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HUMAN PERFORMANCE AND LIMITATIONS

CHAPTER 5 – AILMENTS

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AILMENTS AND COMMON RESTRICTIVE CONDITIONS

INTRODUCTION

Disease and illness may be prevented by maintaining good personal hygiene, following a healthy diet and through regular exercise.

However, some minor ailments are inevitable and although these ailments may be of a temporary nature, it may affect flight operations.



Some of these minor ailments include:

- Colds and Influenza
- Gastroenteritis
- Allergies

SPREADING OF PATHOGENS

The most common medical condition resulting in incapacitation of pilots is gastro intestinal illness. These are commonly caused by the direct invasion of the body by bacteria or viruses, or by food poisoning. The latter is often a result of bacterial invasion of food products.

There are a large number of bacterial and viral infections that can affect the human body. Some bacteria are harmless – we all have bacteria present in our digestive system. Sometimes the pathogens have no noticeable influence in one part of your anatomy, but cause problems when they move to another.



A large number of the 'not too nice' micro-organisms are spread by one or other of a number of methods:

1. airborne
2. ingestion
3. direct invasion
4. wound contamination
5. inoculation

The first two on this list are the ones of most importance in the social context, so we will look at them. The last three result from entry into the body via some form of penetration of our protective layer – the skin.

AIRBORNE



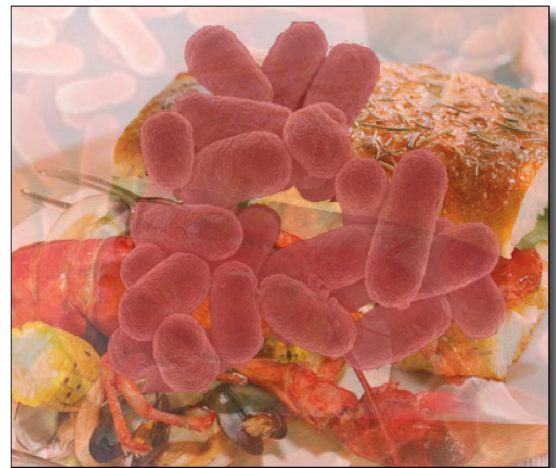
When talking, micro-organisms (pathogens) present in the nose, throat, or mouth are expelled in minute droplets of moisture (aerosols) and projected several feet. The more violent expirations that accompany sneezing and **coughing** will spread millions of pathogen carrying droplets at great speed over considerable distances. It is important to cover the mouth and nose when sneezing or coughing

Measles, mumps, chicken pox, diphtheria, pneumonia, not to mention a host of **cold and influenza strains** are examples of pathogens spread by aerosols.

INGESTION

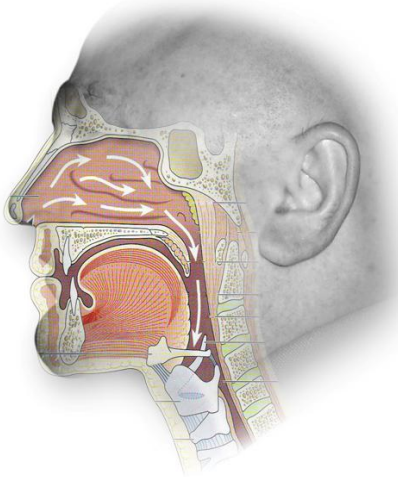
The food we eat usually contains a quantity of bacteria that has been introduced to the food by various ways, including airborne (by way of flies), contact with other materials (plates, bowls, etc) and by human contact. Contamination of food and drink by **human faecal material** is most significant in this form of transmission. Such contamination can occur:

- a) from the soiled hands of workers employed in the preparation and distribution of food.
- b) from hands being contaminated by soiled bathroom/toilet fittings and taps.
- c) through faulty disposal of sewage
- d) through flies landing on food, plates, utensils, etc.



Enteric fevers, dysenteries, cholera, some types of food poisoning, poliomyelitis and infective hepatitis are spread in this way.

UPPER RESPIRATORY TRACT INFECTIONS



Acute upper respiratory tract infections includes rhinosinusitis (the common cold), sinusitis, pharyngitis/tonsillitis, laryngitis and sometimes bronchitis. Symptoms of URIs commonly include congestion of the air passages, sinusitis, coughs, running nose, sore throat, fever, facial pressure and sneezing. Onset of the symptoms usually begins about 1-3 days after exposure to a microbial pathogen, most commonly a virus. The duration of the symptoms is typically 7 to 10 days but may persist longer.

Pain and pressure of the ear caused by a middle ear infection is often associated with upper respiratory infections.

Pilots flying with an URI place themselves in danger of suffering severe barotrauma (see later in this text), with the probability of suffering damage to the ears.

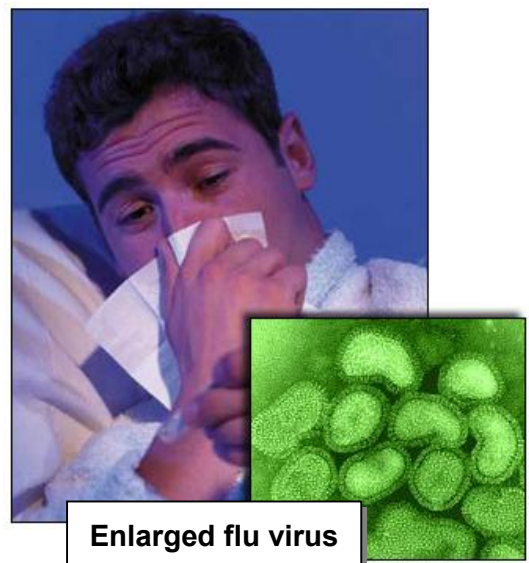
Influenza (the flu) is a more systemic illness, which can also involve the upper respiratory tract, but should be recognized as distinct from other causes of URI.

The use of antibiotics does not appear to offer much benefit in combating URIs. Until more effective treatments are available to treat the common respiratory viruses responsible for the majority of cases, treatment of URIs with rest, increased fluids, and symptomatic care with over-the-counter medications will remain the treatment of choice. Several studies have failed to demonstrate that vitamin C supplementation reduces the incidence of colds in the normal healthy population. The evidence does not support the use of Vitamin C at the onset of colds as effective therapy.

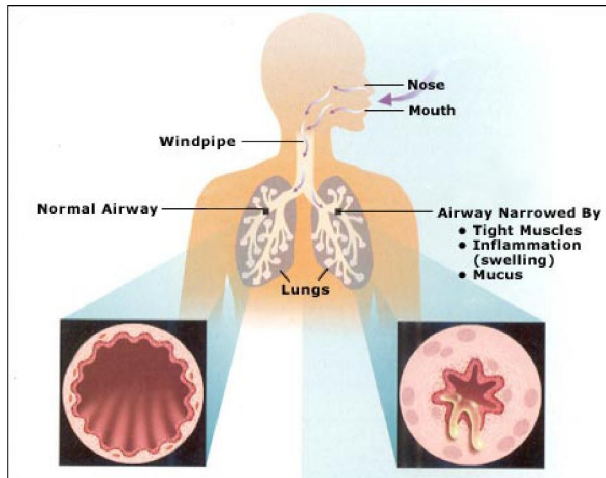
COLDS AND INFLUENZA

These are a well-recognised group of diseases of the upper respiratory tract, which are caused by viruses (contrary to popular belief, they are not caused by being in a cold environment, in fact these viral infections for all practical purposes do not even occur in Antarctica).

There are more than 100 different types of rhinovirus (colds), but only a few of the influenza virus. However, influenza viruses mutate rapidly, hence the phenomenon that there are typically 2 - 3 "new" types of "flu" every year.

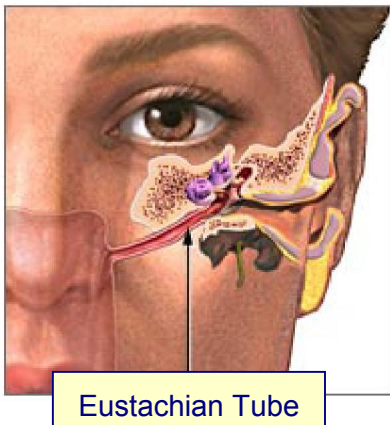


SYMPTOMS



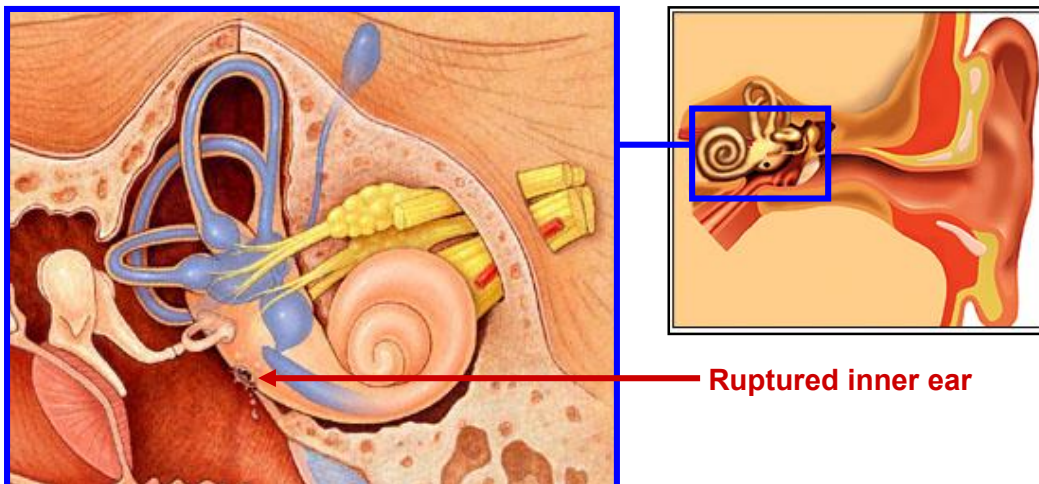
- Runny or blocked nose.
- Sneezing and fever.
- Associated symptoms such as headache, red/watery eyes, sore throat, dry cough, muscle aches, sinus pain (etc.) are variable and differ according to the type of virus as well as from person to person and may also be due to a secondary bacterial infection (due to the immune system having been "distracted" by the cold/flu).

EFFECTS ON THE AIRCREW



Despite the perception that upper respiratory infections (URIs) are often thought to be trivial, they can be extremely dangerous in the aviation environment. These URIs typically cause blockage of the Eustachian tubes and sinus openings, making barotrauma of the ear and sinuses extremely likely.

Flying with a URI may cause Alternobaric vertigo (complete and overwhelming disorientation caused by a rapid equalisation of pressure in the middle ear due to a partially functional Eustachian tube). If this occurs in a single pilot operation, it is likely to have fatal consequences.



Forceful attempts to equalise the pressure in the middle ear can lead to rupture of the round window in the inner ear, producing overwhelming disorientation and hearing loss. If a pilot survives such an episode, his\her certification will have to be confirmed by a DAME.

ACTIONS AND MEDICATION

With very few exceptions, all cold and flu medication is disqualifying for flying due to side effects like drowsiness, jitteriness, impairment of judgement, increased susceptibility to spatial disorientation, etc.

What people often forget, is the fact that the virus infection itself causes impaired concentration, accelerated fatigue, impairment of judgement and even delayed reaction time.

As a result of being a virus, it may be very contagious. A single sneeze indoors can infect everybody within 6 metres! "Toughing it out" and going to work with a URI will almost certainly cause far greater disruption than your absence for a couple of days.



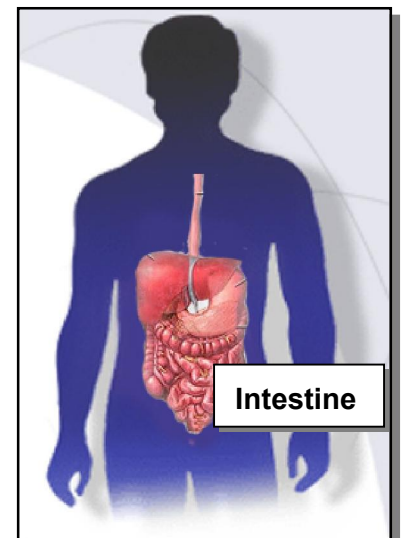
A pilot with a cold or flu, even when the symptoms are controlled with medication:

- Should not fly until cleared by an experienced doctor qualified in Aviation Medicine.
- Should seek medical attention, preferably from a doctor qualified in Aviation Medicine.
- Should be isolated to prevent spreading the infection to others.

GASTROENTERITIS, FOOD POISONING

The most common medical condition resulting in incapacitation of pilots.

Bacteria thrive in warm moist conditions, but lie dormant in refrigerated or frozen food. When the food is warmed these bacteria revive and start to multiply - hence the danger of eating food that has been held at a warm temperature for a long period, or is reheated. Not only are the bacteria a problem, but also some toxins found in some food are very resistant to heat.



Gastroenteritis is a non-specific term for a large range of infections, which give a relatively constant set of symptoms, namely:

- Nausea or vomiting, Stomach pain or cramps, Diarrhoea

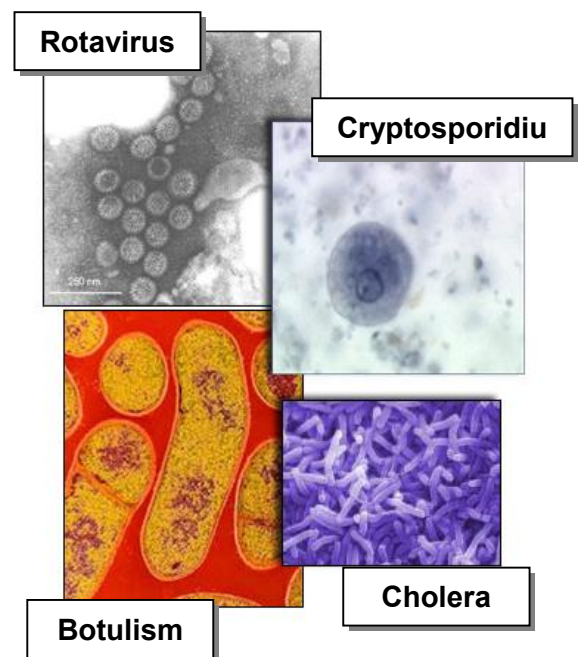
FACTORS

- Warm, humid climates.
- Lower hygiene standards, both personal and in the preparation of food.
- Reheated food, or food that has remained warm for long periods of time. Bacteria that have been dormant under refrigeration will multiply rapidly when warmed.

CAUSES

Gastroenteritis may be caused by any one of the following:

- Viruses; e.g. Rotavirus.
- Bacteria; e.g. *Vibrio Cholerae* (cholera), *Salmonella*, *Shigella* (dysentery) and *Campylobacter*.
- Parasites; e.g. *Amoeba* (amoebic dysentery) and *Cryptosporidium* (travellers diarrhoea).
- Bacterial toxins; e.g. *Staphylococcus*, *Bacillus Cereus* and *Clostridium* (botulism)



SYMPTOMS

Symptoms and specific treatment vary according to cause, but most gastroenteritis will be treated symptomatically with anti-nausea, antispasmodic (for cramps), and anti-diarrhoeal medication, as well as fluids to prevent dehydration.

Pilots should not fly with gastroenteritis, because:

- Nausea
- Fever
- Vision disturbance
- Balance disturbance
- Total incapacitation.
- Vomiting, cramps and diarrhoea can be debilitating or at the very least, a seriously distracting practical problem in the cockpit.
- All medication used to control these symptoms is disqualifying for flying.
- Dehydration in itself can impair performance.



These symptoms can develop almost immediately or development may be delayed for several hours after eating the contaminated food. This is of particular concern to flight crews, who may not become ill until well into the flight.

PRECAUTIONS

- Visit only reliable restaurants.
- Do not eat uncooked or undercooked food, or food that has been remained warm for extended periods.
- Avoid seafood, in particular shellfish.
- Be careful of dairy-based foods such as mayonnaise, cream or cream sauces, or ice-cream that has not been properly stored in below-freezing conditions.
- For 12 hours before flight, and during the flight, the crew should eat different food.
- Be prepared to allow up to 72 hours off flying after being affected.

ALLERGIES

An allergy is an abnormally vigorous response by the immune system. This response is triggered by allergens (e.g. pollen, food or animal hair).

In simple terms, when the body is "attacked" by an allergen, there are a number of responses from the immune system, one of which is the release of (massive doses) histamines and other inflammatory chemicals. These chemicals together induce the inflammatory response typical of an allergy.



SYMPTOMS



- Runny nose
- Hives (itchy reddened skin)
- Watery eyes
- Asthma type symptoms (if inhaled)
- Cramping, vomiting and nausea (if allergen is ingested)

Pilots and aircrew may be tempted to make use of over-the-counter analgesics, decongestants and antihistamines to relieve the discomfort. These in the majority of cases cause drowsiness, euphoria and can impair balance, vision and judgement.

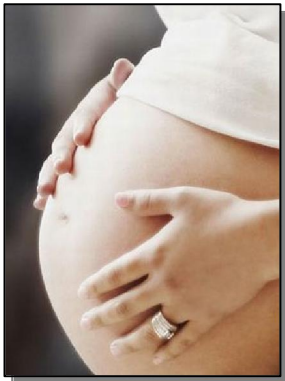
Note: Remember an aviation medical practitioner should ALWAYS prescribe medication used by aircrew.

COMMON RESTRICTIONS ON FLIGHT AND ASSOCIATED PROBLEMS

Pilots need to be aware that many day-to-day minor health problems that don't usually reduce our performance significantly on the ground may be much more noticeable in an aircraft.

HEADACHES AND MIGRAINES

- Headaches can compromise our ability as pilots because of pain, stress, distraction and reduced attention
- Migraine headaches are due to a constriction of the arteries in certain parts of the brain. They can be associated with extreme pain, impaired vision, nausea, vomiting and over-sensitivity to light, therefore can be totally incapacitating.
- Painkillers taken for relief of symptoms can lower mental alertness.



PREGNANCY

Permission of a DAME is required to continue flying. Time of disqualification varies from country to country. Some regulatory authorities allow flying into the second trimester.

One of the considerations as the pregnancy progresses is the possible restriction of rearward movement of the control yoke and positioning of the safety harness.

DEHYDRATION

60% body weight is water and water not replenished will result in varying degrees of incapacitation.

Dehydration will often occur at higher altitudes where the air is drier, particularly if the cabin air is heated, so reducing the relative humidity.

Exposure to air temperatures above 30°C requires 250ml of water every 30 minutes to prevent dehydration. *Any more than this, the body will excrete as urine.*

Performance begins to deteriorate in temperatures above 32° C.

To avoid dehydration drink more fluid than dictated by thirst alone. If you feel thirsty, you are already dehydrated.

On a hot day it is possible to lose up to 5 litres of body fluid. (By perspiration).



BLOOD DONATION

Donating blood is a noble and selfless act that may assist in saving a life. However, there are some aspects of donating that should be understood by pilots.

Mention has been made in several areas of this text, about the importance of an efficient blood circulation necessary to provide a pilot's body with an adequate supply of blood and therefore oxygen. This becomes increasingly important with an increase in altitude.



A blood donation reduces the body's volume of blood, and more importantly, the volume of haemoglobin in the blood supply. While the **blood plasma*** volume will return to normal in around 24 hours, the red blood cells (haemoglobin) are replaced by bone marrow into the circulatory system within about 3-5 weeks, and lost iron replaced over 6-8 weeks. This recovery process can be accelerated slightly by eating foods high in complex carbohydrates and other trace minerals. Due to the time required for iron replacement, (an essential element in the production of haemoglobin) donors are not eligible to donate whole blood until approximately eight to twelve weeks after the previous donation.

This period will vary between people, as our individual capacities to regenerate haemoglobin differ.

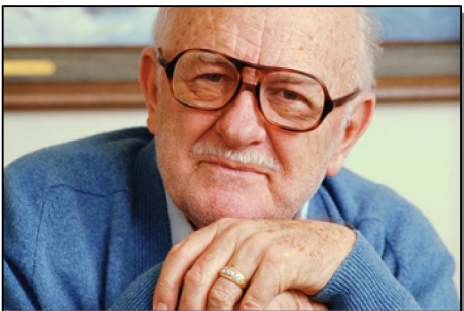
*Blood Plasma

Blood plasma is the liquid component of blood, in which the blood cells are suspended. It is a yellow colored liquid. Plasma is the largest single component of blood, making up about 55% of total blood volume.

The important considerations for a pilot are:

- It is inadvisable to fly within 24 hours of donating.
- Any effects of donating blood will become worse with an increase in altitude.

AGE



A pilot should consider how advancing age affects his ability to safely and efficiently carry out his job.

- Age will eventually affect sight and hearing.
- It will eventually affect mobility and physical capabilities
- Additional medical requirements with age are found in Regulations and Orders.

ANAESTHETICS

- Do not fly for 24 hours after a local anaesthetic, which includes dental.
- Do not fly for 72 hours after general. However, if you need a general anaesthetic, the underlying medical condition will probably be sufficient to preclude flying.

DISQUALIFYING ILLNESSES

There are many medical conditions that may restrict or prevent the issue of a medical certificate. The degree of restriction will depend in some cases to the severity of the illness and the success of treatment, but some of the more common illnesses include:

- Heart attack (usually an absolute and permanent restriction for Commercial licence holders)
- Kidney stones (temporary if treatment successful)
- Pregnancy (usually assessed on an individual basis and normally not recommended after the second trimester)
- Asthma (usually permanent)
- Any significant mental disorder (usually permanent)
- Alcoholism (temporary if treatment successful)
- Insulin dependent diabetes (usually permanent)
- Migraine headaches (usually permanent)
- Epilepsy (usually immediate and permanent)
-



INCAPACITATION

- Sudden incapacitation (happen quickly)
- Subtle incapacitation (happen slowly)
- Total incapacitation (totally unable to function effectively as a pilot)
- Partial incapacitation (Only partly incapacitated but not the best of ability)

IN-FLIGHT INCAPACITATION

Example 1

A student pilot got up at 0430hrs, had some coffee and a piece of toast, and then went to the airport for a session of instrument flying. While at a high altitude, he became increasingly rough in his control of the aircraft. He finally had to admit to his instructor that he felt dizzy, rather warm, and had tingling in his hands and feet. The session was abandoned, but by the time of landing, the student felt better. It was considered that he had had a low blood sugar level, since he'd eaten nothing substantial since 1900hrs the night before, and the effect of altitude were added, his system had no longer been able to cope.

Example 2

The British student pilot of a Cessna 152 was returning from Sunderland in northeastern England on the final leg of his PPL qualifying cross-country flight. In deteriorating weather an hour after sunset, the aircraft struck the ground on a hillside at a height of 600 feet. The pilot survived the impact with serious injuries. The only food he had taken that day was a light breakfast nine hours earlier.

DVTs (Deep Vein Thrombosis) originate in the deep veins of the legs such as the Femoral Vein. They have been known of for many decades, particularly in elderly post-operative and bed-ridden patients in hospitals.

A slowing down of circulation within the legs is the most important factor in the formation of DVTs. The return of venous blood to the heart is dependent to a significant degree on skeletal muscle movement. If a person is lying, or sitting for long periods of time with limited leg movement – a typical situation for passengers and flight crew on long-haul flights, then the conditions are conducive to venous thrombosis.



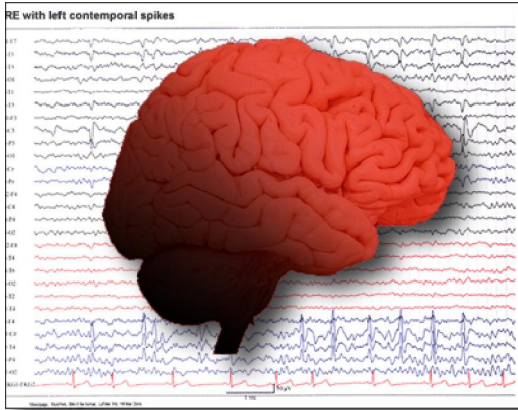
Predisposing factors may be diet, age, smoking, drug use and fitness as well as the individual's genetic make-up.

The best solution is one of prevention. Move the legs and feet frequently to prevent blood from pooling in the lower limbs. Most airlines are now advising passengers to carry out leg exercises during flight.

STROKE

Reduced blood flow (and therefore reduced oxygen supply) to the brain can lead to paralysis, or death. Strokes are usually caused by a blockage of, or by a burst blood vessel in the brain. Depending on wherein the brain the disruption occurs, the result may be loss of muscle movement, speech, sight or intellect. Severity is dependent on the extent and nature of the disruption.

LOSS OF CONSCIOUSNESS



Any sudden loss of consciousness is of concern to a pilot. Generally it will be either a **fit**, or a **faint**. The term fit (or seizure) usually relates to epilepsy, which arises from problems associated with abnormal electrical activity in the brain. The 'faint' (or syncope) results from disruption of blood flow to the brain and is usually temporary in nature and treatable with medication.

Whether major (involving convulsions) or minor (loss of attention), fits or seizures are usually associated with a period of loss of consciousness, and are intolerable on the flight deck. They result in an immediate and absolute ban on flying. Fits can occur without any previous history. They often show early in life and can sometimes result from a head injury.

Electrical activity in the brain is measured by an **Electroencephalogram (EEG)**. An EEG is carried out by placing electrodes on the skull which record small voltages produced during brain activity.

EPILEPSY

- Usually shows early in life.
- Can result from head injury.
- Total ban on flying licence.
- Major fits involve convulsions.

FAINT, OR SYNCOPE

Faints result from a change in consciousness caused by disturbance to blood flow to the brain. They can be caused by:

- Loss of blood, or low blood pressure.
- Shock.
- Standing quickly after sitting especially when hot or dehydrated.
- Lack of food, or fluid.
- G LOC ('g' induced Loss of Consciousness – more later in the course)



PSYCHIATRIC DISEASE

i)

Psychosis – usually results in permanent denial of licence. Psychoses are mental disorders involving removal from reality characterised by the sufferer being **unaware** of the presence of a problem. This is certainly not an acceptable state for a pilot. The major clinical forms of psychosis include:

- Schizophrenia (sometimes wrongly called ‘Split Personality’)
- Manic depression (or bipolar disease)

ii) **Neurosis** – while flying is banned when the condition is active, a sufferer can return to flying after a suitable period of good health without associated drug treatment. Neuroses involve altered perception of reality, however unlike psychosis, the sufferer is often **aware** of the presence of the problem. Neuroses involve the following states:

- Anxiety
- Obsession
- Depression
- Phobia

OTHER IMPORTANT ILLNESSES

The following diseases, whilst often referred to as tropical diseases are not necessarily confined to the tropics. Pilots have an increased risk of contracting these diseases due to their continual travelling and close contact with other international travellers. Pilots therefore need knowledge of the diseases and of precautions to take.

i) Malaria

- Kills more than any other tropical disease
- Fever caused by parasites in the blood, often introduced by mosquitoes.
- No vaccine available yet
- Insect borne - protection from nets (over face, beds, etc), insect spray, tablets (oral prophylactic)
- Prevention is better than cure - wear protective clothing
- The resulting fever can recur for the rest of your life

ii) Yellow fever

- An insect borne, viral infection
- A vaccination is available and is effective, but must be repeated every 10 years
- In severe cases, the liver and kidneys may be affected

iii) Polio (previously called Infantile Paralysis)

- An acute infection of the central nervous system that commonly affects children.
- Vaccination is available and should be repeated every 5 years.
- Caused by virus through nose or mouth.

iv) Typhoid

- **Caused by salmonella bacteria from faeces and urine. Transmitted by contaminated water.**
- A vaccination is available.
- Fever leading to delirium and serious bowel problems.
- Has a high fatality rate.

v) Hepatitis

- Viral infection of the liver
- Short term protection from vaccination
- Transmitted by polluted water or food or coughing and sneezing
- Tiredness, fever progressing to jaundice

vi) Cholera

- Epidemic disease caused by faecal bacteria
- Vaccine gives little protection
- Symptoms include diarrhoea, vomiting, cramps
- Can cause fatal dehydration
- Precautions include boiling all water, cook all food well.

vii) Rabies

- Caused by an animal bite – typically a dog or monkey
- Virus moves to brain – if untreated often fatal (can take days to a year)
- Inoculation can stop viral movement
- Symptoms include headache progressing to convulsions

viii) Worms

These include tapeworms, roundworms, and hookworms which infest the stomach and intestinal tract. Other species infest the blood stream. They may be found in uncooked or partially cooked meat, fresh water ponds and streams and damp soil. These may infect and damage liver, bladder or intestine and the following precaution are indicated:

- Do not swim in polluted water.
- Do not walk barefoot in suspect areas.
- Do not eat uncooked or partially cooked meat.

ix) Sexually transmitted diseases

Sexually transmitted diseases (STDs) include syphilis, gonorrhoea, non-specific urethritis, and human immune deficiency virus, (which cause AIDS) and many others. While HIV infection is more common among high risk groups such as homosexuals and drug addicts, it is not confined to these. Some STDs may remain asymptomatic (ie, no symptoms - you don't know you have them) while others (e.g. syphilis, AIDS) can result in a progressive deterioration of health and your capacity to fly. Medical advice should be sought.

x) Tetanus

- Immunisation very effective, administer immediately after a wound. Repeat every 5 - 10 years for maximum protection.
- Soil bacterium enters puncture type wound
- Symptoms include paralysis of the neck and jaw. Tetanus can be fatal.

Hangover and other headaches

(Independent causes in susceptible individuals)

Hangover:

- Excessive alcohol consumption

Chinese restaurant syndrome:

- Monosodium glutamate (MSG). Used as a flavour enhancer.
- Excessive salt

Hot dog headache:

- Sodium nitrite preservatives

Fermented cheese and salami**Dark chocolate****Aspartame (artificial or diet sweetener)****Caffeine (withdrawal)**

- Occurs when heavy coffee consumption is suddenly stopped.

Consider how often two or more of these occur at the same time?**HYPOGLYCEMIA**

Hypoglycemia is a medical term referring to a pathologic state produced by a lower than normal level of glucose (sugar) in the blood. Hypoglycemia can produce a variety of symptoms and effects but the principal problems arise from an inadequate supply of glucose as fuel to the brain, resulting in impairment of function. Derangements of function can range from vaguely "feeling bad" to coma and (rarely) permanent brain damage or death. Hypoglycemia can arise from many causes and can occur at any age. The most common forms of moderate and severe hypoglycemia occur as a complication of treatment of diabetes mellitus with insulin or oral medications. It can also arise from exertion and fluid loss (e.g. perspiration) following lack of food.

Hypoglycemia is usually treated by the ingestion or administration of glucose, or foods digestible to glucose.