A-305
Risk Management II

Participant Workbook

Prepared by Office of Aviation Services Training Division
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Version Control

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1.00	Original Materials	11/8/13
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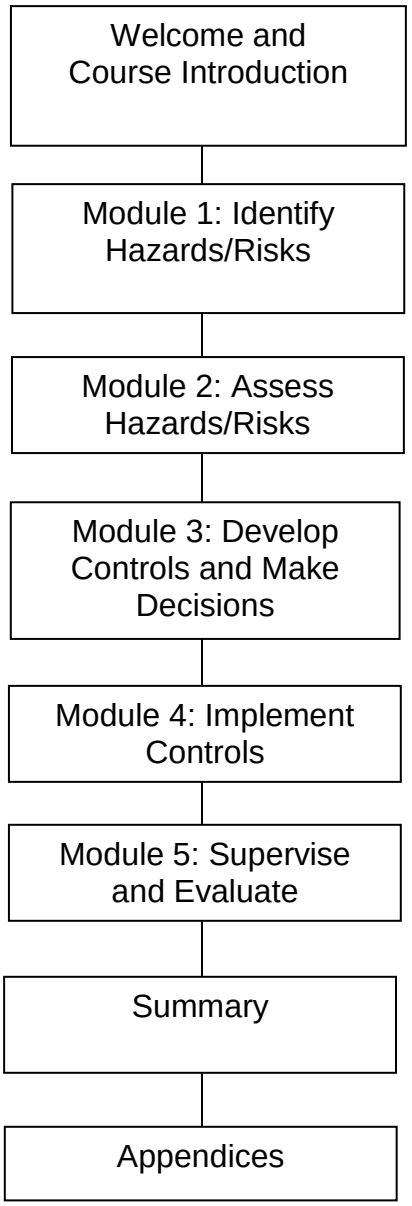
Course Map



Welcome and Course Introduction

Get to Know Your Classmates

Be prepared to share:

- Name
- Where do you work?
- What types of aviation missions have you been involved in?
- What were some of the risks associated with those missions?
- What do you hope to gain from participating in this course?

Course Purpose

This course presents the practical application of deliberate risk management techniques, tools and resources; and how they may be used to identify hazards and to assess risks in natural resource aviation operations. Information presented will let the students use the five steps of the risk management process and the 5M Model as well as working through an operation risk scenario using risk management tools.

Course Expectations

In addition to participation in the course, students must correctly complete the risk management portion of a Project Aviation Safety Plan (PASP) or instructor-designated equivalent.

NOTE: A Level 3 Evaluation Survey may be distributed 3-6 months after the course is completed. Inform students that their participation in that survey is also expected as a part of the course evaluation process.

Course Objectives

At the conclusion of this course, you should be able to:

1. List at least three tools or methods that may help in identifying hazards associated with an aviation operation.
2. Given a scenario, identify hazards using at least one hazard identification method or tool.
3. List at least two tools or methods that may help in assessing hazards associated with an aviation operation.
4. Given a scenario, assess hazards/risks using at least one risk assessment method or tool.
5. Given a scenario, develop and evaluate controls using an appropriate tool or method.
6. Given a scenario, prioritize the identified controls to mitigate hazards and risks.
7. Explain how to determine the appropriate risk approval level for a given scenario.
8. Given a scenario, describe how to implement identified controls.
9. Given a scenario, describe how to supervise and evaluate the impact of changes to the Five M's during an operation.
10. Given a scenario, describe how to conduct and document an After-Action Review to evaluate the effectiveness of the risk management process.
11. Explain how to identify, evaluate and implement changes that impact recurring aviation plans/missions.
12. Given a scenario, develop the risk management portion of a Project Aviation Safety Plan (PASP).

Project Aviation Safety Plans

The required elements of a Project Aviation Safety Plan (PASP) for special use missions in the Department of the Interior and the US Forest Service are specified in OPM-06 and FSM 5711 respectively. Both policy documents require a hazard/risk analysis be conducted as part of the PASP and both refer users to the Interagency Helicopter Operations Guide (IHOG) for risk management principles and tools.

During this course, you will apply the learning objectives to develop the risk management portion of a PASP for a special use natural resource aviation mission.

Let's begin with a review of a few of the terms and concepts covered in A205.
Note: A **Glossary** is also provided in the Appendices for reference.

Safety Risk Management (SRM) and Safety Management Systems (SMS) are core to every aspect of aviation operations. Properly managing risks allows you to:

- Protect lives and conserve resources by avoiding unnecessary risks
- Make more informed decisions
- Identify feasible and effective control measures where specific standards do not exist
- Improve opportunity for successful mission accomplishment

Safety Risk Management (SRM) is a formal system of hazard identification and SRM is essential in controlling risk to acceptable levels. A formal process that describes the system, identifies the hazards, assesses the risk, analyzes the risk, and controls the risk. The SRM process is embedded in the mission planning process and throughout mission operations.

The SRM process should be applied to:

- Initial designs of systems, organizations, and/or products
- The development of operational procedures
- Identified hazards
- Planned changes to operational processes

Risk can be defined as the composite of predicted severity (how bad) and likelihood (how probable) of the potential effect of a hazard in its worst credible (reasonable or believable) system state.

Residual Risk: The safety risk that exists after mitigation has been accomplished or all controls have been implemented or exhausted and verified. Only verified controls can be used for assessing residual safety risk.

Safety risk assessment involves an analysis of identified hazards that includes two components:

a) the severity of a safety outcome; AND
b) the probability that it will occur.

SRM is a comprehensive system for improving individual and organizational performance in all functional areas and can be tailored to meet the unique mission needs and operational requirements of each organization.

SRM provides the processes and tools to develop and increase awareness and understanding of at-risk activities. These processes and tools help create effective risk assessments that identify potential hazards and effective strategies to mitigate or eliminate the hazards.

SRM Assumptions

1. Risk is inherent in all aviation missions, operations and activities.
2. Risk can be effectively mitigated if understood and appropriate action is taken.
3. Everyone is responsible for utilizing SRM concepts, tools and techniques.

SRM Principles

Four principles govern all actions associated with SRM. These continuously employed principles are applicable before, during and after all tasks and operations by individuals at all levels of responsibility:

1. Accept No Unnecessary Risk
2. Make Risk Decisions at the appropriate Level
3. Accept Risk when Benefits outweigh the costs.
4. Integrate Risk Management principles into planning at all levels.

If the safety risks are assessed as intolerable, the following questions become relevant:

a) Can the hazards and related safety risk(s) be eliminated? If the answer is yes, then action as appropriate is taken and documented. If the answer is no, the next question is:
b) Can the safety risk(s) be mitigated? If the answer is no, related activities must be cancelled. If the answer is yes, mitigation action as appropriate is taken and the next question is:
c) Do any residual safety risks exist? If the answer is yes, then the residual risks must be assessed to determine their level of tolerability as well as whether they can be eliminated or mitigated as necessary to ensure an acceptable level of safety performance.

Levels of Risk Management

We categorize risk into three levels:

1. **Strategic**: Long term planning, usually embedded in policy.

2. **Deliberate:** Deliberate SRM planning refers to pre-mission/activity planning and involves the full formal application of the complete 5-Step RM. Deliberate SRM should be implemented in advance of the planned operational mission, Always include the experience, expertise and knowledge of personnel to identify known hazards/risks and strategies to effectively mitigate risks for the specific mission.

   NOTE: This course focuses on the Deliberate level of risk management. The PASP falls into this level.

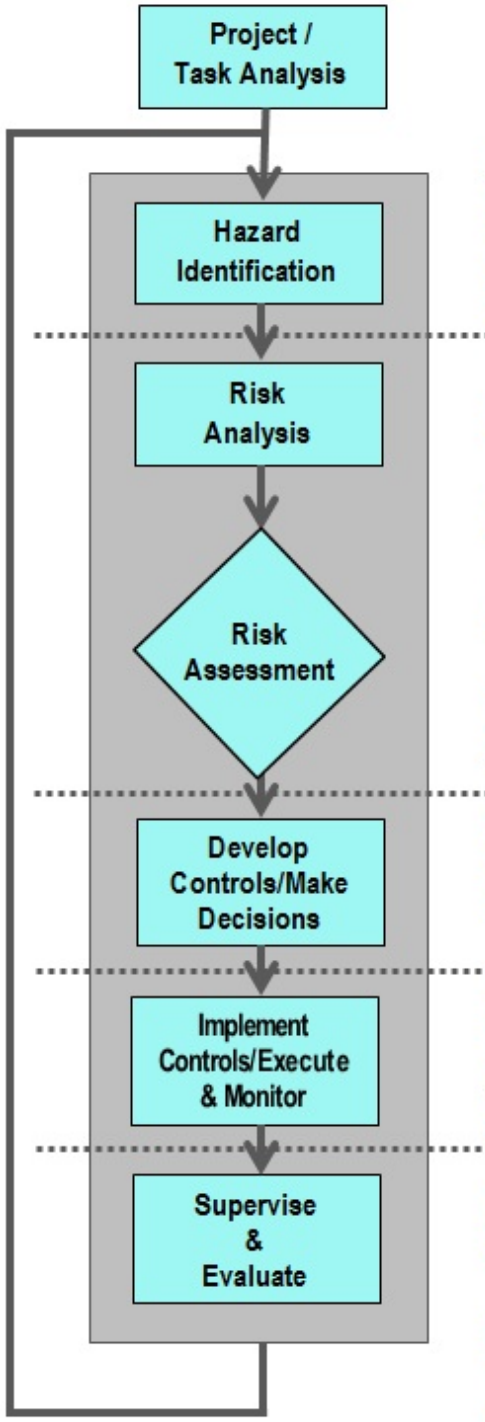
3. **Time Critical**: During the "execution" or Tactical phase of operations. It is usually an informal, mental risk assessment that is done "on the fly" using basic RM process steps to identify and mitigate hazards in the new or changing situation.

The Five-Step Process:

A systematic approach to SRM is useful. In this course, we will describe a **Five-Step Process** for managing risk:

1. Identify the hazard
2. Assess the risk
3. Analyze risk control/mitigation measures
4. Make control decisions and implement controls
5. Supervise and review

Successful risk management relies upon the cyclical nature of the process. At any point, reassessment may require going back through the cycle to address impacts and changes.



The hazards are the potential sources of danger that could be encountered while performing a task or mission.
Hazards include weather, time of flight, terrain, equipment, training, and proficiency level of personnel.

Risk is the probability and severity of loss from exposure to the hazard.

The assessment step determines the level of risk associated with a specific hazard.

This process defines the probability and severity of a mishap that could result from the hazard

Rank the risks in terms of overall impact, addressing the highest risks with the most impact to the operation/activity first.

Identify the control options for all those risks which exceed acceptable levels.
Start with the highest risk and work down.

Once risk control strategies have been selected, an implementation strategy needs to be developed and then applied by management and the work force. Implementation requires commitment of time and resources.

Note any changes to the operation, equipment, environment, and/or people and how they may affect your plan.

Remember that risk management is a continuous process!

Maintain your situational awareness so that you can identify and adjust to unexpected as well as expected threats.

This model adapted from FAA AC 120-92A Page 9.
Other sources include the IHOG and the AFPM90-803.

Module 1: Step 1 – Identify Hazards/Risks

Notes

A hazard is a source of danger that could lead to an unplanned or undesired event such as an accident. Examples include weather conditions, terrain, aircraft component weaknesses, and adverse mental or physiological states of personnel involved in the operation.

As part of the risk management process, it's important to be able to project the possible progression of the existence of a hazard and how it might impact your aviation operation. The ability to project a hazard's impact comes from experience and training.

During this module, you'll have the opportunity to practice identifying hazards associated with aviation operations.

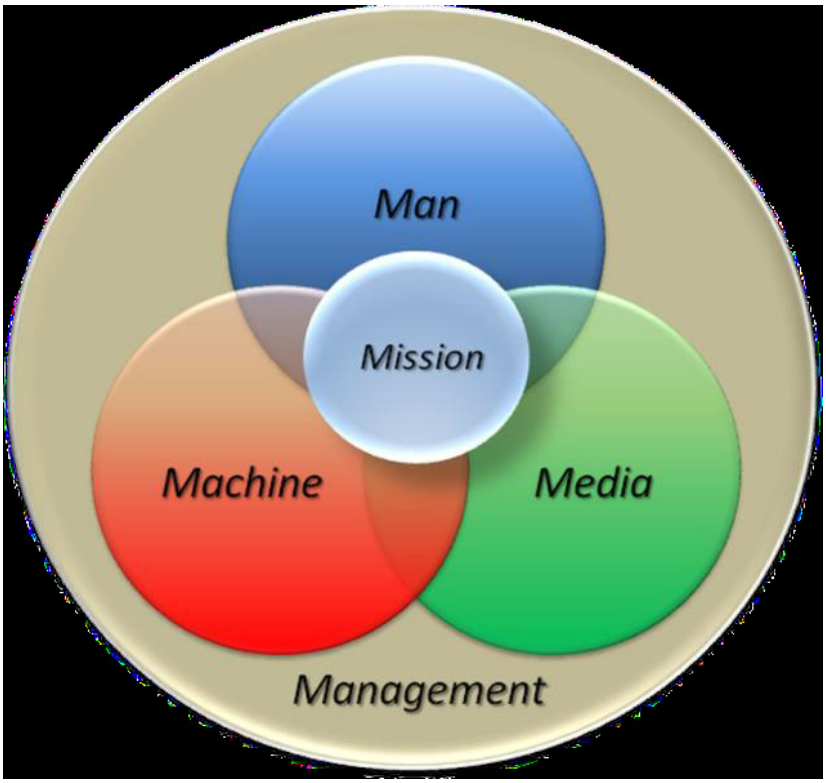
Objectives

- List at least three tools or methods that may help in identifying hazards associated with an aviation operation.
- Given a scenario, identify hazards using at least one hazard identification method or tool.

The 5 M's

Notes

Successful missions, or mishaps, do not just happen; they are indicators of how well a system is functioning. The basic cause factors for mishaps fall into the same categories as the contributors to successful missions—Man, Media, Machine, Mission and Management. These are referred to as "The 5 M's." The 5 M's provide a logical approach to categorize and evaluate potential hazard.



Mission

Examples:

The mission is the purpose or central function of the system. This is the reason that all the other elements are brought together. Always ask yourself:

1. Is this flight necessary?

2. Is there a better way to do it?

Define the mission objectives, what is the desired outcome. The complexity of the mission should be understood, well defined and obtainable.

Man **Examples:**

This is the human element of a system and possibly the area of greatest variability and thus the majority of risks. Identify the hazards of this element by considering the following human elements:

- Crew experience
  - Flight proficiency
  - Knowledge
- Crew composition
  - Knowledge of each other
  - Cohesiveness
  - Changes to the crew
- Fitness for flight
  - Physical state
  - Mental state
- Selection
  - Right person psychologically/physically, trained in event proficiency, procedural guidance, habit pattern
- Performance:
  - Awareness, perceptions, task saturation, distraction, channelized attention, stress, peer pressure, confidence, insight, adaptive skills, pressure/workload, fatigue (physical, motivational, sleep deprivation, circadian rhythm)
- Personal Factors:
  - Expectancies, job satisfaction, values, families/friends, command/control, discipline (internal and external), perceived pressure (over tasking) and communication skills
- Other considerations may include supervision and cultural norms (national, organizational, professional).

Machine **Examples:**

This is the hardware and software. The aircraft and all associated equipment required for the mission. When accessing the hazards related to the machine consider:

- Capabilities and limitations
- Certification
- Reliability
- Support
- Special equipment

Other considerations:

- Machine. Used as intended, limitations, interface with man
- Design: Engineering reliability and performance, ergonomics
- Maintenance: Availability of time, tools, and parts, ease of access
- Logistics: Supply, upkeep, repair
- Tech data: Clear, accurate, usable, and available

Management **Examples:**

Management controls many aspects of our work:

- Policy: CFRs, FARs, agency policy
- Procedures: Manuals and standard operating procedures
- Standards: Company policy
- Controls: Crew standardization, training, and limitations

Media **Examples:**

Media is the environment in which the mission will be executed. These are external, largely environmental forces:

- Climate: Ceiling, visibility, temperature, humidity, wind, precipitation,
- Operational environment: Terrain, wildlife, vegetation, manmade obstructions, daylight, darkness. Landing/takeoff areas: Gravel, dirt, ice, mud, dust, snow, etc.
- Hygienic environment: Ventilation/air quality, noise/vibration, dust, contaminants.

Tools and Resources

Notes

There are a variety of tools and resources that will help you in identifying hazards, including:

- **Operations Analysis**
  A description, normally in time sequence of the events that are expected to occur during the operations, evaluating all elements for risk.

- **Hazard Inventory**
  Based upon an operations analysis and is developed using experience, intuition, brainstorming, regulations, databases, etc. Generally is very broad rather than deep.

- **"What if" Tool/Mind-Mapping/Brainstorming**
  Probably the most practical and effective tool for operators. Visualizes the flow of events in time sequence, considering 'what if' scenarios, looking for the worst credible events possible.

- **Change Analysis**
  Evaluates changes in the 5Ms, analyzes the hazard implications of planned or unplanned change.

- **Trend Analysis** (PASPs, Accidents or SAFECOMS)
  By reviewing past events and the documentation for them, especially those for similar missions or aircraft, you can identify hazards reported by others that may also be present in your operation.

- **Job Hazard Analysis**
  Provides in-depth assessments of all jobs involving significant risk with the active participation of the personnel doing the work. Examines in detail the safety considerations of a single job, beginning with the most significant risk areas first.

Regardless of which tool, method or resource—or combination thereof--you are using, the ultimate goal is to identify the hazards. Additional resources are provided in the appendices.

Exercise: Identify Hazards/Risks

Using the selected scenario and form provided by the instructor, identify the hazards and risks associated with the scenario. Remember that in this step, you are identifying the hazards, not assessing the risk of that particular hazard and not developing mitigations.

Module 2: Step 2 – Assess Hazards/Risks

Notes

Assessing hazards requires evaluating the impact of each hazard in terms of potential loss and cost. Risk must be considered as it applies to the unit and the mission. Individual risk levels must be determined for each hazard identified. Risk assessment is conducted by evaluating specific elements or factors, that when combined, define risk. The level of risk must be understood as it applies to the team and/or the mission.

Objectives:

- List at least two tools or methods that may help in assessing hazards associated with an aviation operation.
- Given a scenario, assess hazards/risks using at least one risk assessment method or tool.

Risk Assessment Tools and Methods

There are many models that many be used to assess risk, i.e. the **Risk Assessment Matrix** (a part of the Safety Management System approach, commonly used with deliberate risk assessment), the **Green/Amber/Red (GAR) Model** (more commonly used with time-critical risk assessment) or the **Severity/Probability/Exposure (SPE) Model** (which addresses specific hazards and calculates in exposure as a third factor).

For the purpose of this course and due to time constraints, we have opted to use the Risk Assessment Matrix method.

Additional information and resources can be in the **Appendices**.

Risk Assessment Matrix

Notes

NOTE: Your organization may use a different list of categories, letters, colors, or numbers for severity, likelihood, and risk assessment codes. However, the purpose and concept are the same in that you are breaking it down into categories from least risk to most risk. We have used examples from the IHOG below.

For each hazard identified, determine the associated degree of risk in terms of likelihood and severity. The result of the risk assessment is a prioritized list of hazards, which ensures that controls are first identified for the most serious threat to mission or task accomplishment. The hazard list is intended for use as a guide to the relative priority of risks involved and not as an absolute order to follow.

Severity. This is an assessment of the potential consequence that can occur as a result of a hazard and is defined by the degree of injury, illness, property damage, loss of assets (time, money, personnel), or effect on the mission or task. Consideration must be given to exposure potential. For example, the more resources exposed to a hazard, the greater the potential severity. Severity categories are assigned Roman numerals according to the following criteria:

Table 1: Severity Categories

CATEGORY	DEGREE OF SEVERITY
Category I: Catastrophic	The hazard may cause death, loss of facility/asset or result in grave damage to national interests.
Category II: Critical	The hazard may cause severe injury, illness, property damage, damage to national or service interests, or degradation to efficient use of assets.
Category III: Marginal	The hazard may cause minor injury, illness, property damage, damage to national, service or command interests or degradation to efficient use of assets.
Category IV: Negligible	The hazard presents minimal threat to personnel safety or health, property, national, service or command interests, or efficient use of assets.

Notes

Likelihood. This is an assessment of the likelihood that a potential consequence may occur as a result of a hazard and is defined by assessment of such factors as location, exposure (cycles or hours of operation), affected populations, experience, or previously established statistical information. Likelihood categories are assigned a letter according to the following criteria:

Table 2: Likelihood Categories

DEGREE OF LIKELIHOOD	DESCRIPTION
Frequent (A)	Continuously or often encountered during each mission.
Probable (B)	Encountered several times during the course of many missions.
Occasional (C)	Encountered sporadically during the course of many missions.
Remote (D)	Encountered infrequently, but changes are remote.
Improbable (E)	Encountered only rarely, chances are possible but unlikely.

Complete a Risk Assessment Matrix. Combine the severity with the likelihood to determine the level of risk for each hazard.

Risk Assessment Matrix				
	Severity			
Likelihood	IV Negligible	III Marginal	II Critical	I Catastrophic
Frequent A			4	
Probable B		3		High
Occasional C		2	Serious	
Remote D	1	Medium		
Improbable E	Low			

Notes

Risk Levels:
At this stage, you are assigning a level of risk to each hazard, based upon where it falls on the risk assessment matrix.

RISK LEVEL	DESCRIPTION
1 Low	The risk involves little or no impact on mission accomplishment. Hazards are those normally associated with flight (possibility of bird strike, mechanical, malfunction, etc.).
2 Medium	Degree of risk is such that the mission can almost certainly be accomplished safely. Hazards exist, but can be mitigated.
3 Serious	Risk is high enough that there is uncertainty as to whether the mission can be accomplished without an accident and/or loss of life or serious injury. Hazards may or may not be mitigable.
4 High	The combination of severity and likelihood indicate that threat/hazard has a greater than 50% chance of exceeding control measures and the result will be critical or worse. Benefit to risk must be carefully weighed and planners ensure that: 1) emergency response resources are positioned for immediate use, 2) approval is made by the highest official in the local organization, and 3) crewmembers are well rested, briefed and aware of the known threats and their controls.

Risk Assessment Pitfalls. The following pitfalls should be avoided during the assessment:

- Over Optimism: Not being totally honest or not looking for root causes.
- Misrepresentation: Individual perspective may distort the data.
- Alarmism: “The sky is falling” or “worst case” estimates are used regardless of their possibility.
- Indiscrimination: All data is given equal weight.
- Prejudice: Subjective or hidden agendas are used vice facts.
- Inaccuracy: Bad or misunderstood data nullify accurate risk assessment.
- Enumeration: Difficulty in assigning a numerical value to human behavior.

Notes

GAR Model

This model differs from the Safety Management System (SMS) model in several ways. First, it provides a more general analysis of the operational system. Second, it provides a qualitative rating scale for each of the categories that correspond to the identified areas of risk. It is important to remember that risk management is a process that continues throughout the mission. Each assessment model provides a method of evaluating risks as they apply to every mission.

Note: Details and instruction on using the GAR Model can be found in the IHOG.

SPE Model

The SPE Model is used in situations addressing specific hazards, adding in exposure as a factor:

Risk = Severity X Likelihood X Exposure

Exercise: Using a Risk Assessment Worksheet (RAW) to Assess Hazards/Risks

Using the same scenario, continue to develop a risk assessment matrix, assessing the identified hazards and risks identified in Step 1.

Module 3: Step 3 – Develop Controls/Make Decisions

Notes

It is assumed a list of known or expected hazards associated with the proposed/planned aviation mission has been compiled in Step 1 of the 5-Step Process. Those hazards were analyzed and evaluated until they were characterized as risks during Step 2. Step 3 deals with developing controls—or mitigating strategies—and making decisions on how to implement those controls.

Objectives:

- Given a scenario, develop and evaluate controls using an appropriate tool or method.
- Given a scenario, prioritize the identified controls to mitigate hazards and risks.
- Explain how to determine the appropriate risk approval level for a given scenario.

Hierarchy of Control

What are the main ways to control a hazard?

The main ways to control a hazard include:

1. **Elimination (including substitution)**:
   Remove the hazard from the workplace.
2. **Engineering Controls**:
   Includes designs or modifications to plants, equipment, ventilation systems, and processes that reduce the source of exposure.
3. **Administrative Controls:**
   Controls that alter the way the work is done, to include: policies, SOPs, procedures, standards, training, etc.
4. **Personal Protective Equipment**
   Equipment worn by individuals to reduce exposure such as contact with chemicals or exposure to noise.

Notes

These methods are also known as the **"hierarchy of control"** because they should be considered in the order presented (it is always best to try to eliminate the hazard first, etc.).

Effectiveness	Type of Control
Most Effective	Elimination or Substitution
	Engineering Controls
	Administrative Controls (Awareness, Training, Procedures)
Least Effective	Personal Protective Equipment

Source:
http://www.ccohs.ca/oshanswers/hsprograms/hazard_control.html#_1_4

The STAAR Model

Several other risk management tools are listed in Appendix J of the IHOG. One such tool for developing control measures in a risk management process is the "STAAR" model described there, under "Develop Controls/Make Decisions." The STAAR model describes the concepts whereby managers and operators attempt to mitigate known or anticipated risks associated with a proposed aviation operation:

- **S**pread…
- **T**ransfer…
- **A**void…
- **A**ccept…
- **R**educe…

A comprehensive listing of all the control measures possible for each identified risk should be honed down to the best/most appropriate controls for each risk based on time, resources, and funds expected to be available to conduct the aviation operation.

Notes

This brainstorming exercise in Step 3 is among many subjective aspects of the overall risk management process. The reason to comprehensively document this step is to be able to modify it (and any other) portion of the overall risk management process during Step 5 “Supervise and Review.”

The completed Risk Assessment Worksheet (RAW) is reviewed after the mission as part of the debrief/after action review (AAR) (Step 5 of the RM process) to identify ineffective (or overly restrictive) mitigation controls. Once the AAR is completed the RAW can be filed for future use the next time a similar mission is conducted.

Note: Additional resources and methods can be found in the **Appendices**.

Accountability

Examples:

One of the principles of risk management is to make risk decisions at the appropriate level. Supervisors and managers have a responsibility to ensure aviation operations are conducted safely and established safeguards are in place to mitigate risks.

As those responsible, supervisors and managers must actively be involved in the risk management process. They may delegate authority for making risk decisions for a specified level of risk, but they maintain overall accountability for the success or failure of adequate risk management.

It is essential that all personnel involved in aviation operations understand how much risk they can accept and when they must elevate the decision to a higher level.

Appropriate aviation management plans or project aviation safety plans should clearly specify the approving authority for levels of risk. When planning a mission, you should consider and address the process for risk approval in the event of changes to the risk level of the operational situation. The greater the risk and/or the more complex the mission, the more senior the risk approval authority required.

Exercise: Develop Controls and Make Decisions

Determine the controls for the identified/assessed hazards, and complete the mitigation segment of the template. Additionally, determine approval levels required (signature authority).

Module 4: Step 4 - Implement Controls

Notes

Once control strategies have been selected, an implementation strategy must be developed and then applied by management and the work force.

Implementation requires commitment of time and resources.

Objective:

- Given a scenario, describe how to implement identified controls.

Leaders and staff are responsible to ensure that risk controls (identified in Step 3 of the risk management process) are integrated into SOPs, written and verbal orders, mission briefings, and other plans. It is critical that risk controls are (properly) understood at all levels. It is important to provide a vision of the end state and describe successful implementation.

Employees are responsible to understand and comply with established risk controls, and to advise leadership when those risk controls are not effective.

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Employees are responsible to understand and comply with established risk controls, and to advise leadership when those risk controls are not effective.

Within DOI risk controls can be implemented in:

Notes

- **Departmental Manuals (DMs)**:
  351 DM 1.1G *"Occupants **shall wear** seat belts and shoulder harnesses during all phases of flight…"*

- **Operational Procedures Memorandums (OPMs):**
  OPM 04 paragraph 5B
  *"Individuals who have aviation duties and/or responsibilities that are identified in more than one position in the matrix (i.e., supervisor and Aviation Manager) **must take** the required training for all positions that apply."*

- **Handbooks (HB):**
  ALSE HB – Chapter 2.1
  *"Flight crewmembers and aircrew members engaged in special use activities, except airplane operations above 500 feet AGL…**are required to wear t**he following ALSE unless exempted by paragraph 1.5B: Flight helmet, Fire-resistant clothing, All-leather or leather and NOMEX gloves, Leather or approved non-leather boots."*

- **Guides** (that have been adopted as policy by a bureau):
  Interagency Helicopter Operations Guide (IHOG)
  Chapter 3 Section VIII
  *"Pre-Flight Briefings. **A briefing** covering both the specifics of the intended mission and helicopter safety **is required**."*

- **Checklists:**
  There are numerous checklists that help to implement risk controls (see the IHOG, specific aircraft checklists, and the new Aviation Operations Checklist.

- **Briefings and Back-briefs:**
- Briefings allow leaders to communicate their risk controls and risk tolerance expectations to their employees. Back-briefs involve the employee repeating the risk controls to the leader so that both have the same understanding.

Notes

- **Tailgate Sessions:**
  Tailgate sessions are a commonly used technique in the Interagency community to provide training and to increase communications between leaders and employees.

- **Rehearsals:**
  Rehearsing the mission or individual elements (i.e. communications plan) is another technique to ensure that the risk controls established in the operations plan (or project aviation safety plan) are properly understood by all participants. Sand table exercises and flight simulators are mean of rehearsing a mission.

- **Training:**
  One common means used to reduce risks in aviation is through training. Some courses such as A-100 (Basic Aviation Safety) provide a broad look at the policies and procedures used to protect our people and accomplish our missions. Other courses such as A-312 (Water Ditching and Survival) are designed to reduce the specific risks faced by personnel who fly over water. Departmental-level training is often supplemented by Bureaus and local units when their missions involve risks that are not adequately covered by Departmental training (i.e. Helicopter Underwater Egress Training (HUET), cold weather survival training for personnel in Arctic environments, etc.).

- **Equipment:**
  New or specialized equipment can be used to implement risk controls. A bureau responsible for long-range low-level airplane missions may look to a new aircraft that has better performance, better visibility, longer range, etc. to replace an older model aircraft. A bureau that flies offshore may require their aircraft to have externally mounted life rafts with integral EPIRBs (Emergency Position-Indicating Radio Beacon).

Notes

Common problems in implementing controls:

- The control is inappropriate for the problem
- Users dislike it
- Managers dislike it
- It costs too much
- It's overmatched by other priorities
- It's misunderstood
- Nobody measures progress until it's too late
- Leadership support is sporadic or lacking

The key to making RM a fully integrated part of the organization culture, is to achieve user ownership in a significant percentage of all risk controls that are developed and implemented by the personnel directly impacted by the risk.

Levels of user involvement in risk controls and the subsequent effectiveness in those controls (listed from stronger to weaker):

- **User Ownership:**
  Operators are empowered to develop risk controls.

- **Co-Ownership:**
  Personnel share leadership of the risk control development team.

- **Team Member:**
  Personnel are active members of the team that developed the risk control.

- **Input:**
  Personnel are allowed to comment and have input before the risk control is developed.

- **Coordination:**
  Personnel are allowed to coordinate on an already developed idea.

- **Comment and Feedback:**
  Personnel are given the opportunity to express ideas.

- **Robot:**
  Operators are ordered to apply the risk control.

Where does your unit operate on this scale?

Notes

Levels of support to risk controls shown by leaders (again listed from stronger to weaker):

- Sustained, consistent behavior
- Ongoing personal participation
- Accountability actions and follow-up
- Follow-up inquiries by phone and during visits
- Verbal support in staff meetings
- Sign directives

Where do the leaders in your organization fit on this scale?

Source: Air Force Pamphlet 90-803

Exercise: Implement Controls

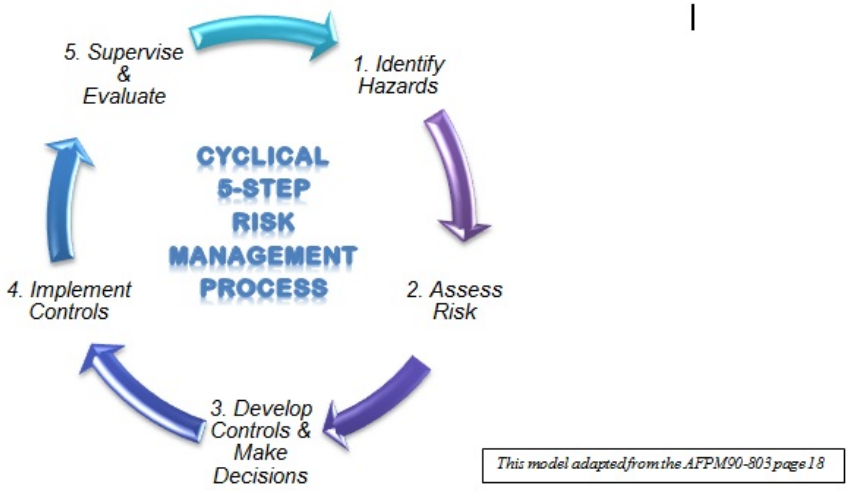
Conduct a briefing regarding risks and the controls used to mitigate those risks, as would be done prior to operation to ensure all items have been addressed. Complete the segment on the PASP to document this and record signatures upon completion.

Module 5: Step 5 – Supervise and Evaluate

Notes

Risk Management Cycle

Remember, safety risk management is a **continuous process**. As situations and conditions change, it is necessary to continuously identify emerging hazards, assess the risks, and develop appropriate controls. Decision makers at the appropriate level choose the best control or combination of controls based on the analysis of overall costs and benefits. Once the Project Aviation Safety Plan (PASP) is completed and signed, hazard identification and risk assessment **continue** as the project moves into implementation.



Objectives:

- Given a scenario, describe how to supervise and evaluate the impact of changes to the 5M's during an operation.
- Given a scenario, describe how to conduct and document an After-Action Review to evaluate the effectiveness of the risk management process.
- Explain how to identify, evaluate and implement changes that impact recurring aviation plans/missions.
- Given a scenario, develop the risk management portion of a Project Aviation Safety Plan (PASP).

Supervise and Evaluate

Notes

The last step of the Risk Management process involves the determination of the effectiveness of risk controls throughout the operation. The FAA describes three aspects of this step:

1. **Supervise**
   Monitor the operation to ensure:
   - The controls are effective and remain in place.
   - Changes, which require further risk management, are identified.
   - Action is taken when necessary to correct ineffective risk controls and reinitiate the Risk Management steps in response to new hazards.

   Any time the personnel, equipment or tasking change or new operations are anticipated in an environment not covered in the initial risk management analysis, the risk control measures should be reevaluated.

2. **Evaluate**
   This process should be systematic. Modes of evaluation include internal review, external audit, red teaming, exercises, and after-action reports. Additionally, for every adopted risk management action there is an expectation that the action will create some identifiable positive benefit.

   The value of testing the effectiveness of strategies using these methods is that it provides different perspectives on the success of the risk management approach and the capabilities of the organization.

   When a decision is made to assume risk, the factors (cost/benefit) involved should be recorded. If an accident or negative consequence occurs, proper documentation allows for the review of the risk decision process to see where errors might have occurred or if changes in the procedures or tools lead to the consequences.

   It is also important to monitor the larger context within which an identified risk and risk management effort exists. Good situational awareness may reveal changes in the context that require corresponding changes in the risk management effort. Both types of monitoring - effectiveness and situational awareness - are essential if risk management efforts are to be effective over time.

Notes

3. Feedback

A review by itself is not enough, a feedback system must be established to ensure that the corrective or preventative action taken was effective ant the any newly discovered hazards identified during the operation are analyzed and corrective action taken.

Feedback can be in the form of briefings, After Action Reviews (AAR), lessons learned, benchmarking, database reports, etc.

The AAR is a learning tool and should detail the actions of the crew during the assignment. Technical, operational, and human elements of crew performance should be discussed as appropriate. Both good and sub-standard performance should be addressed and analyzed. The content of each AAR may vary widely, depending upon the events.

Crew members benefit from AARs through the acquisition of acquire a more complete knowledge of both the technical and human factors problems that they confront, enabling them to develop plans for doing better in the face of similar problems in the future.

(Further guidance for conducting an AAR can be found at http://www.fireleadership.gov/toolbox/after_action_review/aar.pdf)

It is unlikely that every risk analysis will be perfect the first time. When risk analyses contain errors of omission or commission, it is important that those errors be identified and corrected. Without this feedback loop, we lack the benefit of knowing if the previous forecasts were accurate, contained minor errors or were completely incorrect.

The overall effectiveness of these implemented controls must also be shared with other organizations that might have similar risks to ensure the greatest possible number of people benefit.

Notes

In this step of the risk management cycle, consider the following questions:

- How well is my chosen course of action working?
- Has anything changed that requires altering my existing risk management measures? (5Ms – Man, Machine, Media (environment i.e. weather), Mission, Management)
- Are there current trends and/or potential future developments that could require altering my existing risk management measures?

Note: See **Appendix D** for additional resources.

Change Management

Change is perhaps the most significant factor in managing risks at the operational level. When you think about the variety of flight missions conducted by DOI or the USFS they may seem unique, but in fact they are almost always variations of missions conducted hundreds of times before (perhaps by other crews in other aircraft at different times over different locations).

Commonly what distinguishes one mission from another--whether it is wildfire, offshore, migratory bird, wild horse capture, or point-to-point--are changes involving Personnel, Equipment, Terrain, Weather, Management and Mission parameters. Collectively these areas are the 5Ms (Man, Machine, Medium, Mission and Management, as introduced in Module 1).

Change management is the application of a structured process and set of tools for leading the people side of change to achieve a desired outcome.

When change management is done well, people feel engaged in the change process and work collectively towards a common objective, realizing benefits and delivering results.

Responsibilities

- **Individuals**
  Maintain a constant awareness of the changing conditions and risks associated with operations, activities and tasks; then manage these changes at their level or report them to their supervisors.

- **Managers and Supervisors**

Notes

  - **During the planning** phase of a mission, managers and supervisors evaluate the 5Ms to identify differences between the planned mission and previous missions (where control measures have already been established). Implementing a control changes the entire risk balance of the operation.
    Example: On a given mission, replacing the pilot with a more experienced (or a less experienced) pilot will affect the risk posed by the other 5Ms (winds or landing areas that might be inappropriate and unsafe for the less experienced pilot might be acceptable for a more experienced pilot).

  - **During the conduct** of the operation, managers and supervisors monitor the 5Ms for intended and unintended changes and modify control measures accordingly. Intended changes result from preplanned mitigation measures (step 3) which are implemented to reduce or eliminate risk. Unintended changes can result from unidentified hazards or ineffective control measures. By continuously applying risk management principles when changes occur, risk (those known before an operation and those that develop during an operation) can be consistently controlled.|

  - **Following the operation**, managers and supervisors review the mission and evaluate the effectiveness of the control measures used. Risk management is a process that continues throughout the lifecycle of the system, mission or activity. Leaders, supervisors and individuals at every level must fulfill their respective roles in assuring controls are sustained over time. Once controls are in place, the processes must be periodically reevaluated to ensure their effectiveness. If they are found to be inadequate or circumstances have **changed** that alter the effectiveness of the control measure(s), then the process is repeated to find a more effective RM strategy.

Source: FAA AC 120-92a, Element 3.2

Note: See Appendix E and G for additional resources.

Communications

Notes

REMEMBER: Effective communications is at the center of good risk management and plays a role at every step of the cycle. These questions help in identifying and satisfying risk communications needs.

- What risk information needs to be communicated?
- Between whom does it need to be communicated?
- How can necessary risk information be most effectively communicated?

Procedures for Sustaining Risk Control Effectiveness

To be fully effective, risk controls must be sustained. This means maintaining the responsibility and accountability for the long haul, throughout the entire cycle.

Exercise: Supervise and Evaluate

In small groups or individually, determine what to do to complete this step for the given scenario, including documentation.

1) Supervise
2) Evaluate
3) Feedback

Discuss as a large group.

Discuss the completed Risk Management segment of the PASP.

Summary

Notes

You should now be able to accomplish the objectives for this course. If you have any remaining questions regarding them, ask the instructor for clarification at this time.

Objectives:

1. Given a scenario, identify hazards using at least one hazard identification method or tool.
2. List at least three tools or methods that may help in identifying hazards associated with an aviation operation.
3. List at least two tools or methods that may help in assessing hazards associated with an aviation operation.
4. Given a scenario, assess hazards/risks using at least one risk assessment method or tool.
5. Given a scenario, develop and evaluate controls using an appropriate tool or method.
6. Given a scenario, prioritize the identified controls to mitigate hazards and risks.
7. Explain how to determine the appropriate risk approval level for a given scenario.
8. Given a scenario, describe how to implement identified controls.
9. Given a scenario, describe how to supervise and evaluate the impact of changes to the 5M's during an operation.
10. Given a scenario, describe how to conduct and document an After-Action Review to evaluate the effectiveness of the risk management process.

Notes

11. Explain how to identify, evaluate and implement changes that impact recurring aviation plans/missions.

12. Given a scenario, develop the risk management portion of a Project Aviation Safety Plan (PASP).

Evaluation

Please be sure to complete and submit the Course Evaluation Form OAS-111 provided by the instructor.

APPENDICES

A: References and Resources

B: Glossary

C: Risk Assessment Worksheets

D: After Action Review (AAR) Mission Centered Solutions AAR Guide

E: Change Management

F: SAFECOMS

G: Change Management Tool

APPENDIX A: Resources and References

Federal Aviation Administration Advisory Circular, AC No: 120-92a, Introduction to Safety Management Systems for Air Operators (2010)
http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%20120-92A.pdf

FAA Systems Safety Handbook Chapter 15
http://www.faa.gov/regulations_policies/handbooks_manuals/aviation/risk_management/ss_handbook/

ICAO Doc 9858 – Safety Management Manual, Third Edition(2013)http://www.icao.int/safety/SafetyManagement/Documents/Doc.9859.3rd%20Edition.alltext.en.pdf

IHOG: http://www.nifc.gov/aviation/av_ref_ihog.html or
http://www.nwcg.gov/pms/pubs/pms510/

Air Force Pamphlet 90-803
http://static.e-publising.af.mil/production/1/af_se/publication/afpam90-803/afpam90-803.pdf

USFS-BLM Aviation Risk Management Handbook 2011[svr1]
http://www.fs.fed.us/fire/av_safety/risk_management/ARMW%20Individual%20Files/ARM_2011W.pdf

OPM 06 http://oas.doi.gov/library/opm/CY2014/OPM-06.pdf

NOTE: SEE THE A305 RESOURCES FILES FOR ADDITIONAL ITEMS

APPENDIX B: Glossary

Safety Management System (SMS):
SMS is a quality management approach that integrates the practices of controlling risk and safety-related processes into an organized safety culture and business management model. Risk management is a tool under Safety Management.

Operational Risk Management (ORM):
ORM is a process of identifying and controlling hazards. The goal of ORM is to manage risk so the mission can be accomplished with minimum loss. ORM is also a decision-making tool to systematically help identify operational risks and benefits and determine the best course of action for any given situation.

Hazards:
A hazard is a present condition, event, object, or circumstance that could lead to or contribute to an unplanned or undesired event such as an accident. It is a source of danger.
Example: Pilot fatigue is a hazard because the pilot may not realize he or she is too tired to fly until serious errors are made. Humans are very poor monitors of their own mental condition and level of fatigue. Fatigue can be as debilitating as drug usage, according to some studies.

Risks:
Risk is the future impact of a hazard that is not controlled or eliminated. It can be viewed as future uncertainty created by the hazard. If it involves skill sets, the same situation may yield different risks.
Example: If the aircraft is not properly bonded and grounded, there is a build-up of static electricity that can and will seek the path of least resistance to ground. If the static discharge ignites the fuel vapor, an explosion may be imminent.

Controls:
Policies or devices that work to mitigate or eliminate risk to assets, lives, or mission completion.
Example: Using the two examples above organizations can implement a rule of 12 hours of “crew rest” prior the start of a duty day that includes flying, and limiting the length of that day to 12 hours. The other example of a control would be a post flight checklist completion requirement before the aircraft can be signed in for the day and the crew allowed to go home.

Likelihood:
Sometimes referred to as “vulnerability,” the level of possibility of occurrence of something that may impact people, property or resources.

Example: When departing for a flight in weather condition that are “Ceiling and Visibility (CAV) OK”, which is pilot speak for “clear skies” the likelihood of a weather-related incident are low. Conversely departing when the CAV is 1000ft and lightning has been spotted within 10nm has a significantly higher Likelihood of a weather related event.

Total Risk:
The sum of identified and unidentified risks.

Identified Risk:
Risk that has been determined through various analysis techniques. The first task of system safety is to identify, within practical limitations, all possible risks.
Example: The route chosen by a pilot requires them to be fairly close to the edge of their operational range. They realize this in the planning stages and take steps to manage the risk.

Unidentified Risk:
Risk not yet identified. Some unidentified risks are subsequently identified when a mishap occurs. Some risk is never known.
Example: Unforeseen weather changes, clear air turbulence, hazards not properly identified on a hazard map.

Unacceptable Risk:
Risk that cannot be tolerated by the managing activity. It is a subset of identified risk that must be eliminated or controlled.
Example: A Visual Flight Rules rated pilot deciding to fly in Instrument Flight Rules conditions.

Acceptable Risk:
Acceptable risk is the part of identified risk that is allowed to persist without further engineering or management action. Making this decision is a difficult yet necessary responsibility of the managing activity. This decision is made with full knowledge that it is the user who is exposed to this risk.
Example: Leaving the ground in an aircraft carries with it a certain amount of risk. When the skill and training of the pilot reach a level that sufficiently overcomes the risk, then the level of risk is acceptable.

Residual Risk:
Residual risk is the risk remaining after system safety efforts have been fully employed. It is not necessarily the same as acceptable risk. Residual risk is the sum of acceptable risk and unidentified risk. This is the total risk passed on to the user.
Example: Once again leaving the ground in an aircraft carries with it a certain amount of risk that is known, and a certain amount that could arise during the flight that wasn’t planned for.

APPENDIX C: Risk Assessment Worksheets

Aviation Risk Assessment Worksheet

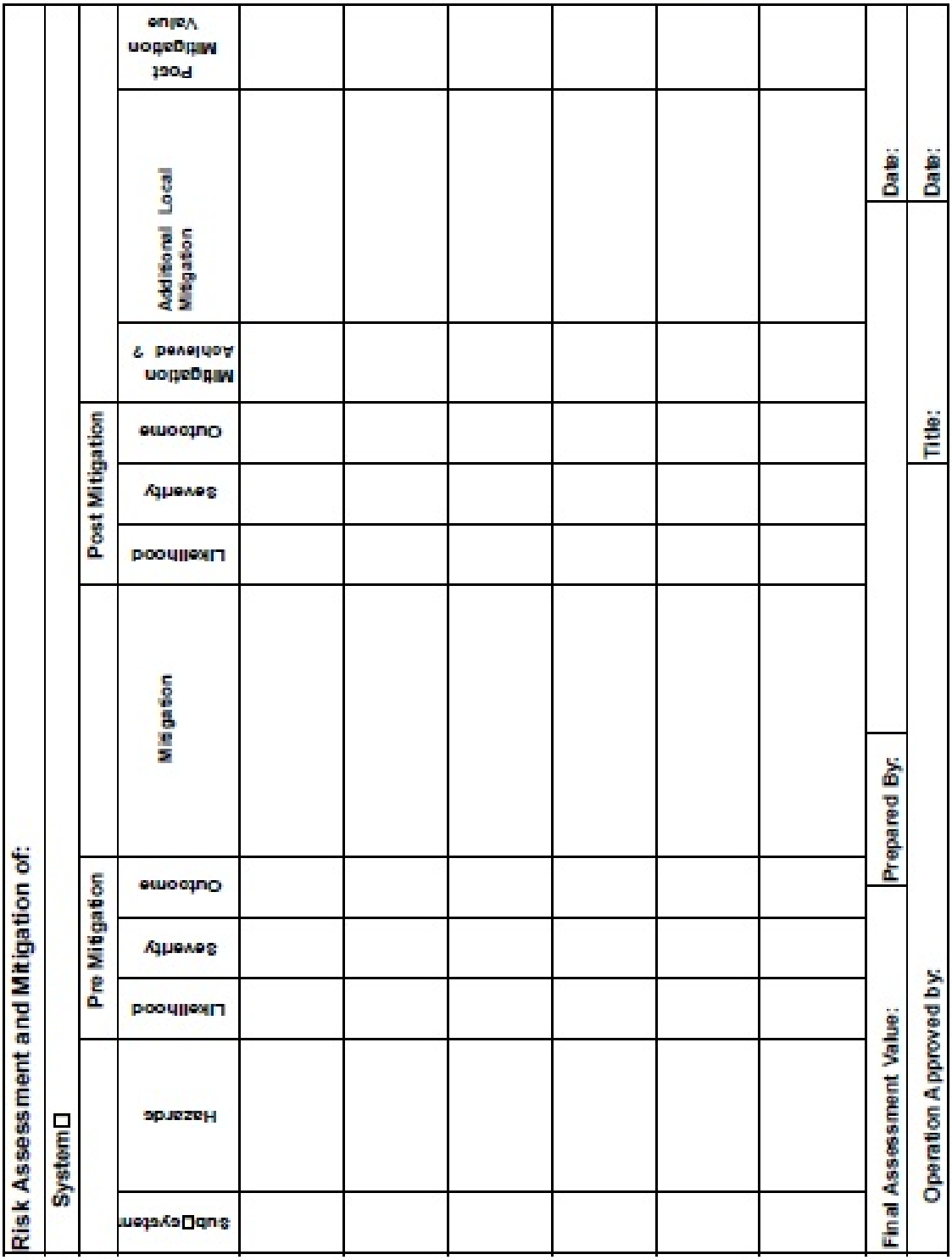
Assess the risks involved with the proposed operation. Use additional sheets if necessary.			
Assignment:	**Date:**		
	Pre-Mitigation hazard rate out		
Describe the Hazard:	Likelihood A-E	Severity I-IV	Risk Level
Pre Mitigation Overall Rating:			

	Post-Mitigation hazards rate out		
Mitigation Controls:	Likelihood A-E	Severity I-IV	Risk Level
Post Mitigation Overall Rating:			
Success Probability/Benefit Statement:			

Operation Approved by:	Title:	Date:

Source: IHOG, Appendix J, Page J-16

Aviation Risk Assessment Worksheet



Source: IHOG, Appendix J, Page J-17

APPENDIX D: After Action Review (AAR) Mission Centered Solutions AAR Guide

Source: MCS AAR Guide
(http://www.fireleadership.gov/toolbox/after_action_review/aar.pdf)

Guidelines for the AAR
The AAR should detail the actions of the crew during the assignment. Technical, operational, and human elements of crew performance should be discussed as appropriate. Both good and sub-standard performance should be addressed and analyzed. The content of each AAR may vary widely, depending upon the events.

Timing the AAR
The AAR is a learning tool. Time it to occur when the crew is ready and able to learn. As a leader or supervisor, you need to plan the AAR so that it can be as effective as possible.

- **End of the day**
  Generally, AARs conducted immediately after the shift will provide the best learning. This is the time when most things are still fresh in the mind both technically and emotionally. Unless the feelings associated with an event are very strong, crew members will not retain an emotional memory of it for long.

- **Split format**
  This format is the second-best choice when a full post-shift AAR cannot be implemented: for example, when you have a tired crew but also have important things to discuss. In the split format, the “What really happened?” part of the AAR is explored at the first opportunity, but the remaining part of the briefing is postponed until later. The “What really happened?” stage requires the most emotional recall and focuses only on recalling the events of the action. Analysis and creative thinking are needed for the latter stages, and a crew with no mental energy will have difficulty with
  In this format, these stages are delayed until the crew is ready to learn.

- **Start of the day**
  Conducted prior to morning briefing, this type of AAR enables crew members to retain many details from the previous day. Crew members are generally not as interactive or engaged as they would be right after the event. Although better than nothing, an AAR conducted the next morning is hard to get started and to keep moving.

- **End of assignment**
  Unlike the post-shift AAR, this AAR is usually is more academic and global in nature because most of the emotional aspect and much of the detail is missing. This type of briefing does not have to be conducted in the four-question AAR format. Since the post-shift AAR is concentrated on daily performance, the post-assignment briefing

may concentrate more on large events, operational procedures, shelved, or organization-related issues.

AAR Benefits

Following are some of the benefits for institutionalizing standardized and formal post-shift AARs:

- Crew members acquire a more complete knowledge of both the technical and human factors problems that they confront, enabling them to develop plans for doing better in the face of similar problems in the future.

APPENDIX E: Change Management

Source: USFS Change Management Guide
http://www.fs.fed.us/fire/aviation/av_library/Change%20Management%20and%20Implementation%20Guide%202011%20Final_w_Cover_toc.pdf

1.0 Introduction to Change Management

The purpose of this Change Management and Implementation Guide is to provide the US Forest Service's Fire and Aviation Management with pertinent information to help **build a strategy when faced with an operational change. This includes change to the agency, a particular program or any other change that has potential to significantly impact personnel or operations whether originating from inside or outside the agency.** As directed from the Chief's Safety Policy:

> *The prevention of accidents can only occur if we commit to safe work practices, **continually assess our changing environment**, refuse to assume unacceptable risks, and continually address unsafe conditions.*

1.1 Safety Management System (SMS) Requirements for a Change Management Plan

Within the four components of SMS, the third component of Safety Assurance incorporates the process for managing change.
The International Civil Aviation Organization (ICAO) and the Federal Aviation Administration (FAA) identify the management of Change as a key element of a Safety Management System (SMS). *FAA AC 120-92a, Element 3.2*

> *The organization will develop and maintain a process to identify changes within the organization or its operational environment which may affect established processes and services and to describe the arrangements to assure safety performance before implementing changes.*

And finally the US Forest Service Aviation SMS Guide states:

> *The Washington Office (WO) Branch of Risk Management will identify and determine acceptable safety risk for changes within the organization which may affect established processes and services by new system design, changing system designs, new operations/procedures or modified operations/procedures.*

In order for SMS to be fully functional, it must include a plan for implementing Change within the organization.

APPENDIX F: SAFECOMS

The Aviation Safety Communique (SAFECOM) database fulfills the Aviation Mishap Information System (AMIS) requirements for aviation mishap reporting for the Department of Interior agencies and the US Forest Service. Categories of reports include incidents, hazards, maintenance, and airspace. The system uses the SAFECOM Form OAS-34/FS-5700-14 to report any condition, observation, act, maintenance problem, or circumstance with personnel or the aircraft that has the potential to cause an aviation-related mishap. The SAFECOM system is **not** intended for initiating punitive actions. Submitting a SAFECOM is **not** a substitute for "on-the-spot" correction(s) to a safety concern. It is a tool used to identify, document, track and correct safety related issues. A SAFECOM **does not** replace the requirement for initiating an accident or incident report.

One desired outcome is the use of risk assessments worksheets to identify the risks and mitigate the hazards associated with the risks in aviation operations.

Change management emphasizes the “people side” of change and targets leadership within all levels of an organization including executives, senior leaders, middle managers and line supervisors.

All have to embrace the changes needed, not just lip service from senior management.

The use of risk assessments developed for project aviation safety plans can make for a safer environment for aviation operations.

APPENDIX G: Change Analysis Tool

(Source Air Force Pamphlet 90-803, page 64)

Historically, change has been an important source of risk in operational processes. Some changes are planned, but many occur incrementally over time without any intentional or conscious direction. Change analysis is intended to analyze the hazard implications of either planned or unplanned changes. Properly used, change analysis allows the RM process to focus on only the changed aspects of the operation. This eliminates the need to re-analyze the total operation simply because a change has occurred in one area. Change analysis is also used to detect the occurrence of change. By periodically and systematically comparing current procedures with previous procedures, unplanned changes are identified and clearly defined. Finally, change analysis is an important mishap investigation tool. Because many mishaps are caused by the injection of change into systems, an important investigative objective is to identify these changes using the change analysis procedure**.**