

Day 2: The Important stuff. **(Required Memorization)**

Risk Management

References: FAA-H-8083-9

Objectives: The student should develop knowledge of the elements related to managing and mitigating risk.

Elements:

1. Principles of Risk Management
2. Risk Management Process
3. Level of Risk
4. Assessing Risk
5. Mitigating Risk
6. IMSAFE Checklist
7. PAVE Checklist
8. 5P Checklist

What

Risk management is a decision-making process designed to perceive hazards systematically, assess the degree of risk associated with a hazard, and determine the best course of action.

Why

Flying is inherently dangerous, but there is no need for it to be unnecessarily dangerous. This lesson will describe ways to recognize and mitigate the risk involved with flying.

Types of Risk	
Total Risk	The sum of identified and unidentified risks.
Identified Risk	Risk which has been determined through various analysis techniques. The first task of system safety is to identify, within practical limitations, all possible risks.
Unidentified Risk	Risk not yet identified. Some unidentified risks are subsequently identified when a mishap occurs. Some risk is never known.
Unacceptable Risk	Risk which cannot be tolerated by the managing activity. It is a subset of identified risk that must be eliminated or controlled.
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.
Residual Risk	Residual risk is the risk left over 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.

Figure 1-1. *Types of risk.*

How:

Principles of Risk Management

1. Accept no Unnecessary Risk
 - a. Accept necessary risk
 - i. Flying is impossible without risk, do not make a situation more dangerous than necessary
2. Make Risk Decisions at the Appropriate Level
 - a. In single pilot situations, the pilot makes decisions
 - b. In other situations it may be beneficial to “go up the ladder” for decisions
 - i. i.e. Talk to the chief pilot or CFI about a potentially risky situation
 - c. Accept Risk When Benefits Outweigh the Costs
 - i. Analyse costs and benefits, make an informed decision
3. Integrate Risk Management into Planning at All Levels
 - a. Safety requires risk management planning in all stages of flight
 - i. Plan early and throughout to avoid unnecessary, amplified risk

Risk Management Process

1. Step 1: Identify the Hazard
 - a. A hazard is any condition that can cause degradation, injury, illness, death, damage to or loss of equipment/property.
2. Step 2: Assess the Risk
 - a. Determine the level of risk associated with the identified hazards
3. Step 3: Analyze Risk Control Measures
 - a. Look into ways to reduce, mitigate, or eliminate the risk
 - b. All risks have 2 components: Probability of occurrence & Severity of the hazard
 - i. Try to reduce/eliminate at least one component
 - c. Use Cost/Benefit analysis to decide if it is worth it
4. Step 4: Make Control Decisions
 - a. Choose the best controls based on steps 1 & 2
5. Step 5: Implement Risk Controls
 - a. Make a plan to apply #4 (time, materials, personnel, etc)
6. Step 6: Supervise and Review

Reevaluate and make necessary changes

Identify Risk: PAVE and IMSAFE Checklists

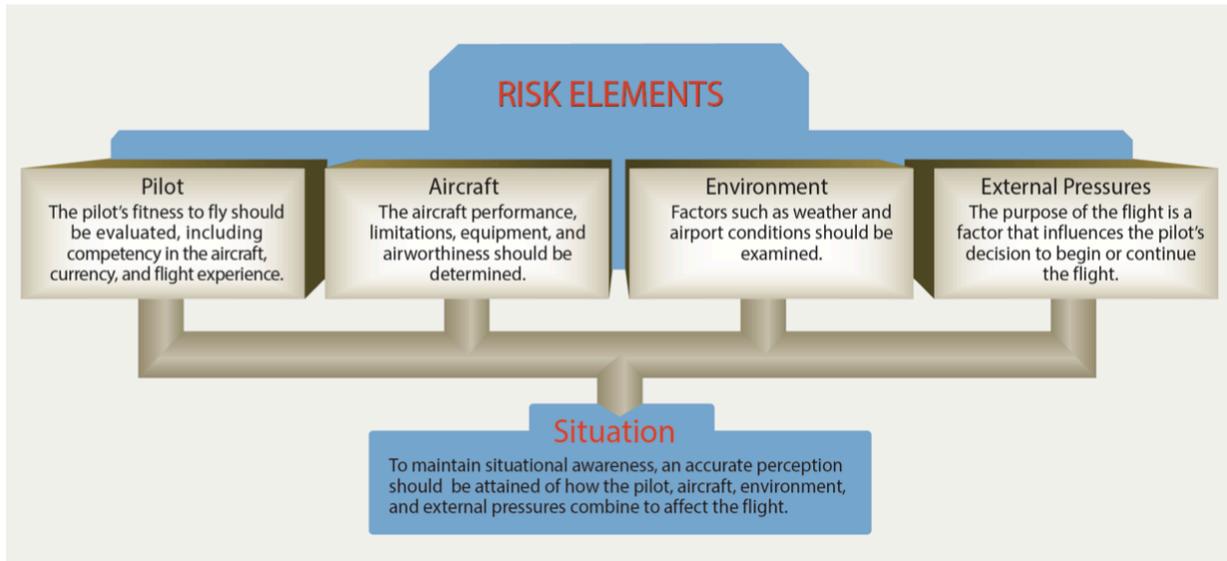


Figure 1-2. One of the most important decisions that the pilot in command makes is the go/no-go decision. Evaluating each of these risk elements can help the pilot decide whether a flight should be conducted or continued.



Figure 1-3. *Prior to flight, pilots may use a checklist to assess their fitness, just as they evaluate the aircraft's airworthiness.*

Assessing Risk: Use Risk Assessment Matrix

Level of Risk

1. The level of risk posed by a given hazard is measured in terms of:
 - a. Severity (extent of possible loss)
 - b. Probability (likelihood that a hazard will cause a loss)

Assessing Risk

- Pilots must differentiate in advance between a low-risk flight and a high-risk flight
- Establish a review process and develop strategies to minimize risk on the high and low risk flights
- Risk Matrix is a helpful risk assessment model
 - a. Assesses the likelihood of an event occurring and the consequences of that event
 - i. Likelihood (probability of occurrence): Probable, Occasional, Remote, Improbable
 1. Likelihood of a pilot flying MVFR to encounter IFR conditions
 - ii. Severity: Catastrophic, Critical, Marginal, Negligible
 1. If pilot is not IFR rated how severe could the consequences be
 - b. High Probability/Severity is bad and vice versa:

Risk Assessment Matrix					
Likelihood		Severity			
		Catastrophic	Critical	Marginal	Negligible
Probable	High	High	Serious		
Occasional	High	Serious			
Remote	Serious	Medium		Low	
Improbable					

Figure 1-4. This risk matrix can be used for almost any operation by assigning likelihood and severity. In the case presented, the pilot assigned the likelihood of occasional and the severity as catastrophic falls in the high-risk area.

Mitigating Risk

1. After determining the level of risk, the pilot needs to reduce the risk
 - a. Analyze options that can reduce unnecessary risk
 - i. Cancel/delay flight, bring CFI or more experienced pilot, etc

2. Flight Risk Assessment Tools (FRAT)

- a. Because every flight has some level of risk, it is critical that pilots can differentiate, in advance, between a low risk flight and a high- risk flight, establish a review process, and develop risk mitigation strategies. A Flight Risk Analysis Tool (FRAT) enables proactive hazard identification, is easy to use, and can visually depict risk. It is a tool many pilots use to make better go/no-go decisions.
- b. Why Should I Use a FRAT?
- c. “In the thick” is no time to try to mitigate a potentially hazardous outcome. When preparing for a flight or maintenance task, pilots and maintenance technicians may set aside time to stop and think about the hazards involved.
- d. Just thinking about this task may not consider the actual risk exposure. We may allow our personal desires to manipulate our risk assessment in order to meet personal goals. A formal process using pen and paper gives a perspective on the entire risk picture and is a good way to make a thorough analysis.

See Handout for FRAT Safety Briefing

Three-P Model for Pilots

As we have just learned with the Identify, Assess, & Mitigate model, risk management is a decision-making process designed to identify or perceive hazards systematically, assess the degree of risk associated with a hazard, and determine the best course of action to mitigate the risk. For example, the Perceive, Process, Perform (3P) model for aeronautical decision-making (ADM) offers a simple, practical, and structured way for pilots to manage risk. [Figure 1-5]



Figure 1-5. *3P Model (Perceive, Process, and Perform).*

To use the 3P model, the pilot:

- Perceives the given set of circumstances for a flight.
- Processes by evaluating the impact of those circumstances on flight safety.
- Performs by implementing the best course of action.

Warning Signs of Fatigue

- 👁️ Eyes going in and out of focus
- 👤 Head bobs involuntarily
- 👄 Persistent yawning
- 🧠 Spotty short-term memory
- 🤔 Wandering or poorly organized thoughts
- 👉 Missed or erroneous performance of routine procedures
- 🎯 Degradation of control accuracy



Figure 1-6. *Fatigue is a threat to aviation safety because it impairs alertness and performance.*

Countermeasures

- 👤 Long naps (3–4 hours*) can restore alertness for 12–15 hours
- 👤 Short power naps (10–30 minutes*) can restore alertness for 3–4 hours
- 🍖 Eat high-protein meals
- 💧 Drink plenty of fluids, especially water
- 🔄 Rotate flight tasks and converse with other crew members or passengers
- ❄️ Keep the flight deck temperature cool
- 🚶 Move/stretch in the seat, and periodically get up to walk around the aircraft, if possible



* Allow 15–20 minutes after awakening to become fully alert before assuming aircrew duties.

Figure 1-7. *Countermeasures for coping with fatigue.*

SRM: Single Pilot Resource Management

SRM is all about helping pilots learn how to gather information, analyze it, and make decisions. Although the flight is coordinated by a single person and not an onboard flightcrew, the use of available resources such as air traffic control (ATC) and Flight Service replicates the principles of CRM.

Operational Pitfalls	
Peer Pressure	Poor decision-making may be based upon an emotional response to peers, rather than evaluating a situation objectively.
Mind Set	A pilot displays mind set through an inability to recognize and cope with changes in a given situation.
Get-There-Itis	This disposition impairs pilot judgment through a fixation on the original goal or destination, combined with a disregard for any alternative course of action.
Duck-Under Syndrome	A pilot may be tempted to make it into an airport by descending below minimums during an approach. There may be a belief that there is a built-in margin of error in every approach procedure, or a pilot may want to admit that the landing cannot be completed and a missed approach must be initiated.
Scud Running	This occurs when a pilot tries to maintain visual contact with the terrain at low altitudes while instrument conditions exist.
Continuing Visual Flight Rules (VFR) into Instrument Conditions	Spatial disorientation or collision with ground/obstacles may occur when a pilot continues VFR into instrument conditions. This can be even more dangerous if the pilot is not instrument rated or current.
Getting Behind the Aircraft	This pitfall can be caused by allowing events or the situation to control pilot actions. A constant state of surprise at what happens next may be exhibited when the pilot is getting behind the aircraft.
Loss of Positional or Situational Awareness	In extreme cases, when a pilot gets behind the aircraft, a loss of positional or situational awareness may result. The pilot may not know the aircraft's geographical location or may be unable to recognize deteriorating circumstances.
Operating Without Adequate Fuel Reserves	Ignoring minimum fuel reserve requirements is generally the result of overconfidence, lack of flight planning, or disregarding applicable regulations.
Descent Below the Minimum En Route Altitude	The duck-under syndrome, as mentioned above, can also occur during the en route portion of an IFR flight.
Flying Outside the Envelope	The assumed high-performance capability of a particular aircraft may cause a mistaken belief that it can meet the demands imposed by a pilot's overestimated flying skills.
Neglect of Flight Planning, Preflight Inspections, and Checklists	A pilot may rely on short- and long-term memory, regular flying skills, and familiar routes instead of established procedures and published checklists. This can be particularly true of experienced pilots.

Figure 1-8. *All experienced pilots have fallen prey to, or have been tempted by, one or more of these tendencies in their flying careers.*

SRM and the 5P Checklist

The 5 Ps are used to evaluate the pilot's current situation at key decision points during the flight, or when an emergency arises. These decision points include preflight, pretakeoff, hourly or at the midpoint of the flight, predescent, and just prior to the final approach fix or for visual flight rules (VFR) operations, just prior to entering the traffic pattern.



Figure 1-9. *The 5P checklist.*

ADM: Aeronautical Decision Making

Aviation training and flight operations are now seen as a system rather than individual concepts. The goal of system safety is for pilots to utilize all four concepts (ADM, risk management, situational awareness, and SRM) so that risk can be reduced to the lowest possible level.

Definitions	
Aeronautical Decision-Making (ADM)	is a systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances.
Attitude	is a personal motivational predisposition to respond to persons, situations, or events in a given manner that can, nevertheless, be changed or modified through training as sort of a mental shortcut to decision-making.
Attitude Management	is the ability to recognize hazardous attitudes in oneself and the willingness to modify them as necessary through the application of an appropriate antidote thought.
Crew Resource Management (CRM)	is the application of team management concepts in the flight deck environment. It was initially known as cockpit resource management, but as CRM programs evolved to include cabin crews, maintenance personnel, and others, the phrase crew resource management was adopted. This includes single pilots, as in most general aviation aircraft. Pilots of small aircraft, as well as crews of larger aircraft, must make effective use of all available resources: human resources, hardware, and information. A current definition includes all groups routinely working with the cockpit crew who are involved in decisions required to operate a flight safely. These groups include, but are not limited to: pilots, dispatchers, cabin crewmembers, maintenance personnel, and air traffic controllers. CRM is one way of addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities.
Headwork	is required to accomplish a conscious, rational thought process when making decisions. Good decision-making involves risk identification and assessment, information processing, and problem solving.
Judgment	is the mental process of recognizing and analyzing all pertinent information in a particular situation, a rational evaluation of alternative actions in response to it, and a timely decision on which action to take.
Personality	is the embodiment of personal traits and characteristics of an individual that are set at a very early age and extremely resistant to change.
Poor Judgment Chain	is a series of mistakes that may lead to an accident or incident. Two basic principles generally associated with the creation of a poor judgment chain are: (1) One bad decision often leads to another; and (2) as a string of bad decisions grows, it reduces the number of subsequent alternatives for continued safe flight. ADM is intended to break the poor judgment chain before it can cause an accident or incident.
Risk Elements in ADM	take into consideration the four fundamental risk elements: the pilot, the aircraft, the environment, and the type of operation that comprise any given aviation situation.
Risk Management	is the part of the decision-making process which relies on situational awareness, problem recognition, and good judgment to reduce risks associated with each flight.
Situational Awareness	is the accurate perception and understanding of all the factors and conditions within the four fundamental risk elements that affect safety before, during, and after the flight.
Skills and Procedures	are the procedural, psychomotor, and perceptual skills used to control a specific aircraft or its systems. They are the airmanship abilities that are gained through conventional training, are perfected, and become almost automatic through experience.
Stress Management	is the personal analysis of the kinds of stress experienced while flying, the application of appropriate stress assessment tools, and other coping mechanisms.

Figure 1-10. *Terms used in AC 60-22 to explain concepts used in ADM training.*

Hazardous Attitudes

Flight instructors should be able to spot hazardous attitudes in a learner because recognition of hazardous thoughts is the first step toward neutralizing them. Flight instructors should keep in mind that being fit to fly depends on more than just a pilot's physical condition and recency of experience. Hazardous attitudes contribute to poor pilot judgment and affect the quality of decisions.

The Five Hazardous Attitudes	
Anti-authority: "Don't tell me."	This attitude is found in people who do not like anyone telling them what to do. In a sense, they are saying, "No one can tell me what to do." They may be resentful of having someone tell them what to do, or may regard rules, regulations, and procedures as silly or unnecessary. However, it is always pilot prerogative to question authority if it seems to be in error.
Impulsivity: "Do it quickly."	This is the attitude of people who frequently feel the need to do something—anything—immediately. They do not stop to think about what they are about to do; they do not select the best alternative, and they do the first thing that comes to mind.
Invulnerability: "It won't happen to me."	Many people believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. They never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk.
Macho: "I can do it."	Pilots who are always trying to prove that they are better than anyone else are thinking, "I can do it, I'll show them." Pilots with this type of attitude will try to prove themselves by taking risks in order to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.
Resignation: "What's the use?"	Pilots who think, "What's the use?" do not see themselves as being able to make a great deal of difference in what happens to them. When things go well, the pilot is apt to think that it is good luck. When things go badly, the pilot may feel that "someone is out to get me," or attribute it to bad luck. The pilot will leave the action to others, for better or worse. Sometimes, such pilots will even go along with unreasonable requests just to be a "nice guy."

Figure 1-11. *Pilots should examine their decisions carefully to ensure that their choices have not been influenced by a hazardous attitude*

Hazardous Attitude	Antidotes
<p>Macho Steve often brags to his friends about his skills as a pilot and how close to the ground he flies. During a local pleasure flight in his single-engine airplane, he decides to buzz some friends barbecuing at a nearby park.</p>	<p>Taking chances is foolish.</p>
<p>Anti-authority Although he knows that flying so low to the ground is prohibited by the regulations, he feels that the regulations are too restrictive in some circumstances.</p>	<p>Follow the rules. They are usually right.</p>
<p>Invulnerability Steve is not worried about an accident since he has flown this low many times before and he has not had any problems.</p>	<p>It could happen to me.</p>
<p>Impulsivity As he is buzzing the park, the airplane does not climb as well as Steve had anticipated and, without thinking, he pulls back hard on the yoke. The airspeed drops and the airplane is close to stalling as the wing brushes a power line.</p>	<p>Not so fast. Think first.</p>
<p>Resignation Although Steve manages to recover, the wing sustains minor damage. Steve thinks to himself, "It doesn't really matter how much effort I put in—the end result is the same whether I really try or not."</p>	<p>I'm not helpless. I can make a difference.</p>

Figure 1-12. Learners in training can be asked to identify hazardous attitudes and the corresponding antidotes when presented with flight scenarios.

Stress Management

Performance generally increases with the onset of stress, peaks, and then begins to fall off rapidly as stress levels exceed a person's ability to cope. The ability to make effective decisions during flight can be impaired by stress. Factors, referred to as stressors, can increase a pilot's risk of error in the flight deck. [Figure 1-13]

Stressors	
Physical Stress	Conditions associated with the environment, such as temperature and humidity extremes, noise, vibration, and lack of oxygen.
Physiological Stress	Physical conditions, such as fatigue, lack of physical fitness, sleep loss, missed meals (leading to low blood sugar levels), and illness.
Psychological Stress	Social or emotional factors, such as a death in the family, a divorce, a sick child, or a demotion at work. This type of stress may also be related to mental workload, such as analyzing a problem, navigating an aircraft, or making decisions.

Figure 1-13. Three types of stressors that can affect pilot performance.

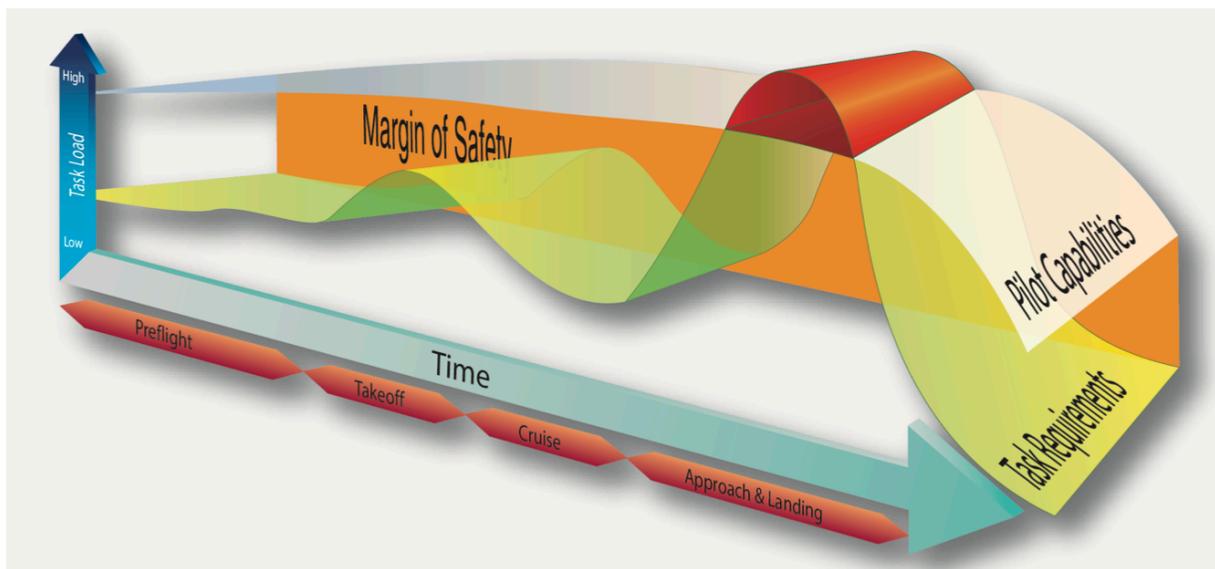


Figure 1-14. Accidents often occur when flying task requirements exceed pilot capabilities. The difference between these two factors is called the margin of safety. Note that in this idealized example, the margin of safety is minimal during the approach and landing. At this point, an emergency or distraction could overtax pilot capabilities, causing an accident.

