

A. TASK**AEROMEDICAL FACTORS****OBJECTIVE**

The student should exhibit knowledge regarding aeromedical factors as required in the PTS.

KEY ELEMENTS

- Hypoxia
- Hyperventilation
- Middle ear and sinus problems
- Drugs & alcohol
- Scuba diving
- Fatigue

SCHEDULE

- IMSAFE
- Discuss objectives
- Review material
- Development
- Conclusion

EQUIPMENT

- White board
- Markers
- Private Pilot Aeronautical Knowledge Book
- AIM
- References
 - AC 61-21

INSTRUCTOR ACTIONS

- Discuss lesson objectives
- Present lecture
- Questions
- Homework

STUDENT ACTIONS

- Participate in discussion
- Take notes

COMPLETION STANDARDS

- Participate in discussion
- Take notes

A. TASK

AEROMEDICAL FACTORS

HYPOXIA

Hypoxia is the inability for the blood to carry oxygen through out the body.

Types

HYPOXIA		
TYPES	DEFINITION	EXAMPLE
HYPOXIC	Lack of oxygen absorbed by the body to atmospheric conditions	Trying to breathe at a higher altitude where partial pressure of oxygen decreases
HYPEMIC	Occurs when the blood is not able to carry a sufficient amount of oxygen to the body cells	Caused by anemia, disease, blood loss, or deformed blood cells or carbon monoxide poisoning
HISTOTOXIC	The inability of the body to use oxygen	Caused by alcohol and other drugs such as narcotics and poisons
STAGNANT	Oxygen deficiency in the body due to poor circulation of the blood	Occurs when you get that feeling when your foot falls asleep

Causes

Possible causes in ballooning:

- Excessive time at altitude
- Inoperative or faulty oxygen mask

Because of wide individual variations in susceptibility to hypoxia, it is impossible to predict precisely when, where, or how hypoxia reactions will occur in each pilot

Symptoms

The onset of hypoxia is insidious and progresses slowly, with symptoms including:

- Euphoria
- Headache
- Increased response time
- Impaired judgment
- Drowsiness
- Dizziness
- Tingling in fingers and toes
- Numbness
- Blue fingernails and lips (cyanosis)
- Limp muscles

Altitude	Time of useful consciousness
45,000 feet MSL	9 to 15 seconds
40,000 feet MSL	15 to 20 seconds
35,000 feet MSL	30 to 60 seconds
30,000 feet MSL	1 to 2 minutes
28,000 feet MSL	2½ to 3 minutes
25,000 feet MSL	3 to 5 minutes
22,000 feet MSL	5 to 10 minutes
20,000 feet MSL	30 minutes or more

Solutions

Solution:

- Descend to a lower altitude
- Use supplemental oxygen

A. TASK**AEROMEDICAL FACTORS****HYPERVENTILATION****Causes**

Hyperventilation is an abnormal increase in the volume of air breathed in and out of the lungs

Possible causes in ballooning:

- Stress
- Panic
- Anxiety
- Hypoxia
- Decreased carbon dioxide in blood
- Under conditions of stress and anxiety, a person's body reacts automatically to such stimuli, whether the danger be imaginary or real
- One of these automatic reactions is a marked increase in breathing rate, which results in a significant decrease in the carbon dioxide content of the blood, which is necessary to regulate the breathing process automatically

Symptoms

As hyperventilation "blows off" excessive carbon dioxide from the body, a pilot can experience symptoms of:

- Lightheadedness
- Nausea
- Suffocation
- Drowsiness
- Tingling in the extremities
- Coolness
- Dry mouth
- Blurred vision
- Rapid pulse and breathing rate

Solutions

To combat hyperventilation

- Remove cause of stress
- Talk out loud
- Breathe into a paper bag: being able to "see" your breath can help a person control their breathing

A. TASK**AEROMEDICAL FACTORS****MIDDLE EAR &
SINUS
PROBLEMS****Causes**

Inability to equalize the pressure differential between the middle ear or sinuses and the outside pressure

Causes of middle ear & sinus problems when ascending and descending

- upper respiratory infection such as a cold or sore throat
- nasal allergic condition
- can cause enough congestion to block the eustachian tube and make equalization difficult

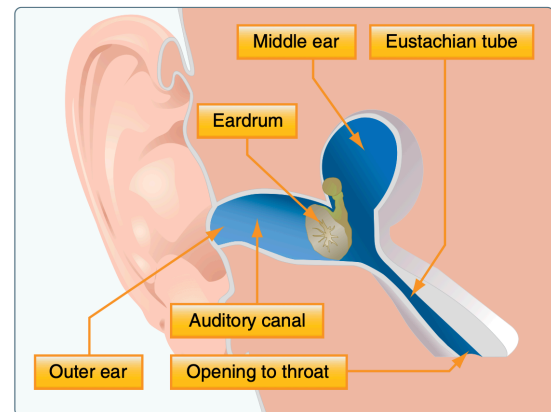


Figure 17-2. The Eustachian tube allows air pressure to equalize in the middle ear.

Symptoms

Symptoms

- discomfort in the ears or sinus
- severe ear pain or loss of hearing
- possible rupture of the ear drum

Solutions

To relieve pressure in head:

- equalizing of the pressure can be attempted through yawning, swallowing, and tensing the muscles in the throat
- Valsalva maneuver: equalization can be attempted by closing the mouth, pinching the nose, and gently blowing out the nostrils
- the only sure way to prevent this is not to fly with any kind of congestion

note: nasal sprays or drops may not be efficient enough to reduce congestion oral decongestants have side effects that can significantly impair a pilots performance

A. TASK**AEROMEDICAL FACTORS****DRUGS &
ALCOHOL**

Alcohol

- alcohol can severely impair a pilots ability to fly
- it is illegal to fly or perform any crew member duties within eight hours of ANY alcohol consumption or being under the influence
- best rule of thumb is to give at *least* 12-24 hours from “bottle to throttle”
-

Over-the-counter drugs

- A pilot should never fly while taking any over the counter drugs such as decongestants, allergy medicine, etc
- They may cause adverse side effects that could significantly reduce a pilot’s ability to fly at peak performance

Regulations

14CFR 91.17 ALCOHOL OR DRUGS review

- 8 hours bottle to throttle
- Under the influence
- Alcohol concentration of 0.04 or greater in blood or breath
- Cannot allow a person who appears intoxicated on aircraft

Resources

RESOURCES FOR APPROVED MEDICATION LIST

https://www.faa.gov/licenses_certificates/medical_certification/media/OTCMedicationsforPilots.pdf

<https://www.leftseat.com>

A. TASK**AEROMEDICAL FACTORS****SCUBA DIVING**

Scuba diving subjects the body to increased pressure, which allows more nitrogen to dissolve in body tissues and fluids. The reduction of atmospheric pressure that accompanies flying can produce physical problems for scuba divers.

A pilot or passenger who intends to fly after scuba diving should allow the body sufficient time to rid itself of excess nitrogen absorbed during diving. If not, DCS (decompression sickness) due to evolved gas can occur during exposure to low altitude and create a serious in-flight emergency.

The recommended waiting time before going to flight altitudes of up to 8,000 feet is at least:

- 12 hours after diving that does not require controlled ascent (non-decompression stop diving)
- 24 hours after diving that does require controlled ascent (decompression stop diving).

The waiting time before going to flight altitudes above 8,000 feet should be at least 24 hours after any scuba dive.

A. TASK**AEROMEDICAL FACTORS****FATIGUE****2 types**

Fatigue in pilots is a general lack of alertness and degradation in mental and physical performance, and can affect pilot alertness, performance, and judgment during flight.

Acute Fatigue: can occur if a person engages in extensive physical activity, is ill, or has a medical condition

Chronic Fatigue: A complicated disorder characterized by extreme fatigue that lasts for at least six months and that can't

Causes

Causes of fatigue in pilots:

- unpredictable work hours
- long duty periods
- circadian disruption
- insufficient sleep

Symptoms

Symptoms associated with fatigue include:

- slower reaction times
- difficulty concentrating on tasks resulting in procedural mistakes
- lapses in attention
- inability to anticipate events
- higher toleration for risk
- forgetfulness
- reduced decision-making ability

Solutions**Do not...**

- Consume alcohol 4 hours before going to bed.
- Take work to bed.
- Watch TV while in bed.
- Use sleeping pills.
- Eat a heavy meal right before bed.

You should...

- Keep a sleeping pattern. Try to go to sleep and wake up at the same time every day.
- Create a sleep sanctuary. Block out all noises, eliminate any light and keep your room cool.
- Get active. Being sedentary will affect the way you sleep. Do something physical during the day.
- Reduce stress. No one goes to bed easily when stressed. Find ways to reduce this.
- Get all your thoughts out onto paper. When your mind is racing it's hard to relax and fall asleep. Write all your thoughts down and address them in the morning.

A. TASK

AEROMEDICAL FACTORS

**IMSAFE
CHECKLIST**

**I'M SAFE
CHECKLIST**



I.....llness

Am I suffering from any illness (also common cold etc.)?



M.....edication

Do I currently take any medicine (especially Aspirin etc.)?



S.....tress

Am I stressed due to work, private issues, holiday planning etc.?



A.....lcohol

Did I drink any alcohol during the last hours (or maybe the night before)?



F.....atigue

Did I have enough sleep to safely conduct the flight?



E.....ating

Am I physically fit enough and did I eat / drink enough?

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