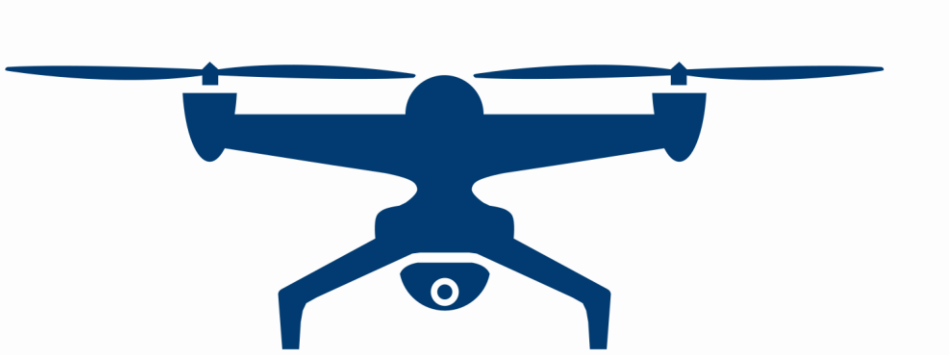
UAS Standards, Reg, Law & Exam

FAA Regulations: Part 107

Lesson 5d – Operations: Aeronautical Decision-Making



Operations – Aeronautical Decision-Making (ADM)

Task	***D. Aeronautical Decision-Making (*)***
References	AC 107-2; FAA-H-8083-2; FAA-H-8083-25
Objective	To determine that the applicant is knowledgeable in aeronautical decision-making.
Knowledge	The applicant demonstrates understanding of:
UA.V.D.K1	Aeronautical Decision-Making (ADM):
UA.V.D.K1a	a. Effective team communication
UA.V.D.K1b	b. Task management
UA.V.D.K2	Crew Resource Management (CRM).
UA.V.D.K3	Situational awareness.
UA.V.D.K4	Hazardous attitudes.
UA.V.D.K5	Hazard identification and risk assessment.
Risk Management	[Reserved]
Skills	[Not applicable]

ADM and Crew Resource Management (CRM)

- ADM is a systematic approach to the mental process used by pilots to determine consistently the best course of action in response to a given set of circumstances
- A RPIC uses many different resources to safely operate a small unmanned aircraft and needs to be able to manage these resources effectively
- CRM is a component of ADM, in which the pilot of a small unmanned aircraft makes effective use of all available resources: human resources, hardware, and information
- Many remote pilots operating under part 107 may use a VO, oversee other persons manipulating the controls of the small UAS, or any other person with whom the remote PIC may interact to ensure safe operations
- Therefore, a RPIC must be able to function in a team environment and maximize team performance
- This skill set includes situational awareness, proper allocation of tasks to individuals, avoidance of work overloads for himself or herself and in others, and effectively communicating with other members of the crew, such as VOs and persons manipulating the controls of a small unmanned aircraft
- Appendix A, Risk Assessment Tools, contains expanded information on ADM and CRM, as well as sample risk assessment tools to aid in identifying hazards and mitigating risks

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1. Purpose of This Appendix. The information in this appendix is a presentation of aeronautical decision-making (ADM), Crew Resource Management (CRM), and an example of a viable risk assessment process. This process is used to identify hazards and classify the potential risk that those hazards could present in an operation. It also provides examples of potential criteria for the severity of consequences and likelihood of occurrence that may be used by a small unmanned aircraft remote pilot in command (PIC).
2. Aeronautical Decision-Making (ADM). The ADM process addresses all aspects of decision making in a solo or crew environment and identifies the steps involved in good decision making. These steps for good decision making are as follows:

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A.2.1 Identifying Personal Attitudes Hazardous to Safe Flight.

- Hazardous attitudes can affect unmanned operations if the remote PIC is not aware of the hazards, leading to such things as:
  - getting behind the aircraft/situation,
  - operating without adequate fuel/battery reserve,
  - loss of positional or situational awareness,
  - operating outside the envelope,
  - and failure to complete all flight planning tasks, preflight inspections, and checklists.
- Operational pressure is a contributor to becoming subject to these pitfalls.

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A.2.1 Learning Behavior Modification Techniques.

- Continuing to utilize risk assessment procedures for the operation will assist in identifying risk associated with the operation.
- Conducting an attitude assessment will identify situations where a hazardous attitude may be present.

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A.2.3 Learning How to Recognize and Cope with Stress.

- Stress is ever present in our lives and you may already be familiar with situations that create stress in aviation. However, small UAS operations may create stressors that differ from manned aviation.
- Such examples may include: working with an inexperienced crewmember, lack of standard crewmember training, interacting with the public and city officials, and understanding new regulatory requirements.
- Proper planning for the operation can reduce or eliminate stress, allowing you to focus more clearly on the operation.

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A.2.4 Developing Risk Assessment Skills.

- As with any aviation operation, identifying associated hazards is the first step.
- Analyzing the likelihood and severity of the hazards occurring establishes the probability of risk.
- In most cases, steps can be taken to mitigate, even eliminate, those risks.
- Actions such as using visual observers (VO), completing a thorough preflight inspection, planning for weather, familiarity with the airspace and operational area, proper aircraft loading, and performance planning can mitigate identified risks.
- Figure A-1, Hazard Identification and Risk Assessment Process Chart, is an example of a risk assessment tool. Others are also available for use.

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A.2.5 Using All Available Resources with More Than One Crewmember (CRM).

- A characteristic of CRM is creating an environment where open communication is encouraged and expected and involves the entire crew to maximize team performance.
- Many of the same resources that are available to manned aircraft operations are available to unmanned aircraft operations. For example, remote PICs can take advantage of traditional CRM techniques by utilizing additional crewmembers, such as VOs and other ground crew. These crewmembers can provide information about traffic, airspace, weather, equipment, and aircraft loading and performance. If conducting operations over people or moving vehicles, crewmembers can also provide timely information regarding the presence of those not directly participating in the operation.

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A.2.5.1 Communication Procedures. One way to accomplish this is for the VO to maintain visual contact with the small unmanned aircraft and maintain awareness of the surrounding airspace and operational area, and then communicate flight status and any hazards to the remote PIC and person manipulating the controls so that appropriate action can be taken. Then, as conditions change, the remote PIC should brief the crew on the changes and any needed adjustments to ensure a safe outcome of the operation.

A.2.5.2 Communication Methods. The remote PIC, person manipulating the controls, and VO must work out a method of communication, such as the use of a handheld radio or other effective means that would not create a distraction and allows them to understand each other. The remote PIC should evaluate which method is most appropriate for the operation and should make a determination prior to flight.

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A.2.5.3 Task Management. Tasks vary depending on the complexity of the operation. Depending upon the area of the operations, additional crewmembers may be needed to operate the small unmanned aircraft safely. The remote PIC should utilize sufficient crewmembers to ensure no one on the team becomes overloaded. Once a member of the team becomes overworked, a greater possibility of an incident/accident exists.

A.2.5.4 Other Resources. Take advantage of information from a weather briefing, air traffic control (ATC), the FAA, local pilots, and landowners. Technology can aid in decision making and improve situational awareness. Being able to collect the information from these resources and manage the information is key to situational awareness and could have a positive effect on your decision making.

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A.2.6 Evaluating the Effectiveness of ADM Skills.

- Successful decision making is measured by a pilot's consistent ability to keep himself or herself, any persons involved in the operation, and the aircraft in good condition regardless of the conditions of any given flight.
- As with manned operations, complacency and overconfidence can be risks. Several checklists and models exist to assist in the decision-making process.
- Use the IMSAFE checklist to ensure adequate mental and physical preparation for the flight.
- Use the DECIDE model to assist in continually evaluating each operation for hazards and analyzing risk.
- Paragraph A.4.8 and AC 60-22, Aeronautical Decision Making, can provide additional information on these models and others.

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A.3 Hazard Identification

- Hazards related to the small unmanned aircraft and its operating environment must be identified and controlled.
- The analysis process used to define hazards needs to consider all components of the system, based on the equipment being used and the environment in which it is operated.
- The key question to ask during analysis of the small unmanned aircraft and its operation is, "what if?"
- Small unmanned aircraft remote PICs are expected to exercise due diligence in identifying significant and reasonably foreseeable hazards related to their operations.
- It is recommended that remote pilots document small unmanned aircraft and operating environment hazards in accordance with the hazard identification process described in Figure A-1.

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A.4 Safety Risk Assessment and Mitigation Steps

- Before flight, the following Safety Risk Assessment and Mitigation steps should be taken.
- Figure A-1 shows hazard identification and risk assessment process chart.
- Figure A-2 in next slide is an example of a risk assessment plan in table format to accomplish this task. This example should not be considered a required format. It is designed simply to show one way to document a risk assessment and mitigation plan.

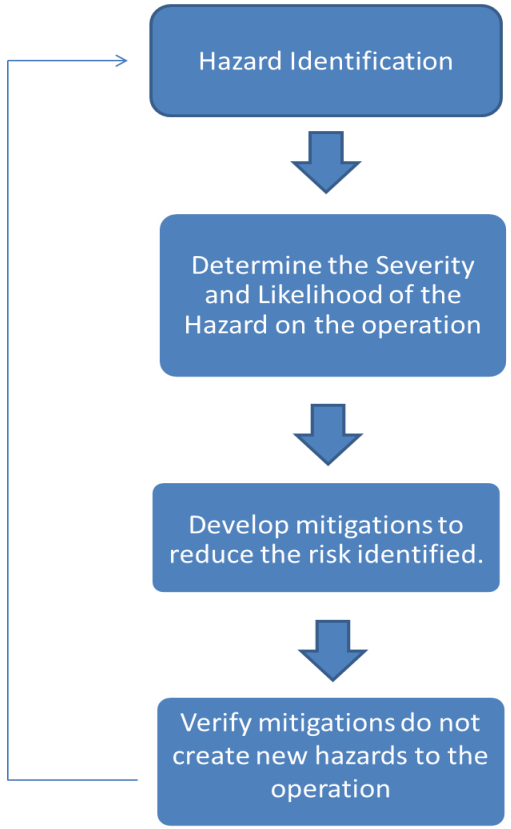

Figure A-1. Hazard Identification and Risk Assessment Process Chart

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Figure A-2.
Sample Safety Risk Assessment and Mitigation Steps Before Flight

<u>Risk Management</u> – Example of Identified Potential Hazard

Hazard	Cause	Effect	Likelihood (1)	Severity (2)	Risk (3)	Mitigation	Emergency or Contingency Procedures (4)
Describe "what might happen?" *Example: Loss of control link over people*	Describe the "why might it happen?" *Example: Loss of power supply from control station, small UAS out of range, signal interference from another device (Wi-Fi, Bluetooth, etc.)*	Describe the effect. *Example: Ground impact, injury to people, damage to small unmanned aircraft.*	Describe the chances of the hazard occurring. *Example: Occasional*	Describe the consequences if the event does occur. *Example: Injury to people (possibly including death)*	State the overall risk. *Example: High*	Describe how the risk is minimized. *Example (partial): The remote PIC must conduct a control link check prior to operations over people. The preflight briefing must include control link loss procedures.*	Describe what will be done if the hazard occurs. *Example: Try to reestablish control link connection with the small unmanned aircraft. If connection cannot be reestablished, start emergency or contingency procedures for loss of control link.*

Notes:

(1)Likelihood: Likelihood the risk will occur – Improbable, Remote, Occasional, Probable, or Frequent.

(2)Severity: Consequence if the hazard occurs – No safety effect, Minor, Major, Hazardous, or Catastrophic.

(3)Risk: Combination of Likelihood and Severity – Low, Medium, High, or Avoid (i.e., changes to operation are required for mitigation or the operation should not be conducted). These definitions are used to assign the level of risk prior to consideration of risk mitigation effects.

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Emergency or Contingency Procedures

- In order to identify effectively all potential hazards and their associated risks, you should first begin with a thorough description of the operational environment. This should include (but is not limited to):
  - Current and forecasted weather conditions.
  - Condition of the equipment to be used and associated operational limitations.
  - Remote pilot, observer, and other participants' fatigue and awareness levels.
  - Terrain and obstacles (such as proximity to power lines, buildings, etc.) in the planned and emergency/contingency flightpath.
  - Identify the hazard(s) associated with flying over people (hazard column above).
  - If the operation will occur at night, identify hazards of flying at night, to include those operations whose mission duration includes portions of day, twilight, and night. Such potential hazards include night vision adaptation when unlit towers and buildings are present in the area of operation. Other potential hazards include current and forecast weather conditions and terrain features that may affect the ability for other aircraft operating in the area to see the anti-collision light for at least 3 statute miles.
  - Identify other hazard(s) present during all small unmanned aircraft flights, such as schedule pressure, health issues, lack of familiarity with equipment, and the list goes on (hazard column above).

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Emergency or Contingency Procedures

- Once you have identified the potential hazards, complete the following steps for each hazard.
- List the cause(s) of each hazard (cause column above).
- List the effect(s) of each hazard (effect column above).

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Emergency or Contingency Procedures

- Perform a qualitative risk assessment by:
  - Estimating the likelihood of each hazard occurring (probability column (1) above).
  - Estimating the severity of each hazard, if it occurs (severity column (2) above).
  - Defining the risk of each hazard as a combination of the probability and severity (risk column (3) above).
  - Describe the mitigation steps for each hazard (mitigation column above). Develop controls to mitigate all risks to an acceptable level. If such development is not possible, the operator should not operate the small unmanned aircraft until the operator can accomplish this.
  - Describe any procedures to accomplish, including emergency and contingency procedures, should the hazard occur (emergency or contingency procedure column (4) above).

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A.4.1 In-Flight Mitigations

- During the flight, the following safety risk assessment and mitigation steps should be taken:
  - Properly use the assessment and inspection checklists, including briefing of appropriate safety risk assessment and mitigation steps.
  - Maintain proper configuration of the small unmanned aircraft for the category of the operation.
  - Constantly re-assess risk.
  - Have and follow procedures for making changes to the flight profile, including crewmember notification.

A.4.2 Post-Flight

- After the flight, the following steps should be taken:
  - Perform a thorough debriefing.
  - Capture lessons learned and recommendations.

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A.4.3 Contributors to Consider When Performing Risk Assessments. The following list contains examples of factors to consider in assigning a risk rating to a specific identified hazard. This is not a comprehensive list, but an initial list of items to consider:

- Workload
- Configuration (gross weight, center of gravity (CG), etc.)
- Environment (weather, ATC, particular airport conditions, turbulence, etc.)
- Specific small unmanned aircraft limitations as stated by the manufacturer
- Consequence of failure in technique, system, or structure

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A.4.4 Formulating Mitigations. Mitigate all risks to an acceptable level. Mitigations are actions to minimize, understand, prepare, or respond to causes of the hazards. They are actions the remote pilot, crewmember(s), or other team member(s) have control over. Mitigations will address reducing either the probability of a cause, the severity of the effect, or both. Mitigations should be detailed and specific in nature. The following items should be considered when formulating mitigations. This is not a comprehensive list, but an initial list of items to consider:

- Set limits on flight conditions (e.g., minimum weather, altitude, minimum/maximum speed, etc.).
- Clearly define and brief criteria that could cause the discontinuation of the flight (e.g., items that affect safety of flight) and who will make and execute decisions.
- Review hazards and specify steps to reduce the associated risk(s).
- Review Weight and Balance (W&B) computations.

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A.4.5 Emergency and Contingency Procedures. Describe any emergency and contingency procedures to accomplish if the hazard occurs, despite mitigation steps (emergency or contingency procedure column (4) in Figure A-2 above).

A.4.6 Other Risk Assessment Tools for Flight and Operational Risk Management. Other tools can also be used for flight or operational risk assessments and can be developed by the remote PICs themselves. The key consideration is ensuring all potential hazards and risks are identified and appropriate actions are taken to reduce the risk to persons and property not associated with the operations.

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A.4.7 Reducing Risk. Risk analyses should concentrate not only on assigning levels of severity and likelihood, but on determining why these particular levels were selected. This is referred to as root cause analysis and is the first step in developing effective controls to reduce risk to lower levels. In many cases, simple brainstorming sessions among crewmembers is the most effective and affordable method of finding ways to reduce risk. This also has the advantage of involving people who will ultimately be required to implement the controls developed.

A.4.7.1 It is very easy to get quite bogged down in trying to identify all hazards and risks. That is not the purpose of a risk assessment. The focus should be upon those hazards which pose the greatest risks. As stated earlier, by documenting and compiling these processes, a remote PIC can build an arsenal of safety practices that will add to the safety and success of future operations.

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A.4.8 Sample Hazard Identification and Risk Assessment

A.4.8.1 I am the remote PIC of a small unmanned aircraft in the proximity of an accident scene shooting aerial footage. Much like pilots in manned aircraft must adhere to preflight action (14 CFR part 91, § 91.103), I must adhere to preflight familiarization, inspection, and aircraft operations (14 CFR part 107, § 107.49).

Let's say there is an obvious takeoff and landing site that I intend to use. What if, while I am operating, a manned aircraft (emergency medical services (EMS) helicopter) requires use of the same area and I am not left with a suitable landing site? Furthermore, I am running low on power. If I consider this situation prior to flight, I can use the Basic Hazard Identification and Mitigation Process. Through this process, I might determine that an acceptable level of risk can be achieved by also having an alternate landing site and possibly additional sites at which I can sacrifice the small unmanned aircraft to avoid imposing risks to people on the ground or to manned aircraft operations. It is really a simple process: I must consider the hazards presented during this particular operation, determine the risk severity, and then develop a plan to lessen (or mitigate) the risk to an acceptable level. By documenting and compiling these processes, I can build a collection of safety practices that will add to the safety and success of future operations. The following are some proven methods that can help a new remote PIC along the way:

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A.4.8.2 Hazard Identification. Using the Personal Minimums (PAVE) Checklist for Risk Management, I will set personal minimums based upon my specific flight experience, health habits, and tolerance for stress, just to name a few. After identifying hazards, I will then input them into the Hazard Identification and Risk Assessment Process Chart (see Figure A-1).

- Personal: Am I healthy for flight and what are my personal minimums based upon my experience operating this small unmanned aircraft? During this step, I will often use the IMSAFE checklist in order to perform a more in-depth evaluation:
  - Illness – Am I suffering from any illness or symptom of an illness which might affect me in flight?
  - Medication – Am I currently taking any drugs (prescription or over-the-counter)?
  - Stress – Am I experiencing any psychological or emotional factors that might affect my performance?
  - Alcohol – Have I consumed alcohol within the last 8 to 24 hours?
  - Fatigue – Have I received sufficient sleep and rest in the recent past?
  - Eating – Am I sufficiently nourished?

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A.4.8.2 Hazard Identification. Using the Personal Minimums (PAVE) Checklist for Risk Management, I will set personal minimums based upon my specific flight experience, health habits, and tolerance for stress, just to name a few. After identifying hazards, I will then input them into the Hazard Identification and Risk Assessment Process Chart (see Figure A-1).

- Aircraft: Have I conducted a preflight check of my small UAS (aircraft, control station (CS), takeoff and landing equipment, anti-collision light for night operations, etc.)? Has it been determined to be in a condition for safe operation? Is the payload properly secured to the aircraft prior to flight?
- Environment: What is the weather like? Am I comfortable and experienced enough to fly in the forecast weather conditions? Have I considered all of my options and left myself an "out?" Have I determined alternative landing spots in case of an emergency? Will I be flying at night and how may that change the way I operate? What are my associated risks when operating at night? Will I have the ability to see the anti-collision light for at least 3 SM? Will other aircraft that may be operating in the area have the ability to see the anti-collision light for at least 3 sm, considering weather and terrain (certain weather phenomena, such as fog, terrain features, and other phenomena, and obstacles such as hills, mountains, and manmade structures, may affect the ability for me and other aircraft to see the anti-collision light for at least 3 sm)? Is the flash rate sufficient to avoid a collision? Will I be operating over people, and if so, how will I ensure I do not create any hazards to persons not directly participating in the operation? Can my operational area be considered an open-air assembly of persons? Will I be operating over moving vehicles, and if so, how will I ensure I do not create any hazards to vehicles? Will my operations (landing spots) need to be relocated due to the people?

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- External Pressures: Am I stressed or anxious? Is this a flight that will cause me to be stressed or anxious? Is there pressure to complete the flight operation quickly? Am I dealing with an unhealthy safety culture? Am I being honest with myself and others about my personal operational abilities and limitations?

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A.4.9 Controlling Risk. After hazards and risks are fully understood through the preceding steps, risk controls must be designed and implemented. These may be additional or changed procedures, additional or modified equipment, the addition of VOs, or any of a number of other changes.

A.4.10 Residual and Substitute Risk. Residual risk is the risk remaining after mitigation has been completed. Often, this is a multistep process, continuing until risk has been mitigated to an acceptable level necessary to begin or continue operation. After these controls are designed but before the operation begins or continues, an assessment must be made of whether the controls are likely to be effective and/or whether they introduce new hazards to the operation. The latter condition, introduction of new hazards, is referred to as substitute risk, a situation in which the resolution is worse than the original issue. The loop seen in Figure A-1 that returns back to the top of the diagram depicts the use of the preceding hazard identification, risk analysis, and risk assessment processes to determine whether the modified operation is acceptable.

A.4.11 Starting the Operation. Once a remote PIC develops and implements appropriate risk controls, the operation can begin.

Good Aeronautical Judgment

- A systematic mental approach to consistently determine the best course of action in a given situation.
- As the RPIC you will use a number of resources to safely operate your UAS: e.g. human resources (visual observers or other the person manipulating the controls), hardware, flight software, and other information.
- RPIC uses ADM to mitigate risk factors associated with flight operations.

Aeronautical Decision-Making

- A systematic mental approach to consistently determine the best course of action in a given situation.
- As the RPIC you will use a number of resources to safely operate your UAS: e.g. human resources (visual observers or other the person manipulating the controls), hardware, flight software, and other information.
- RPIC uses ADM to mitigate risk factors associated with flight operations.

ADM Reduces Risk

- ADM provides a framework with the purpose:
  - Identifying hazards
  - Classifying the potential threat from those hazards

What Does ADM Involve and What Are ADM Best Practices

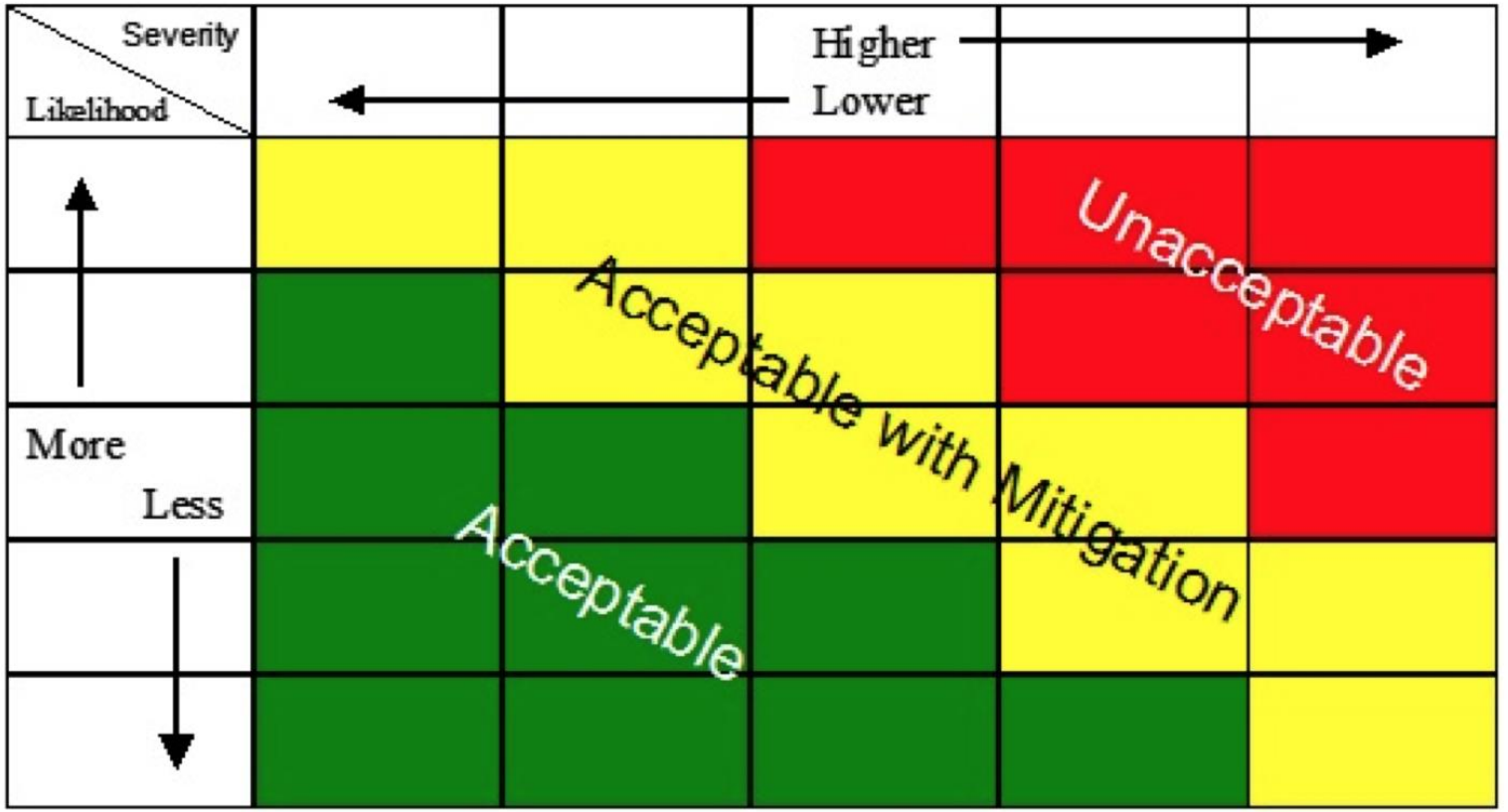
- Conducting an attitude assessment before flight to identify where/when a hazardous attitudes might be present.
- Learning to recognize and cope with stress
  - Situations likely to increase stress include:
  - Inexperienced crewmember(s)
  - Interacting with the public officials
  - Understanding new regulatory requirements
- Using visual observers (VO), who are trained crewmembers in visual line-of-sight of the UAS and who assists the remote PIC with collision avoidance and complying with the rules of flight.
- Completing a thorough preflight inspection
- Planning for weather
- Familiarity with the airspace & project area
- Proper aircraft loading
- Performance planning to mitigate identified risks

Examples of ADM Best Practices

- Schedule flights to avoid possible conflict/overflights of people on the ground. e.g. around school schedules or other activities that take place on a regular schedule.
- Restrict people from area where the flight is to take place. e.g. Cordon off the project area and/or post VOs or other crew members at likely access points.
- Identify alternative landing sites in the event of an emergency or airspace conflict with other aircraft. There are times when it might be necessary to sacrifice your UAV to avoid endangering others. You need to be aware of this possibility and plan accordingly.

Acceptability of Risk

- The acceptability of risk can be evaluated using a risk matrix, that shows three levels of risk acceptability



Sample Severity & Likelihood Criteria

- You may want to revise this table to better suit your operations
- Source: FAA AC 107-2

Severity of Consequences			**Likelihood of Occurrence**		
Severity Level	Definition	Value	Likelihood Level	Definition	Value
Catastrophic	Equipment destroyed, multiple deaths.	5	Frequent	Likely to occur many times	5
Hazardous	Large reduction in safety margins, physical distress, or a workload such that crewmembers cannot be relied upon to perform their tasks accurately or completely. Serious injury or death. Major equipment damage.	4	Occasional	Likely to occur sometimes	4
Major	Significant reduction in safety margins, reduction in the ability of crewmembers to cope with adverse operating conditions as a result of an increase in workload, or as result of conditions impairing their efficiency. Serious incident. Injury to persons.	3	Remote	Unlikely, but possible to occur	3
Minor	Nuisance. Operating limitations. Use of emergency procedures. Minor incident.	2	Improbable	Very unlikely to occur	2
Negligible	Little consequence.	1	Extremely Improbable	Almost inconceivable that the event will occur	1

Risk Acceptance

- Risk Acceptance. In the development of risk assessment criteria, sUAS RPICs are expected to:
  - Develop risk acceptance procedures, including acceptance criteria and designation of authority and responsibility for risk management decision making.

Risk Acceptance

Risk Likelihood		Risk Severity				
		Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely Improbable	1	1A	1B	1C	1D	1E

RED – Unacceptable Risk
YELLOW – Acceptable Risk with Appropriate Mitigation
GREEN – Acceptable Risk

Mitigating Levels of Risk – Unacceptable Risk

- Unacceptable (Red) – when the severity and the likelihood are both high, you fall into the read area
- The risk should be assessed as unacceptable
- In this situation, you should design an intervention to eliminate that associated hazard or to control the factors that lead to higher risk likelihood or severity

Mitigating Levels of Risk – Acceptable Risk with Mitigation

- Acceptable with Mitigation (Yellow) – where the risk assessment falls into the yellow area, the risk may be accepted if you identify ways to mitigate, or lower, the risk.
- Example of this situation - Operations near school.
  - Scheduling the operation to take place when school is not in session to mitigate the likelihood of students being in the area of the project.
  - Another mitigation could be restricting people from the area of operations by placing cones or security personnel to prevent unauthorized access during the flight operation.

Mitigating Levels of Risk – Acceptable Risk

- Acceptable (Green) – when the severity and the likelihood are both low, you fall into the green area.
- The objective in risk management should always be to reduce risk to as low as practicable regardless of whether or not the assessment indicates that it is already an acceptable level of risk.
- Anytime the RPIC becomes apprehensive for the safety of the operations, for any reason, they should request immediate assistance.

Reducing Risk – Root Cause Analysis

- Risk analyses should concentrate not only on assigning levels of severity and likelihood, but on determining why these particular levels were selected.
- The first step in developing effective controls is to reduce risk to lower levels.
  - In many cases, simple brainstorming sessions among crewmembers is the most effective and affordable method of finding ways to reduce risk. This also has the advantage of involving people who will ultimately be required to implement the controls developed.

Procedure for Hazard Identification and Risk Assessment

- Consider the hazards presented during the operation.
- Determine the risk severity.
- Develop a plan to lessen (or mitigate) the risk to an acceptable level.

Responsibility

- It is the responsibility of the RPIC and all participating Crew Members to identify all potential hazards and risks, and that you take all appropriate actions to reduce the risk to people and property.

Risk Management

- As noted above, it is not realistically possible to identify every possible risk.
- Therefore the Risk Assessment should focus on the hazards that pose the greatest risks.
- Once appropriate risk controls are developed and implemented, the operation can begin.

Components of CRM – 1

- **Communication Procedures.** One way to accomplish this is to have the VO maintain visual contact with the small UA and maintain awareness of the surrounding airspace, and then communicate flight status and any hazards to the remote PIC and the person manipulating the controls so that appropriate action can be taken. Then, as conditions change, the remote PIC should brief the crew on the changes and any needed adjustments to ensure a safe outcome of the operation.
- **Communication Methods.** The RPIC, person manipulating the controls, and VO must work out a method of communication, such as hand-held radio, that would not create a distraction and allows them to understand each other. The remote PIC should evaluate which method is most appropriate for the operation and decide on it prior to flight.

Components of CRM – 2

- **Task Management.** Task management is the process pilots use to manage the many concurrent tasks involved in safely flying an aircraft. Tasks vary depending on the complexity of the operation. Depending upon the area of the operations, additional crewmembers may be needed to safely operate. Enough crewmembers should be utilized to ensure no one on the team becomes overloaded. Once a member of the team becomes over-worked, there's a greater possibility of an incident/accident.
- **Other Resources.** Take advantage of information from a weather briefing, air traffic control (ATC), the FAA, local pilots, and landowners. Technology can aid in decision-making and improve situational awareness. Being able to collect the information from these resources and manage the information is key to situational awareness and could have a positive effect on your decision-making.

Situational Awareness

- Situational awareness describes the accurate perception and understanding of all the factors and conditions that affect safety before, during, and after flight.
- An extreme case of a pilot being over-taxed, or "getting behind the aircraft" can lead to the operational pitfall of loss of situational awareness.

Risk Management & Situational Awareness

- Effective Risk management relies on situational awareness, problem recognition and good judgment to risk.
- Checklists and Situational Awareness.
- Don’t rely on short and long term memory for repetitive tasks. Use a checklist, it will make you a safer pilot!
- Checklists help you avoid missing important steps, always use the appropriate checklists.
- Consistent adherence to approved checklists is a sign of a disciplined and competent pilot.

Situational Awareness Checklists

- PAVE, IMSAFE & DECIDE MODELS
- Three model checklists are commonly used in aviation.
- Use of these models can reduce your risk of an incident. (Aviation does not use the term "accident.")

DECIDE Model – Hazard Assessment and Risk Analysis

- Detect – the fact that a change has occurred
- Estimate – the need to react to or counter the change
- Choose – a desirable outcome for the flight or situation
- Identify – actions to control the change successfully
- Do – take the necessary actions
- Evaluate – the effects of the action to react to or counter the initial change

Improving Situational Awareness

- To improve situational awareness, we do everything we can to consider our environment and all of its parts **before, during, and after** flight.
- Example 1: You may want is to monitor the Common Traffic Advisory Frequency (CTAF) at 122.8 MHz for what traffic conditions to expect before entering Class B airspace.
- Example 2: Meet with your client / landowner for mission and location requirements.
- Example 3: Scout out the flight location and intended mission operations prior to flight. Preferably during a pre-mission site visit before going to the field to fly the mission.

Hazardous Attitudes

- To improve situational awareness, we do everything we can to consider our environment and all of its parts **before, during, and after** flight.
- Example 1: You may want is to monitor the Common Traffic Advisory Frequency (CTAF) at 122.8 MHz for what traffic conditions to expect before entering Class B airspace.
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Five Hazardous Attitudes

- 1. Anti-Authority
- 2. Impulsivity
- 3. Invulnerability
- 4. Machismo (or Macho)
- 5. Resignation
- There are well established antidotes for each of these attitudes. Learn them and apply them whenever you become aware you are experiencing any of these 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. Of course, it’s always your prerogative to question authority if you feel it is in error. But don’t be anti-authority.
- Antidote: Follow the rules – they are usually right. Do not bend the rules to get your way, as it will backfire.

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.
- Antidote: Not so fast -- think first. Most situations do not require one-second snap decisions. You have time to evaluate and choose an action.

Invulnerability

- It won't happen to me. Many people feel 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. Remote pilots who think this way are more likely to take chances and increase risk.
- Antidote: Just because you've never had a motor fail or weather turn bad, that does not mean it will never happen to you.

Machismo (or Macho)

- I can do it. Remote pilots who are always trying to prove that they are better than everyone 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. This is not just a male characteristic! Women are equally susceptible to macho attitudes. Many times, the basic drive for a pilot to demonstrate the "right stuff" can have an adverse effect on safety, by generating tendencies that lead to practices that are dangerous, often illegal, and may lead to a mishap.
- Antidote: Taking chances is foolish. Although a certain amount of confidence is required for flying and you are feeling more capable when your skills improve, it's important to keep a realistic view.

Resignation

- What’s the use? Remote 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 them 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."
- Antidote: I'm not helpless -- I can make a difference. Keep to a safety mindset and decide for yourself if a flight is safe, instead of letting outside pressures push you to the final go / no-go decision.

Hazardous Attitudes – Summary

The Five Hazardous Attitudes	Antidote
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 your prerogative to question authority if you feel it is in error.	**Follow the rules. They are usually right.**
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.	**Not so fast. Think first.**
Invulnerability: "It won't happen to me." Many people falsely believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. However, 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.	**It could happen to me.**
Macho: "I can do it." Pilots who are always trying to prove that they are better than anyone else think, "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.	**Taking chances is foolish.**
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 them 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."	**I'm not helpless. I can make a difference.**

Figure 10-2. *The five hazardous attitudes identified through past and contemporary study.*

Source: Remote Pilots Study Guide, P.54

Sources for Hazard ID, Risk Assessment & Hazard Attitude

- Additional Information is available from these documents.
- AC-107-2 small Unmanned Aircraft Systems (sUAS) Circular
- Pilot's Handbook of Aeronautical Knowledge

Both of these documents are available for download on the course website.