Task II.A: Aeromedical Factors

Table of Contents

Lesson Overview

Objective

To determine that the applicant exhibits instructional knowledge of the elements elated to aeromedical factors.

Reference

- Pilot's Handbook of Aeronautical Knowledge, Chapter 17
- 14 CFR Part 67: Medical Standards and Certification
- AC 68-1A: BasicMed

Key Elements

1. IM SAFE — Self Checklist
2. Trust the instruments
3. Carbon Monoxide is 200x more likely to bond with blood than oxygen
4. Drugs + Alcohol + Flying = Very Bad

Elements

1. Obtaining an Appropriate Medical Certificate
2. Hypoxia
3. Hyperventilation
4. Middle Ear and Sinus Problems
5. Spatial Disorientation
6. Motion Sickness

7. Carbon Monoxide Poisoning
8. Fatigue and Stress
9. Dehydration
10. Alcohol and other Drugs
11. Nitrogen and Scuba Diving
12. IM SAFE

Equipment

- Whiteboard and dry erease markers.
- iPad

Schedule

1. Discuss Objectives
2. Review material
3. Development
4. Conclusion

IP's Actions

1. Discuss lesson objectives
2. Present Lecture
3. Ask and Answer Questions
4. Assign homework

SP's Actions

1. Participate in discussion
2. Take notes
3. Ask and respond to questions

Completion Standards

Lesson is complete when the students can demonstrate understanding of aeromedical factors during oral quizzing.

Instructor Notes

Attention

Safety in the aircraft requires knowledge of the factors that could have negative consequences if we were not aware of them and how to treat them. Hypoxia can result in symptoms of euphoria and the inability to make any sort of rational decision – which is obviously not a good thing while you're trying to fly a plane. (There are many good hyperbaric chamber/hypoxia videos on you tube.)

Overview

Review Objectives and Elements/Key ideas

What

Aeromedical factors involve a number of health factors and physiological effects that have great effects on pilots in flight. Some are minor, while others require special attention to ensure safety and survival.

Why

As a pilot, it is important to stay aware of the mental and physical standards required for the type of flying done. In some cases, these factors can lead to in-flight emergencies.

Lesson Details

Obtaining a medical certificate

General rules (standards: part 67, requirements: 61.23)

How to Apply

To fly pilots must obtain appropriate medical certification. A medical certificate Is issued after a routine medical examination which by administered only by FAA-designated doctors called Aviation Medical Examiners (AME). There is an FAA directory of AMEs that can be consulted to find an AME in the student's area.

At one time the student pilot certificate included the medical, but this practice ended as of April 2016. (Medical information is covered in more depth in lesson 3-A, Certificates and Documents.) It is often possible to get a medical certificate even with a medical deficiency, called a "special issuance medical". Operating limitations may be imposed, however.

Once any medical is issued it is self-regulating in that the pilot is always responsible for performing medical self-assessments. It is the pilot who determines whether they are fit to fly, or not.

As of May 1, 2017, a new program was instituted called BasicMed which provides a degree of regulatory relief from the previous medical certification process. It allows pilots to operate without an FAA medical certificate, if appropriate. Under BasicMed a pilot will be required to complete a medical education course, undergo a normal non-AME medical examination, and comply with aircraft and operating restrictions.

Someone with a normally disqualifying condition can, at times, receive a Statement of Demonstrated Ability (SODA) if the condition is one for which a SODA is applicable. At the discretion of the Federal Air Surgeon, a Statement of Demonstrated Ability (SODA) may be granted, instead of an Authorization, to a person whose disqualifying condition is static or nonprogressive and who has been found capable of performing airman duties without endangering public safety. A SODA does not expire and authorizes a designated Examiner to issue a medical certificate of a specified class if the Examiner finds that the condition described on the SODA has not adversely changed.

The actual process of getting a student pilot certificate is like any other FAA certificate. You must complete an application through the Integrated Airman Certification and Rating Application (IACRA) website or by paper using FAA form 8710-1 and submit it to a Flight Standards District

Office (FSDO), an FAA-designated pilot examiner, an airman certification representative associated with a part 141 flight school, or a certificated flight instructor.

How to Obtain a Medical Certificate With Medical Deficiencies (67.401)

- The appeal process for applicants who are denied medical certification, within 30 days after the date of the denial, you may apply for reconsideration.
- Statement of Demonstrated Ability, Special Issuances (SODA)

Causes, Symptoms, and Corrective Actions for a Number of Issues

- Hypoxia
  - Deficiency of oxygen which impairs brain functions and other organs
  - Hypoxic (altitude, blocked airway), Hypemic (anemia, CO poisoning), Stagnant (blood not flowing, high G maneuvers), Histotoxic (cells unable to use oxygen, alcohol, drugs)
  - Atmosphere decreases in pressure with altitude. O remains 21% of air
  - 5k MSL - Night vision deteriorates
  - 12-15k MSL - judgment, memory, alertness, coordination, ability to make calculation. Dizzy, drowsy, aggression or euphoria, tingling in extremities, loss of color vision
  - 15k MSL - within 15 min, Tunnel vision (periphery grays). Fingernails, lips turn blue (cyanosis)
  - Ability to take corrective/protective action lost in 20-30 min at FL180; 5-12 min FL200 followed soon by unconsciousness
  - Effects occur at lower altitude with smoking, alcohol (1 oz = +2000 ft), some medication, stress
  - Difficult to recognize - gradual dulling of senses
  - Ability to recognize symptoms greatly improved by altitude (hypobaric) chamber
- Hyperventilation - Abnormal increase in volume of air breathed - reduces excess CO from body
  - Can occur subconsciously during stressful situations
  - Symptoms: Lightheaded, dizzy sensation, tingling in extremities, hot and cold sensations, muscle spasms, visual impairment, unconsciousness
  - Pilot may react with greater hyperventilation
  - Symptoms subside within few minutes after rate of breathing is brought under control, use paper bag to rebreathe, talk slowly
- Middle Ear and Sinus Problems
  - Discomfort relieved by equalization of pressure in the Eustation tubes.
  - Cold or sinus congestion can make equalization difficult.

    - Severe pain, loss of hearing or eardrum rupture can occur.
    - ***Oral decongestant have impairing side effects.***
- Spatial Disorientation - Human Body uses three sense to orient and detect movement in space.
    - Vistibular - Inner ear, Somatosensonary - nerves/skin
        - The leans
        - Graveyard spin
        - Graveyard spiral
        - Coriolis illusion
    - Visual - Eyes
        - Linear perspective - caused by runways with different widths
        - Upsloping terrain or narrow or long runway - may produce the visual illusion of being too high on final approach
        - Downsloping terrain or wide runway - the visual illusion of being too low on final approach
        - Black-hole approach - the pilot experiencing glide path overestimation (GPO) because of the lack of peripheral visual cues
        - Autokinesis - pilot has the impression that a stationary object is moving in front of the airplane's path
- Motion Sickness
- Carbon Monoxide Poisoning
- Fatigue and Stress
- Dehydration

Effects of Alcohol and Drugs

- Alcohol - detailed effects and studies. (flightpysical.com)
- The one safe rule: DON'T!!
- Alcohol impairs judgement, sense of responsibility, coordination, memory, vision, hearing
- Altitude multiplies effect of alcohol on body
- 8 hours / 0.04%; better rule is 12-24 hours
- While experiencing a hangover the pilot is still under the influence

Effects of Nitrogen Excesses Incurred During Scuba Dives

- Provide the body with enough time to rid itself of excess nitrogen absorbed from diving
- Decompression sickness can occur and create an in-flight emergency

    - Nitrogen bubbles can form in the bloodstream, spinal cord or brain as pressure decreases with altitude
        - In extreme cases this can result in death, in less severe cases this can result in impairment or severe pain
    - Wait at least 12 hrs after a dive not requiring a controlled ascent before flight up to 8,000'
    - For flights above 8,000' wait at least 24 hrs.
- Wait at least 24 hrs after a dive which required a controlled ascent

IMSAFE

I - Illness **M** - Medication. **S** - Stress **A** - Alcohol **F** - Fatigue **E** - Emotion

Conclusion

There are many factors a pilot needs to be aware of in order to ensure a safe flight and to understand the medical risks involved in flying. Remember to use the IMSAFE checklist to evaluate your medical readiness to fly.

ACS Requirements

To determine that the applicant exhibits knowledge of the elements related to aeromedical factors by explaining:

1. How to obtain an appropriate medical certificate.
2. How to obtain a medical certificate in the event of a possible medical deficiency.
3. The causes, symptoms, effects, and corrective action of the following medical factors:
    a. hypoxia.
    b. hyperventilation.
    c. middle ear and sinus problems.
    d. spatial disorientation.
    e. motion sickness.
    f. carbon monoxide poisoning.
    g. fatigue and stress.
    h. dehydration.
4. The effects of alcohol and drugs, and their relationship to flight safety.
5. The effect of nitrogen excesses during scuba dives and how this affects pilots and passengers during flight.