

# OXYGEN EMERGENCIES

## Hypoxia and hyperventilation

### Hypoxia

results from an inadequate supply of oxygen necessary for normal bodily function.

### Hyperventilation

may result directly from hypoxia, or under other conditions, from an increase in the rate and/or depth of breathing. This causes a depletion of CO<sub>2</sub> in the blood resulting in hypoxia symptoms.

### Types of hypoxia

**Hypoxic** due to direct reduction of atmospheric oxygen pressure at altitude.

**Stagnant** due to pooling of blood from positive G forces.

**Histotoxic** due to an inability of body cells to use available oxygen through cell poisoning (ex. alcohol, certain drugs such as sulfa derivatives)

**Hypemic** due to an inability of the red blood cells to carry sufficient oxygen (ex. carbon monoxide poisoning, anemia).

### Symptoms

Any of the following symptoms may indicate an hypoxia or hyperventilation problem—

air hunger	tunnel vision	apprehension
tingling	fatigue	numbness
nausea	muscle spasms	dizziness
euphoria	hot/cold flashes	blue fingernails
blurred vision		

### Action

When hypoxia or hyperventilation is suspected, immediately

1. "Press to test" momentarily:

#### if no pressure is felt in mask

- . pull emergency O<sub>2</sub> bottle
- . descend to 10,000 feet altitude

#### if pressure is felt in mask—

- . select "100% oxygen"
- . select "Safety"
- . breathe normally

#### if no improvement is felt—

- . activate emergency O<sub>2</sub> bottle
- . descend to 10,000 feet altitude

2. Minimize the following:
  - . extreme head movement

- . positive "G"
- . straining maneuvers
- . breath holding

3. Land at nearest suitable airfield.

## Time of useful consciousness (TUC)

This is the time interval between interruption of oxygen supply and loss of useful mental function. Essentially, this is the time available to detect and correct for oxygen deficiency before unconsciousness results. TUC varies with altitude. The following times are average figures (sitting quietly):

Altitude (feet)	Time (seconds)
25,000	180
28,000	90
30,000	75
40,000	30
46,000	12

## Mask removal at altitude

Mask removal at altitude may be necessary for a variety of reasons. Should removal be necessary, the mask must be "off the face" for minimum time necessary for blowing nose, valsalving, etc. TUC is an important deciding factor in the length of time the mask is removed. If you are a passenger, inform pilot of your intent.

The following procedures should apply for any mask removal—

- . check altitude and assess TUC
- . select "100% oxygen"
- . take several normal breaths
- . hold breath and remove mask

When returning mask to face—

- . breathe out
- . take several normal breaths of 100% oxygen
- . re-select "normal" in-flight setting
- . carry out standard in-flight oxygen check
- . if a passenger, inform pilot of all intentions to remove and replace mask

## Miscellaneous oxygen problems

1. Loss of all oxygen pressure — activate emergency oxygen bottle and descend to 10,000 feet.
2. Difficulty in breathing — likely causes:
  - . disconnection
  - . blockage in tube or mask
  - . extremely depleted oxygen supply.

3. Check all connections, contents gauge, press "test mask" to ensure adequate pressure in system. If blockage is caused by kinked hose, select "100% oxygen", take several normal breaths, hold breath and quickly disconnect, un-kink, and re-connect hose, then flood mask with oxygen by pressing "test mask" momentarily. Breathe normally and reselect "normal" oxygen.

4. A leaking inhalation valve causes difficulty in exhalation. This is not an emergency since the oxygen flow is not affected and exhalation is possible around the mask. The mask must not be loosened to assist in exhalation. Usually the valve can be cleared by taking several short breaths or a couple of sharp exhalations.

5. A gushing or run-away regulator may not be an urgent emergency although it is uncomfortable. It may be overcome by flipping the "test mask" lever.

### Decompression sickness

Results from the formation of nitrogen bubbles in the blood, plasma, or tissues due to an exposure to low pressure and is rare below altitudes of 25,000 feet.

Report all suspected cases to physician as a delayed reaction is possible. Four basic forms include:

#### Bends

from bubbles forming in muscle tissue and joints. Characterized by stiffness, "gravelly" sensation, or pain in affected area.

#### Chokes

from bubbles forming in tissues of lungs and throat. Burning sensation in chest and/or dry, non-productive coughing/choking sensation.

#### Parasthesia (creeps, crawls)

from bubbles forming under skin areas; tingling, hot/cold flashes, rash, welt, or itching sensations may be present.

#### CNS (central nervous system) disturbance

from bubbles lodging in brain or nerve tissues. Very serious. Symptoms include paralysis, visual problems, collapse. Can be fatal.

### Action

Whenever decompression sickness is suspected:

- select "100% oxygen"
- immobilize affected area
- declare emergency and descend to land at nearest suitable airfield
- seek medical aid
- symptoms persisting at ground level indicate a potential serious problem.

### Trapped gas problems

These problems can occur as a result of gases expanding in hollow body cavities resulting in pressure/pain in the affected area. The following areas may be affected:

#### Sinuses

may present problems on ascent or descent. Pain in forehead, over eyes, cheek area or nasal region is indicative of sinus problem. Stop ascending and descend, or stop descending and ascend to clear. Problems occurring on descent may be cleared by valsalva.

#### Ears

normally present problems on descent only. Valsalva to clear. To clear blockage on ascent, level off or descend. Reverse valsalva (pinching of nose and swallowing) may help.

#### Teeth

are a rare problem. Pain in teeth or even in maxillary sinuses on ascent may indicate dental work is necessary.

#### Gastro-intestinal

from gas expansion in stomach/intestines may lead to pain and hyperventilation. Vent gas. If unable and pain continues, descend.

To minimize or prevent gas problems at altitude:

- do not fly with colds or upper respiratory infections
- avoid gas forming foods before flight
- eat slowly. Most gas in GI system results from air swallowed during eating of food maintain regular eliminatory habits.

Other entrapped gas problems are:

#### Pressure vertigo

a dizzy, disorienting condition resulting from rapid pressure changes in the middle ear cavity.

#### Spontaneous pneumothorax

a lung rupture resulting in air being forced into the chest cavity and lung collapse. Severe, sharp pain in chest, difficult or impossible respiration, other complications and collapse may rapidly follow. Incidence is rare.

### Heat and cold — physiological effects

#### Effects of heat

Thermal effects of heat act primarily to induce losses of body water and salt through sweating. Principal effects are therefore due to various degrees of dehydration and salt loss.

#### General effects

Increased heart rate and oxygen requirement, dilation of blood vessels, increased sweating, decreased tolerance to acceleration and hypoxia.

#### Simple heat collapse

Due to mild loss of body water. Nausea, faintness, vomiting, weak pulse. Treat by replacing body water.

#### Heat cramps

Due to loss of body salt through sweating. Nausea, vomiting, vertigo, headache, painful cramping of muscles of extremities and abdomen. Treat by ingestion of two salt tablets per quart of water.

**Heat exhaustion**

Due to significant loss of both body water and salt. Dizziness, drowsiness, headache, unconsciousness. Treat by replacing salt and water with rest in cool area. Do not give cold fluids or alcohol.

**Heat stroke**

Due to excessive loss of salt and water with high temperatures. High body temperature, collapse, coma, and death if not treated. Immediately move to cool area, with water immersion necessary. This is an acute medical emergency.

*Effects of cold*

The effects of cold act primarily to induce local or general drop in body temperature resulting in thermal injury.

**General effects**

Peripheral blood vessel constriction, reduced heart rate, shivering.

**Frostbite**

A localized thermal injury on exposed body surfaces. Nose, fingers, and toes are most common areas affected. Tingling, redness, followed by paleness and numbness. Late states show blistering and gangrene. Treat by slow rewarming or rapid rewarming in water (45°C). Stimulate with tea, coffee.

**Hypothermia**

A reduction of entire body temperature below normal level. Results in blood vessel constriction, depressed vital functions, cardiac arrest and death. Most deaths occur at environmental temperatures of 0°C to 10°C. This is an acute medical emergency.

<b>Self-imposed stresses</b>
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These are stresses that the pilot imposes upon himself and reduces flying performance.

**Tobacco**

when smoked yields primarily nicotine and carbon monoxide.

**Nicotine**

stimulates heart, blood vessels, digestive system, kidneys; increases excitation, anxiety and tremors.

**Carbon monoxide**

causes a degree of hypoxia and increases susceptibility to hypoxia in flight; also decreases night vision capability.

**Caffeine**

present in coffee, tea, cola, hot chocolate, several cold medications and analgesics. Two cups of coffee are sufficient to produce effects of caffeinism causing irritability, trembling, nervousness, insomnia, rapid heart rate, increased urination, cramps, diarrhea, heartburn. Severity of effects depends upon quantity consumed.

**Alcohol**

is a depressant. Secondary effects include dehydration, and oscillations of the eyeballs (nystagmus). Nystagmus may still

occur even after the blood alcohol level has returned to zero; it increases susceptibility to disorientation in flight.

**Hypoglycemia**

Low blood sugar results from dieting, or not eating properly balanced meals. Symptoms include fatigue, malaise, irritability, fainting, visual disturbance and increased heart rate may severely lower "G" tolerance.

Source:

"Aeromedical handbook for jet personnel".

Canadian Forces School of Aeromedical Training, 1977

**Oxygen System Checklist****PRICE**

<b>P</b> ressure	1500-1800 psi check oxygen bottle <b>ON</b>
<b>R</b> egulator	Selector to 100%. With mask disconnected from regulator, perform blow-back check on regulator hose. Little or no resistance indicates leaky hose or defective regulator. Selector to <b>NORMAL</b> . Repeat blow-back check.
<b>I</b> ndicator	Selector 100%. Check blinker for operation. Return selector to <b>NORMAL</b> for takeoff.
<b>C</b> onnections	Connection secure at regulator. Check hose for kinks, cuts or fraying. Check quick-disconnect not warped and rubber gasket in place. Check mask hose properly connected.
<b>E</b> mergency	Check bail-out bottle pressure, should read 1800 psi. Check hose properly connected to "quick disconnect".