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HYPOXIA

A. **Hypoxia** is a state of oxygen deficiency in the body sufficient to impair functions of the brain and other organs.

1. Although a deterioration in night vision occurs at a cabin pressure altitude as low as 5,000 ft. MSL, other significant effects of altitude hypoxia usually do not occur in the normal, healthy pilot below 12,000 ft. MSL.
2. From 12,000 to 15,000 ft. MSL (without supplemental oxygen), judgment, memory, alertness, coordination, and ability to make calculations are impaired.
3. Headache, drowsiness, dizziness, and either a sense of well-being (euphoria) or belligerence occur.

B. The effects appear after increasingly shorter periods of exposure to increasing altitude.

1. Pilot performance can seriously deteriorate within 15 min. at 15,000 ft. MSL.
2. At altitudes above 15,000 ft. MSL, the periphery of the visual field turns gray. Only central vision remains (tunnel vision).
3. A blue color (cyanosis) develops in the fingernails and lips.
4. The ability to take corrective and protective action is lost in 20 to 30 min. at 18,000 ft. MSL.
    a. This happens in 5 to 12 min. at 20,000 ft. MSL, followed soon by unconsciousness.

C. Significant effects of hypoxia can occur at even lower altitudes given one or more of the following factors:

1. Carbon monoxide inhaled in smoking or from exhaust fumes
2. Small amounts of alcohol and low doses of certain drugs (e.g., antihistamines, tranquilizers, sedatives, and analgesics)
3. Extreme heat or cold, fever, and/or anxiety

D. Hypoxia is prevented by understanding the factors that reduce your tolerance to altitude and by using supplemental oxygen above 10,000 ft. during the day and above 5,000 ft. at night.

1. Night vision is more susceptible to low oxygen conditions because the visual receptors responsible for night vision require more oxygenation than the day visual receptors.
2. Smoking reduces the effectiveness of the blood-carrying capillaries by approximately 20%.
3. Corrective action if hypoxia is suspected or recognized includes
    a. Use of supplemental oxygen
    b. An emergency descent to a lower altitude

HYPERVENTILATION

1. **Hyperventilation**, which is an abnormal increase in the volume of air breathed in and out of the lungs, can occur subconsciously when you encounter a stressful situation in flight.
    a. This abnormal breathing flushes from your lungs and blood much of the carbon dioxide your system needs to maintain the proper degree of blood acidity.
        1) The resulting chemical imbalance in the body produces dizziness, tingling of the fingers and toes, hot and cold sensations, drowsiness, nausea, and a feeling of suffocation. Often you may react to these symptoms with even greater hyperventilation.
    b. Incapacitation can eventually result from incoordination, disorientation, and painful muscle spasms. Finally, unconsciousness can occur.
2. The symptoms of hyperventilation subside within a few minutes after the rate and depth of breathing are consciously brought back under control.
    a. The buildup of the appropriate balance of carbon dioxide in your body can be hastened by controlled breathing in and out of a paper bag held over your nose and mouth. Also, talking, singing, or counting aloud often helps.
3. It is important to recognize that early symptoms of hyperventilation and hypoxia are similar.
    a. Also, hyperventilation and hypoxia can occur at the same time.
    b. If you are using an oxygen system when symptoms are experienced, set the oxygen regulator immediately to deliver 100% oxygen. This is to make sure you are not experiencing hypoxia.
    c. If it is not hypoxia, give attention to rate and depth of breathing.

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SPATIAL DISORIENTATION

1. Many different illusions can be experienced in flight.
   a. Some can lead to spatial disorientation.
   b. Others can lead to landing errors.
   c. Illusions frequently contribute to fatal aircraft accidents.
2. **Illusions Leading to Spatial Disorientation**. Various complex motions and forces and certain visual scenes encountered in flight can create illusions of motion and position. Spatial disorientation from these illusions can be prevented only by visual reference to reliable, fixed points on the ground or to flight instruments. Read and be aware of the following illusions. You need a general understanding of their nature and cause, but you do not need to be able to explain each one.
   a. **The leans.**An abrupt correction of a banked attitude, which has been entered too slowly to stimulate the motion sensing system in the inner ear, can create the illusion of banking in the opposite direction. The disoriented pilot will roll the aircraft back into its original dangerous attitude, or if level flight is maintained, will feel compelled to lean in the perceived vertical plane until this illusion subsides.
   b. **Coriolis illusion.** An abrupt head movement in a prolonged constant-rate turn that has ceased stimulating the motion-sensing system can create the illusion of rotation or movement in an entirely different axis. The disoriented pilot will maneuver the aircraft into a dangerous attitude in an attempt to stop rotation. This most overwhelming of all illusions in flight may be prevented by not making sudden, extreme head movements, particularly while making prolonged constant-rate turns under IFR conditions.
   c. **Graveyard spin.** A proper recovery from a spin that has ceased stimulating the motion-sensing system can create the illusion of spinning in the opposite direction. The disoriented pilot will return the aircraft to its original spin.
   d. **Graveyard spiral.**An observed loss of altitude during a coordinated constant-rate turn that has ceased stimulating the motion-sensing system can create the illusion of being in a descent with the wings level. The disoriented pilot will pull back on the controls, tightening the spiral and increasing the loss of altitude.
   e. **Somatogravic illusion.** A rapid acceleration during takeoff can create the illusion of being in a nose-up attitude. The disoriented pilot will push the aircraft into a nose-low, or dive, attitude. A rapid deceleration by a quick reduction of the throttles can have the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up, or stall, attitude.
   f. **Inversion illusion.**An abrupt change from climb to straight-and-level flight can create the illusion of tumbling backwards. The disoriented pilot will push the aircraft abruptly into a nose-low attitude, possibly intensifying this illusion.
   g. **Elevator illusion.**An abrupt upward vertical acceleration, usually caused by an updraft, can create the illusion of being in a climb. The disoriented pilot will push the aircraft into a nose-low attitude. An abrupt downward vertical acceleration, usually caused by a downdraft, has the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up attitude.
   h. **False horizon.** Sloping cloud formations, an obscured horizon, a dark scene spread with ground lights and stars, and certain geometric patterns of ground light can create illusions of not being aligned correctly with the actual horizon. The disoriented pilot will place the aircraft in a dangerous attitude.

i. **Autokinesis.** In the dark, a static light will appear to move about when stared at for several seconds. The disoriented pilot will lose control of the aircraft in attempting to align it with the light.

j. **Size-distance illusion.** When one stares at a point of light, it may appear to approach or recede rapidly. This illusion can be caused by a change in the intensity of the light. When a light gets suddenly brighter, it may appear to be much closer.

k. **Reversible perspective.** At night, an aircraft may appear to be going away from you when it is actually approaching. This illusion is easy to eliminate. Simply use the position lights and their relative arrangements to determine the aircraft's orientation and motion.

l. **Flicker vertigo.** A flickering light or shadow at a constant frequency of 4 to 20 times a second may cause dizziness, nausea, and, in extreme cases, convulsions and unconsciousness. When flying toward the sun, the propeller can cause a flickering effect, especially when the engine power is reduced for a landing approach. A slight change in power will usually provide the pilot relief from the flicker effect.

3. **Illusions Leading to Landing Errors.**Various surface features and atmospheric conditions encountered in landing can create illusions of incorrect height above and distance from the runway threshold. Landing errors from these illusions can be prevented by anticipating them during approaches, aerially inspecting unfamiliar airports before landing, using VASI systems when available, and maintaining optimal proficiency in landing procedures. Study the following five illusions, and anticipate and observe them when and if they occur.

a. **Runway width illusion.**A narrower-than-usual runway can create the illusion that the aircraft is at a higher altitude than it actually is. The pilot who does not recognize this illusion will fly a lower approach, with the risk of striking objects along the approach path or landing short. A wider-than-usual runway can have the opposite effect, with the risk of leveling out too high and landing hard or overshooting the runway.

b. **Runway and terrain slopes illusion.**An upsloping runway, an upsloping terrain, or both can create the illusion that the aircraft is at a higher altitude than it actually is. The pilot who does not recognize this illusion will fly a lower approach. A downsloping runway, a downsloping approach terrain, or both can have the opposite effect.

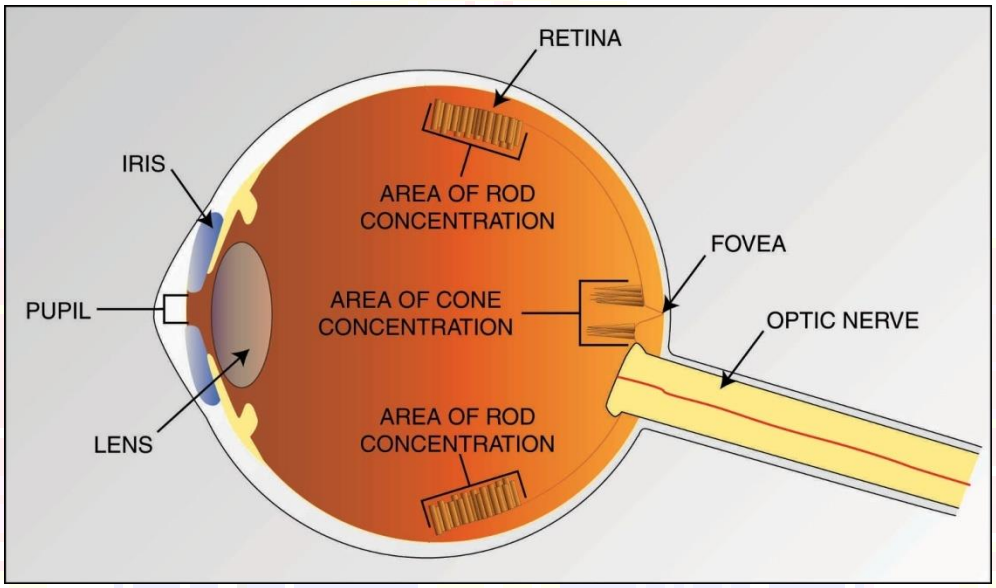
c. **Featureless terrain illusion.**An absence of ground features, as when landing over water, darkened areas, and terrain made featureless by snow, can create the illusion that the aircraft is at a higher altitude than it actually is. The pilot who does not recognize this illusion will fly a lower approach.

d. **Atmospheric illusions.** Rain on the windscreen can create the illusion of greater height, and atmospheric haze the illusion of being at a greater distance from the runway. The pilot who does not recognize these illusions will fly a lower approach. Penetration of fog can create the illusion of pitching up. The pilot who does not recognize this illusion will steepen the approach, often quite abruptly.

e. **Ground lighting illusions.**Lights along a straight path, such as a road, and even lights on moving trains can be mistaken for runway and approach lights. Bright runway and approach lighting systems, especially where few lights illuminate the surrounding terrain, may create the illusion of less distance to the runway. The pilot who does not recognize this illusion will fly a higher approach. Conversely, the pilot overflying terrain which has few lights to provide height cues may make a lower than normal approach.

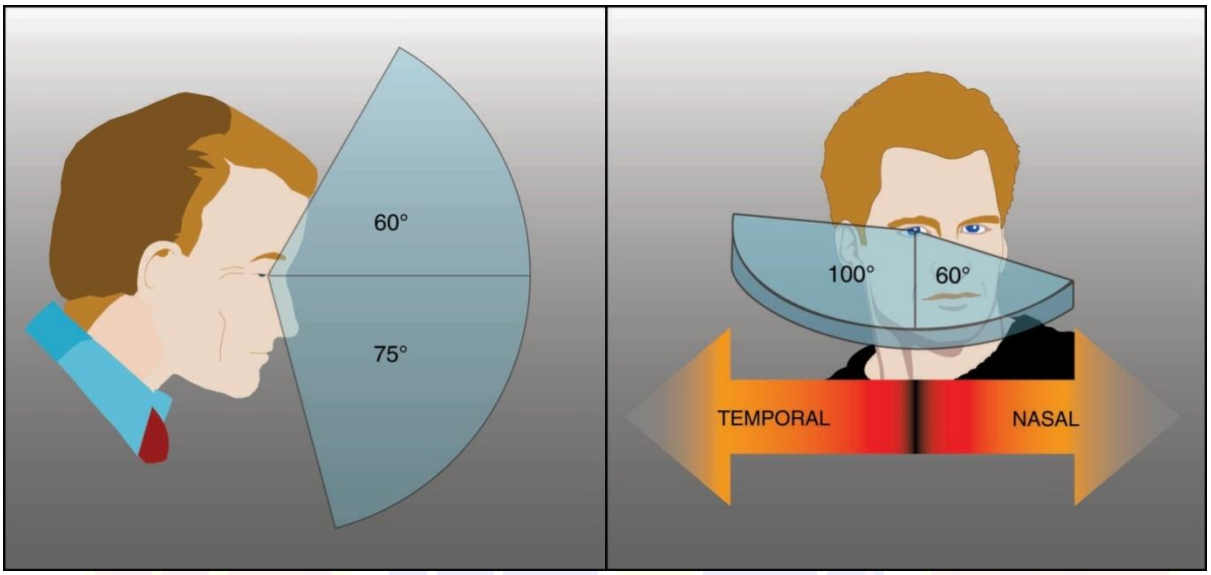
VISION

1. Of the body senses, vision is the most important for safe flight. It is important for you to understand your eye's construction and the effect of darkness on the eye.
   a. Two types of light-sensitive nerve endings called**cones** and **rods** are located at the back of the eye, or retina. They transmit messages to the brain via the optic nerve.



      1) The cones are concentrated around the center of the retina and decrease in number as the distance from the center increases.
         a) Their function is to detect color, details, and distant objects.
         b) They function both in daylight and in moonlight.
      2) The rods are concentrated around the cones and increase in number as the distance from the center increases.
         a) Their function in daylight is to detect objects, particularly those in motion, out of the corner of the eye (i.e., peripheral vision), but they do not give detail or color, only shades of gray.
         b) They function in daylight, in moonlight, and in darkness.

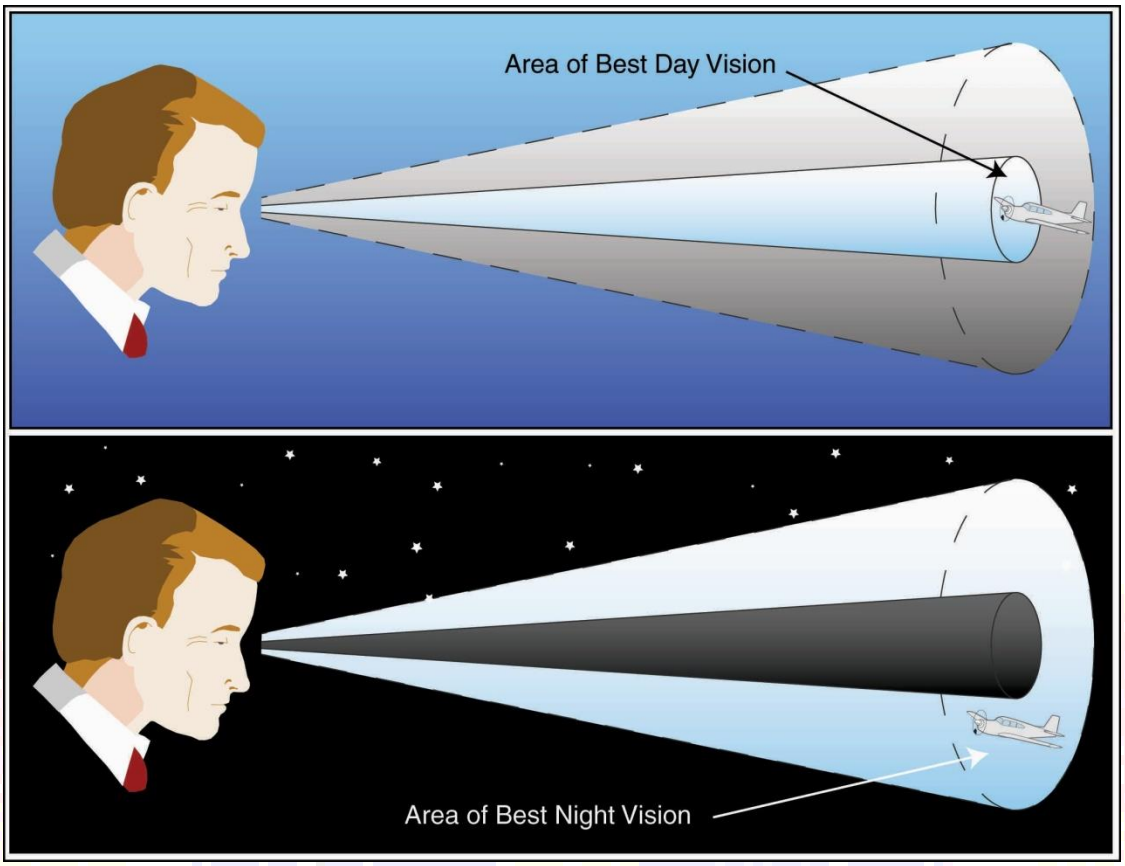
   b. The **fovea** is a small, notched area that is located directly behind the lens on the retina. This area contains cones only.
      1) The fovea is where your vision is the sharpest. Thus, when you look directly at an object, the image is focused mainly on the fovea.
      2) The fovea field of vision is a conical field of only about 1°.
         a) To demonstrate how small a 1° field is, take a quarter and tape it to a flat piece of glass, such as a window. Now stand 4 1/2 ft. from the mounted quarterandcloseoneeye.Theareaofyourfieldofviewcoveredby the quarter is a 1° field, similar to your fovea vision.



3) The normal field of vision for each eye is about 135° vertically and about 160° horizontally, as shown above.
    a) The fovea field is the central 1° field.
4) Your visual acuity (detail) drops off rapidly outside the fovea cone.
    a) EXAMPLE:Outside of a 10° cone (centered on the fovea cone), you will see only about one-tenth of what you can see in the fovea cone. In terms of collision avoidance, an aircraft that you are capable of seeing in your fovea cone at 5,000 ft. away must be as close as 500 ft. to detect it with peripheral vision.

c. The fact that the rods are distributed around the cones and do not lie directly behind the pupils makes **off-center viewing** (i.e., looking to one side of an object) important during night flight.
1) During daylight, an object can be seen best by looking directly at it.
    a) As the cones become less effective as the level of light decreases, you may not be able to see an object if you look directly at it.
        i) Since the cones are at the center of vision, when they stop working in the dark, a night blind spot develops at your center of vision.
2) After some practice, you will find that you can see things more clearly at night by looking to one side of them rather than directly at them.
    a) Remember that rods do not detect objects while your eyes are moving, only during the pauses.

2. Adapting your eyes to darkness is an important aspect of night vision.
a. When entering a dark area, the pupils of the eyes enlarge to receive as much of the available light as possible.
b. It will take approximately 5 to 10 min. (with enough available light) for the cones to become moderately adjusted. After the adjustment, your eyes become 100 times more sensitive than they were before you entered the dark area.



c. After about 30 min., the rods will be fully adjusted to darkness and become about 100,000 times more sensitive to light than they were in the lighted area.

1) Since the rods can still function in light of 1/5,000 the intensity at which the cones cease to function, they are used for night vision.

d. The rods need more time to adjust to darkness than the cones do to bright light. Your eyes become adapted to sunlight in 10 sec., whereas they need 30 min. to adjust fully to a dark night.

e. You must consider the adaptation process before and during night flight.

1) First, your eyes should be allowed to adapt to the low level of light, and then they must be kept adapted.

2) Next, you must avoid exposing your eyes to any bright light which may cause temporary blindness, possibly resulting in serious consequences.

a) Temporary blindness may result in illusions or “after images” during the time your eyes are recovering from the bright light.

3. The eyes are the first part of your body to suffer from low oxygen at altitude because the capillaries are very small and have a limited capacity to carry oxygen.

a. Night vision may be adversely affected above 5,000 ft. MSL.

1) Fly at lower altitudes and/or use oxygen when flying at night to maximize your visual acuity.

b. Good vision depends on your physical condition. Fatigue, colds, vitamin deficiency, alcohol, stimulants, smoking, or medication can seriously impair your vision.

1) EXAMPLE: Smoking lowers the sensitivity of the eyes and reduces night vision by approximately 20%.

CARBON MONOXIDE

1. Carbon monoxide is the product of incomplete combustion of material containing carbon. It is found in exhaust fumes and tobacco smoke.
    a. Carbon monoxide itself is a colorless, odorless, and tasteless gas, but it is usually mixed with other gases and fumes which can be detected by sight or smell.
2. When carbon monoxide is taken into the lungs, it combines with hemoglobin, the oxygen-carrying agent in the blood. The affinity of the hemoglobin for carbon monoxide is greater than for oxygen; consequently, hypemic (anemic) hypoxia occurs.
    a. Exposure to even small amounts of carbon monoxide over a period of several hours can reduce your ability to operate an airplane safely.
        1) Long exposure to low carbon monoxide levels is as hazardous as short exposure to relatively high concentrations.
    b. Susceptibility to carbon monoxide poisoning increases with altitude.
        1) The decreasing air pressure deprives your body of oxygen.
        2) When carbon monoxide is added, your body is further deprived of oxygen.
3. Most heaters in light aircraft work by air flowing over the exhaust manifold.
    a. Using these heaters when exhaust fumes are escaping through manifold cracks and seals is responsible every year for both nonfatal and fatal aircraft accidents from carbon monoxide poisoning.
    b. The danger is greatest during the winter months and at any time when the use of the cabin heating system becomes necessary and outside air vents are closed.
        1) The danger also exists at other times since carbon monoxide may enter the cabin through openings in the firewall and around fairings in the area of the exhaust system.
4. **Symptoms**
    a. Early symptoms of carbon monoxide poisoning are feelings of sluggishness, being too warm, and tightness across the forehead.
    b. These early symptoms may be followed by more intense feelings, such as headache, throbbing or pressure in the temples, and ringing in the ears.
    c. These symptoms may be followed by severe headache, general weakness, dizziness, and gradual dimming of vision.
    d. Large accumulations of carbon monoxide in the body result in loss of muscle power, vomiting, convulsions, coma, and finally death.
5. If you smell exhaust odors or begin to feel any of the symptoms, you should immediately assume carbon monoxide is present and take the following precautions:
    a. Immediately shut off the cabin air heater and close any other openings that might allow air from the engine compartment into the cockpit.
    b. Open outside air vents immediately.
    c. Avoid smoking.
    d. Use supplemental oxygen set to deliver 100% oxygen, if available.
    e. If you are flying, land at the first opportunity, and ensure that any effects from carbon monoxide are gone before further flight.
        1) If symptoms are severe or continue after landing, medical treatment should be sought.
    f. Determine that carbon monoxide is not being allowed to enter the cabin because of a

defective exhaust, an unsealed opening between engine compartment and cabin, or any other factor.

6. Tobacco does more than deprive the body of oxygen because of the carbon monoxide content in smoke.
   a. Tobacco smoke lowers the sensitivity of the eye and cuts night vision by approximately 20%.
      1) Nicotine increases the body's heat production 10% to 15% above normal, creating added oxygen demands.
      2) Ironically, the same cigarette that increases the demand for oxygen also reduces the supply.
   b. Careful tests have shown that the carbon monoxide in tobacco smoke can lower the pilot's tolerance to altitude by as much as 5,000 to 6,000 ft. because the blood is saturated with carbon monoxide.
      1) Thus, pilots who smoke are already at altitude before they ever leave the ground and may need supplemental oxygen at a lower altitude than nonsmokers.

AERONAUTICAL DECISION MAKING (ADM)

1. **Definitions**
   a. **ADM** is a systematic approach to the mental process used by aircraft pilots to determine consistently the best course of action in response to a given set of circumstances.
   b. **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. This is a sort of “mental shortcut” to decision making.
   c. **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.
   d. **Crew resource management (CRM)** in single-pilot or multiperson crew configurations is the effective use of all personnel and material assets available to a pilot or a flight crew.
      1) CRM emphasizes good communication and other interpersonal relationship skills.
   e. **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.
   f. **Headwork** is required to accomplish a conscious, rational thought process when making decisions.
      1) Good decision making involves risk identification and assessment, information processing, and problem solving.
   g. **Judgment** is the mental process of recognizing and analyzing all pertinent information in a particular situation, rationally evaluating alternative actions in response to it, and making a timely decision on which action to take.
   h. **Personality** is the embodiment of personal traits and characteristics of an individual that are set at a very early age and are extremely resistant to change.
   i. **Poor judgment (PJ) chain** is a series of mistakes that may lead to an accident or incident.
      1) Two basic principles generally associated with the creation of a PJ chain are
         a) One bad decision often leads to another.
         b) As a string of bad decisions grows, it reduces the number of subsequent alternatives for continued safe flight.
      2) ADM is intended to break the PJ chain before it can cause an accident or incident.
   j. **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.
   k. **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 flight.
   l. **Risk elements** in ADM take into consideration the four fundamental risk elements:
      1) The pilot
      2) The aircraft
      3) The environment
      4) The external pressures in any given aviation situation
   m. **Single-pilot resource management (SRM)** is the ability for a pilot to manage all resources effectively to ensure the outcome of the flight is successful.

n. **Situational awareness** is pilot knowledge of where the aircraft is in regard to location, air traffic control, weather, regulations, aircraft status, and other factors that may affect flight.

o. **Skills and procedures** are the procedural, psychomotor, and perceptual skills used to control a specific aircraft or its systems.

1) They are “stick and rudder” or airmanship abilities that are gained through conventional training, are perfected, and become almost automatic through experience.

p. **Stress management** is the personal analysis of the kinds of stress experienced while flying and the application of appropriate stress assessment tools and coping mechanisms.

2. **The Decision-Making Process**

a. It is important to understand the decision-making process in order to develop ADM skills. While pilots are well trained to react to emergencies, ADM focuses on decisions requiring a more reflective response.

b. Typically during a flight, some basic steps are followed to make a decision: Examine any changes that occur, gather information, assess risk, and make a decision. These steps are discussed in more detail below.

c. Decision-Making Steps

1) **Defining the problem.** A problem is perceived and, through objective analysis of available information, the nature and severity of the problem is determined. It is critical to ensure that the problem is correctly identified.

2) **Choosing a course of action.** Assess potential actions that may be taken to resolve the situation and what the implications of possible actions may be, then decide on an appropriate response.

3) **Implementing the decision and evaluating the outcome.** Upon selection and implementation of the action, it is important to continue to evaluate the impact of the action. Think ahead and determine how the decision could affect other phases of the flight.

d. The DECIDE Model is a good tool to use to help remember the elements of the decision-making process.

1) **D** etect. The decision maker detects the fact that change has occurred.

2) **E** stimate. The decision maker estimates the need to counter or react to the change.

3) **C** hoose. The decision maker chooses a desirable outcome (in terms of success) for the flight.

4) **I** dentify. The decision maker identifies actions which could successfully control the change.

5) **D** o. The decision maker takes the necessary action.

6) **E** valuate. The decision maker evaluates the effect(s) of his action countering the change.

e. The six elements of the DECIDE Model should be treated as a continuous loop. If a pilot practices the DECIDE Model in all decision making, its use can become very natural and result in better decisions being made under all types of situations.

3. **Risk Management**

a. There are four risk elements involved in decisions made during a flight: the**P**ilot in command, the **A**irplane, the en**V**ironment, and the **E**xternal pressures of the operation. You can remember these items using the PAVE checklist. In decision making, each risk element is evaluated to obtain an accurate perception of circumstances.

1) **Pilot.** Consider such factors as competency, condition of health, mental and emotional state, level of fatigue, and many other variables.
2) **Airplane.** Assess performance, equipment, or airworthiness.
3) **enVironment.** Consider a range of factors not related to pilot or airplane: weather, air traffic control, NAVAIDs, terrain, takeoff and landing areas, and surrounding obstacles.
4) **External Pressures.** Assessing factors relating to pilot, airplane, and environment is largely influenced by the purpose of the operation. Decisions should be made in the context of why the flight is being made, how critical it is to maintain the schedule, and if the trip is worth the risks.

b. You must carefully process each risk you perceive when analyzing the four risk elements to determine the likelihood of it occurring and the severity of the results of such an occurrence. Use the simple table below to quantify the impact of risks encountered during risk management.

Risk Assessment Matrix

Likelihood	Severity: Catastrophic	Critical	Marginal	Negligible
Probable	High	High	Serious	
Occasional	High	Serious		
Remote	Serious	Medium		Low
Improbable				

c. The final step in risk management is reducing, eliminating, or accepting the risks associated with a flight or decision. The goal is obviously to choose the best, safest course of action for a given situation.

1) Experience, training, and personal minimum standards will aid you in determining alternative courses of action to reduce and/or eliminate risks.

4. **Factors Affecting Decision Making**

a. Awareness of the decision-making process alone does not ensure the ability to make effective decisions as pilot in command. While some factors during flight may be out of the pilot's control, the pilot can learn to recognize factors that can be managed and learn skills to improve decision making and judgment.

b. To make effective decisions regarding the outcome of a flight, a pilot should be aware of personal limitations, such as health, recency of experience, skill level, and attitude. A personal checklist can help determine if a pilot is prepared for a particular flight.

c. Prior to flight, pilot fitness should be assessed the same as the airplane's airworthiness is evaluated.

d. Use the Gleim Preflight Risk Assessment Matrix on the next page to determine the risk level of every flight before it begins.

Gleim Preflight Risk Assessment Matrix: During each preflight planning session, use this form to gauge your overall risk. This form is based on the PAVE checklist and will help you determine if your intended flight is riskier than normal based on the factors listed. Making good decisions in the airplane starts on the ground. Grade

yourself in each of these categories in an honest, self-evaluative manner. Further note that this list is not exclusive. If any other factors will affect your flight, you must consider those factors. The go/no-go decision could be entirely based on factors not listed here. **Remember, as the pilot in command, you have the ultimate responsibility for the safety of your flight.**

Before each flight, fill in the appropriate element score in the Rating column and total these numbers to assess your overall flight risk.

	1	2	3	4	5	Rating
Pilot						
Experience	>1500 hours	500-1500 hours	300-500 hours	100-300 hours	<100 hours	
Recency (last 90 days)	>20 hours	15-20 hours	10-14 hours	5-9 hours	<5 hours	
Currency	VFR and IFR		VFR not IFR		Not VFR or IFR	
Emotional Condition	Excellent	Good	Average	Poor	Unacceptable	
Aircraft						
Fuel Reserves	Exceeds requirement		Meets requirement		None	
Time in Type	>400 hours	300-400 hours	200-300 hours	100-200 hours	<100 hours	
Performance	Well within limits		At limits		Outside limits	
Equipment	GPS, weather display	Hand-held GPS	VOR	Minimum required	Does not meet 14 CFR 91.205	
enVironment						
Airport	Adequate, familiar		Barely adequate		Unfamiliar, inadequate	
Weather (IFR/VFR)	VFR		MVFR	IFR	LIFR	
Runways	Dry, hard, long	Dry, hard, short	Dry, soft, short	Wet, hard, short	Wet, soft, short	
Lighting (Day VFR=1)	Runway, taxiway		Runway only		None	
Terrain	Flat, populated		Flat, unpopulated		Mountainous	
External pressures						
Delays/Diversions	No pressure exists		Inconvenient		Not possible	
Alternate Plans	No pressure exists		Inconvenient		Not possible	
Personal Equipment	Emergency kit		Cell phone only		None available	
Additional Factors						
					Total Risk Rating -->	
Risk within normal parameters. Flying is inherently risky. Do not take any unnecessary risks and examine your personal minimums to ensure compliance.						16-33
Elevated risk. Plan for extra time for flight planning. Review your personal minimums to ensure that all your self-determined standards are being met. Carefully analyze any risks near or on the boundaries of your personal minimums. Delay any flight that exceeds your personal minimums until conditions improve.						34-55 Or a 5 in any row
High risk. Plan for extra time for flight planning and consider requesting assistance from a more experienced pilot, if one is available. Carefully examine your personal minimums to ensure none are being violated. Examine methods of reducing the risk to the extent possible. Consider delaying or canceling the flight if risks cannot be reduced to an acceptable level.						56-80 Or a 5 in any two rows

5. **Operational Pitfalls**

a. Pilots, particularly those with considerable experience, as a rule always try to complete a flight as planned, please passengers, meet schedules, and generally demonstrate that they have the "right stuff."

1) The basic drive to demonstrate the "right stuff" can have an adverse effect on safety and can impose an unrealistic assessment of piloting skills under stressful conditions.

2) These tendencies ultimately may lead to practices that are dangerous and often illegal and may lead to a mishap.

b. All experienced pilots have fallen prey to or have been tempted by one or more of these tendencies in their flying careers. These dangerous tendencies or behavior patterns, which must be identified and eliminated, include

1) **Peer pressure.** Poor decision making may be based upon an emotional response to peers rather than an objective evaluation of a situation.

2) **Mind set** may produce an inability to recognize and cope with changes in the situation different from those anticipated or planned.

3) **Get-there-itis.** This tendency, common among pilots, clouds the vision and impairs judgment by causing a fixation on the original goal or destination, combined with a total disregard for any alternative course of action.

4) **Duck-under syndrome** is the tendency to sneak a peek by descending below minimums during an approach, based on a belief that there is always a built-in "fudge" factor that can be used or an unwillingness to admit defeat and shoot a missed approach.

5) **Scud running** refers to pushing the capabilities of the pilot and the aircraft to the limits by trying to maintain visual contact with the terrain while trying to avoid physical contact with it.

a) This attitude is characterized by the old pilot's joke: "If it's too bad to go IFR, we'll go VFR."

6) **Continuing VFR** into instrument conditions often leads to spatial disorientation or collision with ground/obstacles.

a) It is even more dangerous if the pilot is not instrument-qualified or current.

7) **Getting behind the aircraft** means allowing events or the situation to control your actions rather than the other way around. This dangerous tendency is characterized by a constant state of surprise at what happens next.

8) **Loss of positional or situation awareness** is another case of getting behind the aircraft, which results in not knowing your location, being unable to recognize deteriorating circumstances, and/or misjudging the rate of deterioration.

9) **Operating without adequate fuel reserves.** Ignoring minimum fuel reserve requirements while either VFR or IFR is generally the result of overconfidence, lack of flight planning, or ignoring the regulations.

10) **Descent below the minimum en route altitude** is the duck-under syndrome (previously mentioned) manifesting itself during the en route portion of an IFR flight.

11) **Flying outside the envelope** results from an unjustified reliance on the belief (usually mistaken) that the aircraft's high-performance capability meets the demands imposed by the pilot's flying skills (usually overestimated).

12) **Neglect of flight planning, preflight inspections, checklists, etc.**, indicates a pilot's unjustified reliance on his or her short- and long-term memory, regular flying skills, repetitive and familiar routes, etc.

6. **Hazardous Attitudes**

   a. **Antiauthority (*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 is always your prerogative to question authority if you feel it is in error.

   b. **Impulsivity (*Do something quickly!*)** 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 determine the best alternative, and they do the first thing that comes to mind.

   c. **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. 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.

   d. **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.

   e. **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. The pilot is apt to think that things go well due to good luck. When things go badly, the pilot may feel that someone is out to get him or her or may attribute the situation 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 nice.

7. **Antidotes for Hazardous Attitudes**

   a. Hazardous attitudes, which contribute to poor pilot judgment, can be effectively counteracted by redirecting each hazardous attitude so that appropriate action can be taken.

      1) Recognition of hazardous thoughts is the first step in neutralizing them in the ADM process.

   b. After recognizing and labeling a thought as hazardous, the pilot should correct the hazardous thought by stating the corresponding antidote.

      1) Antidotes should be memorized for each of the hazardous attitudes so that they automatically come to mind when needed.

   c. The hazardous attitude antidotes shown below should be learned thoroughly and practiced.

Hazardous Attitude	Antidote
Antiauthority: *Don't tell me!*	Follow the rules. They are usually right.
Impulsivity: *Do something quickly!*	Not so fast. Think first.
Invulnerability: *It won't happen to me.*	It could happen to me.
Macho: *I can do it.*	Taking chances is foolish.
Resignation: *What's the use?*	I'm not helpless. I can make a difference.

8. **Weather-Related Decision Making**

a. Making a well educated go/no-go decision as it relates to weather is an important factor in the process of planning and executing a safe flight.

1) You will have to determine your own personal weather minimums or do so with the guidance of a flight instructor/mentor.

2) Consider such elements as experience, currency, the aircraft being flown, and any other appropriate factors.

3) An example of a personal minimums checklist is available below.

a) Remember that this is just an example. You should create your own personal minimums worksheet to reflect the minimum conditions you feel comfortable operating in.

b) Bear in mind that over time, as your experience grows, your personal minimums will change.

c) Plan to review and revise these minimums at least twice a year.

Baseline Personal Minimums

Weather Condition		VFR	MVFR	IFR	LIFR
Ceiling					
	Day				
	Night				
Visibility					
	Day				
	Night				

Turbulence	SE	ME	Make/Model
Surface Wind Speed			
Surface Wind Gust			
Crosswind Component			

Performance	SE	ME	Make/Model
Shortest runway			
Highest terrain			
Highest density altitude			

	If you are facing:	Adjust baseline personal minimums to:	
Pilot	Illness, medication, stress, or fatigue; lack of currency (e.g., haven't flown for several weeks)	Add	*At least* 500 feet to ceiling
			At least ½ mi. to visibility
Aircraft	An unfamiliar airplane, or an aircraft with unfamiliar avionics/ equipment		*At least* 500 ft. to runway length
enVironment	Airports and airspace with different terrain or unfamiliar characteristics	Subtract	*At least* 5 kt. from winds
External Pressures	"Must meet" deadlines, passenger pressures, etc.		

b. When making weather-related decisions, remember to include not only the current weather conditions in your planning, but also the forecast conditions for the estimated time of your arrival. This is true of both cross-country and local flights.

   1) When flying cross-country, always get a complete weather briefing that includes conditions and forecasts for your departure airport, your route of flight, and your destination airport.

c. General rules for making safe weather-related decisions include

   1) Do NOT fly in or near thunderstorms for any reason.

      a) You can safely fly around scattered thunderstorms if you provide sufficient spacing between your aircraft and the storm.

      b) Never attempt to fly through or underneath a thunderstorm.

   2) Do NOT continue VFR flight into IFR conditions, even if you are instrument rated.

      a) If you are on the ground, wait out the weather or file an IFR flight plan.

      b) If you are in the air, turn around. Remain in VFR conditions and file an IFR flight plan, navigate around the weather if possible, or terminate the flight.

   3) Do NOT proceed “on top” of a ceiling, hoping to find a hole on the other end or expecting ATC to “talk you down” if you get caught on top.

   4) Allow more margin for weather at night. It is harder to see the weather getting worse, especially on a dark, moonless night.

d. Refer to Study Unit 7, “Aviation Weather,” and Study Unit 8, “Weather Services,” to learn more about weather as it applies to pilots.

   1) You will also learn about the tools available to help you make responsible weather-related decisions.