Aeromedical Factors

Medical Certificates

References: 14 CFR 61.29, 14 CFR 61.113, 14 CFR 67.401

There are three classes of medical certificates issued to airmen:

- First-Class
- Second-Class
- Third-Class

Related: Appendix: Duration of Medical Certificates

Obtaining a Medical Certificate

Medical certificates are obtained by first completing an online application using MedXPress and then undergoing a physical examination with an FAA-designated Aviation Medical Examiner (AME).

MedXPress: Information entered into MedXPress remains valid for 60 days and is available to the AME for review at the time of the medical examination.

Link: https://medxpress.faa.gov

AME Directory: The FAA publishes an online directory of all authorized AMEs by name and address.

Link: https://www.faa.gov/pilots/amelocator/

Special Issuance Medical Certificates

If a disqualifying condition is reported on a medical application, the AME cannot issue a medical certificate until the FAA approves it. To receive a Special-Issuance Medical Certificate (Authorization), the applicant must demonstrate to the Federal Air Surgeon that the duties authorized by the class of medical certificate applied for can be performed without endangering public safety. A special medical flight test, practical test, or medical evaluation may be required.

Special-Issuance Medical Certificates look like unrestricted medical certificates, but they are always time-limited and explicitly state the date when the certificate expires or is no longer valid in the limitations section.

Statement of Demonstrated Ability

At the discretion of the Federal Air Surgeon, a Statement of Demonstrated Ability (SODA) may be granted, instead of a Special-Issuance Medical Certificate, to a person whose disqualifying condition is nonprogressive and who has been found capable of performing airman duties without endangering public safety. A SODA does not expire and authorizes AMEs to repeatedly issue a medical certificate of the specified class if the pilot’s condition does not adversely change.

Disqualifying Medical Conditions

The FAA defines disqualifying medical conditions in the regulations; however, in cases when the condition is adequately controlled, the FAA will issue medical certification contingent on periodic reports.

Link: https://www.faa.gov/licenses_certificates/medical_certification/faq/response6/

Replacement of a Lost or Destroyed Medical Certificate

Replacement of a lost or destroyed medical certificate must be requested in writing to the Department of Transportation. A facsimile issued by the FAA may be carried as a medical certificate for up to 60 days pending the receipt of a duplicate.
Medical Certificate Requirements


Operations Requiring a Medical Certificate

Except for the operations listed in the next section, a person must hold a:

- **1st class** medical certificate when exercising the privileges of an ATP certificate.
- **2nd class** medical certificate when exercising the privileges of a commercial pilot certificate.
- **3rd class** medical certificate:
  - When exercising the privileges of a private, recreational, or student pilot certificate.
  - When exercising the privileges of a flight instructor certificate, if the person is acting as PIC or is serving as a required flight crewmember.
  - When taking a practical test in an aircraft for a recreational, private, commercial, ATP, or flight instructor certificate.
  - When performing the duties as an Examiner in an aircraft when administering a practical test or proficiency check.

Flight instruction is not considered a commercial pilot service; therefore, flight instructors are not required to have a 2nd class medical in order to be paid for their service.

Operations Not Requiring a Medical Certificate

A person is not required to hold a valid medical certificate when:

- Training for, or exercising the privileges of a pilot certificate in a glider or balloon.
- Exercising the privileges of a flight instructor certificate in a glider or balloon.
- Exercising the privileges of a flight instructor certificate (other than in a glider or balloon), if the person is not acting as PIC or serving as a required flight crewmember.
- Exercising the privileges of a ground instructor certificate.
- Taking a practical test or a proficiency check in a glider, balloon, flight simulator, or flight training device.
- Conducting operations that are allowed with only a U.S. driver's license or under BasicMed.

Operations Allowed with a U.S. Driver’s License

A current and valid U.S. driver's license may be used in lieu of a medical certificate when exercising the privileges of:

- A sport pilot or student pilot certificate while seeking sport pilot privileges in a light-sport aircraft.
- A flight instructor certificate with a sport pilot rating while acting as PIC of a light-sport aircraft.
- One of the follow certificates while operating under the BasicMed conditions and limitations:
  - A student, recreational or private pilot certificate.
  - A flight instructor certificate and acting as the PIC or as a required flight crewmember.

A person exercising sport pilot privileges using a U.S. driver's license must:

- Comply with all medical requirements or restrictions associated with his or her U.S. driver's license.
- Have been found eligible for the issuance of at least a 3rd class airman medical certificate at the time of his or her most recent application (if the person has applied for a medical certificate).
- Not have had his or her most recently issued medical certificate (if the person has held a medical certificate) suspended or revoked or most recent Authorization for a Special Issuance of a Medical Certificate withdrawn.
- Not know or have reason to know of any medical condition that would make that person unable to operate a light-sport aircraft in a safe manner.
BasicMed


Under the provisions of BasicMed, relief from holding an FAA medical certificate is provided for:

- Persons taking a practical test or proficiency check in an aircraft.
- Student, recreational, and private pilots.
- Flight instructors when acting as PIC.

Note: A person taking a practical test is exercising no more than private pilot privileges because the operation is not being conducted for compensation or hire. Therefore, BasicMed privileges can be used to take a practical test for a commercial pilot or ATP certificate.

To operate under the BasicMed rules, the pilot is required to:

- Act as PIC (i.e., not as SIC or any other required crewmember).
- Have held a medical certificate, regular or special issuance, at any time after July 14, 2006.
- Have not had the most recently held medical certificate revoked, suspended, or withdrawn.
- Have not had the most recent application for airman medical certification completed and denied.
- Have taken a medical education course within the preceding 24 calendar-months.
- Have completed a comprehensive medical examination within the preceding 48 months (4 years).
- Be under the care of a physician for certain medical conditions.
- Have been found eligible for special issuance of a medical certificate for certain specified mental health, neurological, or cardiovascular conditions.
- Possess a valid driver's license issued by a State, territory, or possession of the U.S. and comply with all medical requirements or restrictions associated with that license.
- Consent to a National Driver Register check.
- Not fly for compensation or hire.
- Keep the medical examination checklist and course completion certificate in his or her logbook.
- Operate a covered aircraft in accordance with the following requirements:
  - Carry no more than 5 passengers (i.e., 6 occupants including the pilot).
  - Under VFR or IFR.
  - At an altitude less than 18,000' MSL.
  - Within the U.S. or the Bahamas.
  - At an indicated airspeed not exceeding 250 knots.

Covered Aircraft: An aircraft that:

- Is authorized to carry not more than 6 occupants.
- Has a maximum certificated takeoff weight of not more than 6,000 pounds.

Medical Exam Course and Checklist

To operate under BasicMed, a pilot is required to complete the applicable portions of a medical checklist and present it to the physician performing the required examination. A medical exam is required to be completed every four years.

Link: https://www.faa.gov/documentLibrary/media/Form/FAA_Form_8700-2.pdf

After completing the examination, a medical certification course is required. During the course, the pilot must provide the FAA information regarding the most recent medical exam and self-certify that the checklist was followed and signed by the physician. The course must be retaken at least every two years.

Link: https://basicmedicalcourse.aopa.org

Both the medical examination checklist and the course completion certificate must be retained to show verification of the pilot's eligibility to operate under BasicMed. Digital versions are acceptable.
Operating with a Known Medical Condition

Reference: 14 CFR 61.53

No person who holds a medical certificate may act as PIC, or in any other capacity as a required pilot flight crewmember, while that person:

- Knows or has reason to know of any medical condition that would make the person unable to meet the requirements for the medical certificate necessary for the pilot operation.
- Is taking medication or receiving other treatment for a medical condition that results in the person being unable to meet the requirements for the medical certificate necessary for the pilot operation.

Sensory Systems

The body uses three sensory systems to maintain balance and orientation: the visual, vestibular, and somatosensory.

**Visual:** Of the three sensory systems, the visual system is the most important in maintaining equilibrium and orientation. To some extent, the eyes can help determine the speed and direction of flight by comparing the position of the airplane relative to a fixed point of reference.

**Vestibular:** The vestibular system is used to detect movement and determine orientation, which is called the sense of **proprioception**. The vestibular system is a key component in maintaining balance.

In the inner ear, three semicircular canals are positioned at approximately right angles to each other. Each canal is filled with fluid and has two otolithic organs which are both partially comprised of fine hair cells. Acceleration in any direction causes the fluid to move and deflect the tiny hairs, which in turn stimulates nerve impulses. A nerve transmits the impulses to the brain to interpret motion.

**Somatosensory:** The somatosensory system sends signals from the skin, joints, and muscles to the brain. The signals are interpreted by the brain to provide the sense of **kinesthesia**, the ability to determine body posture and movements. The kinesthetic sense is used whenever the body is involved in a physical activity that requires body movement.

Illusions in Flight

Reference: AIM 8-1-5

Illusions in flight can lead to spatial disorientation and landing errors.

**Illusions Leading to Spatial Disorientation**

Illusions leading to spatial disorientation can be caused by the vestibular and visual systems.

**Vestibular Illusions**

**The Leans:** The leans can result when a banked attitude is entered too slowly to set in motion the fluid within the semicircular tubes in the inner ear. An abrupt correction of this attitude sets the fluid in motion, creating the illusion of a banked in the opposite direction. The disoriented pilot may make the error of rolling the airplane into the original left banked attitude.

**Coriolis Illusion:** When a pilot has been in a long turn, the fluid in the ear canal moves at the same speed as the canal. A movement of the head in a different plane, such as looking at something in a different part of the cockpit, may set the fluid moving and create the illusion of turning or accelerating on an entirely different axis.

**Graveyard Spiral:** A prolonged, constant-rate turn may produce the illusion of not turning. During recovery to level flight, the pilot will experience the sensation of turning in the opposite direction. The disoriented pilot may return the airplane to its original turn. Because an airplane tends to lose altitude in turns, the pilot may notice a loss of altitude. The absence of a turning sensation creates the illusion of being in a level descent. The pilot may pull back on the controls in an attempt to stop the descent. This action tightens the spiral and increases the loss of altitude.
**Somatogravic Illusion:** A rapid acceleration, such as experienced during takeoff, stimulates the otolith organs in the same way as tilting the head backward. This action creates the illusion of being in a nose-up attitude. The disoriented pilot will push the airplane into a nose-low attitude. A rapid deceleration will have the opposite effect, with the pilot pulling the airplane in abruptly into a nose-low attitude, possibly intensifying the illusion.

**Inversion illusion:** An abrupt change from a climb to straight-and-level flight can stimulate the otolith organs enough to create the illusion of tumbling backward. The disoriented pilot will push the airplane into a nose-low attitude, possibly intensifying this illusion.

**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 airplane into a nose-low attitude. An abrupt downward vertical acceleration, usually caused by a downdraft, has the opposite effect, causing the disoriented pilot to pull the airplane into a nose-up attitude.

**Visual Illusions**

**False Horizon Illusion:** Occurs when the pilot confuses cloud formations with the horizon or the ground. A sloping cloud deck may be perceived as horizontal although it may not be level to the ground; thus, the pilot may fly the airplane in a banked attitude. The illusion may result in the pilot placing the airplane parallel to the clouds. This condition is often undetected until the pilot recognizes it and makes the transition to the instruments.

**Autokinesis:** Occurs at night when ambient visual cues are minimal, and a small, dim light is seen against a dark background. After 6–12 seconds of visually fixating on the light, one perceives movement at up to 20° in any particular direction or in several directions in succession, although there is no actual displacement of the object. This illusion may allow a pilot to mistake the object fixated as another aircraft.

**Relative-Motion Illusion:** The falsely perceived self-motion in relation to the motion of another object. The most common example is when an individual in a car is stopped at a traffic light and another car pulls alongside. The individual that was stopped at the light perceives the forward motion of the second car as his own motion rearward. This results in the individual applying more pressure to the brakes unnecessarily.

**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 brighter.

**Reversible Perspective:** At night, an aircraft may appear to be moving away from an observer when it is approaching. To eliminate this illusion, use the position lights and their relative arrangements to determine the aircraft’s orientation and motion.

**Flicker Vertigo:** While technically not an illusion, viewing a flickering light can be distracting. Flicker vertigo may be created by airplane propellers interrupting direct sunlight at a rate of 4–20 cycles per second. Flashing strobe lights, especially while in the clouds, can also produce this effect. Pilots should also be aware that photic stimuli at specific frequencies could produce seizures in those who are susceptible to flicker-induced epilepsy.

**Confusion with Ground Lights:** Occurs when a pilot mistakes ground lights for stars. This illusion prompts the pilot to place the airplane in an unusual attitude to keep the lights above them. When no stars are visible because of overcast conditions, unlighted areas of terrain can blend with the sky. These illusions can be avoided by referencing the flight instruments and establishing the true horizon and attitude.

**Visual Illusions Leading to Landing Errors**

**Runway Width Illusion:** A narrower-than-usual runway can create the illusion that the airplane is at a higher altitude than it is. The pilot who does not recognize this illusion will fly a lower approach, with the risk of impacting the ground short of the runway. A wider-than-usual runway has the opposite effect.

**Runway and Terrain Slopes Illusion:** An up-sloping runway can create the illusion that the airplane is higher than it is. The pilot who does not recognize this illusion will fly a lower approach. A down-sloping runway can have the opposite effect.

**Featureless Terrain Illusion:** An absence of ground features can create the illusion that the airplane is at a higher altitude than it is. This illusion, called the “black hole approach,” causes pilots to fly a lower approach than is desired.

**Atmospheric Illusion:** Rain on the windscreen can create the illusion of greater height, and atmospheric haze the illusion of being 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 abruptly steepen the descent.
**Ground Lighting Illusions:** Streetlights or other lights along a straight path can be mistaken for runway or approach lights. Bright runway lights may create the illusion of less distance to the runway.

**Parallax Error**

Parallax error is the apparent displacement of an object when viewed from an off-center position. When sitting to the left in an airplane with side-by-side seating, the nose of the airplane appears to rise when making a left turn and descend when making right turns. This is due to pilot elevating or lowering in relation to the longitudinal axis.

Parallax error can also affect IFR pilots. During instrument flight, parallax error can occur when viewing an analog instrument on the opposite side of the instrument panel. This error is not applicable to digital displays.

**Spatial Disorientation**

**Explanation:** Spatial disorientation is a state characterized by an erroneous sense of one's position and motion relative to the plane of the earth's surface. When spatial disorientation occurs, pilots are unable to see, believe, interpret, or prove the information derived from their flight instruments. Instead, they rely on the false information that their senses provide. Illness, medication, alcohol, fatigue, sleep loss, and mild hypoxia can increase susceptibility.

**Symptoms:** Spatial disorientation is similar to vertigo, the sensation of feeling off-balance. Spatial disorientation is accompanied by dizziness or incipient nausea.

**Prevention:**
- Always obtain preflight weather briefings.
- Do not continue flight into adverse weather conditions or into dusk or darkness unless you are proficient in the use of flight instruments.
- Ensure that when outside visual references are used, they are reliable, fixed points on the earth's surface.
- Avoid sudden head movements, particularly during takeoffs, turns, and approaches to landing.
- Become proficient in the use of flight instruments and rely upon them.

**Hypoxia**

*Reference: AIM 8-1-2*

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

**Symptoms:**
- An increased breathing rate
- Headaches
- Light-headed or dizzy sensations
- Tingling or warm sensations
- Poor coordination
- Impairment of judgment
- Loss of vision or reduced vision
- Sleepiness
- Cyanosis (blue coloring of skin, fingernails, and lips)
- Euphoria (a feeling of well-being)

Deterioration of night vision can occur at a cabin pressure altitude as low as 5,000' MSL. Other significant effects of altitude hypoxia usually do not occur below 12,000' MSL to a healthy pilot.

**Prevention:** Breathe supplemental oxygen and/or plan a lower cruising altitude.

A pulse oximeter can be used to measure the amount of oxygen in the blood. By transmitting a light beam through a fingertip, it can calculate the degree of oxygen saturation. This does not guarantee that the body's cells will receive the proper amount of oxygen. Carbon monoxide, for example, may prevent the oxygen from being transported.
Types of Hypoxia

Stagnant hypoxia occurs when oxygen-rich blood is not flowing to the body tissues that need it. Common causes are G-forces, extremely cold temperatures, and artery restrictions.

Histotoxic hypoxia is a result of the cells within the body not being able to use the oxygen received by the blood effectively. Common causes are alcohol or other drug use, and poisoning.

Hypemic hypoxia occurs when the blood is not able to carry sufficient oxygen to cells within the body. Common causes are low blood volume, diseases such as anemia, and carbon monoxide poising. Substances such as carbon monoxide bond with hemoglobin, the molecule in the blood that transports oxygen, and reduce its ability to deliver oxygen to the organs.

Hypoxic hypoxia results from insufficient oxygen available to the lungs. For pilots, the most common cause is due to the partial pressure of air being lower at altitude. A blocked airway and drowning are other examples.

Times of Useful Consciousness

The time of useful consciousness is the period of time from the loss of oxygen supply to the time when deliberate function is lost. The average time this takes can be found in the following table. The times are reduced by 1/3 to 1/2 following a rapid decompression.

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL430</td>
<td>9−12 seconds</td>
</tr>
<tr>
<td>FL350</td>
<td>30−60 seconds</td>
</tr>
<tr>
<td>FL300</td>
<td>1−2 minutes</td>
</tr>
<tr>
<td>FL250</td>
<td>3−5 minutes</td>
</tr>
<tr>
<td>FL210</td>
<td>8−10 minutes</td>
</tr>
<tr>
<td>FL180</td>
<td>20−30 minutes</td>
</tr>
</tbody>
</table>

Carbon Monoxide Poisoning

Reference: AIM 8-1-4

Explanation: Carbon monoxide is a colorless, odorless, and tasteless gas contained in exhaust fumes and tobacco smoke. When inhaled, carbon monoxide combines with hemoglobin and reduces its ability to deliver oxygen to the organs.

Most heaters in small airplanes work by blowing hot air over the exhaust manifold. Exhaust fumes escaping through manifold cracks and seals commonly results in carbon monoxide poisoning.

Cigarette smoke may contain as much as 5% carbon monoxide. A person at sea level that smokes may be affected by hypoxia the same as a nonsmoker would at 5,000’ or 6,000’. Cigarette smoke can reduce night vision by about 20%.

Symptoms: Early symptoms of carbon monoxide poisoning include feelings of sluggishness, being too warm, and tightness across the forehead. These symptoms may be followed by more intense feelings such as headaches, throbbing, or pressure in the temples, and ringing in the ears. Significant accumulations of carbon monoxide may result in muscle weakness, vomiting, convulsions, and eventually death.

Prevention:
• Shut off the cabin heater.
• Open the outside air vents.
• Avoid smoking.
• Use supplemental oxygen.

Hyperventilation

Reference: AIM 8-1-3

Explanation: Hyperventilation, or over-breathing, is a disturbance of respiration that may occur in individuals as a result of emotional stress, fright, or pain. If left uncontrolled, over-breathing will lower the body’s carbon dioxide level, which may result in unconsciousness.
**Symptoms:** The typical symptoms of hyperventilation are dizziness, nausea, hot and cold sensations, tingling of the hands, legs, and feet, sleepiness, and ultimately unconsciousness. As hyperventilation progresses, a pilot may experience symptoms of suffocation or drowsiness.

**Prevention:** The breathing rate should be consciously slowed until the symptoms clear. Breathing into a bag or talking aloud can also help overcome symptoms of hyperventilation.

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**Hypothermia**

**Explanation:** Hypothermia occurs when the body loses heat faster than it can produce heat, causing a dangerously low body temperature.

**Symptoms:**
- Shivering, although as it worsens, shivering stops
- Cold hands or feet followed by blue fingers, toes, or lips
- Lack of coordination
- Increased breathing rate
- Slurred speech
- Confusion and poor decision-making
- Drowsiness or very low energy

**Prevention:**
- Ensure the cabin heater is working properly.
- Keep emergency supplies.
- Wear layered, lightweight clothing (heavy clothing that causes perspiration is counter-productive).
- Don’t drink alcohol.
- Stay as dry as possible.

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**Middle Ear and Sinus Problems**

*Reference: AIM 8-1-2*

Any gas trapped in body cavities will expand or contract in accordance with **Boyle's Law**. The inability to release this gas may cause abdominal pain, toothache, or pain in ears and sinuses.

**Ear Block**

**Explanation:** The ear is composed of three sections: the outer, middle, and inner ear. The outer ear is the auditory canal and ends at the eardrum. The middle ear is a cavity surrounded by bones of the skull and is filled with air. The inner ear components are mostly responsible for sound detection and balance.

Each middle ear is connected to the throat by an **eustachian tube** which serves to equalize the air pressure in the middle ear and to drain fluids from the middle ear space. The eustachian tubes are usually closed but can open to equalize air pressure; however, they do not readily open if they become inflamed or clogged with mucus.

As the body ascends or descends, air must escape or be replenished through the eustachian tubes to equalize the pressure in the middle ear cavities with that of the atmosphere. Climbing generally isn’t an issue because excess air escapes through the tube easily. However, during descents, when the pressure in the middle ear must be increased, the eustachian tubes do not open readily.

** Symptoms:** When air is trapped in the middle ear, the eardrum stretches to absorb the higher pressure. The result is pain and sometimes-temporary deafness.
**Prevention:** Make a conscious effort to swallow, yawn, or chew gum to stimulate the muscular action of the eustachian tubes. Small babies should be given a bottle to suck during descents. Sometimes it is advisable to use the **Valsalva technique**, that is, to close the mouth, hold the nose and blow gently. This action forces air up the eustachian tubes.

**Sinus Block**

**Explanation:** The sinuses are air-filled, bony cavities connected with the nose through one or more small openings. If these openings are obstructed by swelling of the mucous membrane lining of the sinuses (as during a cold), equalization of the pressure is difficult.

**Symptoms:** Pain in the cheekbones, on either side of the nose or in the upper jaw, or above the eyes. Bloody mucus may discharge from the nasal passages.

**Prevention:** Shallow descent rates can reduce the pain.

**The Common Cold**

**Explanation:** A common cold affects the sinuses, middle ear, and inner ear, which may lead to ear or sinus block. Disabling pain and pressure during descent could result. Infection of the inner ear can also produce vertigo.

**Symptoms:** Tiredness, irritability, drowsiness, and pain are all symptoms of a cold.

**Prevention:** Don't fly with a cold.

**Motion Sickness**

**Explanation:** Motion sickness (i.e., airsickness) is caused by continued stimulation of the tiny portion of the inner ear, which controls the pilot's sense of balance.

**Symptoms:** The symptoms are progressive. First, the desire for food is lost, then saliva collects in the mouth, and the body perspires freely. Eventually, someone suffering from airsickness will be nauseated and disoriented, experience headaches, and have a tendency to vomit.

**Prevention:**
- Avoid rough air and abrupt maneuvers.
- Open the outside air vents.
- Loosen clothing.
- Use supplemental oxygen, if available.
- Keep the eyes on a point outside the airplane.
- Keep students or passengers interested and occupied.
- Avoid unnecessary head movements.
- Land as soon as possible.

There is no sure cure for airsickness, but resistance or immunity usually can be developed in a relatively short period of time. The flight should be terminated as soon as incipient sickness is experienced. As the student develops immunity, flights can be increased in length.

Pilots who are susceptible to airsickness should not take the preventive drugs available over the counter or by prescription. Motion sickness drugs cause a temporary deterioration of the ability to perform tasks that demand keen judgment.

**Dehydration**

**Explanation:** Dehydration is the term given to a critical loss of water from the body. Dehydration reduces alertness, producing a subsequent slowing of decision-making processes, or even the inability to control the aircraft.

Causes of dehydration are high temperature, wind, humidity, and diuretic drinks such as coffee, tea, alcohol, and caffeinated soft drinks. High altitudes tend to increase the rate of water loss from the body.
**Symptoms:**
- Fatigue (the first noticeable effect)
- Headache
- Abdominal cramps
- Dizziness
- Extreme thirst

**Prevention:**
- Drink plenty of water.
- Avoid high-protein diets.
- Avoid alcohol.
- Wear lightweight, light-colored clothing to reduce perspiration.
- Avoid flying for long periods in hot summer temperatures or at high altitudes.

**Heatstroke**

**Explanation:** Heatstroke is a condition caused by an inability of the body to control its temperature.

**Symptoms:**
- Lack of sweating despite high body temperature
- Muscle weakness or cramps
- Nausea and vomiting
- Confusion
- Disorientation
- Complete collapse

**Prevention:**
- Drink plenty of water.
- Avoid areas of high temperature.
- Avoid alcohol.
- Wear lightweight, light-colored clothing.
- Keeping the aircraft well ventilated to dissipate heat.

**Nutrition**

**Explanation:** Nutrition is the process of providing or obtaining the food necessary for health and growth. Nutritional deficiencies, known as malnutrition, are the result of the body not getting enough of the nutrients it needs.

**Symptoms:**
- Pale skin
- Fatigue
- Weakness
- Trouble breathing
- Unusual food cravings
- Dizziness
- Constipation

**Prevention:**
- Eat a healthy, balanced diet.
- Consider taking supplements or a multivitamin.
Decompression Sickness

Reference: AIM 8-1-2

Explanation: Low barometric pressure causes nitrogen bubbles to form in body fluid and tissue, in accordance with Henry’s Law.

Symptoms:
- The bends (pains in the joints)
- Peculiar sensations of the skin (similar to insects crawling on the skin)
- Spotty rashes on the skin
- Cold and warm sensations on the skin
- Itching
- Tingling
- The chokes (massive blocking of pulmonary arterial circulation by bubbles)
- Deep, sharp chest pain
- Dry, nonproductive cough
- Sensation of suffocation
- Central nervous system disorders

Prevention: Allow the body enough time to rid itself of excess nitrogen absorbed during scuba diving. Otherwise, decompression sickness may create a serious inflight emergency.

Recommended waiting times after diving for flight altitudes (not cabin altitudes):
- **Up to 8,000′ MSL**: At least 12 hours if a controlled ascent is not required, or at least 24 hours if a controlled ascent is required.
- **Above 8,000′ MSL**: At least 24 hours after any scuba dive.

Stress

Explanation: Stress is a term to describe the body’s nonspecific response to demands placed upon it. A certain amount of stress is good since it keeps a person alert and prevents complacency. However, the effects of stress are cumulative and, if not coped with adequately, they eventually add up to an intolerable burden.

Stress falls into two broad categories: acute (short-term stress) and chronic (long-term stress).

**Acute stress** involves an immediate threat that is perceived as a danger. When a threat is perceived, either real or imagined, the hypothalamus in the brain alerts the body. The adrenal gland produces hormones, including adrenaline and cortisol, which prepare the body to meet the threat or to retreat from it— the fight or flight syndrome.

**Chronic stress** is as a level of stress that exceeds the ability of an individual to cope. Long-term activation of the stress-response system puts the individual at increased risk of many health problems, including depression, digestive problems, heart disease, and sleep disorders.

Symptoms:
- Headache
- Muscle tension or pain
- Chest pain
- Fatigue
- Upset stomach
- Problems sleeping
Prevention:

- Cockpit stress management starts with good life stress management:
  - Learn to manage time more effectively.
  - Include relaxation time in a busy schedule.
  - Maintaining a program of physical fitness.
- Avoid situations that distract you from flying the aircraft.
- Reduce your workload to reduce stress levels.
- If an emergency does occur, be calm, think, analyze, and then act.
- Familiarize yourself thoroughly with your aircraft, its systems, and emergency procedures.
- Know and respect your own personal limits.
- Do not let little mistakes build into a big thing; Instead, wait until after landing debrief and analyze past actions.
- If flying is adding to your stress, either stop flying or seek help to manage your stress within acceptable limits.

**Types of Stressors**

**Environmental stressors** result from conditions associated with the environment, such as temperature and humidity extremes, noise, vibration, and lack of oxygen.

**Physiological stressors** result from physical conditions, such as fatigue, lack of physical fitness, sleep loss, missed meals (leading to low blood sugar levels), and illness.

**Psychological stressors** result from 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 pilot workload.

**Fatigue**

**Explanation:** Fatigue is extreme tiredness, typically resulting from mental or physical exertion or illness. It cannot be overcome through training or experience.

Like stress, fatigue can either be acute or chronic. **Acute fatigue** is the normal tiredness felt after long periods of physical or mental strain. **Chronic fatigue** occurs when there is not enough time for full recovery between episodes of acute fatigue.

**Symptoms:**

- Loss of memory or concentration
- Feeling unrefreshed after a night’s sleep
- Chronic insomnia and other sleep disorders
- Lack of awareness of error accumulation
- Muscle or joint pain
- Frequent headaches
- Frequent sore throat

**Prevention:**

- Mitigate the underlying problem.
- Obtain adequate rest.

Recovery from chronic fatigue requires a prolonged and deliberate solution. The underlying cause is generally not “rest-related” and may have deeper points of origin. Therefore, rest alone may not resolve chronic fatigue.

**Medications**

**Explanation:** Pilot performance can be seriously impaired by both prescribed and over-the-counter medications.

**Symptoms:** Many medications, such as tranquilizers, sedatives, strong pain relievers, and cough-suppressant preparations, have primary effects that may impair judgment, memory, alertness, coordination, vision, and the ability to make calculations.

**Prevention:** The safest rule is not to fly while taking any medication unless approved by the FAA. If the label on an over-the-counter prescription warns of side effects, do not fly until twice the recommended dosing interval has passed.
Regulations:

- 14 CFR 91.17 prohibits pilots from using any drug that affects the person's faculties in any way contrary to safety.
- 14 CFR 61.53 prohibits pilots from taking medication or receiving other treatment for a medical condition that results in the person being unable to meet the requirements for the medical certificate necessary for the pilot operation.

Medication Database

The FAA does not publish a list of "approved" medications for pilots, but the Aircraft Owners and Pilots Association (AOPA) and Aviation Medicine Advisory Service (AMAS) both offer a searchable list of FAA approved/disapproved medications for flight.

Links:

- https://www.aopa.org/ (membership required)
- https://www.aviationmedicine.com/medication-database/