United States Department of Agriculture

Forest Service

National Aviation Safety And Mishap Prevention Plan

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USDA FOREST SERVICE
AVIATION SAFETY AND MISHAP PREVENTION PLAN (ASMPP)

CHAPTER 1

INTRODUCTION

1.1 PURPOSE

A. Forest Service Safety Policy Statement: "Our number one job at the Forest Service is to protect our most valuable resource—our employees. Unless we do that, we cannot be a world-class leader in natural resource management. In addition, I (Chief) share a deep commitment with the National Leadership Team to protect every Forest Service partner and the public we serve. Therefore, I expect every line officer, manager, supervisor, and employee to manage risk exposure. That means identifying and abating hazards, refusing to accept unnecessary risk, and making risk-related decisions at the appropriate level."

B. The USDA Forest Service Aviation Safety and Management Strategy reflects our commitment to safety as a core organizational value and invests in a strategy that is dependent upon a strong aviation safety culture. The "Plan" establishes a System Safety approach to ensure that personnel, property, and the public are protected from the risk of aircraft mishaps. Our stated philosophy is that "all accidents are preventable."

1.2 WHAT IS SAFETY?

The ultimate goal of the Forest Service's Aviation Safety Program is "Zero Mishaps", but that alone does not define the safety program. Safety is transforming the severity and likelihood of risk, which is inherent in all human activity, to lower, acceptable levels. Safety is freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

1.3 WHAT IS SYSTEM SAFETY?

System Safety is a group of interacting, interrelated, or interdependent elements forming a complex whole (USFS Aviation is a complex whole). Using analytical techniques to identify system weaknesses and conditions that if left unchanged could lead to unwanted events. Once identified, these potential accidents/incidents must be

communicated to stakeholders with adequate counter measures put in place to prevent an accident.

1.4 ELEMENTS

There are six elements forming the core of the Forest Service National Safety and Health program that provide "umbrella" policy and are addressed by this aviation safety plan, as follows:

1. Program Management (ASMPP Chapters 3 and 6)
2. Safety Training and Education (ASMPP Chapter 5.1)
3. Safety and Health Promotions (ASMPP Chapter 4.5)
4. Recordkeeping and Accident Investigation (ASMPP Chapters 4.2 & 4.3)
5. Inspections (ASMPP Chapter 4.6c)
6. Program Analysis and Evaluation (ASMPP Chapter 4.6 A & B)

CHAPTER 2

AVIATION SAFETY POLICY

2.1 AVIATION SAFETY POLICY

Direction found in FSM 6700 Safety and Health and FSM 5700 Aviation Management establish policy directing the implementation of the Aviation Safety and Mishap Prevention Plan. This plan by design constitutes the detail necessary to further enhance basic aviation safety policy and maintains the same authority.

2.2 SAFETY CULTURE

A. Safety culture is a term used to identify an overall approach to managing safety within an organization. Rather than being a set of rules or procedures, safety culture is an attitude or way of life that is practiced in all endeavors. An example of safety culture is the unprompted action of fastening your seat belt when entering any automobile, even a taxicab, when traveling. For organizations and individuals practicing a culture of safety, giving safety briefings and wearing a safety belt become second nature.

Safety awareness is a mental philosophy and demonstrated attitude fostered by effective management leadership. Forest Service aviation safety management ensures that standards and procedures are established, understood and followed. Promotion of safety awareness, positive attitudes, and appropriate training are key to shaping a culture that believes aviation accidents are preventable.

B. The following are elements of a safety culture that we embrace:

- Unqualified commitment to safety as a behavioral pattern and pervasive way of

life by top management.

- Unambiguous expectations by each level of management as well as each peer group that, for all employees, safe life patterns and work habits are as normal as breathing and must be practiced off the job as well as on the job.
- Availability of quality, standardized equipment with which to accomplish the assigned tasks.
- Clear, easily understood operating procedures, followed without deviation.
- Inclusive system of communications for collecting, analyzing, and exchanging incident data related to safety.
- Non-retribution for submission of safety concerns.
- Peer acceptance that accidents are preventable, regardless of operations.
- Peer acceptance that safety is a matter of lifestyle – a matter of culture.

Core Targets of the Forest Service aviation safety program are:

- To eliminate loss of life, suffering from injury, and anguish of family and friends.
- Reduce the overall costs to the program resulting from mishaps.
- Achieve and maintain the highest quality aviation safety system within our monetary means.
- Provide uncompromising service in all matters pertaining to aviation safety to protect our people and preserve our resources.

CHAPTER 3

MANAGEMENT

3.1 ORGANIZATION

A. FSM 5720.4 Responsibility outlines the duties of individual positions within the organization. All personnel having aviation oversight responsibilities are expected to actively promote the Aviation Safety and Management Strategy through a systems approach. Aviation Safety personnel will work closely with Occupational Safety and Health functions to assure that a seamless safety program supports all FS missions. Operational Risk Management (ORM) will be used at all levels of aviation activities.

B. The National Aviation Safety Center (NASC) is located in Boise, Idaho near the National Interagency Fire Center (NIFC). The NASC Develops, maintains, and oversees safety and accident prevention systems including a website for safety information and data retrieval, SAFECOM mishap reporting system, accident investigations and lessons learned feedback, quality assurance/evaluation measures, safety awards, safety education program and resource library. Interagency participation is encouraged through training, common electronic media, cooperative prevention efforts, and co-located resources.

C. Regions are responsible for ensuring that all aviation operations are in compliance with policy and regulation and that a healthy safety culture is promulgated throughout the various levels of the organization.

3.2 AUTHORITIES AND RESPONSIBILITY

A. The following aviation positions form the core safety functions that provide leadership in the aviation safety culture:

1. National Aviation Safety and Training Manager (NASTM). Provides leadership and oversight for aviation mishap prevention, safety training and education programs on a national level. The NASTM maintains professional relationships with cooperators and other state and federal agencies to promote and foster the safety culture. Staff specialist positions include:
2. National Aviation Safety and Training Specialists. These positions provide coordination, technical support, quality assurance, and standardization for all aviation safety and training programs including: mishap investigation, trend analysis, database and website management, airspace, and training programs.
3. Regional Aviation Safety Manager (RASM). This is a full time position responsible for developing and implementing a comprehensive regional aviation safety program. This includes policy development, safety awareness and mishap prevention, risk management and oversight, aviation safety training and education, and accident/incident reporting and investigation. Each Regional Aviation Safety Manager should maintain qualifications as a Qualified Technical Investigator.
4. Forest Health Protection (FHP) Aviation Safety Manager. Serves as a national focal point for all FHP aviation activities, including safety, training, projects, reviews, and to better integrate the FHP aviation program with Fire and Aviation Management.
5. Forest/Unit Aviation Officer. Ensure safe, cost-effective aviation operations by planning, managing, evaluation and coordinating Forest Service aviation operations and contract aviation services Implements System Safety and Operational Risk Management into all aspects of the operation/plan.

B. The following groups serve to organize efforts in a manner that provides consensus and support to the aviation community and the safety culture:

1. Aviation Safety Council: Comprises the NASC staff and RASMs in an assembly that addresses aviation safety and management issues through regular meetings and conference calls.

2. Safety Technical Assistance Team (STAT): These teams are organized by and report to the RAO and/or RASM. STAT teams provide valuable safety assistance

during periods of peak use of operational resources. They may provide written evaluations of field operations and fix discrepancies on sight without further follow-up.

3. Interagency Aviation Training Steering Group: This group reviews annual safety reports to establish training needs, determine scope of training programs, and coordinate specific training curriculum that directly benefit the aviation safety program.

4. Interagency Committee for Aviation Policy (ICAP): Establishes subcommittees that affect the safety and training standards for Federal aviation programs. The USFS, through the Department of Agriculture, is a standing member of ICAP and as such complies with the requirements for reporting of operational and safety data.

CHAPTER 4

ACCIDENT PREVENTION SYSTEMS

4.1 A SYSTEMS APPROACH

The Forest Service aviation accident prevention system is predicated upon the application of best practices through forward thinking and throughout the entire organization and for the entire life cycle. Units shall develop and maintain appropriate processes that will identify potential hazards before they become an accident. The Aviation Safety Council has the responsibility for maintaining the Aviation Safety and Mishap Prevention Plan on an "as needed" basis.

The practices fostered and promoted by the NASC include a risk management program, the SAFECOM mishap reporting system, accident investigations and lessons learned feedback, standardization and quality assurance measures, safety awards, and a safety education program that is supported by a resource library. Additionally, aviation systems training will be made available through the Interagency Aviation Training (IAT) process and by attending the FAA Systems Safety course for all levels of aviation management.

4.2 REPORTING HAZARDS, INCIDENTS, and MISHAPS

A. The SAFECOM system as authorized by FSM 5720.45, provides the backbone of our accident prevention communication network. Each individual and organizational unit has an obligation and responsibility to share aviation mishap prevention information. The communication tool provided to assist in this effort is the SAFECOM (FS Form 5700-14).

SAFECOMs are used to report any condition, observance, act, maintenance problem, or circumstance, which has potential to cause an aviation-related mishap. Submitting a

SAFECOM is not a substitute for "on-the-spot" correction(s) to a safety concern, rather it is a tool used in the documentation, tracking, and follow-up corrective action(s) related to safety issues.

SAFECOMs may be submitted electronically via the SAFECOM Website at: *www.safecom.gov*, or provided via a written copy on Form 5700-14 to the UAO/FAO, RASM or NASC. Upon receipt of the written copy, the aviation safety staff will submit the SAFECOM electronically. Corrective action(s) and comments should be documented on the form. In either case, the form may be submitted anonymously.

When a mishap involves damage or injury, notify the National Aviation Safety Center immediately by the most expeditious means available. A SAFECOM does not replace the requirement for initiating an accident/incident report (FSM 5723.21), but should be submitted once the initial mishap emergency response is completed.

B. Each Forest Service Unit shall have an aviation mishap response plan which addresses at a minimum; overdue and missing aircraft, an aircraft accident report form, emergency contact list and notification protocols for reporting aircraft mishap. This plan shall be updated annually. (FSM 5723.21)

C. Trends that cause a significant hazard will be addressed and disseminated by an Aviation Safety Alert. Alerts will be distributed on a red-bordered format, sent electronically from the NASC to Regions for distribution. Maintenance difficulties may also be identified as a trend in SAFECOM submissions. Maintenance issues worthy of action, but not considered to be significantly hazardous, may be distributed on blue-bordered Technical Alerts.

4.3 MISHAP INVESTIGATION

A. The primary purpose of aircraft accident and incident investigation is to identify and determine causal factors that may be used in the prevention of future occurrences. The Forest Service may be made a party to the official NTSB investigation team and as such must adhere to the requirements of the NTSB Investigator in Charge.

B. The Forest Service will conduct an independent internal investigation of all accidents and some incidents to identify management factors that may contribute to system-wide adverse effects on the safety of our flight operations and personnel. The process for FS investigations is contained in the USDA Forest Service Accident Investigation Guide.

C. Qualified Technical Investigators (QTI's) will conduct Forest Service aviation mishap investigations. Each RASM should be qualified to conduct a comprehensive mishap investigation as a QTI.

4.4 COMMUNICATION AND LESSONS LEARNED

A. Safety awareness is clearly one of the most important factors in safe and effective aviation operations. It is essential that, in addition to aircraft pilots, aviation users, supervisors, and managers be knowledgeable of the inherent hazards of aviation operations. Lessons learned through investigations and Accident Review Board (ARB) recommendations will be shared through a variety of tools including Safety Alerts, Technical Bulletins, official memoranda, information bulletins, training course materials, and official reports.

B. The NASC maintains a comprehensive database that serves to support our corporate memory and historical record of mishaps. This database is a crucial source of information for identifying long-term trends.

C. NASC maintains a website to facilitate communications with federal and contract personnel. The website contains an annual accident synopsis, safety mishap data, access to SAFECOM and Technical Bulletins, and has access to the DOI/OAS database.

4.5 AVIATION SAFETY AWARDS

A. Individuals who contribute significantly to the safety of Forest Service aviation operations, management, training, or other support roles should be recognized. Individual acts that prevent the occurrence of a mishap, prevent injury, result in the reduction of a significant risk, mitigate a hazard, provide exemplary service, or produce anything that enhances aviation safety may be eligible for an award.

B. There are several types of awards that may be used in recognition of a safety act including cash award, Time Off award, AIRWARDS, or other recognition appropriate to the event. AIRWARDS will be issued as a non-monetary recognition of any deserving safety act.

C. The AIRWARDS program uses on the spot recognition. A compilation of AIRWARDS will be published periodically and distributed on a national basis.

D. The National Aviation Safety Award program is managed by the NASC to provide recognition that is distributed nationally on a periodic basis. Submissions will be made through the RASM to the NASTM for review and approval.

E. Safe Flying Awards recognize Forest Service employee pilots who have distinguished themselves through a history of safe flight operations. Forest Service pilots who have accumulated the specified flight time in hours or longevity in calendar years are eligible for nomination and award. (FSM 5724.2)

4.6 ACCOUNTABILITY AND QUALITY MANAGEMENT

A. The Washington Office has responsibility for fire and aviation program reviews that satisfy our quality management efforts. Program evaluations may be accomplished using a team of FS, interagency and/or industry aviation and management officials to conduct surveys, audits, and reviews. The FS maintains records of program evaluation that comply with the standards established by Interagency Committee for Aviation Policy (ICAP) guidelines. Evaluations are generally conducted on a periodic, five-year cycle that accomplishes the review of each Region sequentially, in accordance with FSM 5700.

B. Safety evaluations are a means of determining compliance with safety standards and detecting unsafe conditions prior to experiencing a mishap involving possible loss of life, personal injury, or property damage. Feedback from field evaluations should be provided by RASM's to the NASC for the purpose of conducting routine and ongoing safety analysis, detection of trends, and early detection of systematic problems.

C. Preparedness reviews/site inspections are conducted on an annual basis by aviation specialists during field assistance visits to Forests, aviation bases, incident bases, and projects. RASM follow-up activity is desirable in order to verify that corrective actions are taken.

CHAPTER 5

AVIATION SAFETY EDUCATION

5.1 NATIONAL AVIATION TRAINING

The Forest Service Fire and Aviation Management program poses unique operational and management challenges that require specialized training. It is the responsibility of the Washington Office to oversee aviation operations training. The National Aviation Safety Center will provide oversight of aviation safety training and education.

A. The goal of the Aviation Safety Education Program is to provide a training program that supplements operational and developmental training efforts. It is our intention to integrate aviation safety training with our cooperators to the extent practicable. However, internal needs will take priority and where applicable, Forest Service policy will be the guiding principles for the development, content, and delivery of our training.

B. The USDA Forest Service provides professional and technical training for employees, cooperators, and contract personnel. Some training is provided through the Interagency Aviation Training (IAT) program. Each operating unit must develop and implement plans for the identification of aviation training needs specific to its mission.

C. Contractor employee training promoted by NASC consists of topics that enhance aviation safety and accident prevention in the Forest Service mission, organization, and operations. Such training is not intended to provide qualification, proficiency, or return to current status for aircraft pilots.

Chapter 6
OPERATIONAL RISK MANAGEMENT (ORM)

6.1 **PURPOSE** - This Instruction is intended to standardize Operational Risk Management (ORM) policy, and outline procedures and responsibilities for implementation.

A. ACTION - Instruction is distributed to the widest extent possible and all personnel comply with its provisions.

B. **DIRECTIVES AFFECTED** - FSM 5700, FSH 5709.16, and all Forest Service and interagency aviation operations and training guides.

C. BACKGROUND - Human error is the leading contributing factor in mishaps that have resulted in the loss of personnel and equipment within the Land Management Agencies. Faulty risk decisions have too often placed our people at greater risk than necessary. The goal of this program is to:

Promulgate a decline in mishap rates with the ultimate goal of attaining a zero fatal accident rate.

Beyond reducing losses, risk assessment and management provides a logical process to identify and exploit opportunities producing the greatest return on our investment of time, dollars, and personnel.

6.2 LEVELS OF RISK MANAGEMENT

The risk management process may need to be altered to meet constraints imposed by time, equipment, or operational needs. The following three conditions identify situations where risk management techniques may be altered:

Time-Critical: Time-critical risk management is an "on the run" mental or verbal review of the situation using the basic risk management process without recording the

information. This option is most frequently applied by ATGS and Lead Plane pilots in routine fire operations.

Deliberate: Deliberate risk management addresses planning for operations conducted at a daily level, where there is opportunity to address hazards before commencement of the actual mission. This level may be more likely to utilize some form of documentation.

Strategic: This process deals with long range planning for complex missions or program development and review.

6.3 THE CONCEPT OF RISK MANAGEMENT:

A. PRINCIPLES: There are four basic risk management principles that should be applied before conducting any anticipated job, action or mission. These principles are relevant throughout an operation. Decision making is a continuous and on-going process as events develop.

1. **Accept No Unnecessary Risk**: All activities contain various levels of risk.
2. **Accept Risk Only When Benefits Outweigh Costs**: Compare all identified benefits to all potential costs. Even high-risk operations may be conducted when decision-makers clearly acknowledge the sum of the benefits exceeds the potential costs.
3. **Make Risk Decisions at the Appropriate Level**: Anyone can make a risk decision. Decisions to allocate resources must be made at the appropriate level to reduce the risk or eliminate the hazard.
4. **Integrate risk management into mission planning, preparation, and execution**: Operational Risk Management is equally critical in all phases of activity. Although risks can be addressed in planning, risk can change during an actual mission as new hazards are realized.

6.4 MANAGEMENT ROLES AND RESPONSIBILITIES:

RAO and RASMs, Forest/Unit Aviation Officers monitor the program to ensure that operators**:**

1) Manage risk effectively.
2) Select from risk reduction options developed.
3) Accept or reject risk based on the benefit derived.
4) Motivate operators and managers to use ORM and utilize training opportunities.

Operators and CORs**:**

1) Assess risks and implement appropriate safeguards as needed.
2) Understand risks that are acceptable.

3) Understand, accept, and implement risk management processes.
4) Maintain situational awareness of the changing risks associated with an operation and notify supervisors when appropriate.

6.5 OPERATIONAL RISK MANAGEMENT PROCESS

A. Identify Hazards In accordance with the FS Health and Safety Code Handbook (FSH 6709.11), Zero Code, pages 0-4 through 0-5, (See also Ch.70) A hazard analysis is required to identify job-related-hazards, manage risk and conduct a "tailgate" safety session to go over the precautions identified in the hazard analysis. The hazard analysis may be documented on Form 6700-7, a Project Aviation Safety Plan (PASP, IHOG) or equivalent.

To successfully identify and analyze risk, carefully define the hazards and their potential severity or impact on the mission. It is critical that personnel with technical knowledge and operational experience in the mission are involved in this step.

Personnel: Human error is the single leading contributing factor in all mishaps. Are personnel properly trained and capable of handling the mission's demands? Are they fatigued, complacent, or suffering from physical or mental stress or possibly taking over-the-counter or prescribed medications (see AIM 8-1-1 at http://www.faa.gov/ATPubs/AIM/Chap8/aim0801.html#8-1-1). All these factors can adversely affect human performance.

Equipment: Is the equipment adequate and functioning properly and will it do so throughout the planned evolution (remember the safety triangle: Cost Effective, Safe and Right)?

Environment: How will weather, geographic influences, physical barriers, workplace climate, and available light affect the event?

B. **Assess Risks**

Using a risk assessment tool such as a risk assessment matrix, identify the level of risk. Develop and use an appropriate risk rating scale for the mission .

RISK ASSESSMENT MATRIX				
	Severity			
Likelihood	Catastrophic	Critical	Marginal	Negligible
Frequent				
Probable				
Occasional				
Remote				

Severity Scale Definitions	
Catastrophic	Accident with serious injuries and/or fatalities. Loss (or breakdown) of an entire system or sub-system.
Critical	Accident or Serious Incident with injuries and/or moderate damage to aircraft. Partial breakdown of a system or subsystem.
Marginal	Accident or Incident with minor injury and/or minor aircraft damage. System Deficiencies leading to poor air carrier performance or disruption to the air carrier schedules.
Negligible	Less than minor injury and/or less than minor aircraft damage. Little or no effect on system or subsystem.

Likelihood Scale Definitions	
Frequent	Will be continually experienced unless action is taken to change events.
Probable	Will occur often if events follow normal pattern
Occasional	Potential for infrequent occurrence.
Remote	Not likely to happen (but could).

Risk Classification	
Red	High Risk – Unacceptable; requires action.
Yellow	Medium Risk – May be acceptable with review by appropriate authority; requires tracking and probable action.
Green	Low Risk – Acceptable without further action.

General Risk Assessment Matrix

C. Analyze risk control measures

Consider options: - Evaluate all options that could be implemented to reduce risk. General options are:

A*void risk*
S*pread risk*
T*ransfer risk*
A*ccept risk*
R*educe risk*

Types of Risk controls: - Specific risk controls may be implemented to mitigate individual or even multiple hazards. Control types are as follows:

- Engineering
  (1) PPE
  (2) Hardware (example: Right equipment for the job?)
  (3) Airframe inspections/modifications
- Administrative
  (1) Modify exposure or mission
  (2) Training
  (3) Warning signs
  (4) Established policy

D. Make control decisions

The control options identified in step 3 must be evaluated, and appropriate controls selected for the operation. The controls selected for use will be based on the following criteria:

- Cost effectiveness.
- Available time to implement new controls.
- Selected controls do not create new risks.
- Decisions must be made at the appropriate level.
- Evaluate effectiveness of new controls.
- Evaluate new risk rating after all controls are in place.

When benefits outweigh risk, controls are at an acceptable level. If controls are inadequate, return to step 3

E. **Implement Controls**

It is important to evaluate the controls already in existence and determine if they are effective and if they will be affected by the new controls. Resource availability may delay the implementation of the new controls. Ensure that such a delay will not adversely affect the new controls. New controls may produce changes that have to be accepted, training and education may be required to properly implement controls. In every case the implementation of new controls must be briefed and all parties affected must have a clear understanding of their roles and responsibilities. As stated earlier it is important that final decisions to implement controls and conduct operations are made at the appropriate level and that knowledgeable personnel are involved in the decision.

F. Supervise and Review

Monitor situation:

- Ensure employees work to standards and communicate problems.
- Supervisors enforce standards and evaluate control effectiveness.
- Are mission objectives being accomplished?
- Has the situation changed?
- Check effectiveness of safeguards.
- Take action when necessary to correct ineffective risk controls
- Reinitiate the risk management steps in response to new hazards.
- Ensure everyone involved with the plan is informed of any changes.

6.6 SUMMARY:

It is important to remember **RISK MANAGEMENT IS A CONTINUOUS PROCESS.** Failure to respond to changes in the operation can become a link in a chain of errors that lead to a mishap. Be prepared to re-assess and begin the ORM process again. **MAINTAIN COMMUNICATION AND SITUATIONAL AWARENESS.**

Safety Risk Management

The System Safety discipline is defined as the application of special technical and managerial skills to the systematic, *forward-looking* identification and control of hazards throughout the life cycle of a project, program, or activity. The primary objective of System Safety is accident prevention. Accident prevention can be achieved by proactively identifying, assessing, and eliminating or controlling safety-related hazards, to acceptable levels. A hazard is a condition, event, or circumstance that could lead to or contribute to an unplanned or undesired event. Risk is an expression of the impact of an undesired event in terms of event severity and event likelihood. Throughout this process, hazards are identified, risk analyzed, assessed, prioritized, and results documented for decision-making. The continuous loop process provides for validation of decisions and evaluation for desired results and/or the need for further action.

The System Safety process steps are depicted graphically in *Figure 1*. It is a formal and flexible process that generally follows the steps in the FAA's *Safety Risk Management Order, 8040.4*. A systematic approach to process improvement requires proactively searching for opportunities to improve the process at every step, not simply identifying deficiencies after an undesired event.

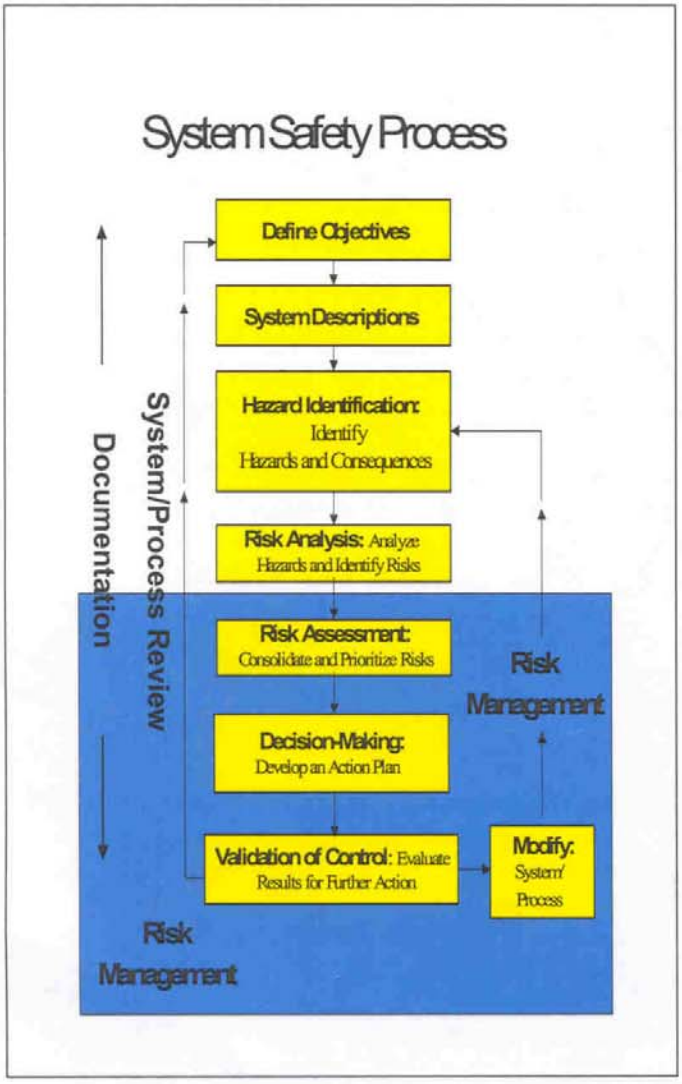

Figure 1 - System Safety Process

1. Define Objectives

The first step in the System Safety process is to define the objectives of the system under review. These objectives are typically documented in business plans and operating specifications.

2. System Description

A description of the interactions among people, procedures, tools, materials, equipment, facilities, software, and the environment. This also includes descriptions of data available.

3. Hazard Identification: Identify hazards and consequences

In this step, potential hazards may be identified from a number of internal and external sources. Generally, hazards are initially listed on a Preliminary Hazard List (PHL) then grouped by functional equivalence for analysis. Prior to risk analysis you must also include the consequence (undesired event) resulting from the hazard scenarios. Hazard scenarios may address the following: who, what, when, why, and how. This provides an intermediate product that expresses the condition and the consequences that will be used during risk analysis.

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4. Risk Analysis: Analyze hazards and Identify Risks

Risk analysis is the process whereby hazards are characterized for their likelihood and severity. Risk analysis looks at hazards to determine **what** can happen **when**. This can be either a qualitative or quantitative analysis. The inability to quantify and/or the lack of historical data on a particular hazard does not exclude the hazard from the need for analysis. Some type of a Risk Assessment Matrix is normally used to determine the level of risk (see an example contained in *Figure 2*).

5. Risk Assessment: Consolidate and Prioritize Risks

Risk Assessment is generally defined as the process of combining the impacts of risk elements discovered in risk analysis and comparing them against some acceptability criteria. Risk Assessment can include the consolidation of risks into risk sets that can be jointly mitigated, combined, and then used in decision making.

6. Decision Making: Develop Action Plans

This step begins with the receipt of a prioritized risk list. Review the list to determine how to address each risk, beginning with the highest prioritized risk. The four options that may be chosen for a risk are **transfer, eliminate, accept, or mitigate (TEAM).** Generally, design engineering follows the "safety order of precedence": 1) Design for minimum risk, 2) Incorporate safety devices, 3) Provide warning devices, or 4) Develop procedures and training. This may result in alternative action plans.

7. Validation and Control: Evaluate Results Of Action Plan For Further Action

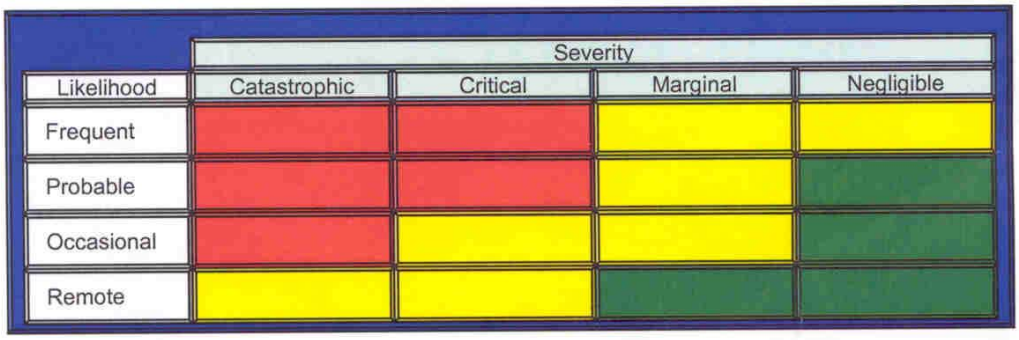
Validation and control begins with (1) the results of scheduled analyses on the effectiveness of actions taken (this will include identification of data to be collected and identification of triggering events if possible; then developing a plan to review the data collected) and (2) the current status of each prioritized risk. The residual risk will either be acceptable, unacceptable, or unknown. If it is acceptable, then documentation is required to reflect the modification to the system, and the rationale for accepting the residual risk. If it is unacceptable, an alternative action plan may be needed, or a modification to the system/process may be necessary.

8. Modify System/Process (If Needed)

If the status of a risk should change or the mitigation action does not produce the intended effect, a determination must be made as to why. It may be that the wrong hazard was being address, or the system/process needs to be modified. In either case, one would then re-enter the system safety process at the hazard identification step.

Figure 2

Risk Assessment Matrix



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APPENDIX 2

DEFINITIONS

Aircraft Accident. An occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. (ref. NTSB 830)

Aircraft Incident. An occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.

Airspace Conflict. A near mid-air collision, intrusion, or violation of airspace rules.

Aviation Hazard. Any condition or set of circumstances that exposes aviation resources or personnel to unnecessary risk or harm.

Contractor. A person or company that is financially procured by the government to provide goods or services. Also referred to as a vendor.

Event. A real or potential condition in which a hazard is encountered that may contribute to or cause a mishap.

Fatal Injury. Any injury, which results in death within 30 days of the accident.

First Aid. Any medical attention that involves no medical bill. If a physician prescribes medical treatment for less than serious injury and makes a charge for this service, that injury becomes "medical attention."

Forced Landing. A landing necessitated by failure of engines, systems, or components, which makes continued flight impossible, and which may or may not result in damage.

General Aviation. That portion of civil aviation that encompasses all facets of aviation except air carriers.

Incident with Potential. An incident that narrowly misses being an accident and in which the circumstances indicate significant potential for substantial damage or serious injury. The Forest Service Aviation Safety Manager, will determine final classification.

Maintenance Deficiency. An equipment defect or failure which affects or could affect the safety of operations, or that causes an interruption to the services being performed.

Medical Attention. An injury, less than serious, for which a physician prescribes medical treatment and makes a charge for this service.

Mishap. A general term used in aviation safety to describe the occurrence of an event that may include an accident or an incident. Mishaps do not include hazards.

Non-chargeable Accidents. Those accidents in which the Forest Service (FS) was not exercising operational control over the aircraft at the time of the accident, but in which FS employees or FS procured aircraft were involved.

Operator. Any person who causes or authorizes the operation of an aircraft, such as the owner, lessee, or bailee of an aircraft.

Precautionary Landing. A landing necessitated by apparent impending failure of engines, systems, or components, which makes continued flight inadvisable.

Serious Injury. Any injury which: (1) requires hospitalization for more than 24 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second or third degree burns, or any burns affecting more than 5 percent of the body surface.

Statistically Accountable Accidents. Accidents in which the Forest Service exercised operational control of the aircraft.

Substantial Damage. Damage or failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage."

Systems Approach. The structured, safety-driven means by which the USFS will certify elements that are designed to interact predictably within the USFS aviation systems and sub-systems.

Systems Safety. The application of special technical and managerial skills to identify, analyze, address and control hazards and risks associated with a complete systems. Systems Safety is applied throughout a system's entire lifecycle to achieve an acceptable level of risk within the constraints of operational effectiveness, time, and cost.