

  
**Problems of Special Occupational groups**  
*Pilots and Drivers*  
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**Learning objectives for this lecture**


- Overall understanding of an Occupation
- Identifying and resolving the risks
- Licensing guidelines – pilots
- Able to extrapolate to all other occupations



**Pilots-Joint Aviation Requirements (JAR)**


**Medical assessment**


- Class 1 Commercial pilot (aeroplane and helicopter),  
Airline transport pilot (aeroplane and helicopter)
- Class 2 Private pilot (aeroplane and helicopter)



**Problems facing by pilots**

- Occupational demands
- Health risks






**Pilot Job Description**

The aircraft is typically operated by two pilots;

One will be the captain who is the **pilot in command**, while the other will be the **supporting first officer**.


One **operating the controls** while the other speaks to air traffic control

Long-haul flights, there may be three or four pilots on board



**Prior to the flight**

- Pilots check flight plans, ensure
- Aircraft's controls are operating efficiently and
- Calculate the required fuel for the flight
- Responsible for checking the weather conditions and briefing crew
- Ensuring all information on the route, weather, passengers & aircraft condition




Create a flight plan which details the altitude for the flight, route to be taken

Ensuring the fuel levels balance safety and supervising the loading

Ensuring all safety systems are working properly

Briefing the cabin crew before the flight and maintaining **regular contact throughout the flight;**




Carrying out pre-flight checks on the **navigation and operating systems**

Communicating with air traffic control before take-off /landing

Ensuring noise regulations are followed during take off and landing

**Understanding and interpreting** data from instruments and controls




Making regular checks on the aircraft's technical performance

Communicating with passengers using the public address system

Reacting quickly and appropriately to environmental changes and emergencies

Updating the **aircraft logbook and writing** a report at the end of the flight noting any incidents or problems with the aircraft.



### Health Risks

Deep Vein Thrombosis

Cabin Radiation

Altitude –ozone


Hypoxia-oxygen because the partial pressure of the oxygen is too low.

Dehydration- DVT, Decision making skills, increased fatigue

Fatigue / Stress

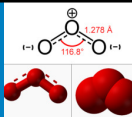
Hypothermia

### Risk factors @ altitudes



- High concentrations of ozone
- Damaging effects of solar and cosmic radiation
- Ultra-violet light
- Low humidity
- Very low temperatures

### Ozone



Ozone- variant of oxygen produced- action of solar radiation & high altitude oxygen

Toxic gas that damages the lungs -destroying the elasticity of the lung tissue

Little ozone is present in the troposphere but

Concentrations rise rapidly increasing with altitude (greatest concentrations in winter and spring)

Ozone enters through AC ducts



At poles the risk from the effects of ozone is greatest on trans-polar flights.

Ozone is a potential danger between **40,000 and 75,000 ft.**

Symptoms of ozone poisoning are dryness of the **nose/throat/ coughing & chest**

OZONE destroys cholesterol-derived metabolites in lung

Ozone layer between about **10 km and 50 km** above the surface



Severe poisoning *breathing difficulties, heart strain and sometimes death.*

**Concentration** of ozone is more significant than its **exposure** time

FAA concentration limit is **0.25** parts per million by volume (ppmv) for commercial flights.

Ozone is partly destroyed by the high temperatures created in the compressors of jet engines



Aircraft with lower compressor temperatures require **catalytic converters and carbon filters** to reduce the ozone concentration

**Higher cabin humidity** reduces the severity of the symptoms of ozone poisoning.

Ozone is usually destroyed by the **pressurization process**

Some planes are equipped with **ozone converters** in the ventilation system to reduce passenger exposure



## Stress

**Physical stressors:** Electromagnetic fields (EMFs), ionizing radiation of cosmic origin (protons, neutrons, and  $\gamma$ -radiation),

which are at appreciably higher levels than at ground level

**Chemical stressors:** Chemical pollutants and environment agents at altitude, such as ozone, the combustion products of jet fuels (e.g., CO, CO<sub>2</sub>, polycyclic aromatic hydrocarbons [PAHs], etc.),

and the chemicals used to construct the interior of aircraft, are sources of exposure.

In a closed aircraft, it is important that a clean supply of air is maintained from the exterior



### Biological stressors:

Food poisonings might occur due to the- foods contaminated

With microorganisms, such as Escherichia coli, vibrios, Salmonella, and Serratia marcescens

**Flu and tuberculosis** may be transmitted from



### Psychological stressors:

Non specific adverse biological responses to emotional disturbances, tiredness, and the disruption of circadian rhythm

Immune functions are altered in stressful situations, and these increase the likelihood of infection.

#### Others:

Other risk factors due to the aviation environment include acceleration forces, disorientation due to irregular flight, hypoxia, noise, and changes in pressures and temperatures.

## Cosmic Radiation International Commission on Radiological Protection



At high altitude, which is the domain of commercial airliners

Cosmic-ray **exposure rates** are hundreds of times greater

A crew member who works 1100 block hours

Would receive an annual radiation dose between **0.3 and 9 mSv**.

Occupational exposure limit of 20 mSv recommended

Pregnant women, the ICRP recommended that occupational exposure to ionizing radiation should not exceed 2 mSv.



A four hour flight above 35,000 ft equates to the same radiation dose as a **full chest X-Ray**

Radiation carries - risk of cancers

Cosmic radiation monitoring equipment must be carried on aircraft operating above **49,000 feet**.



Increased exposure to cosmic radiation because low level of Ozone and UV is higher

Crew members flying transpolar routes -exposed to about 6 mSv-1

### Average dose of rates received:

Concorde, 12-15  $\mu$ Sv (microsieverts) per hour;

Long haul aircraft, 5  $\mu$ Sv (microsieverts) per hour;

Short haul aircraft, 1-3  $\mu$ Sv (microsieverts) per hour dependent on the altitude reached.



## Health concerns to pilots in the cockpit

Pilots more exposure to cosmic radiation in the cockpit because:

The design of the aircrafts cannot avoid the **cosmic ray** to go through the **glasses in the cockpits**

Closer to the Poles the more radiation being received

**Electronic devices** contain radiation to the flight crews in the cockpit

*Hence, pilots absorb more radiation than flight attendants*



## Health concerns to flight attendants

Working hours of a flight attendant are probably similar to pilots

Many flight attendants are females- breast cancer and skin cancer

Amount of cosmetics that they use,

Female flight attendants' skin more likely to be worse than non- flying females.



## Blue and UV Light

At high altitude the light is much brighter than at sea level.

It contains considerably more high energy blue light and ultra violet light than normal

This can damage the retina over a period of time

Appropriate sunglasses for protection should be recommended

Impact resistant with thin metal frames

Photochromatic or phototropic sunglasses – not permitted

## Humidity



High altitudes the temperature is very low - humidity also low

Air enters the aircraft engines - maybe 50%

Air is heated to temperatures acceptable for the aircraft cabin  
the capacity of the air to hold water vapour is increased

**But the amount of water vapour itself remains the same.**

Pressurization air may have a relative humidity of as low as 3%.

Relative humidity levels of 40 to 60% are considered comfortable.

## Very Low Temperatures



Body heat is generated by the metabolism of oxygen & carbohydrates

Very low temperatures require higher level of metabolism

That means higher amounts of oxygen

Exposure to very low temperatures increases the susceptibility to hypoxia.

@ 33000ft - minus 40degrees

Low relative humidity can cause a **drying of the mucous membranes of the eyes, nose and throat** leading to discomfort.

Relative humidities of less than 30% encourage the survival of viruses and bacteria

Drinking larger amounts of fluids and avoiding diuretics like tea/coffee

## Cabin Pressure



Safe and comfortable environment  
pumping conditioned air into cabin

Hypoxia

Reduction in O<sub>2</sub> tension - in lungs

Subsequently in the brain, leading to sluggish thinking, dimmed vision, loss of consciousness, and ultimately death

760 mm of Hg (160 mm of Hg- oxygen)



Typical cruising altitudes in the range 11 000–12 200 m (36 000–40 000 feet)

Air pressure in the cabin is equivalent to the outside air pressure at 1800–2400 m (6000–8000 feet)

**Hypoxia** — particularly heart and lung diseases and blood disorders such as anaemia

**Gas expansion**

Decreasing cabin air pressure causes gases to expand

Popping" sensation in the ears -air escaping from the middle ear and the sinuses

Prior to landing, air must flow back into the middle ear and sinuses in order to equalize pressure.

Ears or sinuses may feel as if they are blocked and pain can result.

Treatment for a detached retina- may introduce air or other gases

Sea level 14.7 PSI (pounds per square inch)

Aeroplane at 33,000 feet (roughly 6 miles up) is approximately 4 PSI.

## Decompression Sickness



low partial pressure of gases, principally nitrogen (N<sub>2</sub>)

dissolved gases in the bloodstream

gas embolism or bubbles in the bloodstream

### Barotrauma:

As the aircraft climbs or descends

acute pain as gases trapped within their bodies expand or contract.

## Epidemiological evidence



Flight personnel and **cancer risk** by demonstrating elevated levels of micronuclei and cytogenetic aberrations

Significant excesses of melanoma and breast cancer –Females

Melanoma and incidence of prostate cancer - Males

## Risk management



### Reduction of cosmic rays:

Fly less frequently or to take longer intervals between flights, thus increasing recovery times.

Fly safer routes based on the computational estimation

**Metallic lead** was used in aircraft construction

**New radiation-resistant materials**

## Maintenance of quality /clean environment



It is necessary to keep **optimal oxygen concentrations** and comfortable temperatures and pressures in flight

### Avoidance of micro-organism contamination

Careful examination of all possible items e.g., food

Foods need to be boiled or heated before serving, cutlery/sterilized

## First aid and health professionals



Cabin attendants in stressful situations should be advised to take **antioxidant vitamins**

Because these agents are known to block or prevent the formation of **chromosomal aberrations and oxidative DNA damage**, and immune suppression.

For safe flying ...one should check



## Acronym PAVE



### Personal:

How many hours of sleep do you usually need to function well?

Are you healthy?

Have you battled any illness or are you on any medications?

How much flight experience do you have in the aircraft you're flying?

How many hours have you flown in the past week/month/year?

Are you rusty? Stressed?

IM SAFE

## I - Illness



Colds, allergies and other common illnesses can cause problems for pilots.

From sinus pressure to general malaise, pilots can easily become more of a **risk to the flight than an asset.**

## M - Medication



Over-the-counter medications can be dangerous for a pilot

Specific effects of the medication with an aviation medical examine

Mental or physical impairment - would interfere with the safety of flight.

## S - Stress

Physiological stress  
Environmental stress  
Psychological

## A - Alcohol



No doubt that alcohol and flying don't mix

affects the brain, eyes, ears, motor skills - for safe flight

Prohibits the use of alcohol within the 8 hours before flying

blood alcohol content of .04% or greater

## F - Fatigue

Difficult problem to address completely,

**E - Emotion** - Unusually angry or impatient- self assessment -hard

## Aircraft



Is the aircraft airworthy?

Did it undergo any inspections recently?

Do you have the fuel necessary?

Are you comfortable- weight and balance and performance the flight?

Do you know the aircraft limitations?

Do you have current charts? Is the GPS up-to-date?

## Environment:



What's the weather like?

Are you comfortable and experienced enough -forecast weather conditions?

Have you considered all your options and left yourself an "out"?

Are you instrument-current?

Are you at comfortable flying in busy airspace or  
on edge about the air traffic control situation?

Are you familiar with the terrain?

## External Pressures



Are you stressed or anxious?

Is this a flight that will cause you to be stressed or anxious?

Is there pressure to get to your destination quickly?

Do you have a plan B?

Are you dealing with difficult passengers or an unhealthy safety culture?

Are you being honest with yourself and others about your pilot abilities and limitations?

## Jet Lag



Jet lag is the tiredness you feel mainly due to lack of sleep on a long flight

While lack of sleep is the main cause, sitting in the same position for 5 hrs or more will increase jet lag.

No way to **avoid jet lag** on an airline except through comfortable sleep

Jet lag is worse if you have an important function immediately you land.

**Drink plenty of water too.**

Sleeping aids such as ear plugs, blind folds, and pillows

## Fatigue



Long-haul pilots have reported falling asleep at the controls.

Cargo pilots that fly at night face fatigue from - body's natural internal clock.

Six hours of sleep – acceptable for desk job

But the additional stressors of a pilot's 10-hour workday,

Long commutes  
Lengthy flights, terrible airport diets,  
Long layovers in airport lounges,  
and potential jet-lag increase operational risks for pilots.

Pilots, like everyone else, face unique family situations, financial stress and other life stress outside of work

Fatigue socially acceptable risk in aviation



## Fatigue



### Commuting:

Pilots start 2-3 hours earlier than others in order to commute to work.

Some have to drive a long distance to the airport;

and he must **fly in from a different airport**, adding hours his day.

### Layovers at airports:

Sometimes pilots will have a 12-hour layover at an airport, where they are meant to rest.

Instead, **some choose not to sleep, or otherwise can't get to sleep**

They watch TV, check email, or catch up with old friends and

Might get a few hours of sleep before their next flight departs







### Monotonous tasks:

Pilots that fly the same aircraft on the same routes into the same airports daily are prone to boredom fatigue.

### Symptoms of fatigue

- Falling asleep
- Yawning
- Poor visual acuity
- Feeling "sluggish" or "drowsy"
- Decreased reaction time
- Decreased concentration



### Effects:

Lack of motivation  
 Poor performance of tasks  
 Forgetfulness  
 Poor judgment  
 Diminished decision-making skills, including making rash decisions or lack of making a decision at all  
 Ultimate risk of pilot fatigue-**aircraft accident & potential fatalities**  
 Reduced alertness  
 Reduced communication – hamper crew coordination



### Other causes of fatigue

Inadequate sleep  
 Night flights  
 Extended duty time  
 Requirement of **sleeping during light hours**  
 Sleep restrictions  
 Insomnia  
 Mental boredom – **auto pilot engaged**  
 Stress anxiety  
 Poor sleeping habits



### Management of mental or physiological stress

Exercise is a good choice for the management of stress.  
 Stretching and massage could be highly effective at promoting circulation  
 Sound and sufficient sleep  
 Drinking alcohol as a sleeping aid,- deplete all vitamins – not recommended



### How to become a pilot

Airline pilots are, indeed, commercial pilots, commercial pilots are not necessarily airline pilots.

Commercial pilots can be cargo pilots, tour pilots, or backcountry pilots

They can be flight instructors, ferry pilots

Fly a regularly scheduled passenger service, or to fly for an airline,

Airline pilot needs to have a commercial pilot certificate, but also an Airline Transport Certificate (ATP)



### JAR Class I

#### Eye

1. No abnormality of the function of the eyes /adnexae, or any active pathological condition, congenital or acquired, acute or chronic, or any sequelae of eye surgery or trauma, which is likely to interfere with applicable license
2. A comprehensive eye examination at recruitment
3. A routine eye examination - all re-validation and renewal examinations.



A comprehensive ophthalmological examination at the following intervals:

Every five years to the **40<sup>th</sup> birthday**  
Once every **two years** thereafter  
Authorised Medical Examiners - ophthalmological assessments (age of 50 years)

after which slit lamp examination and tonometry will be required.



Distant visual acuity, with/without correction, shall be 6/9 or better **monocularly**, and 6/6 or **better binocularly**.

**Spectacles or contact lenses** must provide optimal visual function and should be **suited** for aviation purposes.

Refractive error shall not exceed +/-3.00D

No more than +/-2.00 dioptres **astigmatic component** and  
No more than 2.00 Dioptres of **anisometropia**.



If the refractive error is within the range -3/-5 dioptres

No significant pathology can be demonstrated

Refraction has remained stable for at least four years after the age of 17 years

Visual correction by contact lenses has been considered.  
experience satisfactory to the Authority has been demonstrated.



Able to read N5 at 30-50cms and N14 at 100cms with correction

Diplopia or significant defects of binocular - **unfit**.

There is no requirement for **Stereopsis**.

Central vision in one eye below the limits - considered re-certification if binocular visual fields are normal and the underlying pathology

A satisfactory flight test is required - limited to multi-pilot only.

An applicant with convergence insufficiency - as unfit.



Heterophorias exceeding limits - as unfit unless the fusional reserves are sufficient to prevent asthenopia and Diplopia.

Normal perception of colours defined as no mistakes on Ishihara plates (24 plate version)

Tested in daylight or in artificial light

Applicants who fail Ishihara shall be assessed as colour safe on extensive testing with methods acceptable to the Aeromedical Section

Who fails the acceptable colour perception as **unfit**.



Spectacles - 'available for immediate use',

Single vision full lens for near – not acceptable


Multifocals acceptable

An applicant should disclose to the optometrist of relevant reading distances for the flight deck.

The occupational - fulfilled by bifocal, trifocal or varifocal lenses.

**An intermediate correction in the upper field may be required,**

Flip-up spectacles are also acceptable



Sunglasses required & encouraged to use.

Tints should be neutral grey.


**but polarised lenses are not permitted** and

**Photochromic** lenses are discouraged

An additional pair of **untinted** spectacles must be carried

Contact lenses are permissible, but if soft lenses are used, they should not be high water content

Bifocal contact lenses are not approved.




**JAR II**

Distant visual acuity, with or without correction, **shall be 6/12** or better monocularly, and **6/6 or better binocularly**.

No limits apply to uncorrected visual acuity.

With the use of correction, **the spectacles or contact lenses** must provide optimal visual function and should be suitable

Refractive error shall not exceed +/-5.00 dioptres




With no more than +/-3.00 dioptres astigmatic/Anismoetropia

If the refractive error is within the range -5/-8 dioptres,

No significant pathology can be demonstrated.

Refraction has remained stable for at least four years after(17 years)


Visual correction by contact lenses has been considered.



With amblyopia, the visual acuity of the amblyopic eye shall **be 6/18 or better** and may be accepted as fit provided the visual acuity in the other eye is 6/6 or better.

With visual fields which are not normal shall be assessed as unfit.

Color Vision normal.



**Drivers**



**Transport:**

- Goods
- Public

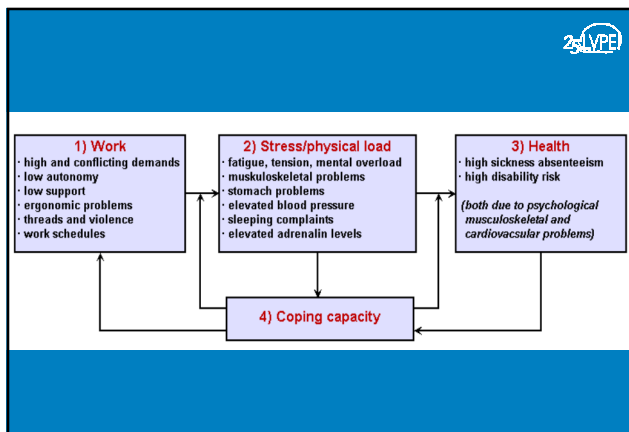
Task of a driver is mentally demanding because

- Having to cope with conflicting demands
- Public want the driver to maintain good contact with passengers and to be service-oriented
- Need to drive safely according to traffic regulations and conditions

### Job Description

25 LVPE

- Check the bus tires, lights, and oil and do other basic maintenance
- Keep the bus clean and presentable to the public
- Pick up and drop off passengers at designated locations
- Follow a planned route according to a time schedule
- Help disabled passengers get on and off the bus
- Obey traffic laws and state and federal transit regulations
- Follow procedures to make sure they and all passengers are safe
- Keep passengers informed of possible delays



### Work stress among drivers

25 LVPE

- Ergonomics of the driver's cabin
- timetables, shift schedules and the quality of break periods
- Social work environment and management style

## Thank you!

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so that all may see

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