regional Airport uses the 5-step process for hazard assessment which includes:

1. Describing the System
2. Identifying Hazards
3. Analyzing Risk
4. Assessing Risk
5. Mitigating Risk

The 5-step process is instituted for any operational change on the airport including changes in tenant operations within the movement and non-movement areas, and for changes in airfield infrastructure. The 5-step process is used when safety trends are identified through Safety Assurance activities or hazards are identified through self-inspection, maintenance logs, management meetings, or reported through the Confidential Hazard Reporting System. The SMS Manager has the authority to conduct hazard assessment for any other issue he or she deems necessary.

Hazard assessment takes two forms: hazard triage and integrated hazard assessment.

The SMS Manager has the authority to conduct or delegate hazard triage. All identified hazards, trends, or operational changes already being implemented go through hazard triage which is when the SMS Manager or their designee individually conducts the 5-step process to quickly determine if any hazards present unacceptable risk and require immediate mitigation.

For those complex changes to airfield infrastructure, or if identified hazards require a subject matter expertise from outside the airport, then an integrated hazard assessment is conducted. The SMS Manager notifies the Safety Committee when an integrated hazard assessment is needed. The Safety Committee then establishes a panel of subject matter experts.

Individuals or panels conducting hazard assessment use the following definitions and tables for analysis. No High Risk is accepted without mitigation. The Accountable Executive is informed of any hazard assessment that results in High Risk. Where mitigation is not possible, the Accountable Executive is responsible for approving the continued operation.

SEVERITY LEVELS	
Catastrophic	Loss of aircraft, loss of structures, fatalities
Major	Damage to aircraft, structures, serious injuries
Minor	Slight damage, functional impairment, slight injuries
Minimal	Miniscule operating/personnel costs and damages

LIKELIHOOD LEVELS	
Frequent	Probability happening from a daily to weekly basis
Probable	Probability happening from a weekly to monthly basis
Remote	Probability happening on an annual basis
Improbable	Probability assumed unlikely to occur

Predictive Risk Matrix		LIKELIHOOD			
		Improbable	**Remote**	**Probable**	**Frequent**
SEVERITY	**Catastrophic**			HIGH RISK	
	Major			MODERATE HIGH RISK	
	Minor		MEDIUM RISK		
	Minimal	LOW RISK			

High Risk level occurrences are unacceptable and should be promptly mitigated to an acceptable level of safety.

Moderate-High level of occurrences, are generally unacceptable, but with the implementation of appropriate controls, the occurrence could become an acceptable risk.

Medium level of occurrences, are generally acceptable, providing the appropriate safety controls have been established.

Low level occurrences, pose little or no risk and have adequate levels of control established.

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3.3 Means for ensuring mitigations are effective

[Describe the process or procedure that will be used to verify that mitigations are having their desired effect. This process or procedure will be closely tied to Safety Assurance. Who is responsible for this action and will the hazard assessment need to be re-verified?]

The SMS Manager is responsible for reviewing data through the airport's Safety Assurance program to verify that mitigations required under SRM are having their desired effect. In those cases where data indicates mitigations are ineffective, the SMS Manager re-verifies the hazard assessment and for those developed by a panel; determines whether the panel should re-convene.

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3.4 Documentation and Record Retention

[Describe the documentation and retention policies for SRM related documents.]

All hazard assessments conducted either individually by the SMS Manager, their designee, or by a panel of subject-matter experts established by the Safety Committee, are documented using the Hazard Assessment Form (Appendix 4). Dissenting opinions or any additional narrative are included by attachment to the Form.

SRM related documents are retained electronically in the airport's shared network for the life of the change, operation, or as long as mitigations are being implemented.

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Section 4: Safety Assurance

Safety Assurance is a critical part of the SMS because it includes processes that help determine the effectiveness of SMS initiatives and institute a Confidential Hazard Reporting System. Safety Assurance is the process management functions that evaluate the continued effectiveness of implemented risk mitigation strategies; support the identification of new hazards; and function to systematically provide confidence that an organization meets or exceeds its safety objectives through continuous improvement.

4.1 Safety Performance Monitoring

[Describe how safety objectives will be monitored. What data will be collected and how? Who's responsible for collecting and analyzing the data? Include any procedures for accident and incident investigations. Describe methods for safety evaluation including who conducts, how often, and what they should cover.]

The SMS Manager is responsible for overseeing data collection and analysis to look for safety trends, identify new hazards, and verify compliance with SMS requirements. Data analysis also is used to verify performance with safety objectives.

Data is collected from the following sources:

- Daily Self-Inspection Reports
- Maintenance Logs
- ….

Safety evaluations are conducted quarterly and annually. Quarterly evaluations focus on evaluating compliance with one aspect of SMS requirements. Annual evaluations verify airport-wide compliance with all SMS requirements and report on safety performance as it relates to established safety objectives.

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4.2 Confidential Hazard Reporting System

[Explain how the airport will establish and maintain a confidential hazard reporting system. Include any clauses that except individuals from confidentiality such as intentional or reckless behavior. What format will reports be made? Who reviews the reports and is responsible for action? How will reporters get feedback?]

Gambrills Regional Airport encourages everyone who has access to the airfield to report any and all safety concerns, hazardous conditions, and incidents and accidents. Many incidents can be avoided if a concern is reported in a timely manner.

Employees and tenants have two ways to report safety concerns: in paper via drop-boxes throughout the airport and electronically through the airport's internet portal. A copy of the Hazard Reporting Form is available in Appendix 5. Reporters can submit the form anonymously or include their name and contact information.

Operations staff is responsible for checking drop-boxes daily and forwarding any forms found to the SMS Manager. The SMS Manager reviews the paper and electronic forms on a daily basis to identify immediate safety concerns requiring action through hazard triage or forwarding to the SMS Committee for panel review.

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4.3 Reporting Safety Information

[Describe what types of information will be reported to the Accountable Executive. Who has responsibility for this task and what method or format will be used to communicate? How often is this information communicated?]

The SMS Manager reports weekly and monthly to the Accountable Executive regarding safety information.

On a weekly basis, the SMS Manager reports the following via written report:

- Number of hazard reports received with summary of status
- Summary and examples of safety related communications with tenants
- ….

SXI Safety Management System Manual

On a monthly basis, the SMS Manager meets with the Accountable Executive to report the following:

- Performance with safety objectives
- Status of ongoing mitigations required under SRM
- Status of SMS implementation
- ….

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Section 5: Safety Promotion

Safety Promotion means the combination of safety culture, training, and communication activities to support the implementation and operation of an SMS. At the Gambrills Regional Airport, employees have the resources necessary to carry out SMS initiatives including appropriate training. Further, airport management is committed to ensuring employees and tenants receive safety critical communications in a timely manner.

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5.1 Training

[Describe what training will be provided and identify who receives what training. When will employees and tenants be trained? Can tenants train/inform their own employees? How will training be documented and how long will training records be kept? How often with the program be reviewed for currency? It may be beneficial to include the syllabus or course objectives of the training programs as an appendix to this section.]

Gambrills Regional Airport has a two-prong approach to training. All employees responsible for SMS implementation and oversight receive specific SMS training upon initial hiring and on an annual recurring basis. All other individuals, including tenant employees, with access to the airfield receive a safety orientation package upon hiring.

The SMS Manager is responsible for developing, implementing, and updating the training program and ensuing that tenants have safety orientation packages for all new employees.

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5.2 Communication

[What constitutes safety related information that should be communicated? Describe the process for communicating information with employees and tenants including the method or format for communicating. How long will communications documentation be kept?]

Gambrills Regional Airport is committed to open and continuous communication of safety critical issues. The airport communicates safety issues using the following formats:

- Monthly Managers/Tenant Meetings

- Safety Bulletin Boards
- Direct email (via SMS Manager)

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Appendix 1: Definitions and Acronyms

Appendix 2: Safety Policy Statement

Appendix 3: Safety Objectives

Appendix 4: Hazard Assessment Form

Appendix 5: Hazard Reporting Form

APPENDIX E. SAMPLE SAFETY REPORTING DASHBOARDS

Figure E-1. Sample Dashboard 1 (Courtesy of San Antonio Airport System)

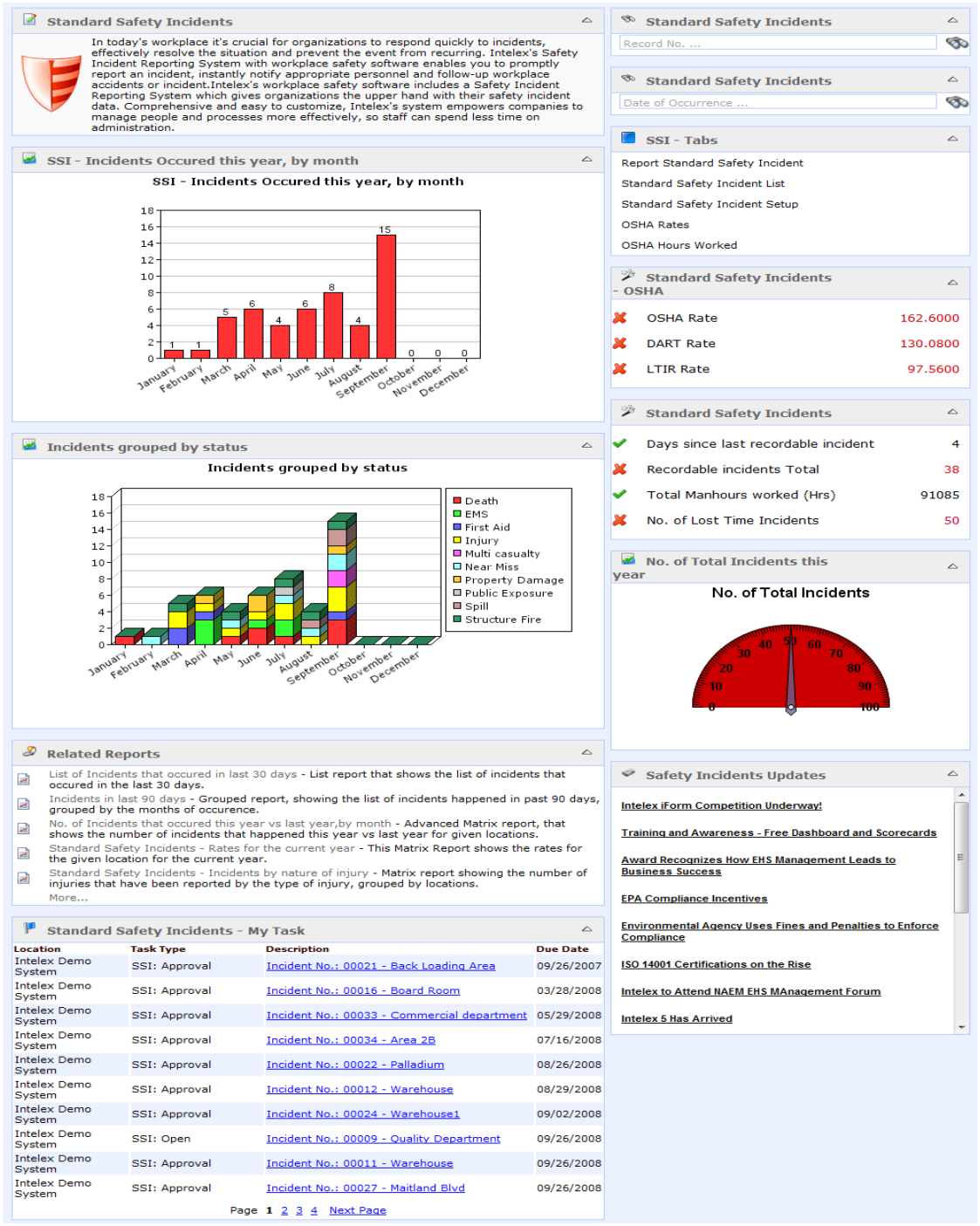


Figure E-2. Sample Dashboard 2 (Courtesy of San Antonio Airport System)

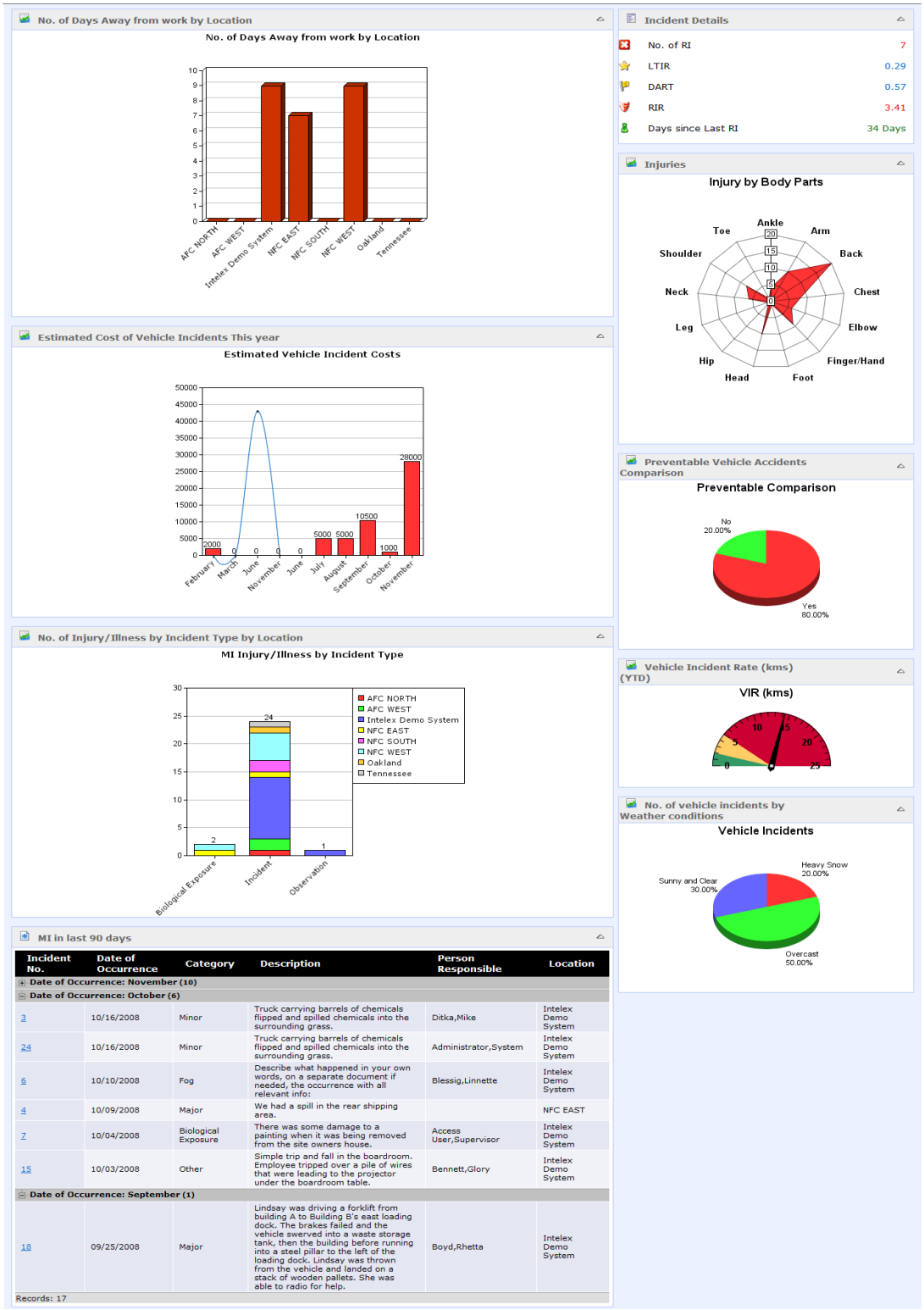
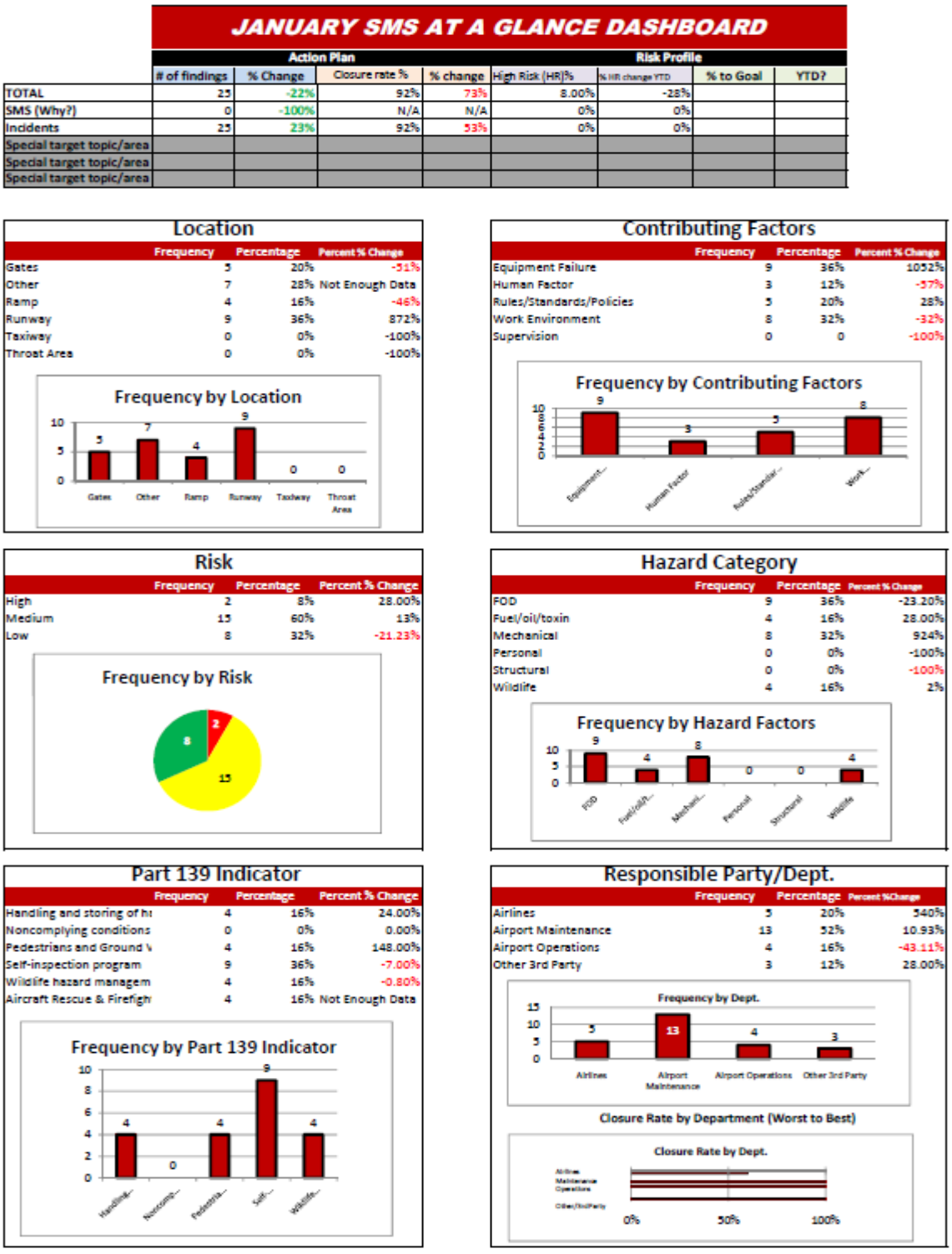


Figure E-3. Sample Dashboard 3 (Courtesy of City of Atlanta)



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Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) mailing this form to Manager, Airports Division, Federal Aviation Administration ATTN: AAS-300, 800 Independence Avenue SW, Washington DC 20591 or (2) faxing it to the attention of the Office of Airport Safety and Standards at (202) 267-5257.

Subject: AC 150/5200-37A Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____
_____
_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____
_____
_____

☐ Other comments:

_____
_____
_____

☐ I would like to discuss the above. Please contact me at (phone number, email address).

Submitted by: _____ Date: _____