

# Guidebook for Developing a Safety Management System (SMS) for Flight Trainers

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## Purpose:

The purpose of this Guidebook is to provide a framework and offer developmental guidance to aid flight training organizations in defining their organization's Safety Management System (SMS). This Guidebook is limited to the most basic explanation of what is required and why it is required to have an effective Safety Management System.

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## Introduction to the Guidebook

The purpose of this Guidebook is to provide a framework and offer developmental guidance to aid flight training organizations in defining their organizational safety structure. The resulting SMS Manual the organization develops will contain the safety management policy, procedures, and controls to ensure that its operations always provide the highest degree of safety.

This Guidebook also will provide a roadmap for developing and implementing a Safety Management System. It contains a logical, structured, methodical, and auditable process that provides measures to enable an organization to value safety standards in much the same manner that the organization values and uses financial reports. When used in conjunction with a viable financial plan, an SMS provides an organization with the best opportunity for profitability, while also allowing the organization to operate in the public's best interest. An SMS does this by constantly seeking out unnecessary risk and managing it before it becomes an unwanted adverse event.

Each section of this Guidebook includes the following three types of guidance: objectives **(OBJ)**, standards **(STND)**, and developmental guidance **(DG)**.

- **(OBJ)** provide a statement of the objective and expected outcome of a specific SMS clause. An organization will be expected to develop policy statements that include its objectives in its Safety Management System Manual to meet an SMS standard and should use the **(OBJ)** to help in the development of its policies and procedures. The SMS Manual will be complete when the organization has developed policies, procedures, and controls that meet the organization's specific needs and fit within the organizational structure.
- **(STND)** provide the specific language of the SMS standard that the maintenance organization will be held to in order to meet the statement of requirements conveyed in the (P&P) section.
- **(DG)** provides instruction to an organization regarding how it can develop its policy, procedures, and controls to address each specific requirement of the Safety Management System. For each section of the manual, the organization will need to consider the developmental guidance included in this Guidebook. The (DG) is intended to guide the organization philosophically in the development of the manual.

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# Introduction

**(OBJ)** The Safety Management System for flight trainers is based on a strong safety culture. Flight training poses unique risks that must be managed by solid training fundamentals. Safety processes must be ingrained in every aspect of training to ensure the safest possible operations.

## 1. Scope and Applicability

**(OBJ)** An organization's SMS will address aviation safety related operational and support processes and activities, including products and/or services provided to its customers. This process also will include a description of the responsibilities for the safety of services or products contracted to or purchased from other organizations.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 1. Scope and Applicability

A) This Standard describes the requirements for a product/service provider's Safety Management System (SMS-P) in the air transportation system.

1) This standard is intended to address aviation safety related operational and support processes and activities rather than occupational safety, environmental protection, or customer service quality.

2) The requirements of this standard apply to Safety Management Systems developed and used by organizations that provide products and/or services in the air transportation system.

3) Operators and service providers are responsible for the safety of services or products contracted to or purchased from other organizations.

B) This document establishes the minimum acceptable requirements; oversight entities can establish more stringent requirements.

**(DG)** The mission of an SMS is to assure that safety is not just a catch phrase, but is woven into the fabric of an organization's culture and is a measurable component of everyday work functions. Beginning January 1, 2009, the International Civil Aviation Organization (ICAO) will require that all air operators and aviation maintenance organizations have and use a Safety Management System.

The Federal Aviation Administration's (FAA) Advisory Circular (AC) 120-92, Introduction to Safety Management Systems for Air Operators, provides an overview of the SMS philosophy, and includes in an appendix the SMS elements that must be in place and will be audited for functionality if an organization chooses to implement an SMS. These elements are broken down into the following four "Pillars of Safety":

### 1. Policy

2. Safety Risk Management
3. Safety Assurance
4. Safety Promotion

The SMS manual system described in this Guidebook is structured to capture all the required SMS elements appendix 1 to AC 120-92 in a logical and systematic fashion. The policy, procedure, and controls address each individual elemental requirement of the Safety Management System recommended by the FAA. Routine audits, whether internal or external, will ensure that the SMS continues to work as it was originally designed. Audits are not designed or intended to be used to measure individual employee performance.

Important: A Safety Management System is a tool that requires the highest degree of management commitment. An organization's adoption of SMS philosophies and procedures evidences management's dedication to providing aviation services with the expectation of the highest level of safety.

## **2. SMS Vision & Mission Statements**

**(OBJ)** An organization may desire to develop a Mission & Vision statement that reflects the organization's goals and objectives regarding safety.

**(DG)** Developing mission and vision statements helps focus an organization and provides a sound foundation on which to base all further organizational policy. The statements should reflect the objective of using an SMS (mission) and how the organization is going to obtain that objective over time (vision).

The following are examples of mission and vision statements:

### **MISSION**

**To foster our development of structured business plans to manage safety, reduce accidents and costly safety significant events, while increasing our operational efficiency.**

### **VISION**

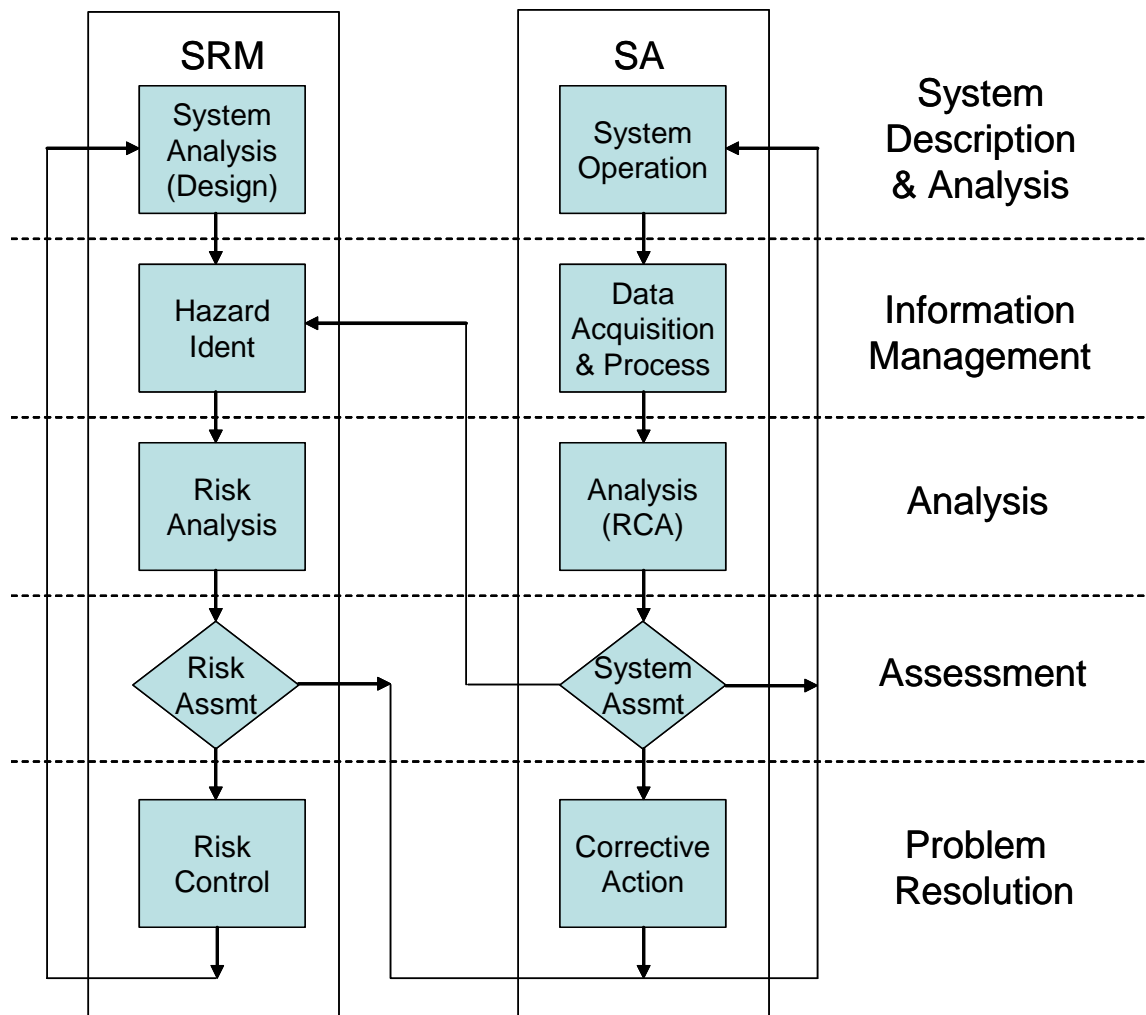
**Assist our flight training organization to achieve the highest degree of safety through the adoption of Safety Management Systems. To facilitate organizational cultures that design safety as an integral core value. Continuously identify and manage risk through the development of formal procedural controls, dedicated resources and open collaboration.**

### 3. SMS Flowchart

**(DG)** An organization should develop a flowchart as a first step in designing its SMS. Flowcharting is a valuable tool for system-level thinking and provides a logical flow and framework for the more detailed policies and procedures an organization needs to create.

No example provides the level of detail and unique structure that would fit an organization. Each organization should logically work through the way it plans to have the SMS actually flow and function in its unique organization. The following pages include two examples of flowcharts:

#### SAFETY RISK MANAGEMENT & ASSURANCE INTERFACE



## 4. Policy

### 4.1 General Requirements

**(OBJ)** The expectation of this process is that an organization will develop an integrated, comprehensive, SMS for its entire organization.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 4. Policy

##### 4.1. General Requirements

- A) Safety management shall be included in the complete scope of the operator's systems including:
- 1) flight operations;
  - 2) dispatch/flight following;
  - 3) maintenance and inspection;
  - 4) cabin safety;
  - 5) ground handling and servicing;
  - 6) cargo handling; and
  - 7) training.
- B) SMS processes shall be:
- 1) monitored;
  - 2) measured; and
  - 3) analyzed.
- C) SMS outputs shall be:
- 1) monitored;
  - 2) measured; and
  - 3) analyzed.
- D) The organization shall promote the growth of a positive safety culture (described in Sections 4.2 and 7.1).

**(DG)** For any system to function properly and achieve its objectives, it should be organized, directed, and controlled strategically towards those objectives. Policy leads the organization to obtain its goals and objectives.

### 4.2 Safety Policy

**(OBJ)** The expectation of this process is that Top Management will define the organization's safety policy and convey the expectations and objectives to its employees.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

**4.2. Safety Policy**

- A) Top management shall define the organization's safety policy.
- B) The safety policy shall:
  - 1) include a commitment to implement an SMS;
  - 2) include a commitment to continual improvement in the level of safety;
  - 3) include a commitment to the management of safety risk;
  - 4) include a commitment to comply with applicable regulatory requirements;
  - 5) include a commitment to encourage employees to report safety issues without reprisal;
  - 6) establish clear standards for acceptable behavior;
  - 7) provide management guidance for setting safety objectives;
  - 8) provide management guidance for reviewing safety objectives;
  - 9) be documented;
  - 10) be communicated to all employees and responsible parties;
  - 11) be reviewed periodically to ensure it remains relevant and appropriate to the organization; and
  - 12) identify responsibility of management and employees with respect to safety performance.

**(DG)** Top Management's Philosophical Commitment to Safety

The policy should include Top Management's absolute commitment to Safety in the following areas:

1. The development and implementation of a Safety Management System.
2. The management of risk.
3. A continual improvement in the level of safety.
4. An assurance of regulatory compliance at all times.
5. The encouragement of employees reporting safety issues without reprisal (non-punitive reporting system).
6. The development and implementation of standards of acceptable behavior.
7. The establishment, documentation, and measurement safety objectives.
8. Communication of the safety policy to all employees and responsible parties.
9. Periodic review of the safety policy to ensure it remains relevant.
10. Identification of individual safety responsibilities.

The organization should have a proactive approach to the management of safety and health risks. This should be a key element of the personal and organizational integrity, ethical behavior, and corporate social responsibility. These are considered to be essential components necessary for long-term business success. The assurance of a safe and healthy workplace and product/service should be a common goal shared by the organization, managers, and employees. The organization should always strive to operate in a manner that consciously

safeguards the employees, contractors, visitors, customers and the communities in which the organization does business.

### 4.3 Quality Policy

**(OBJ)** The expectation of this process is that an organization will integrate and interface safety and quality within its organization. Because Safety Management Systems use a quality approach to manage safety, both the safety and quality policy statements may be combined.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 4.3. Quality Policy

Top management shall ensure that the organization's quality policy is consistent with the SMS.

**(DG)** For quality in flight trainer this portion will adhere to FAA requirements and any quality policies that the organization is a part of.

### 4.4 Safety Planning

**(OBJ)** The expectation of this process is that an organization will describe its safety management plan to meet the objectives described by its safety policy.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 4.4. Safety Planning

The organization shall establish and maintain a safety management plan to meet the safety objectives described in its safety policy.

**(DG)** Management has historically been defined as planning, organizing, directing, and controlling. Therefore a Safety Management System will start with a plan to meet the Safety Objectives. A plan should be set by Top Management that will direct and sequence the implementation of the Safety Management System. Planning at one level becomes direction at the next level. The first thing to plan is how much and on what time table the various portions of the Safety Management System will be created, who will be responsible for the overall system and the various portions of it.

### 4.5 Organizational Structure & Responsibility

**(OBJ)** The expectation of this process is that an organization will define the roles, responsibilities, and relationships with regard to safety throughout its organization.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

4.5. Organizational Structure and Responsibilities

- A) Top management shall have the ultimate responsibility for the SMS.
- B) Top management shall provide resources essential to implement and maintain the SMS.
- C) Top management shall appoint a member of management who, irrespective of other responsibilities, shall have responsibilities and authority that includes:
  - 1) ensuring that process needed for the SMS are established, implemented and maintained
  - 2) reporting to top management on the performance of the SMS and the need for improvement, and
  - 3) ensuring the promotion of awareness of safety requirements throughout the organization.
- D) Aviation safety-related positions, responsibilities, and authorities shall be:
  - 1) defined;
  - 2) documented; and
  - 3) communicated throughout the organization.

**(DG)** Top Management should develop an organizational structure that assigns responsibility, authority, and accountability to assure the Safety Management System will function as planned. This should include an organizational chart that depicts the organization's structure. The organizational chart should interface with a document that includes a description of the responsibilities and authorities.

Top Management has the ultimate responsibility for the SMS and should provide the resources essential to implement and maintain the SMS. Top Management should appoint a member of management, often referred to as the Safety Manager, who, irrespective of other responsibilities, has responsibilities and authority that includes:

- (1) Ensuring that processes needed for the SMS are established, implemented, and maintained
- (2) Reporting to Top Management on the performance of the SMS and the need for improvement , and
- (3) Ensuring the promotion of awareness of safety requirements throughout the organization.

Aviation safety-related positions, responsibilities, and authorities shall be defined, documented and communicated throughout the organization.

A defined organizational structure is necessary to provide the structure and order for the coordination of activities to reach the goals set by Top Management. Organizational structure and responsibilities are a prerequisite for effectively directing and controlling an organization's activities. Solutions to problems in

reaching stated goals are often obtained by refinements in, or alterations to, the organizational structure. In addressing organizational structure, an organization should pay particular attention to the communication interfaces between its various departments. In an organization's structure it is essential that the organization assure that the right hand always knows what the left hand is doing and why it is important.

#### 4.6 Compliance with Legal and other Requirements

**(OBJ)** The expectation of this process is that the organization will integrate compliance with regulatory, legal, and Safety Management System requirements. To ensure compliance, these requirements will be clearly and consistently conveyed to all employees. The organization also will establish and maintain a procedure to identify applicable requirements.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

##### 4.6. Compliance with Legal and Other Requirements

- A) The SMS shall incorporate a means of compliance with safety-related legal and regulatory requirements.
- B) The organization shall establish and maintain a procedure to identify to current safety-related legal and regulatory requirements applicable to the SMS.

**(DG)** A Safety Management System is intended to attain the highest level of safety that is practical for an organization. Regulatory compliance is intended to assure that the minimum level of safety is obtained. It is not possible to reach the level of safety required by an SMS if regulatory non-compliance exists. Employees will not believe or buy into organizational claims for improved safety goals if they know of any intentionally allowed non-compliance.

#### 4.7 Procedures and Controls

**(OBJ)** The expectation of this process is that the organization will assure that auditable procedures exist to provide clear direction and control over all organizational activities.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

##### 4.7. Procedures and Controls

- A) The organization shall establish and maintain procedures with measurable criteria to accomplish the objectives of the safety policy.
- B) The organization shall establish and maintain process controls to ensure procedures are followed for safety-related operations and activities.

**(DG)** These activities should be accomplished in a safe and preplanned manner. The risks involved in each activity should be identified and addressed.

The organization should plan and maintain procedures with measurable criteria to accomplish the objectives of the safety policy. Supervisory and operational controls should be established and maintained to ensure procedures are followed for safety-related operations and activities.

Measures are not expected for each procedural step. However, measures and criteria should be of sufficient depth and level of detail to ascertain and track accomplishment of objectives. Criteria and measures should be expressed in either quantitative or qualitative terms.

A Safety Management System requires direction and control to assure the intended outcome is obtained. Documented procedures are a method used to assure requirements are complied with and are the vehicle used to obtain the highest level of safety that is practical. Nearly every mishap involves some aspect of failing to follow procedures. Norms, poorly written procedures, and lack of awareness are usually the underlying reasons that procedures are not always followed. Mishaps do not happen every time procedures are not followed and this seduces management and employees into believing that there is no consequence to deviating from organizational procedures.

Following well written procedures that account for inherent risks should enable the system to capture errors that are likely to be made. Mishaps happen more frequently when errors are made and when procedures are not followed.

#### 4.8. Emergency Preparedness and Response

**(OBJ)** The expectation of this process is that the organization will develop and implement procedures that it will follow in the event of an accident or incident.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

##### 4.8. Emergency Preparedness and Response

The organization shall establish procedures to:

- 1) identify the potential for accidents and incidents;
- 2) coordinate and plan the organization's response to accidents and incidents;  
and
- 3) execute periodic exercises of the organization's response.

**(DG)** The organization should tailor these procedures depending on its size. The organization should identify the types of accidents and incidents that are possible given its type of operation. The organization should develop a set of coordinated response procedures that describe the duties and responsibilities assigned to each

department as well as each participant. The response should include the protection of response participants from unnecessary risks.

The organization should execute periodic exercises of the stated response process to assure effectiveness and efficiency.

An important key in responding to an emergency is to have in place a written Emergency Response Plan, which consists of workable procedures that allow an organization to respond in a logical, coordinated manner to an accident. Following this plan should provide consistent timely information to those that need it, effectively contribute to the investigation, and prevent duplication of work.

The first step in the development of this plan is to identify and assemble a team of key personnel, each of whom will have specific, pre-assigned responsibilities and duties should an accident or incident occur. Obviously, the size of the team should depend on the size of the organization and include all departments and facets.

Another important consideration is that of communication. Each member directly participating in the Emergency Response Plan should have a reliable way of communicating with one another to ensure information is exchanged directly, privately, and rapidly.

An accident can happen at any time and in any place, and the person receiving the news might not be part of the Response Team. Therefore, as a minimum, an organization should develop a checklist of what information it should collect. The organization should place the checklist in an easily accessible location and make all employees aware of its location.

In executing an Emergency Response Plan, participants should actively look for, identify and communicate the existence of unsafe conditions that they believe may have contributed to the event. This enables the organization to search for any safety systemic errors and implement root cause solutions while the symptomatic cause is being investigated.

The best test of effectiveness of the Emergency Response Plan is to create periodic hypothetical accidents.

## 4.9 Documentation and Records

**(OBJ)** The expectation of this process is that the organization will have clearly defined and documented safety policies, objectives, and procedures that may be in paper or electronic format.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 4.9. Documentation and Records Management

#### A) General.

The organization shall establish and maintain information, in paper or electronic form, to describe:

- 1) safety policies;
- 2) safety objectives;
- 3) SMS requirements;
- 4) safety-related procedures and processes;
- 5) responsibilities and authorities for safety-related procedures and processes;
- 6) interaction/interfaces between safety-related procedures and processes; and
- 7) SMS outputs.

#### B) Documentation Management.

- 1) Documentation shall be:
  - a) legible;
  - b) dated (with dates of revisions);
  - c) readily identifiable;
  - d) maintained in an orderly manner; and
  - e) retained for a specified period as determined by the organization (and approved by the oversight organization).

- 2) The organization shall establish and maintain procedures for controlling all documents required by this Standard to ensure that:
  - a) they can be located;
  - b) they are periodically:
    - (1) reviewed,
    - (2) revised as necessary, and
    - (3) approved for adequacy by authorized personnel;
  - c) the current versions of relevant documents are available at all locations where operations essential to the effective functioning of the SMS are performed; and
  - d) obsolete documents are promptly removed from all points of use or otherwise assured against unintended use.

C) Records Management.

- 1) For SMS records, the organization shall establish and maintain procedures for their:
  - a) identification;
  - b) maintenance; and
  - c) disposition.
- 2) SMS records shall be:
  - a) legible;
  - b) identifiable; and
  - c) traceable to the activity involved.
- 3) SMS records shall be maintained in such a way that they are:
  - a) readily retrievable; and
  - b) protected against:
    - (1) damage,
    - (2) deterioration, or
    - (3) loss.
- 4) Record retention times shall be documented

**(DG)** Procedures that document the organizational processes are required by an SMS and should answer the questions; Who, What, When, Where, and How. All procedures should have a clearly identified person with the responsibility and authority to manage the process. During development and revision of procedures and other related documents, the organization should consider and address the interaction and interfaces between affected areas.

The organization should develop and implement a procedure to control all SMS documents. This procedure should include requirements for approval prior to use, periodic review, and revision. The procedure also should include requirements to make relevant documents available at points of use. The organization should ensure that obsolete documents are not used.

SMS documentation should be maintained in an orderly manner, readily identifiable, retrievable, legible, and include a date of revision. As determined by the organization, documents should be retained for a specified period.

Records should be established and maintained to provide evidence of conformity to requirements and of the effective operation of the SMS. Records should remain legible, readily identifiable, and retrievable. An organization should establish documented procedures to define the controls needed for the identification, storage, protection, retrieval, retention time and disposition of records.

The reason the organization should document policies, objectives, procedures, and other related documents (detailed work instructions, forms, etc.) is to ensure that it can function in a standardized and consistent manner. A record is proof that the organization has met requirements stated in documented policies, objectives, procedures, and other related documents.

The ability to measure the effectiveness and efficiency of a process is dependent on the accuracy, completeness, and ability to retrieve the pertinent record(s).

## **5. Safety Risk Management**

**(OBJ)** The expectation of this process is that an organization will understand the critical characteristics of its systems and operational environment and apply this knowledge to the identification of hazards, risk decision making, and the design of risk controls. It is expected that Safety risk management will be applied to initial system design and reviewed as changes occur to the organization's operational environment to maintain safe operations.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

5. Safety Risk Management

- A) SRM shall, at a minimum, include the following processes:
  - 1) system and task analysis;
  - 2) identify hazards;
  - 3) analyze safety risk;
  - 4) assess safety risk; and
  - 5) control safety risk.
- B) The SRM process shall be applied to:
  - 1) initial designs of systems, organizations, and/or products;
  - 2) the development of operational procedures;
  - 3) hazards that are identified in the safety assurance functions (described in Section 6); and
  - 4) planned changes to the operational processes to identify hazards associated with those changes.
- C) The organization shall establish feedback loops between assurance functions described in Section 6 to evaluate the effectiveness of safety risk controls.
- D) The organization shall define acceptable and unacceptable levels of safety risk (or safety risk objectives).
  - 1) Descriptions shall be established for:
    - a) severity levels, and
    - b) likelihood levels.
  - 2) The organization shall define levels of management that can make safety risk acceptance decisions.
  - 3) The organization shall define acceptable risk for hazards that will exist in the short-term while safety risk control/mitigation plans are developed and executed.
- E) The following shall not be implemented until the safety risk of each identified hazard is determined to be acceptable in:
  - 1) new system designs;
  - 2) changes to existing system designs;
  - 3) new operations/procedures; and
  - 4) modified operations/procedures.
- F) The SRM process shall not preclude the organization from taking interim immediate action to mitigate existing safety risk.

**(DG)** There is a proactive and a reactive aspect to Safety Risk Management. The proactive aspect is reviewing the existing or revised procedures and operations to try and foresee and identify inherent risks. The reactive portion is information gained through continuous monitoring, auditing, and investigation.

From both proactive and reactive aspects there is a second analytical dimension regarding the type and detail of analysis and the level of organizational decision making.

Risk is an inherent by-product of conducting business in aviation. The risks and costs inherent in aviation necessitate a rational process for decision-making.

It is accurate to say that accidents have a context in which they happen as much as it is to say that they have a specific combination of causes. This is because each contributing factor has its own set of pre-existing causal factors and each of those can have their own set of preexisting factors. The particular permutation of causal factors in an accident is not as crucial to preventing future accidents as the identification and mitigation of as many potential causal factors as possible. Therefore, an organization performs risk assessments to foresee and identify potential causal factors before mishaps occur.

Current accident causation theory views all accidents as failures of the organization, where the ultimate responsibility lies, and where true ownership of the associated risks is. Errors are considered as symptoms of latent conditions that exist in the system. These latent or pre-existing conditions in the system become erroneously viewed as harmless either because they have not been noticed or because there has been no consequences associated with them yet. Even the conditions that are known to be unsafe may be erroneously viewed as being safer than they really are because no significant consequence has been associated with them yet.

Just like our physical senses attenuated over time our corporate safety sense has a tendency to make us feel safer as time goes by when in reality operational safety tends to deteriorate over time. Safety measurement and assessment activities are necessary to obtain and maintain a high level of safety

## 5.1. System and Task Analysis

**(OBJ)** The expectation of this process is that an organization will analyze its operational environment to gain an understanding of critical design and performance factors, processes, and activities to identify hazards.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

5. Safety Risk Management

5.1. System and Task Analysis

- A) System and task descriptions shall be developed to the level of detail necessary to identify hazards.
- B) System and task analyses should consider the following:
  - 1) the system's interactions with other systems in the air transportation system (e.g. airports, air traffic control);
  - 2) the system's functions for each area listed in para 4.1 A);
  - 3) employee tasks required to accomplish the functions in 5.1 B) 2);
  - 4) required human factors considerations of the system (e.g. cognitive, ergonomic, environmental, occupational health and safety) for:
    - a) operations, and
    - b) maintenance;
  - 5) hardware components of the system;
  - 6) software components of the system;
  - 7) related procedures that define guidance for the operation and use of the system;
  - 8) ambient environment;
  - 9) operational environment;
  - 10) maintenance environment;
  - 11) contracted and purchased products and services;
  - 12) the interactions between items in Section 5.1.B., 2 - 10 above; and
  - 13) any assumptions made about:
    - a) the system,
    - b) system interactions, and
    - c) existing safety risk controls

**(DG)** System and task analysis should include the following:

1. System and task descriptions developed to the level of detail necessary to identify hazards including human factors, equipment, procedures, training, and related operational environment aspects.
2. System and task analyses identifying the authority, responsibilities, communication interfaces, process measures, and controls, to assure that the operational tasks are accomplished as intended and that all related functions are interacted with properly.

These concepts apply to the external environment including the Air Transportation System and other organizations contracted with to purchase products/services.

To be proactive in managing risk, one essential requirement is to identify the risks associated with the system design. Good procedures and training that are designed

to take into consideration all the complex sets of interrelated factors and conditions associated with the accomplishment of the task is the foundation upon which safe operations depend.

Safety cannot be inspected into an organization's processes, but should be designed in. For preexisting systems the task analysis provides the opportunity to ensure risks are considered.

## 5.2 Identify Hazards

**(OBJ)** The expectation of this process is that an organization will identify, describe, and document the characteristics of hazards in its operations in sufficient detail to determine associated risk and determine acceptability.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 5.2. Identify Hazards

A) Hazards shall be:

- 1) identified for the entire scope of the system that is being evaluated as defined in the system description; and
- 2) documented.

B) Hazard information shall be:

- 1) tracked, and
- 2) managed through the entire SRM process.

**(DG)** While it is recognized that identification of every conceivable hazard is impractical, organizations are expected to exercise due diligence in identifying and controlling significant and reasonably foreseeable hazards related to their operations.

**Hazard Identification Example: An employee or student pilot used the voluntary employee reporting system to identify a hazard. Procedures at a certain small airport requires personnel to walk through areas of de-icing fluid, water, jet fuel and other materials to get to the aircraft.**

## 5.3 Analyze Safety Risk

**(OBJ)** The expectation of this process is that the organization will determine and analyze the severity and likelihood of potential events associated with identified hazards.

5.3. *Analyze Safety Risk* The safety risk analysis process shall include:

- 1) existing safety risk controls;
- 2) triggering mechanisms; and
- 3) safety risk of reasonably likely outcomes from the existence of a hazard, to include estimation of the:
  - a) likelihood; and
  - b) severity.

**(DG)** The process used to analyze the hazards should consider all the components of the system.

Risk is the composite of predicted severity and likelihood of the potential effect of a hazard in the worst credible system state.

The organization's safety risk analysis process should include existing safety risk controls, triggering mechanisms, and the safety risk of reasonably likely outcomes from the existence of a hazard. This process should include an estimation of the risk's likelihood and severity.

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 to an accident or incident.

Hazards may be identified from System Task Analysis (5.1) and Information Acquisition (6.3). The organization may decide to analyze the safety risk for all hazards identified in Information Acquisition or only some of those as identified in the Data Analysis (6.4) and System Assessment (6.5) processes.

New system designs and/or changes to existing system designs should not be implemented until the safety risk of each identified hazard is determined to be acceptable.

The assignment of a value to the likelihood and severity of the risk associated with identified hazards is intended to increase the objectivity of the analysis of the risk. This allows a quantified basis to prioritize the risks that are most urgent.

**Risk Analysis Example: Analysis identified the following components in the hazard;**

- **Jet fuel and de-icing fluid are slippery**
- **Water often freezes on the ramp in the winter**
- **Passenger stairs become slippery when combined with fluids**
- **The aircraft entry is slippery when wet.**

**All the components are individually analyzed and assessed using the severity and possibility of the worst potential effect. The composite of each component**

**analysis is combined to assess the hazard. The occurrence was determined to be occasional, leading to a hazardous condition in the case of a personnel slipping while on the aircraft stairs.**

#### 5.4 Assess Safety Risk

**(OBJ)** The expectation of this process is that the organization will assess each hazard and define acceptance procedures and levels of management that can make safety risk acceptance decisions. The organization will define the decision making processes to determine risk acceptability and requirements for risk controls.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

##### 5.4. Assess Safety Risk

- A) Each hazard shall be assessed for its safety risk acceptability using the safety risk objectives described in Section 5D.
- B) The organization shall define levels of management that can make safety risk acceptance decisions.

**(DG)** In the development of its risk assessment criteria, organizations are expected to develop risk acceptance procedures, including acceptance criteria and designation of authority and responsibility for risk management decision making. The acceptability of a risk may be determined using a risk matrix, which quantifies severity and likelihood. The objective in risk management should always be to reduce risk to as low as practicable regardless of whether or not the assessment shows that it can be accepted as is. This is a fundamental principle of continuous improvement. All risks that can be lowered should be lowered. All identified risks that are judged to be at an unacceptable level must be mitigated to an acceptable level.

**Risk Assessment Example: After analyzing the components, the resulting risks are plotted on a safety matrix. The matrix identified the highest risk as unacceptable. The company safety committee assigned the Director of Safety to develop a plan to mitigate the risk.**

#### 5.5 Control Safety Risk

**(OBJ)** The expectation of this process is that the organization will design and implement a risk control for each hazard for which there is an unacceptable risk. For each Risk Control the residual or substitute risk will be analyzed before implementation.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

5.5. Control Safety Risk

- A) Safety control/mitigation plans shall be defined for each hazard with unacceptable risk.
- B) Safety risk controls shall be:
  - 1) clearly described;
  - 2) evaluated to ensure that the requirements have been met;
  - 3) ready to be used in the operational environment for which they are intended; and
  - 4) documented.
- C) Substitute risk shall be evaluated in the creation of safety risk controls/mitigations.

**(DG)** Risk Controls should include a method to prioritize, track, implement, and determine the effectiveness of all actions taken.

Risk Controls are intended to improve the level of safety in the organization by lowering the risk associated with hazards identified in the organization's operation.

It is essential that all controls and mitigation plans be reviewed after implementation to assure they were fully implemented and determined to be effective.

**Risk Control Example: The Director of Safety developed a plan to install a raised walkway for passenger use on the way to the aircraft. A substitute risk analysis was performed and found no newly introduced negative effects. A residual risk analysis showed that the occurrence of a passenger slipping would be remote with the new control, thus reducing the risk to an acceptable level.**

**The Safety Committee accepted the plan and added an audit requirement every 3 months to assess the condition of the walkway. Any deterioration will be documented and monitored for 12 months.**

## 6. Safety Assurance and Internal Evaluation

### 6.1 General Requirements

**(OBJ)** The expectation of this process is that an organization will monitor, measure, and evaluate the performance and effectiveness of all risk controls, as well as ensure regulatory compliance. The purpose of the SMS is to identify, document, monitor, and control hazards in its operation.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

## 6. Safety Assurance and Internal Evaluation

### 6.1. General Requirements

The organization shall monitor their systems and operations to:

- 1) identify new hazards;
- 2) measure the effectiveness of safety risk controls; and
- 3) ensure compliance with regulatory requirements.

**(DG)** The purpose of Safety Assurance is to gain confidence in the performance and effectiveness of risk controls and to identify new hazards in the operational environment. Refer to AC 120-59A (IEP) for additional information.

### 6.2. System Description

**(OBJ)** The expectation of this process is that an organization will base its safety assurance function on a comprehensive system description as follows and described in System and Task Analysis (5.1).

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 6.2. System Description

The safety assurance function shall be based upon a comprehensive system description as described in Section 5.1.

**(DG)** The Safety Assurance function should be designed to assure that everything in the operation performs as intended and accomplishes the intended outcome.

### 6.3. Information Acquisition

**(OBJ)** The expectation of this process is that the organization will collect and manage the data necessary to demonstrate the effectiveness of organizational processes and the SMS.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 6.3. Information Acquisition

The organization shall collect the data necessary to demonstrate the effectiveness of the organization's:

- 1) Operational processes; and
- 2) the SMS.

**(DG)** Information acquisition is a key element in the SMS process because an SMS is a data driven system.

#### 6.3.1 Continuous Monitoring

**(OBJ)** The expectation of this process is that the organization will monitor sufficient operational data to conduct analysis. Products and services received from contractors also will be monitored to ensure a system view.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 6.3. Information Acquisition

#### 6.3.1 Continuous Monitoring

A) The organization shall monitor operational data (e.g., duty logs, crew reports, work cards, process sheets, or reports from the employee safety feedback system specified in Section 7.1.5 to:

- 1) assess conformity with safety risk controls (described in Section 5);
- 2) measure the effectiveness of safety risk controls (described in Section 5);
- 3) assess system performance; and
- 4) identify hazards.

B) The organization shall monitor products and services received from contractors.

**(DG)** Changes in the operating environment and other sources can induce new hazards that the system has not previously experienced. Only through continuous monitoring can the effects of these new hazards be identified.

#### 6.3.2 Internal Audits and 6.3.3 Internal Evaluation

**(OBJ)** The expectation of this process is that the organization will perform regularly scheduled internal audits of safety-related operational processes, including those processes performed by contractors. These audits will be used in determining the conformance and effectiveness of safety related controls that are currently in place.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.3.2 Internal Audits by Operational Departments

- A) Line management of operational departments shall ensure that regular internal audits of safety-related functions of the organization's operational processes (production system) are conducted. This obligation shall extend to any subcontractors that they may use to accomplish those functions.
- B) Line management shall ensure that regular audits are conducted to:
  - 1) determine conformity with safety risk controls; and
  - 2) assess performance of safety risk controls.
- C) Planning of the audit program shall take into account:
  - 1) safety significance of the processes to be audited; and
  - 2) the results of previous audits.
- D) The audit program shall include:
  - 1) definition of the audit:
    - a) criteria,
    - b) scope,
    - c) frequency, and
    - d) methods;
  - 2) the processes used to select the auditors;
  - 3) the requirement that individuals shall not audit their own work;
  - 4) documented procedures, which include:
    - a) the responsibilities; and
    - b) requirements for
      - (1) planning audits,
      - (2) conducting audits,
      - (3) reporting results, and
      - (4) maintaining records; and
      - (5) audits of contractors and vendors.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.3.3 Internal Evaluation

- A) The organization shall conduct internal evaluations of the operational processes and the SMS at planned intervals to determine that the SMS conforms to requirements.
- B) Planning of the evaluation program shall take into account:
  - 1) safety significance of processes to be audited; and
  - 2) the results of previous audits.
- C) The evaluation program shall include:
  - 1) definition of the evaluation:
    - a) criteria;
    - b) scope;
    - c) frequency; and
    - d) methods;
  - 2) the processes used to select the auditors;
  - 3) the requirement that auditors shall not audit their own work;
  - 4) documented procedures, which include:
    - a) the responsibilities, and
    - b) requirements for:
      - (1) planning audits,
      - (2) conducting audits,
      - (3) reporting results,
      - (4) and maintaining records; and
  - 5) *audits of contractors and vendors.*
- D) The program shall be under the direction of the management official described in Section 4.5.
- E) The program shall include an evaluation of the program required described in Section 6.3.2.
- F) The person or organization performing evaluations of operational departments must be functionally independent of the department being evaluated.

**(DG)** Procedures should be established that include responsibilities and requirements for planning and conducting audits. These procedures also should include reporting requirements and a means of analyzing the results. Vendors and contractors should be included in the audit plan. Records of the results of the audits should be maintained.

During its audit planning, an organization should include definitions of its audit criteria, scope, frequency, and methods. Audit records should be maintained.

It is essential to audit an organization's processes to ensure that they are effective and provide the intended results for which they were designed.

### 6.3.4 External Auditing of the SMS

**(OBJ)** The expectation of this process is that the organization will include the results of audits of oversight organizations in its Analysis of Data (6.4).

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 6.3.4 External Auditing of the SMS

A) The organization shall include the results of oversight organization audits in the analyses conducted as described in Section 6.4.

### 6.3.5 Investigation

**(OBJ)** The expectation of this process is that the organization will establish procedures to collect data and investigate incidents and accidents that occur. Instances of potential regulatory noncompliance also will be included in the investigation process.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 6.3.5 Investigation

A) The organization shall collect data on:

- 1) incidents, and
- 2) accidents.

B) The organization shall establish procedures to:

- 1) investigate accidents;
- 2) investigate incidents; and
- 3) investigate instances of potential regulatory non-compliance.

**(DG)** The progress of Safety Management through its history has always been dependant on mishap investigation and the use of information gained being fed back into the operational system as improvements. The goal of Safety Management Systems today is to obtain higher levels of safety by proactively identifying and managing risks. The historical rudiments of safety management are mishap investigations and regulatory compliance. These rudiments still should be maintained as the foundation from which modern risk management obtains its additional gains.

### 6.3.6 Employee Reporting and Feedback System.

**(OBJ)** The expectation of this process is that the organization will establish and maintain a confidential employee safety reporting and feedback system. Employees will be encouraged to use the safety reporting and feedback system without reprisal. Feedback should be rapid, useful, accessible, and intelligible to the reporting community.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 6.3.6 Employee Reporting and Feedback System.

- A) The organization shall establish and maintain a confidential employee safety reporting and feedback system as in Section 7.1.5).
- B) Employees shall be encouraged to use the safety reporting and feedback system without reprisal as in Section 4.2 B) 5).
- C) Data from the safety reporting and feedback system shall be monitored to identify emerging hazards.
- D) Data collected in the safety reporting and feedback system shall be included in analyses described in Section 6.4.

**(DG)** The organization should consider using any external reporting and disclosure programs available, such as AC 00-58, Voluntary Disclosure and Reporting Systems, AC 120-66, Aviation Safety Action Program, and the NASA Aviation Safety Reporting System. An organization should monitor data from the employee safety reporting and feedback system to identify emerging hazards. An organization should include data collected in its analysis of data.

Often the best source of information concerning the problems in organizations is the employees that work closest to the process. As with any quality improvement method, Safety Management Systems require information that only the employees possess concerning the true effectiveness or brittleness of the system. Employees are most often the best source for solutions to operational problems. To make it safe for the employees to provide such information, an organization's reporting system should be non-punitive. This policy should not apply to information received by the organization from a source other than the employee, or which involves an illegal act or a willful disregard of regulations or procedures. For the reporting system to be effective, the non-punitive aspect should exist both internally and externally.

### 6.4. Analysis of Data

**(OBJ)** The expectation of this process is that the organization will summarize, correlate between data sources, and analyze the data described in the above

process entitled, Information Acquisition (6.3), to demonstrate the performance, efficiency, and effectiveness of the organization's operational processes and the SMS and to determine root cause of nonconformances. Analysis will include a method to identify trends and include areas for potential improvement.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 6.4. Analysis of Data

- A) The organization shall analyze data the data described in Section 6.3 to demonstrate the effectiveness of:
  - 1) risk controls in the organization's operational processes, and
  - 2) the SMS.
- B) Through data analysis, the organization shall evaluate where improvements can be made to the organization's:
  - 1) operational processes, and
  - 2) SMS.

**(DG)** An organization's data analysis should include data from the Employee Reporting and Feedback System (6.3.6), information related to customer satisfaction, including, customer feedback, and customer complaints, as well as results of continuous monitoring of operational data, auditing, and investigations.

All information available should be collected and included in the analysis of data. Anything identified to have a safety implication should be subject to a System Assessment (6.5). There should be a prescreening of data to determine if new hazards and therefore requirements for safety risk management exist. Risk analysis is usually high level with limited detail while root cause analysis is lower level with increased detail.

#### 6.5. System Assessment

**(OBJ)** The expectation of this process is that the organization will perform an assessment of the output of its Analysis of Data (6.4). This data will be assessed to determine regulatory compliance, performance of safety related functions of operational processes, and conformity with SMS requirements. Taking into consideration the results of the Analysis of Data, a decision will be made regarding the disposition of identified nonconformances.

If a nonconformance identifies a new hazard or ineffective control, the associated risk will be analyzed in accordance with section 5.3, "Analyze Safety Risk". In all cases, a Corrective Action will be initiated and tracked until it is determined to be effective.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.5. System Assessment

- A) The organization shall assess the performance of:
  - 1) safety-related functions of operational processes against their requirements, and
  - 2) the SMS against its requirements.
- B) System assessments shall result in a finding of:
  - 1) conformity with existing safety risk control(s)/ SMS requirement(s) (including regulatory requirements);
  - 2) nonconformity with existing safety risk control(s)/ SMS requirement(s) (including regulatory requirements); and
  - 3) new hazard(s) found.
- C) The SRM process will be utilized if the assessment indicates:
  - 1) the identification of new hazards; or
  - 2) the need for system changes.
- D) The organization shall maintain records of assessments in accordance with the requirements of Section 4.9.

**(DG)** System Assessment is the decision function that follows Data Analysis and determines whether further risk analysis is required or what corrective action should be taken. This process of creating effective methods to manage identified risks eliminates potential precursors to accidents from the organization.

6.6. Preventive/Corrective Action

**(OBJ)** The expectation of this process is that the organization will take action to eliminate identified nonconformances identified during analysis to prevent recurrence. The process also will include a method to prioritize, track, implement, and determine the effectiveness of all actions taken.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.6. Preventive/Corrective Action

- A) The organization shall develop, prioritize, and implement, as appropriate:
  - 1) corrective actions for identified nonconformities with risk controls; and
  - 2) preventive actions for identified potential nonconformities with risk controls actions.
- B) Safety lessons learned shall be considered in the development of:
  - 1) corrective actions; and
  - 2) preventive actions.
- C) The organization shall take necessary corrective action based on the findings of investigations.
- D) The organization shall prioritize and implement corrective action(s) in a timely manner.
- E) The organization shall prioritize and implement preventive action(s) in a timely manner.
- F) Records shall be kept of the disposition and status of corrective and preventive actions per established record retention policy.

**(DG)** The organization's corrective action process is a reactive approach for the correction of identified nonconformances. The organization should develop a process to address identified areas for potential improvements as preventive actions.

The organization should keep records regarding the disposition and status of corrective and preventive actions per the established record retention policy.

The Safety Management System is dependent on corrective and preventive actions for system improvements that reduce the overall risk. This aspect of the Safety Management System is crucial because it is here that an organization should be the most creative and design truly effective improvements to its systems. The employees' perspective is often the best source of effective solutions for identified nonconformance.

## 6.7. Management Reviews

**(OBJ)** The expectation of this process is that Top Management will conduct regular reviews of the SMS, including outputs of Safety Risk Management (Section 5); Safety Assurance (Section 6); and Lessons Learned (Section 7.5). Top Management will determine the reporting requirements (inputs) to support this function.

Management reviews will include assessing the effectiveness of an organization's operational processes and the need for possible changes. Action items from previous Management Reviews also will be reviewed.

Top Management will document the outputs of the Management Review.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.7. Management Reviews

A) Top management will conduct regular reviews of the SMS, including:

- 1) the outputs of SRM (Section 5);
- 2) the outputs of safety assurance (Section 6); and
- 3) lessons learned (Section 7.5).

B) Management reviews shall include assessing the need for changes to the organization's:

- 1) operational processes, and
- 2) SMS.

**(DG)** Management Reviews of all aspects of Safety Management System performance is necessary to close the feedback loop back to the original Safety Plan (4.4). Top Management should use this information to course correct the organization's Safety Management System by improving the Safety Management Plan. The Management Review process is crucial in demonstrating management commitment and ensuring the effectiveness of the Safety Management System.

## 6.8 Continual Improvement

**(OBJ)** The expectation of this process is that the organization will use the outputs of the Management Review to continually improve the effectiveness of the SMS and of safety risk controls through the use of the safety and quality policies, objectives, audit and evaluation results, analysis of data, and corrective and preventive actions.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

6.8 Continual Improvement

The organization shall continuously improve the effectiveness of the SMS and of safety risk controls through the use of the safety and quality policies, objectives, audit and evaluation results, analysis of data, corrective and preventive actions, and management reviews.

**(DG)** Safety Management Systems are intended to continuously improve safety by using Quality Management techniques to reduce operational risks.

## 7. Safety Promotion

### 7.1 Safety Culture

**(OBJ)** The expectation of this process is that Top Management will communicate the safety related responsibilities for the organization's personnel including clear and regular communication of safety policy, goals, objectives, and standards.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 7. Safety Promotion

##### 7.1. Safety Culture

Top management shall promote the growth of a positive safety culture through:

- 1) publication of senior management's stated commitment to safety to all employees;
- 2) visible demonstration of their commitment to the SMS;
- 3) communication of the safety responsibilities for the organization's personnel;
- 4) clear and regular communication of safety policy, goals, objectives, standards, and performance to all employees of the organization
- 5) an effective employee safety feedback system that provides confidentiality as is necessary;
- 6) use of a safety information system that provides an accessible efficient means to retrieve information; and
- 7) allocation of resources essential to implement and maintain the SMS.

**(DG)** Top Management should promote the growth of a positive safety culture through the organization's safety policy. Top Management should document and demonstrate its commitment to safety, which should be visible to all employees. This commitment should include the allocation of resources that are essential to the implementation and maintenance of the organization's SMS.

For Top Management's commitment to safety to be credible, the organization should develop and implement an effective and non-punitive employee safety feedback system that provides confidentiality and fosters a climate that welcomes criticisms, comments, and feedback from all levels. Visible management commitment should help to promote a safety culture that is proactive toward risk reduction.

The SMS, by virtue of Documentation and Records Management (4.9), should provide a safety information system that includes an accessible and efficient means to retrieve information. This objective is best met by maintaining a database.

Culture is belief externalized or lived out. Safety Culture is a subset of corporate culture. Safety Culture is the outward manifestation of the beliefs concerning safety held by the people in the organization. Safety culture of an organization reflects the true philosophical commitments of the senior executives, not only what they say, but more importantly what their actions confirm they believe. In this culture, risk questions are asked in making day-to-day decisions and performing routine operations. Safety management cannot be an add-on patch to an existing organization; it must be included in the complete scope of the organization's systems.

A prerequisite to a culture that values safety is the belief that complying with safety regulations is paramount. This is essential because compliance with safety regulations is intended to assure that the minimum level of safety is obtained.

## 7.2 Communication and Awareness

**(OBJ)** The expectation of this process is that Top Management will communicate the output of the organization's SMS to its employees and to the oversight organization.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

### 7.2. Communication and Awareness

- A) The organization shall communicate outputs of the SMS to its employees, as appropriate.
- B) The organization shall provide access to the outputs of the SMS to its oversight organization, in accordance with established agreements and disclosure programs.

**(DG)** Organizations with a positive safety culture are characterized by communication founded on mutual trust. Truth in communication is the foundation upon which trust is built. Organizations with the most positive safety cultures will, by definition, have open and compliant attitudes towards safety regulations and will willingly participate in the voluntary disclosure and reporting programs available to them.

Safety is everybody's job. All employees need to know their part and role in assuring safety, especially the importance of raising safety concerns through the Safety Management System.

The organization should provide access to the outputs of the SMS to its oversight organization, in accordance with established agreements and disclosure programs.

When information is being disseminated a de-identification system should be used to maintain confidentiality.

### 7.3 Personnel Requirements (Competence)

**(OBJ)** The expectation of this process is that Top Management will promote the growth of a positive safety culture by developing and documenting competency requirements for those positions identified as safety related. The organization also will ensure that those individuals in safety related positions meet competency requirements for those positions.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 7.3. Personnel Requirements (Competence)

- A) The organization shall document competency requirements for those positions identified in Section 4.5.D).
- B) The organization shall ensure that those individuals in the positions identified in 4.5.D) meet those competency requirements.

**(DG)** The organization should develop a minimum qualification standard for safety-related personnel and ensure that those individuals meet or exceed that standard. By ensuring that the appropriate personnel are competent, an organization will reduce the risk of error in the performance of its safety-related functions. Competency is knowledge, skills, and abilities as obtained by education, training, and experience.

### 7.4 Training

**(OBJ)** The expectation of this process is that Top Management will promote the growth of a positive safety culture through the organization's policies by assuring that employees receive initial and recurrent training commensurate with their positions. The organization also will evaluate and document the effectiveness of training.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 7.4. Training

Training shall be developed for those individuals in the positions identified in 4.5.D).

- 1) Training shall include:
  - a) initial training; and
  - b) recurrent training.
- 2) Employees shall receive training commensurate with their:
  - a) Level of responsibility; and
  - b) Impact on the safety of the organization's product or service
- 3) To ensure training currency, it shall be periodically:
  - a) reviewed; and
  - b) updated

**(DG)** For each safety-related job, the training standard should retain currency through periodic reviews and updates. This could require additional training if the job content changes significantly.

If investigation identifies an individual not meeting the performance standards, the investigation should determine the area of knowledge lacking and remedial training may be required.

Training is essential to any corporate improvement effort and the Safety Management System is no exception. Initial and recurrent training should be used to provide the common philosophy, direction, expectations, and procedural requirements necessary for the Safety Management System to be effective.

#### 7.5 Safety Lessons Learned

**(OBJ)** The expectation of this process is that the organization will promote continuous improvement of its SMS by using safety lessons learned and communicating them to all personnel.

**(STND)** - FAA Advisory Circular AC 120-92 Appendix 1

#### 7.5. Safety Lessons Learned

- A) The organization shall develop safety lessons learned.
- B) Lessons learned information shall be used to promote continuous improvement of safety.
- C) The organization shall communicate information on safety lessons learned.

**(DG)** Unless it is demonstrated that the organization learns from its failings, it will never reduce its risk. When it is apparent that the organization does this, its safety

message becomes credible to the employees whose participation is essential to the success of the Safety Management System.

## 8. References

This Guidebook was developed from the following documents:

1. Federal Aviation Administration, Advisory Circular 120-92, Introduction to Safety Management Systems for Air Operators
2. Federal Aviation Administration, Advisory Circular 145-XX, Introduction to Safety Management Systems for Maintenance Organizations
3. International Civil Aviation Organization (ICAO) Document 9859, ICAO Safety Management Manual
4. International Civil Aviation Organization (ICAO) Document 9734, Safety Oversight Manual
5. International Civil Aviation Organization (ICAO) Document 9722, ICAO Accident Prevention Program
6. Annex 6 to the Convention on International Civil Aviation, Operation of Aircraft

## **APPENDIX A - Definitions**

**Accident** – an unplanned event or series of events that results in death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

**Analysis** – the process of identifying a question or issue to be addressed, modeling the issue, investigating model results, interpreting the results, and possibly making a recommendation. Analysis typically involves using scientific or mathematical methods for evaluation.

**Assessment** – process of measuring or judging the value or level of something.

**Audit** – scheduled, formal reviews and verifications to evaluate compliance with policy, standards, and/or contractual requirements. The starting point for an audit is the management and operations of the organization, and it moves outward to the organization's activities and products/services.

**Internal Audit** – an audit conducted by, or on behalf of, the organization being audited.

**External Audit** – an audit conducted by an entity outside of the organization being audited and include second and third party audits.

- **Second Party Audit** – conducted by persons having an interest in the organization, such as customers or other persons on their behalf.
- **Third Party Audit** – conducted by external or independent auditing organization.

**Aviation System** – the functional operation/production system used by the service provider to produce the product/service.

**Complete** – nothing has been omitted and the attributes stated are essential and appropriate to the level of detail.

**Continuous Monitoring** – uninterrupted watchfulness over the system.

**Corrective Action** – action to eliminate or mitigate the cause, or reduce the effects, of a detected nonconformity or other undesirable situation.

**Correct** – accurately reflects the item with an absence of ambiguity or error in its attributes.

**DG** – specific procedural guidance and/or examples on how to develop portions of a Safety Management System manual.

**Documentation** – information or meaningful data and its supporting medium (e.g., paper, electronic, etc.). In this context it is distinct from records because it is the written description of policies, processes, procedures, objectives, requirements, authorities, responsibilities, or work instructions.

**Evaluation** – a means of assurance through scheduled and unscheduled reviews and verifications of activities and operations to assess the effectiveness of the overall program, identify areas in need of improvement, and verify the results of those improvements. The starting point for an evaluation is the impacts and outputs of the organization and it moves inward to examine the operational reasons for these results.

**Hazard** – 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 to an accident or incident.

**Incident** – a near miss episode with minor consequences that could have resulted in greater loss. An unplanned event that could have resulted in an accident, or did result in minor damage, and indicates the existence of, though may not define, a hazard or hazardous condition.

**Lessons Learned** – knowledge or understanding gained by experience, which may be positive, such as a successful test or mission, or negative, such as a mishap or failure. Lessons learned should be developed from information obtained from within, as well as outside of, the organization and/or industry.

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

**Line Management** – management structure that operates the aviation system.

**Nonconformity** – non fulfillment of a requirement (ref. ISO 9000). This includes but is not limited to noncompliance with Federal regulations. It also includes company requirements, requirements of operator developed risk controls or operator specified policies and procedures.

**Operational Data** – duty logs, crew reports, work cards, process sheets or reports from the Employee Survey Feedback System.

**Operational Life Cycle** – period of time spanning from implementation of a product/service until it is no longer in use.

**Oversight** – a function that ensures the effective promulgation and implementation of the safety-related standards, requirements, regulations, and associated procedures. Safety oversight also ensures that the acceptable level of safety risk is not exceeded in the air transportation system. Safety oversight in the context of the safety management system will be conducted via oversight's safety management system (SMS-O).

**P&P** – “Policy and Procedural” expectations for the development from a manual format “shell” to a functioning Aviation Service Provider SMS manual system.

**Preventive Action** – action to eliminate or mitigate the cause or reduce the effects of a potential nonconformity or other undesirable situation.

**Procedure** – specified way to carry out an activity or a process.

**Process** – set of interrelated or interacting activities which transform inputs into outputs.

**Product/Service** – anything that might satisfy a want or need, which is offered in, or can be purchased in, the air transportation system. In this context, administrative or licensing fees paid to the government do not constitute a purchase.

**Product/Service Provider** – any entity that offers or sells a product/service to satisfy a want or need in the air transportation system. In this context, administrative or licensing fees paid to the government do not constitute a purchase. Examples of product/service providers include: aircraft and aircraft parts manufacturers; aircraft operators; maintainers of aircraft, avionics, and air traffic control equipment; educators in the air transportation system; etc. (Note: any entity that is a direct consumer of air navigation services and or operates in the U.S. airspace is included in this classification; examples include: general aviation, military aviation, and public use aircraft operators.)

**Quality Management System (QMS)** – a management system that directs and controls an organization with respect to quality.

**Records** – evidence of results achieved or activities performed. In this context it is distinct from documentation because records are the documentation of SMS outputs.

**Residual Safety Risk** – the remaining safety risk that exists after all control techniques have been implemented or exhausted, and all controls have been verified. Only verified controls can be used for the assessment of residual safety risk.

**Risk** – The composite of predicted severity and likelihood of the potential effect of a hazard in the worst credible system state.

**Risk Control** – refers to steps taken to eliminate hazards or to mitigate their effects by reducing severity and/or likelihood of risk associated with those hazards.

**Safety Assurance** – SMS process management functions that systematically provide confidence that organizational products/services meet or exceed safety requirements.

**Safety Culture** – the 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 preventive measures.

**Safety Management System (SMS)** – the formal, top-down business-like approach to managing safety risk. It includes systematic procedures, practices, and policies for the management of safety (as described in this document it includes safety risk management, safety policy, safety assurance, and safety promotion).

- **Product/Service Provider Safety Management System (SMS-P)** – the SMS owned and operated by a product/service provider.
- **Oversight Safety Management System (SMS-O)** – the SMS owned and operated by an oversight entity

**Safety Objectives.**<sup>1</sup> – something sought or aimed for, related to safety.

- NOTE 1: Safety objectives are generally based on the organization’s safety policy.
- NOTE 2: Safety objectives are generally specified for relevant functions and levels in the organization.

**Safety Planning**<sup>2</sup> – part of safety management focused on setting safety objectives and specifying necessary operational processes and related resources to fulfill the quality objectives.

**Safety Risk** – the composite of predicted severity and likelihood of the potential effect of a hazard.

**Safety Risk Control** – anything that reduces or mitigates the safety risk of a hazard. Safety risk controls must be written in requirements language, measurable, and monitored to ensure effectiveness.

**Safety Risk Management (SRM)** – a formal process within the SMS composed of describing the system, identifying the hazards, assessing the risk, analyzing the risk, and controlling the risk. The SRM process is embedded in the processes used to provide the product/service; it is not a separate/distinct process.

**Safety Promotion** – a combination of safety culture, training, and data sharing activities that support the implementation and operation of an SMS in an organization

**Severity** – the consequence or impact of a hazard in terms of degree of loss or harm.

**Substitute Risk** – risk unintentionally created as a consequence of safety risk control(s).

**System** – 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.

**Top Management** – (ref. ISO 9000:2000 definition 3.2.7) the person or group of people that directs or controls an organization.

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<sup>1</sup> Adapted from definition 3.2.5 in ISO 9000-2000 for “quality objectives.”

<sup>2</sup> Adapted from definition 3.2.9 in ISO 9000-2000 for “quality planning.”

## APPENDIX B – Implementation Strategy

### The SMS Maturity Model

Initial implementation strategy will follow the four phases outlined in the ICAO SMS training course (as of Jan. 07). The phases of implementation will be arranged in the format of a maturity model, similar to that developed as the Capability Maturity Matrix (CMM) by the Software Engineering Institute of Carnegie-Mellon University. This technique has also been employed by the U.K. Health and Safety Executive (HSE – equivalent to U.S. OSHA) as a safety culture maturity model. Figure B-1 depicts the maturity model that is the framework for the implementation strategy.

In addition to the four phases in the ICAO model, the maturity model used will contain a level zero, which will be a preliminary phase of orientation and familiarization for air carriers. In this phase, voluntary SMS participants will be given briefings and other information to help them decide whether or not they wish to implement an SMS. It is envisioned that once SMS regulations are in place, level zero will be deleted. Moreover, once existing certificated operators have implemented required SMSs, the implementation strategy will be integrated into the certification process.

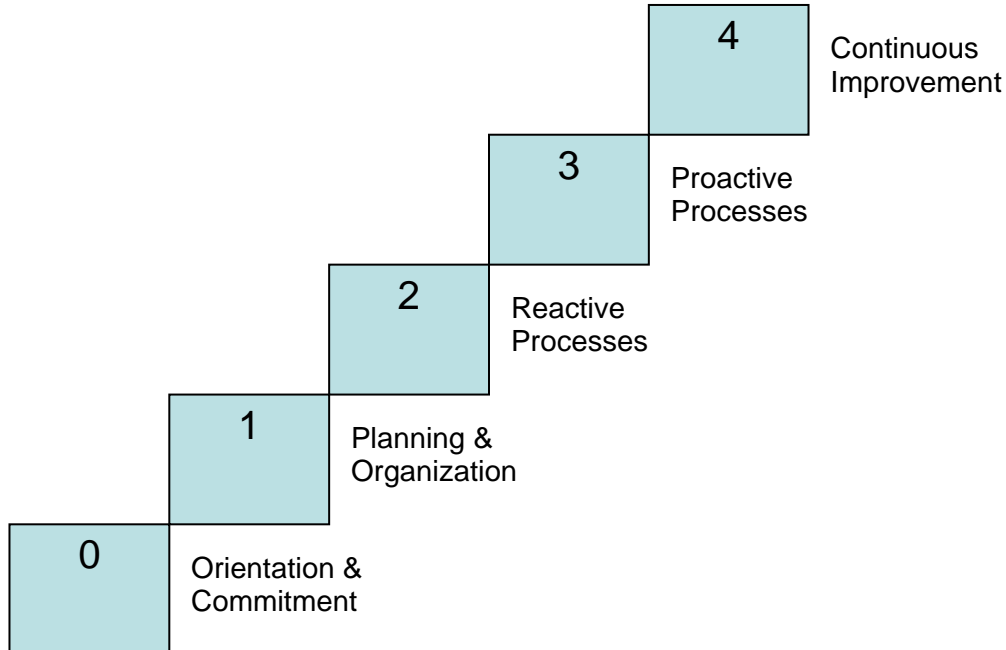


Figure B-1. SMS Maturity Model

## Phases of Implementation

Phases of implementation, based on the maturity model shown above, are outlined below. Numbers in parentheses refer to the clauses in Appendix 1 of AC 120-92.

### Level 0 – Orientation and Familiarization

Level zero is for certificated operators voluntarily participating in the SMS process, as outlined above. After issuance of the final SMS rule, level zero will apply only to those operators and other service providers who are not required to have an SMS. Level zero ends with a documented commitment on the part of the service provider's management to implement an SMS.

- Orientation and outreach presentations
- Distribute SMS documents and participant guide
- Secure commitment to implement SMS (4.2 A & B1)

### Phase 1 – Planning & Organization

In phase 1, basic planning and assignment of responsibilities are conducted. Level 1 begins with a gap analysis. From this gap analysis, participants can determine the current status of the service provider's current safety management processes. From here, detailed planning for development of remaining processes can be done. Phase 1 ends with the completion of an SMS implementation plan.

- Identify and assign safety responsibilities to managers.
  - 1.1 Management commitment and responsibility (4.2B, 4.5A, 4.5B)
  - 1.2 Safety responsibilities of managers (4.5D, 4.1)
- Identify the person responsible for implementing the SMS.
  - 1.3 Appointment of key safety personnel (4.5C)
- Describe the system.
  - 1.4 SMS implementation plan (4.4, 4.1)
- Conduct a gap analysis of existing resources compared to SMS requirements.
  - 1.4 SMS implementation plan (4.4)
- Develop an SMS implementation plan.
  - 1.4 SMS implementation plan (4.4)
- Develop documentation relevant to safety policy and objectives.
  - 1.6 Documentation (4.9)
- Develop and establish means for safety communication.
  - 4.2 Safety communication (7.2)
- Communicate the SMS implementation to all employees.
  - 4.2 Safety communication (7.2)
- Develop an initial training plan for all employees.
  - 4.1 Training and education (7.4)

## **Phase 2 – Reactive Processes**

The objective of phase 2 is to correct known deficiencies in safety management practices and operational processes. These may be based on a variety of sources including past inspection and audit reports, accident and incident investigations and employee reports, among others. For this reason, this phase is considered reactive. In order to perform these processes in a systematic fashion, basic safety information management and analytical processes must be in place. At the end of phase 2, most of the essential safety management structure and basic functions will be in place. However, because the forward looking systems and task analyses have not yet been conducted, the system is still functioning at a reactive level.

- Develop and implement basic safety information management and analytical processes for reactive safety management processes (6.3-6.7)
  - Information acquisition (6.3)
  - Analysis of data (6.4)
  - System assessment (6.5)
  - Preventive and corrective actions (6.6)
  - Management reviews (6.7)
- Implement safety risk management (SRM) for reactive processes.
  - 2.1 Hazard identification process (5.2)
  - 2.2 Risk assessment and mitigation processes (5.3, 5.4, 5.5)
  - 2.3 Internal safety investigations (6.3.5)
- Perform training relevant to SMS implementation plan and SRM components.
  - 4.1 Training and education (7.4)
- Develop documentation relevant to SMS implementation plan and SRM components (reactive processes).
  - 1.4 SMS implementation plan (4.4)
  - 1.6 Documentation (4.9)
- Initiate a non-punitive voluntary employee reporting system. (6.3.6, 4.2B5)

## **Phase 3 – Proactive and Predictive Processes**

During phase 3, systems and task analyses are conducted for all of the operational systems listed in clause 4.1 of Appendix 1, AC 120-92 (or equivalent). The results of these analyses are, in turn, used in a hazard analysis to determine potential problems with the operational processes, their documentation, training, etc. that could pose safety risk. The results of these analyses are then passed through the SRM process, including development of any risk controls and associated process re-design that may be deemed necessary. Information management and analytical processes are refined as necessary. At the end of phase 3, an initial proactive analysis of the service provider's processes has been performed but the system lacks the mature safety assurance processes necessary to ensure sustainment of these processes over time and changes in the operational environment.

- Implement safety risk management for proactive and predictive processes.
  - 2.1 Hazard identification process (5.2)

- 2.2 Risk assessment and mitigation processes (5.3, 5.4, 5.5)
  - 2.3 Internal safety investigations (6.3.5)
- Perform training relevant to proactive and predictive processes.
  - 4.1 Training and education (7.4)
- Develop documentation relevant to proactive and predictive processes.
  - 1.4 SMS implementation plan (4.4)
  - 1.6 Documentation (4.9)
- Perform a system and task analyses (5.1)
- Incorporate hazards from system and task analyses into SRM process (5.1 – 5.5)
- Refine safety information management and analytical processes to incorporate proactive safety management processes (6.3 – 6.6)
  - Information acquisition (6.3)
  - Analysis of data (6.4)
  - System assessment (6.5)
  - Preventive and corrective actions (6.6)
  - Management reviews (6.7)
- Develop policies and procedures for safety assurance (6.2)

#### **Phase 4 – Operational Safety Assurance and Continuous Improvement**

Phase 4 is the final mature phase of the SMS. In this phase, continuing operational safety is assessed through the implementation of periodic auditing, feedback, and continuous corrective action to maintain both existing risk controls as well as adaptation of operational systems to meet changing needs.

- Implement an operational safety assurance program (6.x)
  - 3.1 Safety performance monitoring and measurement (6.3.1 - 6.3.3)
  - 3.2 The management of change (5B4, 5E)
  - 3.3 Continuous improvement of the safety system (6.8, 4.2B2)
- Develop acceptable level(s) of safety (4.7)
- Develop safety indicators and targets (4.7)
- Perform training relevant to operational safety assurance.
  - 4.1 Training and education (7.4)
- Develop documentation relevant to operational safety assurance.
  - 1.6 Documentation (4.9)