

FITNESS TO FLY

A MEDICAL GUIDE FOR PILOTS



ICAO

IN COLLABORATION WITH:



© 2018, International Civil Aviation Organization
Published in Montréal, Canada

International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Quebec, Canada
H3C 5H7

www.icao.int

DISCLAIMER: This guide makes use of information from third parties. All third party content was obtained from sources believed to be reliable and was accurately reproduced in the guide at the time of printing. However, ICAO specifically does not make any warranties or representations as to the accuracy, completeness or timeliness of such information and accepts no liability or responsibility arising from reliance upon or use of the same. The views expressed in this guide do not necessarily reflect individual or collective opinions or official positions of ICAO Member States.

TITLE: FITNESS TO FLY - A MEDICAL GUIDE FOR PILOTS

Acknowledgements

ICAO gratefully acknowledges contributions from:

Dr. Nicola Cordell, Cordell Health Ltd, Reading, UK
Dr. Claude Thibeault, International Air Transport Association
Dr. Antti Tuori, International Federation of Air Line Pilots' Associations
Dr. Anthony Evans, Editorial Consultant
Caroll Rojas, Project Manager
Laurie Seline, Editor
Christina O'Shaughnessy, Editor
June Kim, Graphic Designer
Cecilia Silva Venturini, Infographic Designer

Preface

FITNESS TO FLY: A Medical Guide for Pilots has been prepared by the International Civil Aviation Organization (ICAO) in collaboration with the International Federation of Airline Pilots' Associations (IFALPA) and the International Air Transport Association (IATA). It is intended to provide pilots with a simple, easy-to-read guide to maintaining good health throughout their careers.

Historically, ICAO's approach to medical fitness in licence holders has been based on detecting increased medical incapacitation risk (from ill health) once it has occurred, and by taking action to reduce the impact on aviation safety, such as restricting a licence or removing the licence holder from operations.

This publication, however, focuses on prevention. It provides guidance to pilots on how to stay healthy, thereby minimizing the need for interventions that might involve licence restrictions.

The guidelines focus on professional pilots because they represent the most important group of safety-critical personnel who have a major interest in maintaining their health in order to keep their licences. The information on the medical conditions that interrupt their careers, temporarily or permanently, is better documented than for other groups.

But most of the information here also applies to anyone involved in the aviation sector, such as cabin crew, air traffic controllers and private pilots.

Interest in the subject of maintaining and improving health varies considerably from one person to another. The guide is structured so that those who wish to simply know how to avoid the main causes of ill-health can read the summary at the end of the guide for a quick overview. Those who desire more detail will find that reading the entire guide provides a comprehensive look at all the major issues affecting fitness to fly. Each chapter ends with a section on the relevance to aviation of the condition under consideration.

Foreword



| ICAO



Globally, modern aircraft carry no fewer than 10 million passengers and many thousands of tonnes of freight each and every day. Aviation keeps growing at a tremendous pace, which will pose challenges to aviation stakeholders. ICAO's role in civil aviation is to determine the international standards and recommended practices to ensure safe, efficient and sustainable aviation transport.

ICAO collaborates with its Member States, numerous industry groups, and other international organizations and associations to achieve this objective. From an aviation medicine perspective ICAO, in line with the UN Sustainable Development Goals (SDGs) and specifically a health related SDG (Ensure healthy lives and promote well-being for all at all ages), supports the concept of health promotion which is defined by the World Health Organization as: "the process of enabling individuals and communities to increase control over the determinants of health and thereby improve their health".

Fitness to Fly – A Medical Guide for Pilots is a handbook (developed in collaboration with IFALPA and IATA), focused on the health risks pilots face during their careers and the medical recommendations that help mitigate those risks. The handbook is intended to close the gap between pilots' medical requirements in order to fly and the preventive measures that help them fulfill those requirements. This is ICAO's contribution to promoting the well-being of the aircrew community - a priority shared by all aviation stakeholders. The recommendations contained in this guide are not only applicable to pilots, cabin crew and air traffic controllers, but should also be of value to anyone working within the aviation industry.

The handbook is easy-to-read, motivating, and educational (preventive medicine), with engaging content, graphics and charts from credible sources of information. We hope this book will not only have positive impacts in improving the personal health of aviation personnel in the short term; but will also result in positive outcomes for all aviation stakeholders in the long term.

Stephen P. Creamer
Director, Air Navigation Bureau
ICAO



Professional pilots have seen profound changes in the aviation industry in recent years. Careers are lasting much longer and pilots are retiring later than in the past. Annual flying hours and work-related demands are constantly increasing. It is crucial, now more than ever, for professional pilots to maintain, not only their medical certificate, but also optimal physical and mental health both during and after their flying careers.

Age is an important risk factor for many of the conditions that may result in the loss of a pilot's licence. While we cannot control the aging process, there are many other risk factors that we can mitigate. This

guidance has been developed to inform pilots of the known risk factors concerning pilots' medical certification and personal wellbeing, and how to reduce them. The earlier the risks are identified, the more effectively they can be addressed, and the better the results will be. With the help of this guide, it will be easier for pilots to focus on the right preventive measures.

This guide also reflects the shared responsibility of pilots, operators, and authorities in keeping pilots fit. While pilots make their own personal decisions, operators can facilitate these decisions and authorities can guide their national regulation in the right direction.

IFALPA hopes our fellow pilots will find this guide useful, and that it will enable them to fly healthier.

Captain Ron Abel
President
IFALPA

Foreword



In February 2016, the International Civil Aviation Organization (ICAO) notified its Member States that the ICAO Council had accepted a proposal to amend Annex 1 of the Convention on International Civil Aviation with two significant changes:

“the replacement of a current Recommendation relating to health education and prevention of ill health in Class 1 applicants under forty years of age by means of a new Standard addressing similar principles but with wider application; and

the upgrading of a Recommendation to a Standard concerning the application of basic safety management principles to the medical assessment process.”

As mentioned in the Preface to this manual, ICAO’s historic approach to medical fitness in licence holders has been based on detecting increased medical incapacitation risk (from ill health) once it has already developed. This new, proactive approach recognizes that the function of medical regulators to protect flight safety should not be confined to the validity of a

medical certificate, a six month or one year responsibility, but a longer term one. It also helps put an end to the unproductive debate on the separation between regulatory medicine and preventive medicine. All medical encounters, regardless of the context, should use all tools available to protect health, especially in a world that requires more pilots, not less.

This new approach also sends the message that all parties involved are working jointly toward the same goal, which is to maintain the health of the licence holders for as long as possible while also maintaining flight safety.

In order to reinforce the above concept, ICAO went one step further and asked the International Federation of Air Line Pilots’ Associations (IFALPA) and the International Air Transport Association (IATA) to participate in developing a co-branded guidance manual on health promotion entitled *Fitness to Fly — A Medical Guide for Pilots*.

IATA is extremely pleased to cooperate in such an endeavour, one that we believe will be another step in progressively changing

the current regulatory medical culture (with its potential to induce an adversarial environment between pilot and medical examiner) into a more collaborative one with all its benefits.

This well-written document, which includes many references to available resources, covers all the major items in health promotion, many of which are supported by good research material. While it may not be a book that one reads cover to cover on the same day, each chapter can be taken independently at one's leisure.

The new Standards and Recommended Practices (SARPs) and the associated guidance document constitute an important step in the right direction. IATA is very happy to participate and cooperate with its partners, IFALPA and ICAO, to help professional pilots maintain their fitness to fly whilst helping to assure flight safety in the long term.

Gilberto Lopez Meyer
Senior Vice President,
Safety and Flight Operations, IATA

Table of contents

Preface

2

Foreword

ICAO
IFALPA
IATA

4

Introduction
MAINTAINING
FITNESS TO FLY

9

Chapter 1
**UNDERSTANDING
CARDIOVASCULAR RISK**

17



Chapter 2
**HOW TO KEEP MENTALLY
WELL**

35



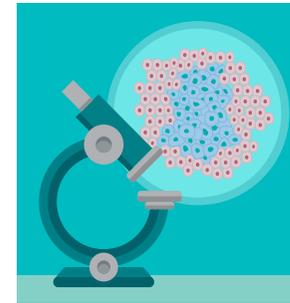
Chapter 3
**IMPACT OF ALCOHOL AND
DRUGS ON PERFORMANCE
AND HEALTH**

49



Chapter 4
**WHAT WE KNOW ABOUT
CANCER**

67



Chapter 5
**HOW TO REDUCE YOUR
HEALTH RISKS FROM
MUSCULOSKELETAL INJURY**

86



Chapter 6
**NUTRITION AND WEIGHT
MANAGEMENT**

101



Chapter 7
**SLEEP AND THE IMPACT
OF MEDICAL CONDITIONS**

122



Chapter 8
**TRAVEL
HEALTH**

141



Chapter 9
**HEARING
AND VISION**

156

Annexes
ANNEX 1
ANNEX 2

171

INTRODUCTION

MAINTAINING FITNESS TO FLY

WHAT ARE THE ISSUES?

Professional pilots are at risk of becoming affected by similar conditions to those occurring in the general population.

This can sometimes result in periods of ill health of such degree that they have to cease flying, usually on a temporary basis but sometimes permanently.

BACKGROUND

The International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations. It works with 192 Member States and international organizations around the world¹ “in support of a safe, efficient, secure, economically sustainable and environmentally responsible civil aviation sector”. (1)

Medical fitness of pilots is part of the civil aviation safety landscape. To ensure flight safety, pilots must be free of (or have under control) conditions that cause or have the potential to cause a significant reduction in pilot performance.

In collaboration with specialists from governments and international organizations, ICAO develops a global consensus on the appropriate level of medical fitness for different groups of pilots and other licence holders. Known as Standards and Recommended Practices (SARPs), these international standards are incorporated into national law by national aviation authorities.

Although the international standards are harmonized to a degree, some medical areas still exist where standards are not harmonized, nor interpreted in the same manner nor applied consistently by different national regulators.

One major advantage of having an international set of standards is that an aircraft which is operated in accordance with ICAO Standards (which include pilot medical fitness requirements) can operate in another country’s airspace without having to seek special authorization to do so.

MINIMAL MEDICAL RISK

Lifestyle

By promoting a healthy lifestyle, it is possible to help ensure that professional pilots pose a minimal risk to safety from the beginning of their careers until they retire. This can be accomplished if pilots:

- maintain a healthy heart
- develop mental health resilience
- adopt a low-risk strategy towards alcohol
- avoid illicit drugs
- adopt cancer avoidance habits
- manage diet and weight
- manage risks associated with accidental injury
- get sufficient sleep
- understand and reduce travel-related risks
- protect their hearing and vision.

While no amount of screening and health risk assessment can guarantee that an individual does not ultimately pose a safety risk, minimizing this risk is both desirable and achievable. The benefits are three-fold:

- improved flight safety
- reduced number of interrupted careers due to health-related events
- reduced (health-related) costs to the aviation industry.

Risk management

Medical incapacitations always form part of the overall air transport safety risk. Even remotely piloted aircraft systems are at risk of a pilot incapacitation unless the operation is completely autonomous from take-off to landing (which at the time of writing

1

This guide has been written in collaboration with the International Air Transport Association (IATA) and the International Federation of Air Line Pilots’ Associations (IFALPA). IATA is the trade association for the world’s airlines, representing 265 airlines and 83 per cent of total air traffic. IFALPA represents more than 100 000 professional pilots globally, who are members of 100 pilot associations.

is uncommon). The role of regulators is therefore to ensure the risk of incapacitation in an individual is reduced to an acceptable level and, where possible, to mitigate any remaining risk.

Complexity of medical regulation

Medical regulation in the aviation sector is complex. Doctors who carry out periodic medical examinations of pilots are required to take a training course in aviation medicine and then to be designated as an examiner by a national civil aviation authority, which employs specialist staff to oversee the system. Often, the challenge for these doctors does not reside in the medical examination itself but in knowing how to proceed if something out of the ordinary is detected during the examination or the associated routine medical tests (e.g. electrocardiogram, audiogram, urine sample).

While regular medical examinations are an important part of the regulatory system, they are not the most common way that medical conditions are identified in pilots. Most conditions come to light in between periodic medical examinations and may not be communicated to the Aviation Medical Examiner. The medical screening process for identifying those at increased risk is therefore not infallible.

Determining acceptable medical risk for a professional pilot

A pilot may have an abnormal electrocardiogram (ECG) during a routine examination. Further investigation indicates that he/she has suffered a small, silent (i.e. without symptoms) myocardial infarction (heart attack) in the past few months, causing irreversible damage to part of the heart muscle. He/she feels well, is not taking any disqualifying medications and is exercising

normally in day-to-day life, but is thought to have about an 1 per cent risk of recurrence of a similar event in the next year — although it can't be predicted when. However, should it occur, the next event could be incapacitating. Is an event rate of 1 per cent per annum an acceptable risk for a professional pilot?

Several aspects need to be considered here and these are addressed in detail in other publications (e.g. *ICAO Manual of Civil Aviation Medicine* (2)). For example, is the pilot operating solo or is there another pilot who could take over the controls in the event of an incapacitation? Is the pilot flying a fixed wing aircraft or helicopter (fixed wing aircraft are usually more stable than helicopters when pilot control inputs cease)? How does the medical risk compare with an acceptable risk of an aircraft engine failure? Might the pilot be considered unfit to fly professionally but fit for private flying?

It is not always easy for the regulatory authority to determine if a professional pilot who has suffered a significant medical event remains fit to fly. While it is challenging to make such a decision when a physical illness is under consideration, it is an even greater challenge when the situation involves a mental (e.g. depression) or behavioural (e.g. alcohol-related) condition. These conditions are often less easy to diagnose and estimating the associated risk can be more problematic. The need to make such difficult decisions could be avoided if these illnesses could be prevented from occurring in the first place.

Reasons pilots are declared medically unfit **Data on professional pilots assessed as “unfit”**

Professional pilots are required to undertake periodic medical examinations throughout their careers at intervals no less frequently than those that are

promulgated by ICAO (typically annually). Such examinations are scheduled, managed and kept on record by the national civil aviation authority or by medical examiners, medical centres or other institutions designated by the national civil aviation authority. It might seem a simple task to record when pilots become unfit and generate data on the diagnoses and numbers involved. However, this is not always so easy to keep track of or analyse global data.

Some pilots who become unwell may choose to retire from flying. They may simply not turn up for their next periodic examination. Since pilots typically do not spend more than about 10 per cent of their time in the air, the chances of suffering a medical problem when on the ground are much higher, and events that occur on the ground are far less likely to be reported to the regulatory authority.

Also, regulatory authorities may not make a distinction between “permanent unfitness”

Table 1.

Professional pilots assessed as “permanently unfit” in Norway, during 12 552 pilot-years for 2006–2010 (based on [reference 3](#), with permission)

DIAGNOSTIC CATEGORIES	NUMBER	PER CENT
Heart and blood vessel	15	17.65
Nervous system*	22	25.88
Muscles/bone/joint	10	11.76
Mental	13	15.29
Ear, nose, throat (ENT)	13	15.29
Eye disease	4	4.71
Cancer	5	5.88
Others	3	3.53
TOTAL	85	100.00

* Refers to brain, spinal cord, nerves

and “temporary unfitness”. There is no requirement for them to do so since, as long as the unwell pilot is assessed as unfit and is not flying, flight safety is not affected.

Because of the significant consequences of a “long-term” or “permanently” unfit decision to the pilot and because this is an event that is amenable to statistical analysis (a so-called “hard” end point), some regulatory authorities do collect such data. Sometimes data can also be obtained from insurance companies that settle claims when pilots lose their medical certificate and employment due to a medical problem. Combining these sources of information can provide a reasonably accurate picture of the causes of professional pilot “loss of licence” for medical reasons.

One regulatory authority, Norway, has recorded the number of “permanently unfit” decisions as can be seen in Table 1. The number of “permanently unfit” decisions made over five years (2006–2010) was 85 (an average of 17 per year). Put another way, 0.68 per cent of the professional pilot population became permanently unfit, from a variety of medical causes, during the five years of the survey.

A previous Norwegian study published in 2004, found that a total of 275 commercial pilots were permanently grounded in the period 1982–2001. (4)

Top of the list during 1982–2001 was heart and blood vessel (cardiovascular) disease, but in the period 2006–2010 neurological disease (epilepsy, head injury, strokes, brain tumours, migraine) was found to be the top reason for medical disqualification.

This is in line with a major decrease in cardiovascular disease observed in the general population in many countries

over recent decades, due primarily to reduced smoking rates, better control of blood pressure and more effective treatments of the disease. Data from a large North American insurance provider confirms the main medical reasons for pilot disqualifications (over a period of approximately 12 years). See Table 2 below.

Table 2.

REASONS FOR A LUMP SUM PAYOUT BY A LARGE INSURANCE PROVIDER IN NORTH AMERICA, FROM THE MOST TO LEAST COMMON

(personal communication, ALPA, 2016)

1. Mental/nervous (psychiatry)
2. Cancer
3. Circulatory system (cardiovascular disease)
4. Back problems
5. Diseases of the nervous system (neurology)
6. Ill-defined and miscellaneous conditions
7. Musculoskeletal problems (muscles and bone/joint)
8. Infectious and parasitic diseases
9. Diabetes
10. Injury other than back
11. Diseases of the ear
12. Diseases of the eye
13. Diseases of the genitourinary system
14. Respiratory
15. Maternity

Although back problems and cancer are relatively common causes of career termination, they rarely feature on lists of causes of in-flight incapacitation. This is because they tend to evolve relatively slowly and the pilot stops flying before an acute event has an opportunity to occur in-flight. In

Norway, tinnitus (hearing a sound when no external noise source is present) is a frequent problem that seems to be more common than in North America. It may be due to noise exposure in North Sea helicopter operations servicing the offshore oil industry. Helicopters generally provide a noisier flight deck than do large commercial aeroplanes.

“Temporarily unfit” assessments

As might be expected, pilots become “temporarily unfit” more commonly than they become “permanently unfit”. Furthermore, medical conditions that can prevent a pilot from working might result in only a minor inconvenience for a ground-based worker, for a number of reasons:

1. Piloting activities must routinely be undertaken in sequences that are time-critical. Unlike an office worker, a pilot during flight must not delay an action or do it more slowly than normal because of feeling unwell.
2. Pilots need to be alert to respond quickly to a variety of possible emergency situations, which requires an appropriate level of both physical and mental fitness.
3. A physical problem, such as a broken leg, may render a pilot unable to work until healing is complete, whereas an office worker may be able to return to work relatively soon after treatment.
4. Minor upper respiratory illnesses can lead to ear and sinus problems due to cabin pressure changes that are not experienced on the ground.
5. Some medications that affect thinking processes may be acceptable in office workers but unacceptable for pilots.

ICAO has relevant provisions on medical unfitness.²

Because most medical conditions that affect pilots are temporary in nature, few records of these are kept by regulatory authorities. If records are kept, they may not be easily amenable to scientific analysis.

However, a study by the United Kingdom Civil Aviation Authority (CAA) published in 2012 reviewed the number of professional pilots issued with an “unfit” notice during 2004 among its 16,145 (96.2 per cent male) professional licence holders who also held a valid Class 1 (professional pilot) medical certificate. No distinction was made as to whether or not the unfit notice was for a temporary or permanent condition. (5)

A total of 720 temporary “unfit” notifications were issued (670 male, 50 female) to 700 pilots (20 pilots received two notifications that year). A total of 4.3 per cent of all pilots were therefore assessed as unfit at some stage during 2004. The causes of episodes of unfitness during 2004 are provided in Table 3.

It should be noted that in 2004 it was the statutory responsibility of a pilot to notify the CAA of an injury or an illness lasting 21 days or more. Therefore, presumably, the CAA was not notified in many cases of illnesses lasting less than 21 days from which a recovery was made, and these cases were not recorded in their temporary “unfit” data.

Of the top five most common causes of temporary unfitness, accidents and gastrointestinal illness stand out as being absent from the usual causes of loss of licence. Accidents generally result in injuries that heal and most of those who suffer from gastrointestinal illness (e.g. diarrhoea/vomiting) usually make a good recovery. However, in some cases it might result in loss of licence.

BENEFITS OF ADOPTING HEALTH-PROMOTING HABITS

Reducing risk of loss of licence

Taking into account data from various resources (including an ICAO survey conducted amongst Member States in 2016), the four main medical risks to completion of a full career seems to be:

- psychiatric (mental health)
- cardiovascular (heart and blood vessels)
- musculoskeletal (muscles and bone/joint conditions, including back problems)
- neurological (brain, spinal cord, nerves).

In addition, ear nose and throat problems were noted as a frequent cause of grounding in the Norwegian study, and cancer was the second commonest cause of payouts by the North American insurance company.

The risk of developing the medical conditions mentioned above can, however,

2

ICAO publishes a (mandatory) Standard (1.2.6.1) and two (non-mandatory) Recommendations on actions to be taken in the event of an illness, as stated in Annex 1 – Personnel Licensing to the Convention on International Civil Aviation as follows (5):

1.2.6.1 Holders of licenses provided for in this Annex shall not exercise the privileges of their licenses and related ratings at any time when they are aware of any decrease in their medical fitness which might render them unable to safely and properly exercise these privileges.

1.2.6.1.1 Recommendation.— States should ensure that license holders are provided with clear guidelines on medical conditions that may be relevant to flight safety and when to seek clarification or guidance from a medical examiner or Licensing Authority.

1.2.6.1.2 Recommendation.— Each Contracting State should, as far as practicable, ensure that license holders do not exercise the privileges of their licenses and related ratings during any period in which their medical fitness has, from any cause, decreased to an extent that would have prevented the issue or renewal of their Medical Assessment.

Table 3.
Causes of temporary unfitness among commercial pilots in the United Kingdom in 2004
 (based on reference 6, with permission)

CATEGORY	NUMBER	PER CENT
Accidents	131	18
Musculoskeletal (muscles and bone/ joint)	126	18
Cardiovascular (heart and blood vessels)	103	14
Psychiatric (Mental)	71	10
Gastrointestinal (stomach and gut)	59	8
Ear, Nose, and Throat	46	6
Genitourinary	30	4
Neoplasms (cancer)	25	3
Pregnancy related	24	3
Neurologic (nervous system)	21	3
Ophthalmologic (eye and vision)	17	2
Respiratory (lung disease)	15	2
Miscellaneous	12	2
Infectious disease	9	1
Cerebrovascular (brain's blood vessel system)	8	1
Diabetes	8	1
Endocrine (hormone problems, other than diabetes)	5	<1
Information not received	5	<1
Dermatologic (skin)	3	<1
Haematologic (blood)	2	<1
TOTAL	720	100

be significantly reduced. For example, in healthy people, increased levels of physical activity are associated with a 20–30 per cent reduction in mortality (death) from all causes (not just cardiovascular disease). (7) Smoking increases the risk of developing lung cancer by about 25 times and of having coronary disease or stroke by 2 to 4 times. (8)

Other risks, such as excessive alcohol intake can be reduced. Musculoskeletal risks can also be reduced (e.g. by physical conditioning and by knowing the safe way to lift a weight, whether it is a flight bag or a concrete slab in the garden).

Other conditions that can result in loss of licence include diabetes, infectious diseases, eye problems, respiratory problems and genitourinary problems, including sexually transmitted diseases. However, by adopting appropriate behaviour, risks can be significantly reduced. The guide provides practical, risk reduction behaviours for these categories.

Reducing risk of temporary unfitness

Table 3 (page 16) lists the main causes of episodes of temporary unfitness. For example, the use of medication to treat high blood pressure will usually require a period of grounding until it is determined that the medication causes no significant side effects. A mental condition may need a period of treatment on the ground before the pilot is well enough to resume flying. However, such conditions can eventually result in a more serious event that may potentially result in a permanent grounding, so the avoidance, when possible, of such conditions in the first place will clearly reduce the risk of this. Guidance on avoidance of problems that cause temporary unfitness is therefore also relevant to reducing periods of longer-term unfitness or "permanent unfitness".

References

- 1 International Civil Aviation Organization
www.icao.int/
- 2 ICAO Manual of Civil Aviation Medicine, Part III
www.icao.int/publications/pages/publication.aspx?docnum=8984
- 3 Høva JK, Thorheim L, Wagstaff AS. Medical Reasons for Loss of License in Norwegian Professional Pilots. *Aerosp Med Hum Perform*. 2017; 88(2):146–149
www.ingentaconnect.com/content/asma/amhp/2017/00000088/00000002/art00013
- 4 Årva P, Wagstaff AS. Medical disqualification of 275 commercial pilots: changing patterns over 20 years. *Aviat Space Environ Med*. 2004; 75:791– 4
www.ncbi.nlm.nih.gov/pubmed/15460631
- 5 ICAO Annex 1 – Personnel Licensing, 11th edition, International Civil Aviation Organization, 2011, Montreal, Canada
- 6 Evans S, Radcliffe S-A. The annual incapacitation rate of commercial pilots. *Aviat Space Environ Med* 2012; 83:42 – 9
www.ncbi.nlm.nih.gov/pubmed/22272515
- 7 European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). *European Heart Journal* (2012) 33, 1635–1701: doi:10.1093/eurheartj/ehs092
<https://academic.oup.com/eurheartj/article/33/13/1635/488083>
- 8 United States Centers for Disease Control and Prevention
www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/



CHAPTER 1

UNDERSTANDING CARDIOVASCULAR RISK

Summary Guide

for maintaining mental health and well-being (1)

☑ **GET ACTIVE!**

Aim for a minimum of 150 minutes per week of moderate intensity exercise, or 75 minutes per week of vigorous exercise.

☑ **UNDERSTAND YOUR BLOOD FAT (LIPID) LEVELS**

including cholesterol, and how to keep them within healthy limits.

☑ **MANAGE YOUR BLOOD PRESSURE**

Take action with your doctor to keep blood pressure within the recommended levels, using medication if necessary.

☑ **EAT A HEALTHY DIET**

Your diet should include a wide variety of foods, in the right proportions (not just low in calories or sugar).

☑ **MAINTAIN A HEALTHY WEIGHT**

This requires a balance between food intake (energy in) and exercise (energy out).

☑ **UNDERSTAND THE RISK OF DIABETES**

Ask your doctor if you are at risk of diabetes and discuss whether or not a blood sugar check is advisable.

☑ **STOP SMOKING**

If you are a smoker, take steps to stop and ask for help from your doctor if needed.

WHAT IS A HEALTHY HEART?

Imagine firmly squeezing a ball, roughly the size of your fist, 70 times a minute, 100,000 times a day and 2.5 billion times in an average 75-year lifetime: this is the function a healthy heart will perform. When you're sitting or lying, your heart pumps around 5 litres of blood per minute (one UK gallon or 1.3 US gallons) throughout the body. During intensive exercise, this increases to 15–20 litres per minute (lpm) in a sedentary individual and to up to 40 lpm for highly trained athletes. The more blood the heart can pump, the greater the amount of oxygen that can be transported to working muscles and the greater the “aerobic” exercise capacity. Higher levels of exercise have a greater protective effect on cardiovascular health than other health promoting habits. (1)

If you only make one change to your lifestyle (the most important one, in terms of maintaining cardiovascular health) is to improve your physical fitness.

The heart is a muscle. Therefore, it requires oxygen to function, which is supplied by the coronary arteries (Figure 1). The left coronary artery splits into two branches – three major arteries therefore supply the heart muscle. The risk of a cardiovascular

problem increases if these arteries narrow and blood flow is obstructed.

Exercise can be divided into “aerobic” exercise, requiring oxygen, and “anaerobic”, without oxygen. Anaerobic exercise provides for high intensity exercise but can only last for a short period of time (up to a couple of minutes) whereas aerobic exercise provides energy for less intense exercise but can do so for many hours. Energy may be supplied simultaneously by both sources in varying proportions depending on the exercise intensity.

Regular physical exercise reduces the risk of developing narrowed coronary arteries.

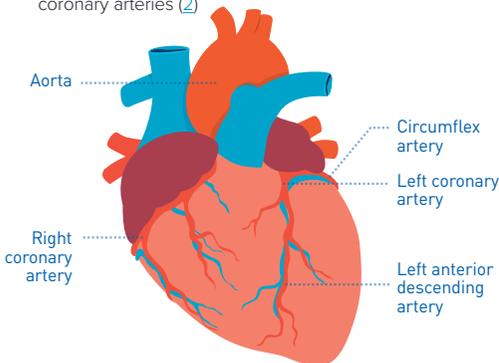
The heart rate is controlled by an electrical system, which is also influenced by hormones. Average resting heart rate is 60–80 beats per minute (bpm). Excitement or anxiety causes the heart to speed up, as does exercise. The maximum attainable heart rate decreases with increasing age. It can be roughly calculated by subtracting your age in years from 220: a 50-year-old person therefore has an estimated maximum rate of 170 bpm (220–50).

As age increases, the maximum capacity of the heart to pump blood gradually diminishes.

With physical training, the heart can pump more blood with each beat. As a result, the heart rate at rest decreases. In highly trained athletes, this rate may go from 60–80 bpm to 40–50 bpm. Further, in a trained individual who is exercising at their maximum heart rate, more blood can be pumped with each beat, increasing exercise capacity. Maximum heart rate does not vary much with increased fitness for a given age, unlike the resting heart rate, which decreases with increasing fitness, for any given age.

Figure 1.

The heart, showing the aorta and the right and left coronary arteries (2)



Resting heart rate can be used as an indicator of physical fitness — a lower resting heart rate suggests improved fitness.

Heart rate variability (the time difference between individual heart beats) has been shown to decrease in those who have a sedentary lifestyle and those who are at risk of, or who have suffered, heart problems.

Heart rate variability can be used as a marker for an individual's fitness and as a monitor for stress levels. (3)

From population statistics, we see that mortality risk (risk of death) rises as the resting heart rate increases and as maximum heart rate decreases. Both observations become noticeable with increasing age. However, resting heart rate can be reduced by being physically fit, although the maximum rate will reduce with age. (4)

A good way to understand your heart rate is to wear some form of heart monitor such as a Fitbit or Apple Watch.

THE CARDIOVASCULAR SYSTEM

The term “cardiovascular system” refers not only to the heart but also to the network of blood vessels throughout the body. From the aorta (see [Figure 1 on page 19](#)), oxygenated blood is supplied to all parts of the body through the arteries and is returned to the heart through the veins. Blockage of an artery is often a serious medical event (e.g. a blockage that upsets the normal blood circulation to the head may cause rapid loss of consciousness due to lack of oxygen to the brain).

THE FOUR MAIN CARDIOVASCULAR HEALTH RISKS IN AVIATION — HEART ATTACKS, HIGH BLOOD PRESSURE, STROKE AND ARRHYTHMIAS

1 Heart attacks

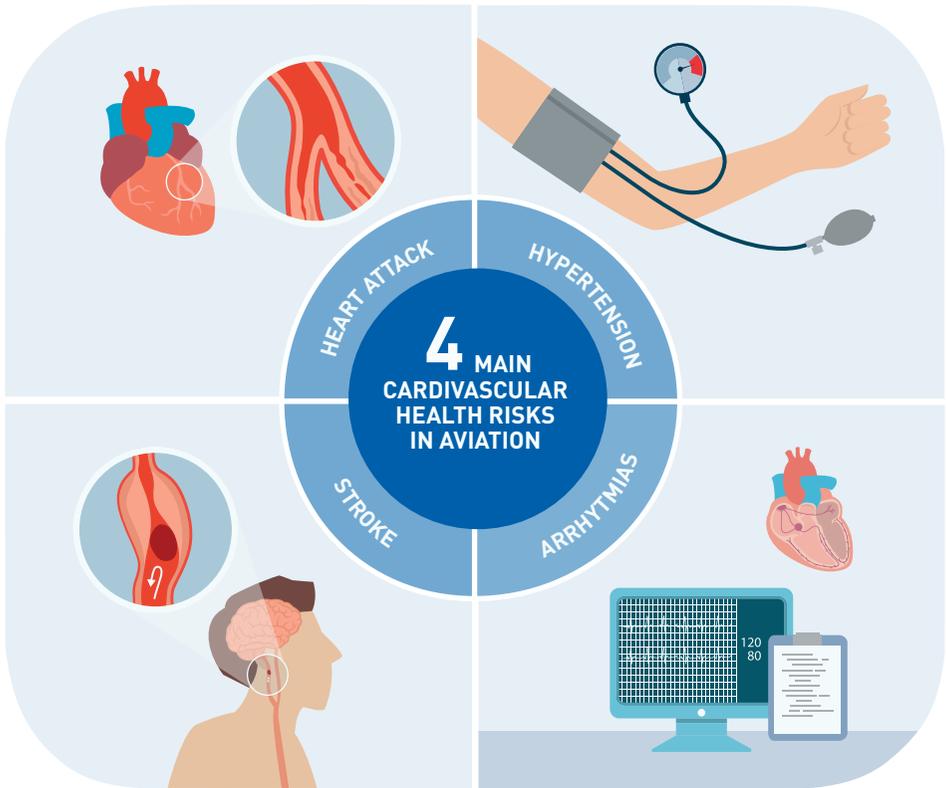
The term “heart attack” covers a variety of conditions that adversely affect the heart. The most common and serious type of heart attack is a “myocardial infarction” (myocardial = heart muscle; infarction = death of cells, usually from blockage of an artery), commonly abbreviated to “MI”.

Myocardial infarction is the leading cause of death in most industrialized countries. Risk increases with age, especially over the age of 40.

2 High blood pressure (hypertension)

Hypertension is a common medical condition that can develop at a relatively young age but more frequently occurs with increasing age. It may sometimes be a sign of a specific illness (your physician will determine the type you may have). It increases the risk of damage to arteries, which can lead to a variety of problems including myocardial infarction, stroke and kidney disease. In the United States, about one third of adults over 20 years of age have treated or untreated hypertension. (5) Various healthy habits can help prevent or delay the onset of hypertension.

Blood pressure can be controlled effectively with medication — usually without affecting a pilot's medical



certification – although additional medical investigations might be required and only selected types of medications may be allowed by different regulatory authorities.

3 Stroke

A stroke occurs when the blood supply to part of the brain is reduced to the extent that some brain cells die (an “infarction”). It can be caused by a blockage to an artery or by bleeding from an artery into brain tissue. Strokes can cause various problems, including weakness/paralysis, speech/vision problems, confusion and dizziness.

According to the American Stroke Association, 80 per cent of strokes are preventable. ⁽⁶⁾

Sometimes a transient ischaemic attack (TIA), often called a “mini-stroke”, can occur. This is usually due to a small part of a blood clot that has formed over a long period of time in an artery, usually in the neck, breaking off from the main part of the clot, travelling with the blood flow into the brain and becoming stuck in a smaller artery, blocking the downstream blood supply and causing damage to brain tissue due to lack of oxygen. Symptoms are similar to a stroke.

However, unlike with a full stroke, recovery from a TIA occurs within 24 hours (hence the term transient ischaemic attack). Unfortunately, the risk of recurrence remains after recovery. It is a problematic diagnosis for a professional pilot because

symptoms resolve completely and it is not possible to predict when the next attack may occur. Prevention for a TIA follows the same lines as that for a stroke.

4 Arrhythmias

An “arrhythmia” is an irregular heart rhythm, or a rhythm that may be regular but too fast or too slow. Normally, the heart beats with a regular rhythm, accelerating from a resting rate when driven by emotion or physical activity. Many healthy individuals have minor, short-lived, arrhythmias, which may be felt as the heart “missing a beat” or a brief fluttering in the chest. Arrhythmias are often without symptoms and can be inconsequential for medical certification. More serious arrhythmias are those that are prolonged and which significantly reduce efficiency of the cardiac pump or have the potential to do so. The type of arrhythmia can only be accurately determined with an electrocardiogram (ECG). Sometimes a 24-hour ECG is needed to diagnose an intermittent arrhythmia.

In pilots, an arrhythmia is usually discovered by a regulatory ECG. Treatment, if required, is usually successful and compatible with continued medical certification.

SEVEN PRACTICAL WAYS TO ACHIEVE OPTIMUM CARDIOVASCULAR HEALTH

1 Get active!

Regular physical exercise can be the single most important action you take to protect your health and prolong your pilot’s career. It increases both the length and quality of life and may reduce cardiovascular risks, including risk of a myocardial infarction, by 20–30 per cent. [Z](#)

If you get at least 30 minutes of moderate physical activity (like brisk walking) five times per week or 75 minutes of vigorous exercise (like running) per week, you can almost guarantee yourself a healthier and more satisfying life while lowering your risks for heart disease, stroke and diabetes. Additional benefits have been shown with more extensive periods of exercise, up to a doubling of these times.

If necessary, all the exercise can be compressed into one or two sessions per week (the “weekend warrior” approach). Any form of physical activity is beneficial. Benefits can be seen in all those who are active, including individuals who are overweight/obese.

It may be a challenge for professional aircrew to exercise on a regular basis. However, physical activity does not necessarily require a trip to the gym. When you’re at home, you can get useful exercise by gardening, walking or using an exercise bike. And when you’re travelling, many hotels catering to airline personnel have gyms or swimming pools that are open 24 hours a day.

If you have enough time on a layover, it is worthwhile to exercise even if you're feeling tired. This need not be high intensity exercise. Thirty minutes of moderate exercise can improve your cardiovascular system and can also help you sleep. However, do avoid vigorous exercise just before bedtime as this can delay sleep onset (See [Chapter 7](#)). If there is no gym available or gym work does not interest you, consider a 30-minute brisk walk in the area of the hotel. The aim is to **incorporate regular exercise, at whatever type and level you can manage, into a lifestyle that can be maintained in the long term.**

Measuring the steps you take daily and trying to average over 10,000 steps a day is a good way to measure your level of activity and to ensure that, even when you don't have time for a regular gym session or sporting activity, you can at least maintain a healthy level of physical activity every day. This number of steps may seem high, but can be achieved without too much difficulty – the average person walks 3,000–4,000 steps per day. There are a number of smart phone apps and devices that can monitor this information for you.

Watch this entertaining video animation (10 minutes) on the benefits of exercise: www.youtube.com/watch?v=aUalnS6HIGo

2 Understand your blood fat (lipid) levels

Your total cholesterol level is made up of different components: these include Low Density Lipoprotein (LDL) or “bad” cholesterol, High Density Lipoprotein (HDL) or “good” cholesterol, and triglycerides.

LDL cholesterol can build up on the walls of your arteries and increase the chances of heart disease. It is therefore wise to try and keep your LDL cholesterol as low as possible.

In contrast, HDL cholesterol protects against heart disease by reducing LDL cholesterol in your blood and keeping it from building up in your arteries. Therefore, a high HDL level is good for your cardiovascular health.

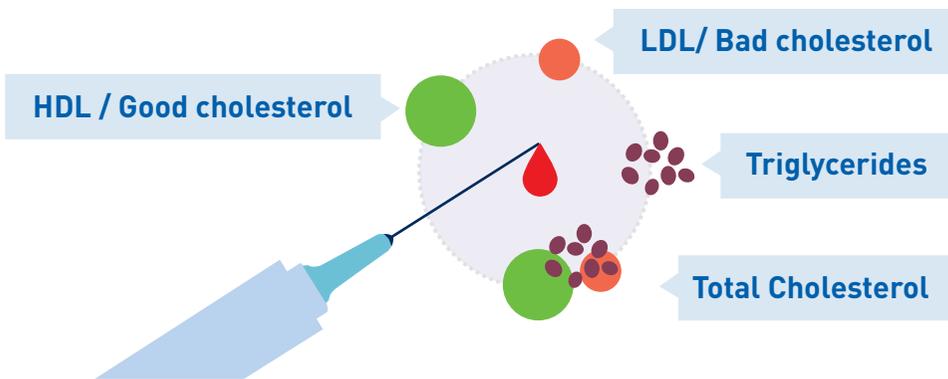
Regular exercise increases HDL cholesterol levels and decreases LDL cholesterol levels.

Triglycerides are fats carried in the blood from the foods we eat or drink — sugar, in particular, is converted to triglycerides. “Metabolic Syndrome” is the combination of the following conditions: high blood pressure, high blood sugar, too much fat around the waist (high waist/hip circumference ratio), low HDL cholesterol, and high triglycerides. Metabolic syndrome increases your risk for heart disease, diabetes and stroke.

Knowing your lipid profile (the levels of different lipids in the blood) is important particularly if you are over 40 years of age or who have any of the following risk factors:

- overweight or obesity
- high blood pressure
- diabetes
- a family history of heart or cardiovascular problems
- a family history of high cholesterol.

Other medical conditions, age, sex and ethnic background can also make a difference to your lipid profile.



Lipid profile — guide levels:

- **Total cholesterol** should be 5 millimoles per litre (mmol/L), (i.e. 193 milligrams per decilitre (mg/dl)) or lower;
- **LDL** cholesterol should be 3 mmol/L (116 mg/dl) or lower;
- **HDL** level should be above 1 mmol/L (38.7 mg/dl);
- **Triglyceride** level should be below 1.7 mmol/L (150.6 mg/dl).

For people with higher risks, such as heart disease or high blood pressure, your doctor may set lower targets, such as the following:

- **Total cholesterol** of 4 mmol/L (154.7 mg/dl) or lower;
- **LDL** of 2 mmol/L (77.3 mg/dl) or lower.

3 Manage your blood pressure

High blood pressure is also a major risk factor for heart disease and stroke. But when your blood pressure stays within a healthy range, you reduce the strain on your heart, arteries and kidneys, which keeps you healthier for longer.

Blood pressure readings have two numbers, for example 140/90 mmHg (millimetres of mercury, representing the height of a column of mercury that can be sustained by the pressure of the blood). The higher number is the systolic blood pressure (the highest pressure in your main arteries when your heart beats and pushes the blood through your body). The lower number is your diastolic blood pressure (the lowest pressure when your heart relaxes between beats).

Ask your doctor what your blood pressure is and make sure that it is kept within an acceptable range throughout your life, even if this requires medication.

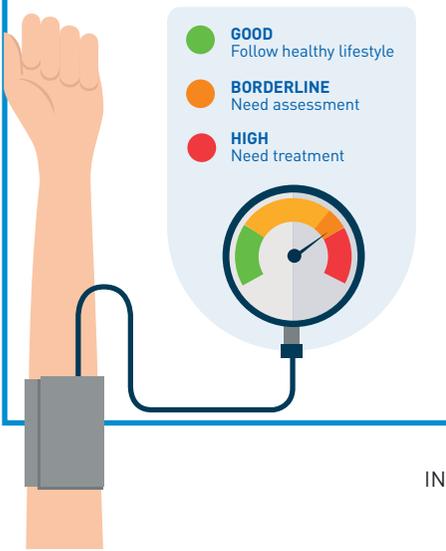
Blood pressure values and what they signify:

- **90 over 60 (90/60) or less:**
You may have low blood pressure, which may result in dizziness and fainting. If you do not have these symptoms, however, there is little to worry about.
- **More than 90 over 60 (90/60) and less than 120 over 80 (120/80):**
Your blood pressure is ideal and healthy. Follow a healthy lifestyle to keep it at this level.

- **More than 120 over 80 and less than 140 over 90 (120/80-140/90):** Your blood pressure is normal; but as it is a little higher than ideal, you should try to lower it. Make healthy changes to your lifestyle.
- **140 over 90 (140/90) or higher (over a number of weeks):** You may have high blood pressure (hypertension) which would benefit from a change in your lifestyle or possibly medication to lower these numbers.

Remember the following:

- If the **higher** number is 140 or more, then you may have high blood pressure, regardless of the lower number.
- If the **higher** number is 90 or less, then you may have low blood pressure, regardless of the lower number.
- If the **lower** number is 90 or more, then you may have high blood pressure, regardless of the higher number.
- If the **lower** number is 60 or less, then you may have low blood pressure, regardless of the higher number.



A diagnosis of high blood pressure cannot normally be made on the basis of one recording, because blood pressure can vary quite significantly from day to day, or at different times during the day. Pilots (and others who rely on medical fitness for their job) may be affected by what's known as "white coat hypertension" — an increase in blood pressure when it is measured by a doctor or medical personnel. To avoid this, blood pressure that on one reading may be high should be measured on a number of occasions. A 24-hour blood pressure monitor, that repeatedly measures blood pressure throughout a day and a night, is often used to obtain more representative values.

If you've been diagnosed with high blood pressure, you might be worried about taking medication to bring your numbers down. But the good news is that **there are various lifestyle measures that can help reduce your blood pressure without the need for medication.**

If you are above your healthy weight, moderate weight loss of 10 lb (4.5 kg) can significantly reduce your blood pressure. Being overweight not only has the potential to increase your blood pressure but can also interfere with breathing while you sleep (obstructive sleep apnoea (or apnea)) (See [Chapter 7](#)), which can further raise your blood pressure.

Regular physical activity (at least 30 minutes most days of the week) **can lower your blood pressure by 4 to 9 mmHg.** It's important to be consistent because, if you stop exercising, your blood pressure can rise again. Both aerobic exercise such as walking, jogging, cycling, swimming or dancing, and strength training can help reduce blood pressure.

Eating a diet that is rich in whole grains, fruits, vegetables and low-fat dairy products and which skimps on saturated fat and cholesterol can lower your blood pressure by up to 14 mmHg. An eating plan such as the Dietary Approaches to Stop Hypertension (DASH) can be recommended. www.nhlbi.nih.gov/health/health-topics/topics/dash

The reduction of sodium (salt) in your diet can reduce blood pressure by 2 to 8 mmHg. Some ways to reduce sodium include: reducing the amount of processed foods you eat, not adding salt to your food, using herbs and spices for flavouring and reading food labels to find low salt alternatives.

Alcohol generally raises blood pressure, even when consumed in moderate amounts. (See [Chapter 3](#) for further guidance on alcohol consumption.)

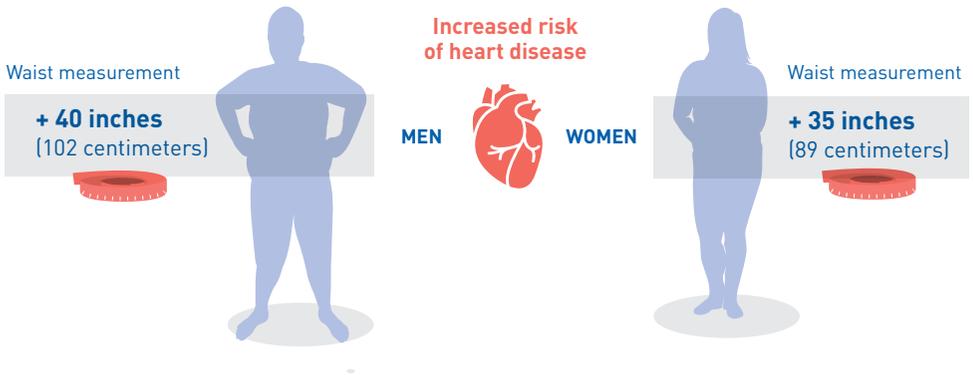
An average intake of more than two drinks a day for men under 65 years of age and more than one drink a day for women, and for men older than 65, is not advised.

Tobacco use is known to increase blood pressure and is one of the most important causes of acute myocardial infarction globally, especially in men. (8, 9)

There is increasing support for the hypothesis that chronic stress is an important contributor to high blood pressure. (10) Take time to think about what causes you to feel stressed. Factors may include work, family, finances or illness. Once you know what's causing your stress, consider how you can eliminate or at least reduce it.

Recommendations to adopt a healthy lifestyle





4 Eat a healthy diet

A healthy diet is important in reducing cardiovascular risk. If you are frequently skipping vegetables, fruit, low-fat dairy products, fibre-rich whole grains, lean meats, and fish, your body may be missing some important components for a healthy life. In particular, a healthy balanced diet includes fruit and vegetables, with increasing reductions of cardiovascular disease, cancer and deaths from all causes in those who eat up to as many as 10 portions (800 g) per day. (1)

If you have food intolerances, it can be difficult to have a varied healthy diet but understanding more about what your body needs will be helpful in achieving this. You might consider speaking to a dietician. For more information about the role of diet, see [Chapter 6: Nutrition and Weight Management](#).

5 Maintain a healthy weight

Everyone has some fat in their body, but if you have too much — especially if much of

it is at your waist — you're at higher risk for such health problems as high blood pressure, high blood cholesterol and diabetes.

If you are overweight or obese, you can reduce your risk for heart disease by successfully losing weight and keeping it off. Even losing 2.5–5 kg (5.5–11 pounds) may reduce your blood pressure significantly.

- Men are at increased risk if their waist measurement is greater than 40 inches (102 cm).
- Women are at increased risk if their waist measurement is greater than 35 inches (89 cm).

Know how to calculate your “body mass index” (see [Chapter 6](#)) and what constitutes a normal range. Note any upward trend that may occur and take action to manage this.

If your weight is normal, adopt a lifestyle that maintains this weight through life.

6 Understand the risk of diabetes

Most of the food we eat is turned into glucose (often called “blood sugar”), which is transported in the bloodstream, and that our bodies use for energy. Over time, high levels of blood sugar can damage your heart, kidneys, eyes and nerves. **Raised blood sugar is the main factor in diabetes.**

Usually, a regulatory medical examination does not include a blood sugar measurement, although it will include a urinary sugar measure (which is less predictive than a blood sugar measurement). Discuss with your doctor if it would be worthwhile to have a blood sugar test. He or she will consider your overall risk of developing diabetes before making a recommendation. (See [Chapter 6](#) for more information on diabetes.)

7 Stop smoking

Cigarette smokers have a much higher risk of developing cardiovascular disease.

On average, smoking increases the risk of heart disease or stroke 2–4 times and of developing lung cancer about 25 times compared with non-smokers. (12)

Smoking damages your entire arterial system, and increases your risk for coronary heart disease, hardened arteries, aneurysm (localized enlargement of an artery, which can leak blood) and blood clots. One risk creates another. Blood clots and hardened arteries increase your risks for heart attack, stroke and generalized artery disease. Smoking reduces your “good” cholesterol”, and your lung capacity – which makes it harder to get the physical activity you need for better health.

HOW TO TEST YOUR BLOOD SUGAR



1

Urine test



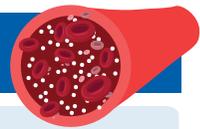
2

Finger prick



3

Blood test



EFFECTS OF SMOKING

Greater risk of heart disease

Decrease in "good" cholesterol
HDL

Reduced lung capacity

BENEFITS OF QUITTING

Easier to breathe

Improves blood circulation

Lung capacity improves
UP TO 10%

Giving up smoking can make a significant difference to a person's life and health.

People breathe more easily and cough less when they give up smoking because their lung capacity will improve by up to 10 per cent within nine months. And within 2 to 12 weeks of stopping smoking, blood circulation improves, (13) which makes all physical activity, including walking and running, much easier.

However, note that in some cases a smoker's cough may initially get worse for up to a few weeks after stopping smoking, before it improves. Although this may give the impression that stopping smoking may not be having a useful effect, it is in fact a sign that things are returning to a more normal state. The reason is that microscopic hair-like vibrating structures (called cilia) in the respiratory passages start to work again

when exposed to a smoke-free atmosphere, and waft up to the throat the mucous/ phlegm that has accumulated over a period of time.

Giving up smoking will also boost your immune system, making it easier to fight off colds and flu. The increase in oxygen in the body can also reduce tiredness and the likelihood of headaches.

Breathing second-hand smoke may also cause health problems such as lung cancer, heart disease and stroke.

For more information on stopping smoking, go to: <http://whyquit.com>

ADDITIONAL INFORMATION

www.uspreventiveservicestaskforce.org

The US Preventive Services Task Force (USPSTF) reviewed the value of different preventive strategies for various types of cardiovascular disease, as follows:

POPULATION	RECOMMENDATION	GRADE
Adults without obesity who do not have known cardiovascular disease risk factors	The USPSTF recommends that primary care professionals individualize the decision to offer or refer adults without obesity who do not have hypertension, dyslipidemia, abnormal blood glucose levels, or diabetes to behavioral counseling to promote a healthful diet and physical activity. Existing evidence indicates a positive but small benefit of behavioral counseling for the prevention of cardiovascular disease (CVD) in this population. Persons who are interested and ready to make behavioral changes may be most likely to benefit from behavioral counseling.	C (Offer or provide this service for selected patients depending on individual circumstances)
Adults who are overweight or obese and have additional CVD risk factors	The USPSTF recommends offering or referring adults who are overweight or obese and have additional cardiovascular disease (CVD) risk factors to intensive behavioral counseling interventions to promote a healthful diet and physical activity for CVD prevention.	B (Offer or provide this service)
Adults aged 40 to 75 years with no history of CVD, one or more CVD risk factors, and a calculated 10-year CVD event risk of 10 per cent or greater	The USPSTF recommends that adults without a history of cardiovascular disease (CVD) (i.e., symptomatic coronary artery disease or ischemic stroke) use a low- to moderate-dose statin for the prevention of CVD events and mortality when all of the following criteria are met: 1) they are aged 40 to 75 years; 2) they have one or more CVD risk factors (i.e., dyslipidemia, diabetes, hypertension, or smoking); and 3) they have a calculated 10-year risk of a cardiovascular event of 10 per cent or greater. Identification of dyslipidemia and calculation of 10-year CVD event risk requires universal lipids screening in adults aged 40 to 75 years. See the “Clinical Considerations” section for more information on lipids screening and the assessment of cardiovascular risk.	B (Offer or provide this service)
Adults who are not pregnant	The USPSTF recommends that clinicians ask all adults about tobacco use, advise them to stop using tobacco, and provide behavioral interventions and U.S. Food and Drug Administration (FDA)–approved pharmacotherapy for cessation to adults who use tobacco.	A (Offer or provide this service)

In a study, (14) a pooled analysis of population-based surveys included 63,591 adult respondents. All-cause mortality risk was approximately 30 per cent lower in “active” vs “inactive” adults. “Active” adults included (a) “weekend warrior” respondents who performed the recommended amount of 150 minutes of moderate (or 75 minutes of vigorous) activity in one or two sessions per week; (b) “insufficiently active” respondents, who performed less than the recommended amount in one or two sessions per week; and, (c) “regularly active” respondents who performed the recommended amount in three or more sessions per week.

Another study (15) found robust associations between mortality and participation in certain types of sport and exercise, indicating substantial reductions in all-cause and CVD mortality for swimming, racquet sports and aerobics and in all-cause mortality for cycling. It concluded that “the growing evidence should support the sport community to develop and promote health-enhancing sport programmes to reach more people and contribute to a greater proportion of population meeting the PA [physical activity] guidelines for health”.

In a longitudinal study over 12 years, (16) it was found that avoidance of low fitness and smoking would have prevented 13 per cent of the deaths (all causes) in the population studied (n = 11,240). A brisk walk of approximately 30 minutes on most days of the week was associated with moderate to high levels of fitness (as determined by an exercise treadmill test).

Calculation of cardiovascular risk in commercial pilots

A paper by Houston et al. (17) reports a retrospective cross-sectional study on 14,379 commercial pilots that assesses 10-year cardiovascular risk using a Framingham Heart Study model that does not include blood test values (i.e. using indicators that are available from a simple medical examination such as those obtained during a periodic regulatory medical examination). This method of calculating risk may be useful for health professionals as a basis for discussing health-promoting habits in commercial pilots.

You can also calculate your 10-year and lifetime risk of developing cardiovascular disease here:

<http://tools.acc.org/ASCVD-Risk-Estimator/>

AVIATION CONCERNS

The text below is taken from an incident report in 1996 that records an in-flight event in a Boeing 757, likely to have been a cardiac incapacitation:

At about 17:05 hrs, as the aircraft was descending through about FL 150, the crew was given a radar heading of 180° to position for a direct intercept of the ILS for Runway 14 at Malaga. At this time, although nothing had been said, the first officer noticed that the commander appeared to be struggling for breath and so he pressed the cabin crew call button twice to summon assistance. The No 1 cabin attendant heard the double chime and picked up the interphone to hear the first officer ask for assistance. She went into the flight deck and, seeing the commander slumped and apparently unconscious, pulled him upright and locked his harness. She then slid his seat back, reclined it and removed his feet from the rudder pedals. She also loosened his collar and tie and, having selected 100 per cent oxygen, placed his crew oxygen mask on him. (18)

The aircraft was safely landed at Málaga by the first officer.

The main concerns of regulators in relation to cardiovascular disease (CVD) are that it is common in the general (and pilot) population, it increases with age and it has the potential for sudden and complete in-flight incapacitation.

On the other hand, when a pilot is suddenly incapacitated, it is usually obvious to an observer and if there are two pilots, the second pilot can take over and operate the aircraft to a safe landing, which is usually what happens, as demonstrated in the event recounted above.

The five main aspects of the periodic medical examination that may indicate an increased risk of cardiovascular disease are: an abnormal electrocardiogram (ECG) tracing, raised blood pressure, smoking, obesity and lack of regular exercise.

The last documented investigation of a fatal accident of a large airliner that reported cardiovascular incapacitation as a contributory cause was in 1972. The incapacitation affected the captain of a British European Airways Trident that had just departed from Heathrow airport in the United Kingdom.

Although fatal accidents caused by cardiovascular disease are very rarely reported in airline operations, several cardiovascular disease related in-flight incapacitation events occur every year but are normally safely managed by the second pilot. In smaller commercial operations and in private flying, when the pilot may be flying solo, the risk of a CVD-related accident is much higher.

Many of those CVD-related in-flight incapacitation events could probably be avoided if the pilot community actively managed their lifestyle to reduce cardiovascular risk.

References

- 1 Sala R, Malacarne M, Pagani M, Lucini D. Association between aerobic fitness and indices of autonomic regulation: cardiovascular risk implications. *J Sports Med Phys Fitness*. 2016;Jun;56(6):794-801. Epub 2015 Feb 13
www.ncbi.nlm.nih.gov/pubmed/25678208
- 2 Texas Heart Institute. Heart information center. Myocardial bridge
www.texasheart.org/HIC/Topics/Cond/MyocardialBridge.cfm
- 3 Wayne LC, Harp DG, Cerqueira MD, Stratton JR. Effect of Endurance Exercise Training on Heart Rate Variability at Rest in Healthy Young and Older Men. *Am J Cardiol* 1998;82:1236-1241
www.researchgate.net/publication/13454874_Effect_of_endurance_exercise_training_on_heart_rate_variability_at_rest_in_healthy_young_and_older_men
- 4 Thaulow E, Erikssen JE. How important is heart rate? *J Hypertens Suppl* 1991; Dec 9 (7):S27-30
www.ncbi.nlm.nih.gov/pubmed/1686457
- 5 Centers for Disease Control and Prevention, National Center for Health Statistics
www.cdc.gov/nchs/fastats/hypertension.htm
- 6 American Stroke Association
www.strokeassociation.org/STROKEORG/
- 7 European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). *European Heart Journal* 2012; 33, 1635–1701: doi:10.1093/eurheartj/ehs092
<https://academic.oup.com/eurheartj/article-lookup/doi/10.1093/eurheartj/ehs092>
- 8 Najem B, Houssière A, Pathak A, Janssen C, Lemogoum D, Xhaët O, Cuylits N, van de Borne P. Acute cardiovascular and sympathetic effects of nicotine replacement therapy. *Hypertension*. 2006;47(6):1162. Epub 2006 May 1
www.ncbi.nlm.nih.gov/pubmed/16651463
- 9 Teo KK, Ounpuu S, Hawken S, et al. Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: a case-control study. *Lancet*. 2006;368(9536):647
[www.thelancet.com/journals/lancet/article/PIIS0140-6736\(06\)9249-0/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)9249-0/fulltext)
- 10 Spruill TM Chronic Psychosocial Stress and Hypertension. *Current Science Inc.* 2010; 12: 10. doi:10.1007/s11906-009-0084-8
www.ncbi.nlm.nih.gov/pmc/articles/PMC3694268/

-
- 11 Aune D, Giovannucci E et al; Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. *Int J Epidemiol* 2017; Jun 1;46(3):1029-1056. doi: 10.1093/ije/dyw319
www.ncbi.nlm.nih.gov/pubmed/28338764
 - 12 Centers for Disease Control and Prevention. Smoking and Tobacco Use
www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/
 - 13 NHS Choices. 10 health benefits of stopping smoking
www.nhs.uk/Livewell/smoking/Pages/Betterlives.aspx
 - 14 O'Donovan G, Lee IM, Hamer M, Stamatakis E. Association of “weekend warrior” and other leisure time physical activity patterns with risks for all-cause, cardiovascular disease, and cancer mortality. *JAMA Intern Med.* 2017 Jan 9
www.ncbi.nlm.nih.gov/pubmed/28097313
 - 15 Oja P, Kelly P, Pedišić Ž, et al. Associations of specific types of sports and exercise with all-cause and cardiovascular-disease mortality: a cohort study of 80,306 British adults. *Br J Sports Med.* 2017 May;51(10):812-817. doi: 10.1136/bjsports-2016-096822. Epub 2016 Nov 28
www.ncbi.nlm.nih.gov/m/pubmed/27895075/
 - 16 Sui X, Li H, Zhang J, Chen L, Zhu L, Blair SN. Per centage of Deaths Attributable to Poor Cardiovascular Health Lifestyle Factors: Findings from the Aerobics Center Longitudinal Study. Hindawi Publishing Corporation, *Epidemiology Research International* 2013; Volume 2013, Article ID 437465, 9 pages. doi:10.1155/2013/437465
<http://dx.doi.org/10.1155/2013/437465>
 - 17 Houston S, Mitchell S, Evans S. Application of a cardiovascular disease risk prediction model among commercial pilots. *Aviat Space Environ Med* 2010; 81: 768 – 73
www.ncbi.nlm.nih.gov/pubmed/20681237
 - 18 UK Aircraft Accident Investigation Branch Bulletin No: 4/96 Ref: EW/A96/1/2 Category: 1.1 Boeing 757-2T7, G-BYAM, 28 January 1996
www.gov.uk/aaib-reports



CHAPTER 2

HOW TO KEEP MENTALLY WELL

WHAT IS MENTAL HEALTH?

Mental health is an integral and essential component of health. According to the World Health Organization (WHO):

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

An important implication of this definition is that mental health is more than just the absence of mental disorders or disabilities. It is a state of well-being in which an individual realizes his or her own abilities; can cope with the normal stresses of life; can work productively; and can make a contribution to his or her community. (2)

WHY IS MENTAL HEALTH IMPORTANT?

In post-mortems following fatal accidents involving private pilots, prescription drugs, over-the-counter medications and alcohol have been found in high proportions. (3) And in an analysis of medically related fatal accidents in commercial air transport operations from 1980 to 2011, the most common causes were related to psychiatric conditions, including illicit/psychotropic drugs and alcohol. (4)

Mental disorders were found to be among the top five causes resulting in loss of licence for medical reasons, as reported by a regulator. (5)

Mental health problems cover a wide range of medical conditions including anxiety, depression, psychosis (e.g.

schizophrenia, bipolar disorder) and drug- and alcohol-related problems (the latter are covered in more detail in [Chapter 3](#)).

“**Anxiety**” is a feeling of apprehensive uneasiness. It is often an appropriate emotion in situations of danger. It becomes a problem when the emotion is prolonged or excessive in comparison to the actual situation, or results in impaired functioning.

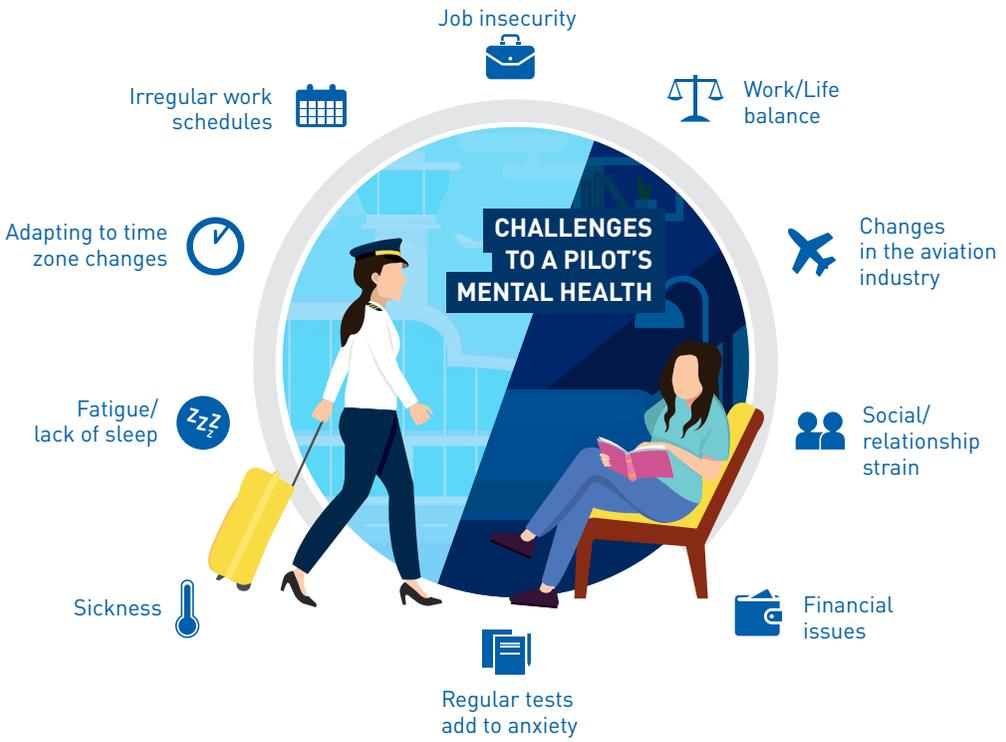
“**Depression**” is a feeling of sadness. It is often an appropriate emotion following bereavement. It becomes a problem when the emotion is prolonged or excessive, or results in impaired functioning.

“**Psychosis**” is an abnormal condition of the mind that involves loss of contact with reality. Symptoms include hallucinations (seeing or hearing things that are not present or do not exist) and unusual or bizarre behaviour.

One or two mental symptoms alone cannot identify or predict a mental illness. But if a person is experiencing several at one time and the symptoms are impairing the ability to work, study or relate to others, that person should be seen by a mental health professional.

People with suicidal thoughts or intent, or thoughts of harming others, need immediate attention.

Good mental health is a prerequisite for an individual’s ability to lead a fulfilling life. Good mental health is essential to being able to study and work, to form relationships, pursue leisure interests and make day-to-day decisions and choices without undue anxiety.



The life of a professional pilot is psychologically and emotionally challenging, involving frequent absences from home, reduced opportunities to spend time with family and friends, difficulty in balancing the demands of work and family, sleep disruption, and regular technical competency checks and medical fitness assessments. In addition, job insecurity and risk of unemployment are becoming an increasing cause for concern for pilots in many parts of the world. Unemployment is a well-established risk factor for mental ill health. (6)

Much evidence exists that **reducing psychosocial risk factors can prevent mental disorders.** (1) Even though scientists believe some individuals have a genetic predisposition for mental illness, environmental factors can also have an impact.

FACTORS THAT AFFECT MENTAL HEALTH (7)

Good mental health and well-being (feelings of contentment, enjoyment, confidence, self-esteem and engagement with the world) are affected by a number of factors: individual, social and economic. These can either protect or threaten mental health, and they can interact.

Mental health influences begin in the womb and continue during infancy, childhood, adolescence and throughout adult life. Mental health can also fluctuate during a person's lifetime. Some habits that are developed early — such as tobacco, alcohol and drug use — can later on become triggers and precipitate

health risks that can affect a pilot’s career. But these risks are potentially avoidable.

Professional pilots have a level of education that implies good access to educational opportunities during childhood. In addition, those who can obtain a commercial pilot licence and successfully complete initial training with an operator are likely to have developed effective life skills and higher levels of “mental resilience” when compared with the general population.

Pilots, as with all individuals, remain vulnerable to adverse life events during their careers that may make them susceptible to mental health problems. However, **it is possible to reduce these risks by increasing mental resilience.** This is particularly true for conditions of anxiety and depression.

Over time, every pilot will be exposed to major life stressors, and their ability to cope may vary from one individual to another. These coping mechanisms are mostly developed by the time adulthood is reached, although they can be enhanced by learning additional preventative and protective behaviours, thoughts and actions. Additional factors that aid the ability to cope with stress include support networks and safeguarding one’s physical and mental health and well-being.

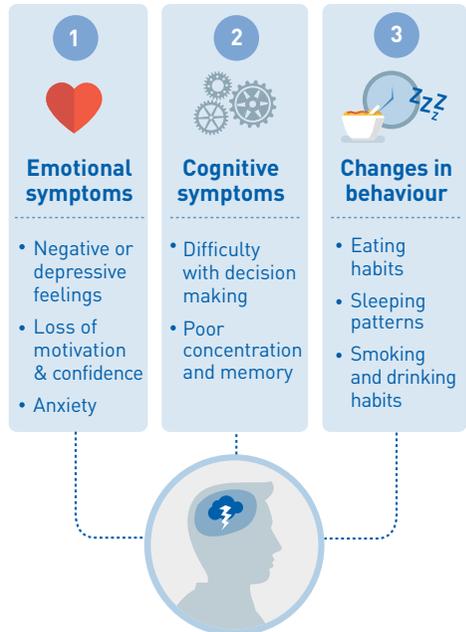
Stress can manifest itself in many ways as a result of the body releasing the hormones cortisol and adrenaline in response to a stressful stimulus – this is often called the “fight or flight response”.

IMPROVING MENTAL HEALTH RESILIENCE

The American Psychological Association defines mental “**resilience**” as:

“the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress – such as family and relationship problems, serious health problems or workplace and financial stressors. It means “bouncing back” from difficult experiences.” (8)

SOME SIGNS OF STRESS



STRESS REDUCTION IS ASSISTED BY HAVING OR DEVELOPING THE FOLLOWING:

1. **TRUSTED RELATIONSHIPS**
inside and outside the family
2. **A POSITIVE VIEW OF ONESELF**
3. **GOOD COMMUNICATION SKILLS**
4. **THE ABILITY TO MANAGE STRONG FEELINGS AND EMOTIONS**
5. **THE ABILITY TO DEVELOP AND IMPLEMENT PLANS**
6. **SKILLS IN PROBLEM SOLVING**

Two main ways in which we can reduce stress: by managing external pressures and by improving emotional resilience.

Managing external pressures:

Try to ensure that you don't have too many external pressures at the same time as this puts you at risk of being overwhelmed and can trigger symptoms of stress. When faced with mounting external pressures, understand potential triggers, organize your time effectively, make good use of support networks, accept the things you can't change and if you do need to make changes, set goals. **Pilot assistance programmes provide well-recognized support networks that can help you find solutions to different stressors.**

Some practical examples include: addressing work pressures by discussing issues with your manager; getting advice from a qualified financial advisor concerning financial problems; planning effectively when moving house; obtaining support when dealing with family issues; and allowing time (including time off work) for coping with bereavement.

Improving emotional resilience

Develop hobbies and interests, make time for friends and family, communicate effectively when dealing with people who are making unreasonable or unrealistic demands, learn to improve your work-life balance, improve sleep, exercise regularly and use relaxation or mindfulness techniques.

WORK-LIFE BALANCE

Whereas for most individuals, mental health and well-being are improved by having a job, for pilots, work can bring additional stresses that add pressure to those who may already have a stressful home life. In addition, since pilots have only limited influence on their work schedules, a pilot's work can create stress at home, requiring the family to adapt to the roster.

Understanding how different pressures impact on an individual and how best to manage these to achieve an appropriate work-life balance is an essential part of optimizing mental health (6)

The degree to which pilots can control their work schedules or time spent away from home depends on the company's rostering system and labour agreements. Sometimes accepting optional work-related activities can affect the work-life balance (e.g. management or union tasks), which the pilot can control to some degree.

On the other hand, job insecurity, workplace conflict or bullying, organizational change and atypical working hours are less controllable by the individual pilot and may benefit from discussion with a trusted advisor (see "[Know where to seek help](#)", on page 44).

COGNITIVE PERFORMANCE AND ITS ROLE IN FLYING

"Cognitive performance" can be described as the ability to make use of the mental processes of perception, learning and reasoning for the performance of tasks. Good cognitive performance is therefore essential for professional pilots.

With increasing age, basic cognitive functions, such as attention and memory, will deteriorate. There is much research on how to positively influence cognitive performance. Sleep deprivation is one aspect that can have a negative impact on cognitive performance. (9) (See [Chapter 7](#)) Exposure to a traumatic event may cause a traumatic stress reaction that can have a significant impact, including effects on memory, judgement, decision-making and the ability to focus. (10)

Individuals with high blood pressure, obesity, impaired blood lipids and impaired blood sugar regulation (which are associated with Type 2 diabetes — a serious health risk for professional pilots), could have an increased risk of reduced cognitive performance as they reach middle age. Research shows that improved diet and exercise habits can mitigate this effect in Type 2 diabetics.

More recently, evidence has shown that in healthy individuals with no medical condition (other than overweight or mild obesity), **improved cognitive performance can be achieved with a diet that also reduces cardiovascular risk** (i.e. one that is low in meat, refined grains and sugar, salt, and saturated and trans fats). (11) More guidance on nutrition can be found in [Chapter 6](#).

FIVE PRACTICAL WAYS YOU CAN ACHIEVE OPTIMUM MENTAL HEALTH AND WELL-BEING

(including improved cognitive performance)

1 Connect socially with others

“When it comes to our well-being, other people matter”. (12) The single most important factor in coping with life’s stressful events is to have in place a good social network (i.e. to be connected with the people around you: your family, friends, colleagues and neighbours). **Take time to develop and maintain your relationships and social support network when things are going well.**

When life becomes tough (e.g. loss of a loved one, a divorce, or even loss of a job), these social networks are invaluable. They can help you regain your mental resilience, mitigate some of the impact, and provide support.

Ways to build family and other social relationships include:

- **Find creative ways to spend time interacting with your family every day**, as you may not always be able to be there in person. A call to home or to a partner is one option.
- **Keep in touch with friends** — make contact by phone from time to time (rather than emailing or texting). Meet up with a colleague or friend you haven’t seen in a while.
- **Meet new people.** Make the effort to speak to a newcomer in your community or workplace. Consider volunteering as a way to reduce isolation.
- **If you have children, spend activity time with them and talk to them.** There are many tips available for helping parents discuss feelings with their children. These can be very useful when things aren’t going so well and the relationship is strained. (13)



2 Get active!

There is evidence to show that **being physically active** not only improves physical health but **improves mental well-being, too.** (12) Find a level of activity that you can sustain, as part of a lifestyle. It need not involve visits to a gym or playing competitive sports if that doesn't interest you. Find something that you enjoy. Otherwise, the motivation to continue is likely to be short-lived. It is recommended that you exercise for 150 minutes a week (for moderate exercise) or 75 minutes per week (vigorous exercise). However, any amount of regular exercise has benefits. [Chapter 1](#) includes more guidance on physical activity.

Exercise has been shown to help those with mild depression and can help protect against anxiety. It improves self-esteem, self-control and the ability to meet challenges.

3 Keep learning

Most pilots continue to learn throughout their careers. A new aircraft type rating or a promotion can be challenges that, when successfully met, can generate satisfaction and thereby maintain or improve mental well-being. Because airline flying can become routine, you may find opportunities for **hobbies outside the workplace to expand your horizon, improve your self-esteem, and to connect with others,** all of which improve mental resilience. (12)

Furthermore, personal growth and the development of alternative career paths and skills, helps to reduce the risks presented by industrial uncertainty, job insecurity and health risks that may affect medical certification.

4 Give to others

In a consumer society, we can be easily led to believe that well-being follows material success, such as a well-paid job, a nice home and a good car. For our mental well-being, however, acts of giving and kindness are, in fact, much more important. They give us a sense of purpose and increase our feelings of self-worth. (12)

5 Be mindful

Pilots may become preoccupied with thoughts unrelated to the task at hand (e.g. a poor sim check evaluation, concern about the next regulatory medical examination, worry about job insecurity). Such thoughts may become persistent and detract from enjoyable living activities. Mindfulness training starts with the view that the mind is often thinking about topics that are unconnected with the activity being undertaken at that particular moment. It aims to **increase attention to the present moment, rather than dwelling on past or future concerns.** (12)

In addition, **mindfulness does not try to prevent unwanted thoughts from appearing nor does it try to make them disappear** when they are present. Instead, it trains the mind to develop a different relationship to them. For example, mindfulness may change the approach from "I might fail my next sim check" to a more neutral and remote "this is anxiety" which can be managed more easily. There are online courses on mindfulness, some of which are free: www.bemindfulonline.com

KNOW WHERE TO SEEK HELP

As pilots are selected for their ability to be self-reliant decision makers, they may be reluctant to seek help for what they perceive could be seen as a weakness. However, **all individuals, including pilots, are vulnerable to mental stress** and can benefit from support and informed advice from time to time.

There are several means of accessing support. Here are some suggestions:

- Identify what support exists for you in your **immediate support network** that you trust.
- A trusted **aviation medical examiner** can often provide advice before a situation requires more formal involvement by the regulatory authority. A pilot's general practitioner may also be able to assist.
- **Pilot Assistance Programmes.** Numerous peer-driven support programmes exist, run by pilots for pilots, in which peers are trained as volunteers to support their fellow aviation licence holders. The programmes are confidential and can offer referral to professional resources when appropriate. Peer support programmes work because pilot volunteers, speaking a common professional language and sharing common work experiences, can help restore a pilot's focus. Pilots are often willing to trust and confide in a peer.

In line with the aim of this guide, the best approach to attaining good mental health is to **take steps to avoid developing a problem in the first place.**

Guidance on minimizing mental health risks is given in this chapter. However, knowing where to go for assistance in the earliest stages of a mental event such as depression or anxiety is also important. This requires some thought. To whom would you turn? You could consider scheduling a meeting with that person to discuss some of the potential issues that are affecting your mental health and sense of well-being, before a problem occurs.

If you do have mental health concerns at the moment, try to **overcome any reluctance to discuss such issues with someone else.** The earlier you deal with these concerns, the better the result is likely to be.

ADDITIONAL INFORMATION:

United Kingdom National Health Service

www.nhs.uk/pages/home.aspx

Some of the information in this chapter is derived in part from information posted online by the United Kingdom National Health Service (NHS). In its website, “NHS Choices”, the NHS provides guidance on a wide range of issues, also useful to an international audience.

Information is obtained from a variety of sources such as peer reviewed scientific research, practising doctors, national charities with recognized expertise, patients and ordinary members of the public, patient organizations and a charity website at the University of Oxford that undertakes qualitative research into patient experiences:

www.healthtalk.org

World Health Organization

www.who.int/en/

The World Health Organization produces data and guidelines for governments on a wide range of topics, including mental health.

www.who.int/mental_health/mhgap/risks_to_mental_health_EN_27_08_12.pdf

The onset of a mental health disorder increases the likelihood of neglect of physical health, reduced physical activity, an unhealthy diet or use of psychoactive substances, which in turn leads to increased risk of physical illness such as cardiovascular disease or diabetes.

American Psychological Association

www.apa.org

The American Psychological Association describes itself as the leading scientific and professional organization representing psychology in the United States. Its mission is to advance the creation, communication and application of psychological knowledge to benefit society and improve people’s lives.

American Psychiatric Association

<https://www.psychiatry.org/patients-families/warning-signs-of-mental-illness>

The American Psychiatric Association provides some simple guidance on how to recognize signs and symptoms of mental illness.

IFALPA Pilot Assistance Manual

IFALPA’s Pilot Assistance Manual provides information on different pilot assistance programmes and can be used as a guide when setting up such a programme.

www.ifalpa.org/downloads/Level1/Briefing_Leaflets/Human_Performance/Pilot_Assistance_Manual_-_March_2018.pdf

National Civil Aviation Regulatory Authority / Aviation Medical Examiner

A regulatory authority/medical examiner is in a position to identify risks early so appropriate support can be provided, ideally while the pilot continues to work, or requires only a short period free of duty.

AVIATION CONCERNS

Mental health problems are relatively common in the general population and also in the pilot community. Depression is the leading cause of disability worldwide (14) but can be treated effectively.

A number of regulatory authorities now accept the use of certain antidepressants by currently operating professional pilots, with appropriate monitoring. This acceptance is based on evidence that (a) some modern antidepressants do not have unacceptable side effects compared with the sedative effects of older medications and that (b) flight safety is better protected if a pilot is diagnosed with and treated for mental depression versus a pilot with

depression who is flying while unmonitored or untreated.

Disclosing psychological problems is often a challenge. Generally, people find it easier to discuss physical (somatic) symptoms than talk about their emotional problems. This happens for a number of reasons, including a fear of being stigmatized. (15) This is especially true of pilots, who are aware of potential threats to their medical certification. The consequence is that individuals tend to be slow to seek help when facing emotional difficulties. They prefer to think that what they are experiencing is normal, rather than recognizing that they are facing significant psychological distress.

Example of an in-flight incapacitation event from a mental health problem: BAC One Eleven 501EX, G-AWYS, 9 May 1996

“The aircraft was operating on a scheduled flight from Birmingham to Milan Linate. When approaching the Moulins VOR at Flight Level 330, the first officer complained of feeling unwell, stating that he was “frightened of the altitude”. The commander summoned the purser onto the flight deck using a single chime of the cabin staff call system. The first officer refused the offer of oxygen and a soft drink. He continued to show symptoms of anxiety and stress, such that the purser felt unable to comply with the standard incapacitation drill, which calls for the crew member to be slid back in the seat with the harness locked.

The commander informed ATC of the situation, but did not issue a PAN call. He

requested a diversion to Lyon Satolas (the nearest suitable airport). The first officer’s condition appeared to improve during the descent, such that he was able to assist the commander by reading the descent and approach checklists. The commander considered that the first officer’s condition had improved sufficiently that he was unlikely to have caused further problems or interfered with the operation of the aircraft. A member of the cabin crew was seated on the flight deck jump seat, ready to assist in case of any recurrence of the situation.

An uneventful manual procedural ILS approach was flown by the commander and medical assistance was waiting when the aircraft arrived on stand.” (16)

References

- 1 NHS Choices. Five steps to mental well-being
www.nhs.uk/conditions/stress-anxiety-depression/pages/improve-mental-wellbeing.aspx
- 2 World Health Organization Media Centre. Mental Health: strengthening our response. Fact sheet (April 2016)
www.who.int/mediacentre/factsheets/fs220/en/
- 3 Chaturvedi AK, Craft KJ, Canfield DV, Whinnery JE. Toxicological findings from 1587 civil aviation accident pilot fatalities, 1999-2003. *Aviat Space Environ Med* 2005 Dec;76(12):1145-50
www.ncbi.nlm.nih.gov/pubmed/16370264
- 4 Mitchell S, Lillywhite M. Medical cause fatal commercial air transport accidents: analysis of UK CAA worldwide accident database 1980-2011. Aerospace Medical Association 81st Scientific Meeting, 2011. Abstract
- 5 Høva JK, Thorheim L, Wagstaff AS. Medical Reasons for Loss of License in Norwegian Professional Pilots. *Aerosp Med Hum Perform* 2017; 88(2):146–149
www.ingentaconnect.com/content/asma/amhp/2017/00000088/00000002/art00013
- 6 Harvey SB, Modini M, Sadhbh J et al. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. *Occup Environ Med* 2017; 74; 301-310
www.ncbi.nlm.nih.gov/pubmed/28108676
- 7 World Health Organization. Mental health, resilience and inequalities, Dr. Lynne Friedli, WHO Europe, 2009
www.euro.who.int/__data/assets/pdf_file/0012/100821/E92227.pdf
- 8 American Psychological Association: The road to resilience
www.apa.org/helpcenter/road-resilience.aspx

-
- 9 Alhola P, Polo-Kantola P. Sleep deprivation: Impact on cognitive performance. *Neuropsychiatr Dis Treat*. 2007 Oct; 3(5): 553–567
www.ncbi.nlm.nih.gov/pmc/articles/PMC2656292/
 - 10 US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment, Rockville, Maryland. Trauma-informed care in behavioral health services. A treatment improvement protocol (TIP no. 57), 2014. Chapter 3, Understanding the impact of trauma
www.ncbi.nlm.nih.gov/books/NBK207191
 - 11 Anne Nilsson; Juscelino Tovar; Maria Johansson; Karl Radeborg; Inger Björck A Diet Based on Multiple Functional Concepts Improves Cognitive Performance in Healthy Subjects. *Nutr Metab*. 2013;10(49)
<http://pubmedcentralcanada.ca/pmcc/articles/PMC3720285/>
 - 12 NHS Choices. Stress, anxiety and depression. Connect for mental wellbeing
www.nhs.uk/Conditions/stress-anxiety-depression/Pages/Connect-for-mental-wellbeing.aspx
 - 13 NHS Choices – Talking to your teenager
www.nhs.uk/livewell/mentalhealth/pages/talkingtoteens.aspx
 - 14 WHO Fact Sheets – Depression
www.who.int/mediacentre/factsheets/fs369/en/
 - 15 Tait L. To disclose or not to disclose psychological problems to GPs. *Br J Gen Pract*. 2009 Sep 1; 59(566): 638–639
www.ncbi.nlm.nih.gov/pmc/articles/PMC2734350/
 - 16 AAIB Bulletin No: 9/96 Ref: EW/G96/5/3 Category: 1.1
https://assets.publishing.service.gov.uk/media/5422f14aed915d1374000369/dft_avsafety_pdf_502355.pdf



CHAPTER 3

IMPACT OF ALCOHOL AND DRUGS ON PERFORMANCE AND HEALTH

Summary Guide

Impact of alcohol and drugs on performance and health

ALCOHOL

☑ **UNDERSTAND**

the risks to your health and career by drinking alcohol.

☑ **COMPLY**

with your company's alcohol policy.

☑ **FIND OUT**

the alcohol drinking guidelines in your country.

☑ **SET**

sensible personal drinking levels.

☑ **LEARN ABOUT**

the amounts of alcohol found in spirits, wine and beer, and between stronger and weaker drinks in the same category.

☑ **SPREAD**

your weekly alcohol consumption over a few days. And don't "binge drink".

☑ **HAVE SEVERAL ALCOHOL-FREE DAYS PER WEEK**

☑ **KNOW**

how to mitigate the short-term effects of alcohol when you drink.

☑ **KNOW WHERE TO SEEK HELP**

for yourself or a colleague.

NON-PRESCRIBED DRUGS

☑ **UNDERSTAND**

the risks to your health and career from non-prescribed drugs.

☑ **COMPLY**

with your company's drug policy.

☑ **DO NOT PARTICIPATE**

in the use of any drug that is illegal.

RISKS FROM ALCOHOL AND OTHER PSYCHOACTIVE SUBSTANCES

Alcohol

In most parts of the world, alcoholic drinks can be purchased legally and drinking alcohol may even be part of the national culture. Many people enjoy alcohol for increased sociability without any evidence of detrimental effects. However, for some, **alcohol can cause serious harm to health, which for professional pilots, may also result in regulatory action**, sometimes leading to a long-term-unfit assessment, and/or disciplinary action by their company.

A major challenge in identifying alcohol problems is that there are few outward signs, particularly in the early stages, or the clues may be seen only intermittently. **Persons with an alcohol problem often become skilled at hiding it from others.** In addition, the great majority of those with an “alcohol use disorder” (a broad term meaning a mental or physical health problem resulting from drinking alcohol) can function in society well for many years, and work is often the last area to be adversely affected. When problems do surface at work, it generally means the problem is longstanding and probably serious.

The responsibility for providing public health guidance on drinking alcohol rests with national governments. **There are currently no international guidelines issued by the World Health Organization or other international body.** National guidelines vary among countries and not all offer quantitative recommendations for safe drinking. Of those that do, most provide recommendations for daily levels of consumption — although some offer only weekly guidance. National daily alcohol

intake recommendations vary and this variability makes providing internationally applicable recommendations a challenge.

(1) What follows is guidance on how to understand the risks and develop consumption reduction strategies.

Health effects – long-term

Excessive alcohol consumption has a wide range of detrimental long-term health effects on the body. It can cause cancer, stroke, heart disease, liver disease and brain damage. However, it seems that cardiovascular benefits can be seen with small amounts of alcohol — up to one or two drinks per day (2) and there also appears to be a protective effect against developing Type 2 diabetes.

The effect on different individuals of a given volume of alcohol consumed will vary, due to differences in how alcohol is broken down, in gender, in body size and in race. Even if you’re following the guidelines on sensible drinking but have problems sleeping through the night, feel moody or lacking in energy, it may be that you need personal limits that are more restrictive than those indicated by the official guidelines. Try cutting back for a few weeks and see if that helps. If you notice no benefit, then perhaps there are other issues that should be addressed.

While current evidence shows that drinking small amounts of alcohol may protect against cardiovascular disease, **neither the British Heart Foundation nor the American Heart Association recommends drinking alcohol for its potential cardiovascular benefits.** And neither group recommends starting to drink alcohol if you currently do not. It is, in their view, more important to take physical exercise, eat a balanced diet and stop smoking.

For cardiovascular risk, consuming more than 14 drinks per week increases the risks of cardiac muscle disease, abnormal heart rhythms, high blood pressure and stroke, all of which can have negative implications for medical certification.

Heavy drinking has been linked to an increased risk of several different types of cancer and, unlike cardiovascular disease and Type 2 diabetes, there appears to be no protective effect from consuming small amounts of alcohol.

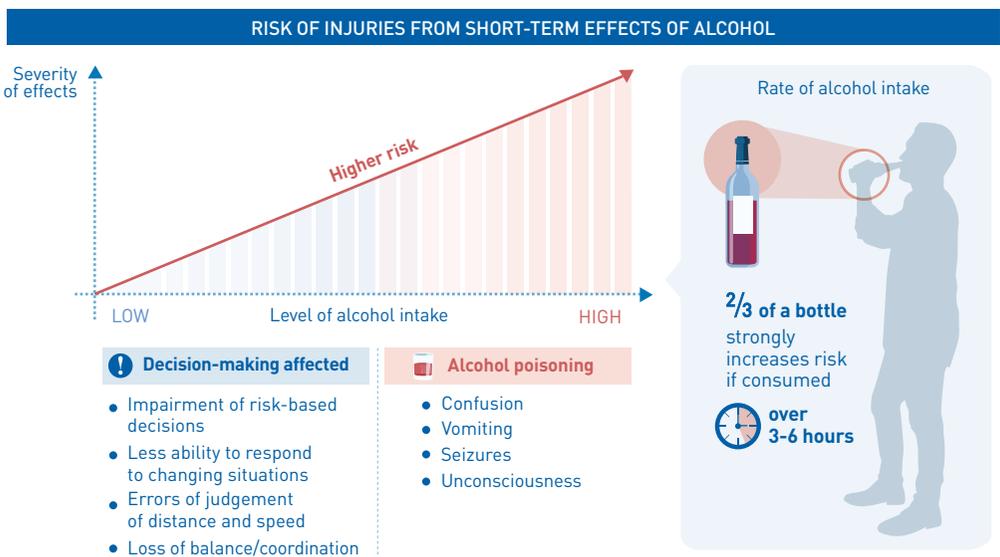
In general, **for those who have light to moderate drinking patterns (up to three drinks per day for men and half this amount for women), any increased cancer risk is likely to be minimal. However, for women, the risk of alcohol-related breast cancer increases with only one alcoholic drink per day.** (3) For women in the United Kingdom, it is estimated that if alcohol consumption was reduced to less than one drink per week, the number of reported breast cancers could be reduced by 6 per cent. (4)

About **10–15 per cent of those with an alcohol-use disorder will develop cirrhosis of the liver**, an irreversible scarring of the liver which can cause death. The risk is mainly dependent on the duration and the amount of heavy drinking. Earlier stages of liver damage are alcoholic fatty liver and alcoholic (non-infectious) hepatitis — both are usually reversible if alcohol consumption is stopped. Early stages of liver damage are usually asymptomatic, but may be detected during a medical examination if the liver is enlarged. (5)

Long-term excessive intake of alcohol affects the brain's communication pathways, which in turn affects mood and behaviour and makes it difficult to think clearly. Balance can also be affected. Effects on the brain are likely to be irreversible.

Short-term effects of alcohol — within hours of consumption (but can last up to 2–3 days)

Short-term effects of alcohol cover a wide spectrum ranging from mild to severe (even death). **At relatively low levels of alcohol intake, decision-making is affected.**



One study reviewed the effect of 0.6 g alcohol per kg of body weight on decision-making (equivalent to two thirds of a bottle of 12 per cent alcohol wine for an average 75 kg man). It was shown that this amount of alcohol impairs risk-based decisions and the ability to alter responses appropriately in the light of changing situations (an ability that is clearly important for pilots). (6)

Of relevance to pilots, other short-term effects result in errors of judgement of distance and speed, loss of balance and coordination, which can also cause head injuries, fractures, facial injuries, scarring, etc. After consuming large amounts of alcohol, effects on the inner ear can last for up to 72 hours.

When about two thirds of a bottle of 12 per cent alcohol wine is consumed over a 3–6 hour period, the risk of injuries increases 2–5 times. (7) See [graphic on page 52](#). Alcohol poisoning (resulting in confusion, vomiting, seizures and unconsciousness) can occur with very high intakes of alcohol. Inhalation of vomit when a person is intoxicated can cause death — the person should be placed on their side to reduce this risk.

It is not possible to increase the elimination rate of alcohol from the blood (e.g. coffee, exercise have no effect). The liver metabolizes about 10 ml of pure alcohol (8 g) per hour. However, it is possible to mitigate the short-term effects on the body of a given amount of alcohol consumed by reducing the rate of absorption from the intestine (see "[Nine Practical Ways to Minimize Risk From Alcohol](#)", on page 55).

Drinking and driving

Most countries specify an upper blood alcohol concentration (BAC) limit below

which it is regarded as legally acceptable to drive an automobile. This upper limit varies between zero and 0.1 per cent BAC (100 mg per 100 ml), with most countries having limits of 0.05 per cent or 0.08 per cent BAC (50–80 mg/100 ml).

Clearly, the best risk reduction strategy is to avoid driving after drinking alcohol, but if you do intend to drink and drive, **be aware of the limit in the country in which you are driving and follow the guidance below on how peak blood alcohol levels can be reduced.**

There are some calculators available on the web that will calculate your BAC based on gender, weight, amount of alcohol consumed in a given time period, etc. However, these are not very accurate — so you shouldn't rely on them. **When attending an event where you know you will drink alcohol, consider using a transport method back to your residence that will not involve you driving.**

This is relevant in any country, but particularly so when you are abroad, when the reaction of the authorities to an accident involving a pilot who has been drinking may be less predictable than in your home country.

Risks from other psychoactive substances

◆ Over-the-counter drugs/internet drug purchases

The United States National Transport Safety Board undertook a survey of drug use in aviation during the period 1990–2012. An analysis was made of the toxicological findings in fatally injured pilots. **The per centage of pilots (the majority were general aviation pilots) with over-the-counter, prescription and illicit drugs in their system at the time of death increased from just less than 10 per cent in 1990 to 40 per cent in 2011.** The findings were consistent

with increasing drug use in the general population in the United States.

Sedating antihistamines (a common allergy treatment) were the most frequently identified drug category. Unlike other drug types (for which use increased with increasing age), use of illicit drugs was more common in younger age groups, decreasing in use with increasing age. [\(8\)](#)

Almost all medications have the potential to adversely affect flying abilities. Pilots should not use any medication, including herbal treatments, without knowing the ingredients, the intended effects and the possible side effects. You should give any new treatment a trial on the ground to ensure there are no significant unwanted effects before using it during flight. Since the implications for flight safety can be critical, **discuss the use of any new medication with a doctor that has aviation medicine expertise prior to using it for the first time in flight.**

While drugs prescribed by a doctor and obtained from a pharmacy are likely to have been licensed by the government and manufactured using government-approved production methods, this does not necessarily apply to non-licensed drugs, such as “herbal” or “natural” treatments. For the latter, the contents are often not well regulated and it is hard to be confident of what is in the product, or in what concentrations. **Be particularly wary of using any unlicensed/non-prescribed medicinal product.**

Any drugs that are purchased in a developing country may not be subject to the same controls as those in a developed country and should not be purchased unless you are convinced the source is reliable. This advice also applies to

any Internet purchases — there may also be legal/customs consequences from importing certain medical supplies. If you live in a developing country, you should ensure that any drugs you may be taking are of a high quality. Your aviation medical adviser may be able to provide advice on this.

◆ **Controlled drugs**

Some drugs that are commonly categorized as illicit or illegal may occasionally be permitted by national law when used for therapeutic purposes — such as heroin, cocaine, stimulants and cannabis. These are also referred to as “controlled drugs” (i.e. under the control of the international drug control conventions, and which have abuse potential). According to the United Nations, about 1 in 20 adults in the general population used at least one controlled drug in 2014. [\(9\)](#)

Use of controlled drugs is a major risk to flight safety and to employment as a pilot.

Cannabis is widely available in a number of countries, and in some, non-therapeutic use is not illegal. However, cannabis changes an individual's view of reality (time seeming to slow down, for example) which can be undesirable from a flight safety viewpoint. The effects depend on the route of consumption, dose and prior use of the drug (tolerance develops over time). Psychosis can be induced, as can seizures, particularly if drugs are taken for a sustained period.

Even if the consumption of cannabis is legal where you live or visit, you must avoid it because there are many unknown factors concerning its effect on flying performance.

Avoid other controlled drugs completely (heroin, cocaine, stimulants, etc.). Their

effects tend to be more severe than cannabis and dependence is more likely. Acute effects of such drugs are detrimental to decision-making and their prolonged use can result in an overriding desire to obtain more of the drug. A history of use is rarely compatible with holding a pilot licence and successful rehabilitation, once a person becomes addicted, can be very challenging.

◆ Prescription drugs

Prescription-only drugs are those prescribed by a licensed medical doctor for the purpose of treating a patient who has a medical condition. Usually, the drugs involved are available only on prescription because they have more powerful effects (including unwanted side effects) than over-the-counter drugs, which can be purchased without prescription.

Don't assume that a prescription drug is acceptable to use when you're flying because it has been prescribed by a doctor. You can minimize the risk of taking an unacceptable drug by ensuring that any doctor who prescribes to you is aware that you are a pilot. Even so, the doctor may be unaware of the potential issues in aviation if he or she has no aviation medicine training. Contact a doctor experienced in aviation medicine for advice prior to first use in the air.

There are many drugs that are fully compatible with safe flying, but even those that are generally acceptable may not be suitable for everyone. Therefore, take a ground-based trial before using them in flight. A useful description of different classes of drugs and their effects is available in a SKYbrary article: [http://skybrary.aero/index.php/Lifestyle_and_Adverse_Performance_Effects_\(OGHFA_BN\)#Medicines](http://skybrary.aero/index.php/Lifestyle_and_Adverse_Performance_Effects_(OGHFA_BN)#Medicines)

NINE PRACTICAL WAYS TO MINIMIZE RISK FROM ALCOHOL

1 Understand the risks to your health and career

The International Federation of Airline Pilots' Associations has produced a useful briefing leaflet titled: Alcohol – How much is too much? (10) that includes the Alcohol Use Disorders Identification Test (AUDIT) questionnaire, which is used to screen for alcohol misuse. The questionnaire was designed by the World Health Organization. (11) It contains ten questions (e.g. "How often do you have a drink containing alcohol?"; "Have you or someone else been injured because of your drinking?"), which are scored. The total score can then be used to assess risk. The full questionnaire is included under "[Additional Information](#)" on page 61. If you score eight points or higher, discuss your drinking with a trusted friend or adviser.

1 Assess your habits to identify alcohol misuse

Take the AUDIT questionnaire



2 Scored high?

Discuss your drinking habits with a trusted advisor



2 Comply with your company's alcohol policy

In general, national and company policies are more restrictive, or at least more specific, than

the international Standard set by ICAO, which requires that **pilots shall not be “under the influence of any psychoactive substance, by reason of which human performance is impaired”**. ⁽¹²⁾ Some countries adopt this requirement into their national legislation without additional legislation, whereas others may require some form of drug testing (e.g. breathalyzer, urine test, blood test). Such tests may be random or scheduled, and **they often apply to foreign pilots temporarily in a country where the rule applies.**

Regulatory authorities and/or companies may also establish as a rule, or at least a recommendation, a period of time between taking an alcoholic drink and reporting for duty, the so-called “bottle to throttle” period, varying between 8 and 24 hours. However, as the **effects of alcohol on the inner ear can last for up to 72 hours**, well beyond the point at which the blood alcohol level has returned to zero, for pilots such a limit may be insufficient to ensure optimum performance.

Companies and regulators are usually supportive of pilots who ask for help, but less so if a pilot is found to be under the influence of alcohol (or its after-effects) when on duty, in breach of published policies.

3 Find out about the drinking guidelines in your country

Recommended levels of drinking provide guidance on the amount of alcohol consumed during a day, or over a week. However, many countries that provide guidance do so on the

basis of “units” of alcohol or the number of “standard drinks” consumed.

Since the amount of alcohol in a “standard drink” or “unit of alcohol” can vary from country to country (8–20 g alcohol), as can the units by which the amount of alcohol in a drink is measured (grams, fluid ounces or millilitres), pilots need a reliable way of determining how much alcohol they’re drinking, how a standard drink is defined and what units are in use in any particular country. Note that some countries do not use a system of standard drinks/units for describing the recommended upper limit.

In order to calculate the amount of alcohol in a drink, you need to know its volume and the concentration of alcohol. With this information, the amount of alcohol can be calculated by multiplying the volume by the concentration:

- A standard 750 ml bottle of wine of 12 per cent alcohol by volume (ABV) contains 90 ml of pure alcohol (750×0.12).
- For 12 per cent ABV wine, 25 ml of pure alcohol would have a volume of about 208 ml ($25/90 \times 750$) i.e. a large glass¹.

4 Learn about the amounts of alcohol found in different drinks: spirits, wine and beer, and between strong and weaker drinks in the same category

Different types of alcoholic drinks contain different amounts of alcohol by volume (ABV) e.g. spirits typically contain about 40 per cent alcohol (equivalent to “80 proof”), wine 12 per cent and beer 5 per cent. But

1

Note the conversion between different ways of measuring alcohol: 10 millilitres = 0.34 US fluid ounces = 8 grams.

This is worth knowing because, for example, beer measurements can be sold by the number of fluid ounces, or number of millilitres. Note that in the US, beer is often sold by the pint (16 fluid ounces), but in the UK and some other countries, a pint is 20 fluid ounces.

whatever the strength, you can calculate the amount of alcohol in a drink by multiplying the volume of a drink by its alcoholic strength.

5 Set sensible personal drinking levels

Countries have different recommended upper limits of alcohol intake. Two methods of determining a “sensible” limit are given below.

i. United Kingdom guidelines

The UK guidelines (7) for “low risk” drinking are as follows (the UK provides recommendations for a maximum weekly intake, but not for daily intake):

- drink a maximum of 14 units per week (a “unit” is equivalent to 83 ml (a small glass) of 12 per cent ABV wine);
- spread intake over three or more days;
- have several drink-free days in the week.

Typical volumes of alcoholic drinks contain the following number of British units (approximately):

- 166 ml of 12 per cent ABV wine contains two units.
- 500 ml of 5 per cent ABV beer contains 2.5 units.
- 25 ml (one “shot”) of 40 per cent ABV spirit contains one unit.

ii. United States guidelines

The United States (13) takes a somewhat different approach, and unlike the United Kingdom, does not provide a weekly limit. It provides guidelines for daily “moderate drinking”. It focuses on a daily limit since most adults do not drink every day (i.e. the daily limit is not intended to be an average over a week or several days).

Providing a daily limit should, in practice, result in most drinkers consuming less than seven times the daily limit in a week. The United States recommends no more than a daily intake of:

- two Standard Drinks for a male
- one Standard Drink for a female

“Heavy drinking” is defined as 15 or more standard drinks for a male and 8 for a female in a week. (13)

A Standard Drink in the United States contains 14 g (17.7 ml) of pure alcohol and is found in the following typical drinks:

- 12 fl oz (fluid ounces) (about 355 ml) of 5 per cent ABV beer;
- 5 fl oz (about 148 ml) of 12 per cent ABV wine;
- 1.5 fl oz (about 44 ml) of 40 per cent ABV spirit.

It can be seen that a US “Standard Drink” contains significantly more alcohol than a UK “Unit” (17.7 ml versus 10 ml). It is important to recognize that these differences exist between countries when describing a “standard drink” or a “unit”.

The differences in the recommendations between the United Kingdom and the United States (especially for males) highlight the different approaches that these two countries (also reflected in other countries) have taken in devising their recommendations.

In the United Kingdom, a “low risk” approach is taken, with guidelines based on the lowest level of consumption at which alcohol-related harm may occur (risk of developing cancers in particular). In the United States, an attempt is made to balance the net effects of

1 Assess your drinking habits



Take the AUDIT questionnaire

2 Comply with your company's alcohol policy



3 Find out the drinking guidelines in your country



4 Learn about the amounts of alcohol in different drinks



7 Know where to seek help



8 Mitigate the short-term effects of alcohol

Alternate with water



Eat a meal prior to drinking



9 PRACTICAL WAYS

to minimize risk from alcohol



5 Set sensible drinking levels

UNIT= small glass / 12% ABV

UK guidelines

Max 14 units/week
Spread over 3+ days

US guidelines

Max Daily 1 2

7 Have several alcohol-free days per week



6 Don't "binge drink"

The effects of binge drinking can last for **up to 72 hours**



Blood alcohol level = or + 0.08 grams

the potential for health benefit (reduction in cardiovascular risk and of developing Type 2 diabetes from consuming small amounts of alcohol) as well as harm from alcohol consumption. There is considerable debate about which is the best approach from a public health perspective.

Given the disparities among countries in guidance concerning the appropriate levels of alcohol consumption, it is recommended that you **follow the guidelines relating to recommended maximum levels of consumption published by the public health authority of your own country**, or follow the guidelines of one that does.

6 Spread your weekly alcohol consumption over a few days. Don't "binge drink"

The US Centers for Disease Control and Prevention (USCDC) states that "binge

drinking is the most common, costly and deadly pattern of excessive alcohol use in the United States". Binge drinking is defined as a pattern of drinking that brings a person's blood alcohol level up to or above 0.08 grams per cent (80 mg per 100 ml). (14) This typically occurs when men consume five or more US Standard Drinks or women consume four or more drinks, over a period of about two hours.

In the United States, the upper legal blood alcohol limit for driving is 0.08 grams per cent (80 mg per 100 ml, with some variations among States), the same as in England and Wales. In other countries, the limit may be lower, typically 0.05 g per cent or 50 mg/100 ml.

Several countries have a blood alcohol limit for pilots, as well as for automobile drivers. In the United Kingdom the limit for both pilots and air traffic controllers is 20 mg/100 ml, (0.02 g per cent), a quarter of the drink-drive limit for England and Wales.

In the United States, the limit is 0.04 g% (40 mg/100 ml), half the federal drink-drive limit.

Binge drinking is more common among people with household incomes above US\$ 75,000, which will include the majority of professional pilots. It is associated with car crashes, falls and burns, sexually transmitted diseases and unintended pregnancy, cardiovascular disease, liver disease and cancer.

The risk of accidents, injuries and death is obviously significantly increased after binge drinking. Accidents are the most common reason for periods of temporary unfitness in professional pilots. Note that **most people who binge drink are not alcohol dependent.**

The effects of a hangover after heavy binge drinking can last for up to 72 hours. (15) An effect lasting this long would be unusual, but consequences to the inner ear (which helps with balance) have been demonstrated up to this time after a heavy drinking session. This is clearly an important effect in pilots, in comparison with those on the ground, since pilots travel and work in three dimensions and utilize balance cues for orientation.

Experience shows that pilots who spend periods of time away from home are at increased risk of developing a pattern of binge drinking when compared with the general population. Although there is limited data, pilots who are identified as being intoxicated when on duty seem to be identified most often when about to depart after a layover, suggesting an episode of binge drinking during the previous night. **Avoid excessive drinking the night before flying.**

Alcohol adversely affects sleep quality. While getting to sleep after a few drinks is

facilitated, early morning waking is likely, which (especially if coupled with jet lag) is a potent way of increasing fatigue levels. See [Chapter 7](#) for more information on managing sleep.

7 Have several alcohol-free days per week

This is a good pattern to develop, especially if your overall weekly consumption tends to be on the high side. It reduces overall consumption and helps to avoid the development of “tolerance” to alcohol.

When alcohol is regularly consumed “tolerance” develops (i.e. to achieve the same effects, increasing amounts must be consumed). When this occurs, it can lead to the belief that alcohol is not having any harmful effects, perhaps resulting in increased consumption. In fact, **tolerance to alcohol (“he can hold his drink”) is an indication that consumption is high and the risk of developing psychological or physical dependence is increased.** Note that tolerance does not affect the blood alcohol concentration (BAC), only the effects that a given BAC will have. (16)

8 Mitigating the short-term effects of alcohol

Alcohol is partly absorbed from the stomach, but mainly from the small intestine into which food passes after leaving the stomach. **Eating a meal prior to drinking fills the stomach for a while, which reduces the rate of alcohol absorption from the stomach.** It also slows down the rate at which alcohol reaches the small intestine, where the majority of alcohol is absorbed. These two effects from eating a meal result in a significant reduction of peak

blood alcohol level, which in turn results in reduced effects.

In order to benefit from this effect, eat a meal before you drink alcohol. If this is not possible, try to save your alcohol until you have eaten some food during a meal. If you are served wine with your starter, you could ask for a glass of water or a soft drink and drink this while waiting for the main course to be served. It is a good idea to **alternate alcohol intake with water whether with a meal or not, as this will tend to reduce the overall volume of alcohol consumed.**

Men tend to have a lower peak blood alcohol level than women for the same alcohol intake because, for a given bodyweight, men have more muscle. Muscle contains more water than does fat. Alcohol, being water soluble, is absorbed from the blood by the water in muscle, which tends to reduce the peak blood alcohol concentration.

9 Know where to seek help — for yourself or a colleague

One of the most challenging aspects of an alcohol problem is its secrecy. This results in the majority of those who drink excessively being undiagnosed. The affected individual is often unable to recognize that he or she has a problem, and friends, colleagues and relatives are often worried that if the problem is disclosed, it could have significant implications for the person concerned. So, they may keep any concerns to themselves. They may also be worried that their concerns are misplaced and that alcohol (or other drugs) may not be involved. Denial of the problem by an affected individual is a well-recognized

characteristic of dependency and is a defence mechanism against accepting unwelcome information (i.e. that it would be logical to cut down or stop drinking).

If you are worried about your own drinking, seek advice early. Seek guidance from, for example, your pilot assistance programme, your general practitioner or a trusted aviation medical examiner. The earlier that problem drinking is managed, the more likely it is that a career will not be adversely affected. Programmes designed to rehabilitate pilots who have recognized they have a problem have a very high success rate in helping them to continue their career (e.g. Human Intervention Motivation Study (HIMS), an occupational substance abuse treatment programme). [\(17\)](#) **The outlook is less favourable once dependence has occurred.**

If you do not have a problem yourself, but are concerned about a colleague, you could seek advice from the sources mentioned above. Managing the situation of a colleague who may have an alcohol or drug-related problem can be extremely challenging and having an idea from whom you could seek help, in advance of an issue developing, may be of great value should you be faced with such a situation during your career. **The HIMS website provides good advice on how to recognize if a professional pilot is drinking excessively,** from the viewpoint of the family (where problems are often first noticed), peers and supervisors. [\(17\)](#)

ADDITIONAL INFORMATION

There is overwhelming evidence that the early identification of excessive drinking has great potential for minimizing risks to health. Screening can be of some value in this. This guide does not recommend a policy concerning the use of screening in a regulatory setting, although it is clear that it may be of use in other environments.

The World Health Organization, in guidance concerning the use of its AUDIT screening questionnaire, reinforces the benefit of early identification of problem drinking as follows: “Of utmost importance for screening, however, is the fact that people who are not dependent on alcohol may stop or reduce their alcohol consumption with appropriate assistance and effort. Once dependence has developed, cessation of alcohol consumption is more difficult and often requires specialized treatment.” (11)

The US Preventive Services Task Force (USPSTF) has reviewed the evidence concerning alcohol screening and provides the following guidance: www.uspreventiveservicestaskforce.org

The USPSTF states that “Counseling interventions in the primary care setting can improve unhealthy alcohol consumption

behaviors in adults engaging in risky or hazardous drinking”.

It recommends three screening instruments for use in the primary care setting:

- Alcohol Use Disorders Identification Test “AUDIT” – A World Health Organization developed questionnaire, validated in six different countries (Norway, Australia, Kenya, Bulgaria, Mexico, and the United States) and the only questionnaire validated for international use.
- AUDIT C – an abbreviated AUDIT questionnaire (developed in the United States from the AUDIT questionnaire).
- Single question screening e.g. “How many times in the past year have you had five (for men) or four (for women and all adults older than 65 years) or more drinks in a day?”

There are two types of AUDIT questionnaires, one for use in an interview setting and one for self-completion. The introductory text is different between the questionnaires (mainly to explain what is meant by a “drink” in the country in question) but the questions are identical in both forms. ([The self-report version](#) is given on page 62, with a total score of eight or more considered to be an indicator of hazardous drinking.)

POPULATION	RECOMMENDATION	GRADE
Adults aged 18 and older	The USPSTF recommends that clinicians screen adults aged 18 years or older for alcohol misuse and provide persons engaged in risky or hazardous drinking with brief behavioral counseling interventions to reduce alcohol misuse.	B Offer or provide this service.

Note:

B grading indicates that “there is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.”

(1. reproduced with permission)

Box 10

The Alcohol Use Disorders Identification Test: Self-Report Version

PATIENT: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest.

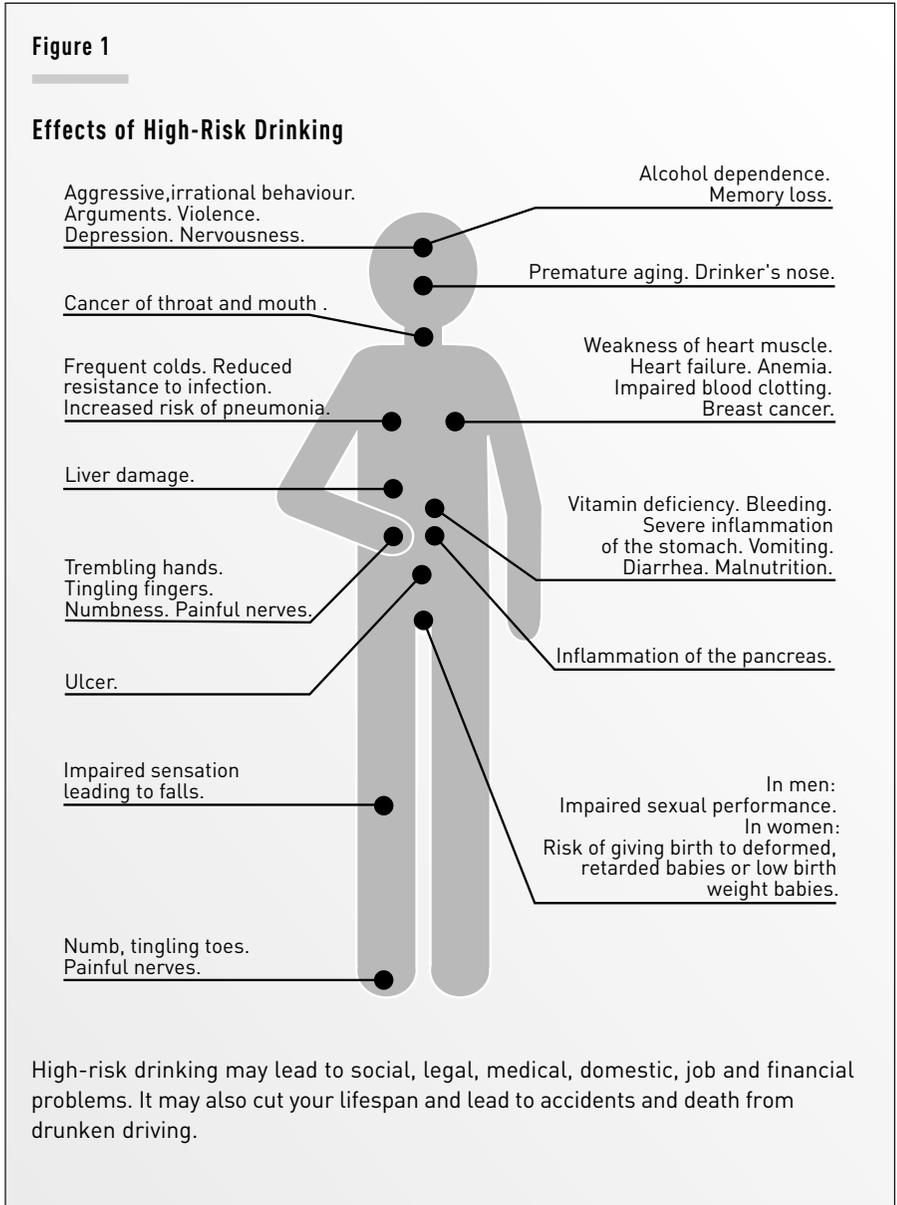
Place an X in one box that best describes your answer to each question.

Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					Total	

See below for an image that summarizes the potential health effects from high-risk drinking.

Effects of high-risk drinking

(11, reproduced with permission)



AVIATION CONCERNS

There is a clear flight safety risk associated with problematic use of alcohol, or other psychoactive substance, by any safety-critical individual. In the short-term, the effects of small amounts of alcohol such as increased self-confidence and reduced anxiety can adversely affect decision-making, with a greater intake causing incoordination, double vision and impaired reaction time, among a variety of other detrimental effects.

ICAO has rules in place to reduce this risk by stipulating that flight crew on duty shall not be under the influence of alcohol or other psychoactive substances, however regulatory authorities and employers can often indicate a minimum time required between the last alcoholic drink and reporting for duty.

Alcohol problems are relatively common in the general population. Approximately 6.2 per cent of adults in the United States had “alcohol use disorder” in 2015. (18) Of those affected, fewer than 10 per cent receive any treatment and it is possible that some of these may be pilots.

Mental health conditions, including inappropriate drug and alcohol use, have been reported in some studies to be the most common medically related causes of fatal accidents in large two-pilot aircraft, which comprise the majority of aircraft operations. (19)

An example of the effects of intoxication on pilot performance was seen on 13 January 1977, in a fatal accident involving a McDonnell-Douglas DC-8, taking off from Anchorage, in Alaska.

www.nts.gov/investigations/AccidentReports/Reports/AAR7807.pdf

The accident investigation determined the accident was partly caused by intoxication of the captain, whose blood alcohol level was found to be over 0.2 g per cent (200 mg per 100 ml). At the time, a blood alcohol level of 0.1 g per cent (100 mg per 100 ml) was considered intoxicating for drivers in the State of Alaska. The cargo aircraft had been affected by airframe icing and the handling pilot, the captain, did not take effective action to recover after it had stalled at approximately 160 feet above the runway.

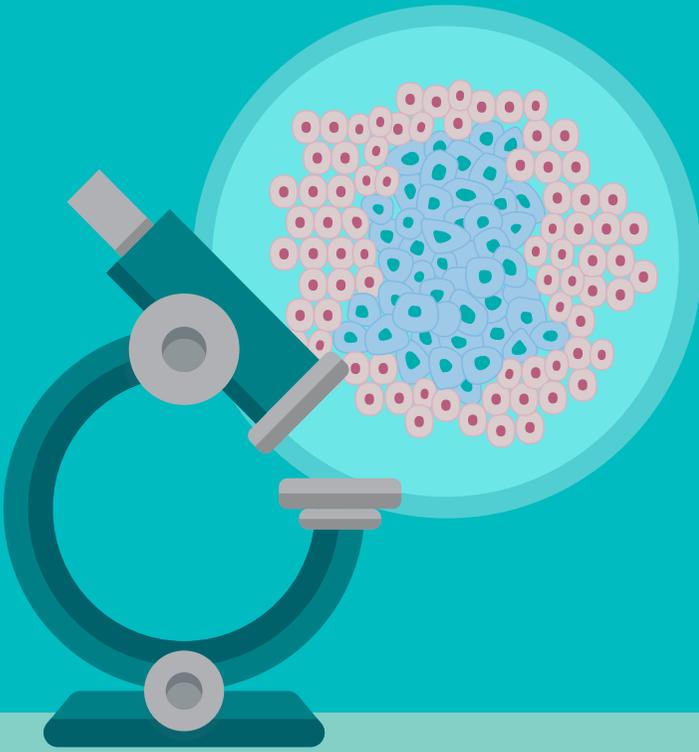
This is an extract from the accident report, which indicates the acute effects of alcohol intoxication on pilot performance:

“The captain’s physical and mental states were such that he could not effectively control the aircraft. The amount of alcohol in his system would have severely hampered his reactions, coordination, and reasoning ability. These conditions were demonstrated by his: Getting lost while taxiing to the active runway; initially selecting the wrong runway for takeoff; faster than normal rotation; rotation to a higher-than-normal pitch attitude after takeoff; failure to recognize the aircraft buffet as a stall warning; and his failure to take normal corrective action to correct the stall.”

References

- 1 International Alliance for Responsible Drinking. Health and Policy Reviews; National Drinking Guidelines (Jan 2017)
www.iard.org/science-and-policy/
- 2 Mukamai K, Lazo M. Alcohol and cardiovascular disease. *BMJ* 2017;356:j1340
www.bmj.com/content/356/bmj.j1340
- 3 Cao Y, Willett WC, Rimm EB, Stampfer MJ, Giovannucci EL. Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies. *BMJ*. 2015; 351: h4238. doi: 10.1136/bmj.h4238
www.ncbi.nlm.nih.gov/pmc/articles/PMC4540790/
- 4 Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment, Annual Report 2004
<https://cot.food.gov.uk/sites/default/files/cot/cocsection.pdf>
- 5 Mann RE, Smart RG, Govoni R. The epidemiology of alcoholic liver disease
<https://pubs.niaaa.nih.gov/publications/arh27-3/209-219.htm>
- 6 George S, Rogers RD, Duka T. The acute effect of alcohol on decision-making in social drinkers. *Psychopharmacology (Berl)*. 2005 Oct; 182(1):160–169. Epub 2005 Sep 29
www.ncbi.nlm.nih.gov/pubmed/16032411
- 7 UK Chief Medical Officers' Low Risk Drinking Guidelines, August 2016
www.gov.uk/government/publications/alcohol-consumption-advice-on-low-risk-drinking
- 8 US National Transportation Safety Board, 2014. Drug Use Trends in Aviation: Assessing the Risk of Pilot Impairment. NTSB/SS-14/01, PB2014-108827, Notation 8565A Adopted September 9, 2014
www.nts.gov/safety/safety-studies/Documents/SS1401.pdf
- 9 United Nations Office on Drugs and Crime. World Drug Report 2016
www.unodc.org/doc/wdr2016/WORLD_DRUG_REPORT_2016_web.pdf

-
- 10 IFALPA Medical Briefing Leaflet: Alcohol – How much is too much?
<https://ifalpa.org/downloads/Level1/Briefing%20Leaflets/Medical/10MEDBL02%20-%20Alcohol%20information%20for%20pilots.pdf>
 - 11 World Health Organization. The Alcohol Use Disorders Identification Test. Guidelines for Use in Primary Care, Second edition, 2001
http://apps.who.int/iris/bitstream/10665/67205/1/WHO_MSD_MSB_01.6a.pdf
 - 12 International Civil Aviation Authority, Annex 2, Rules of the Air, 2005
 - 13 US Centers for Disease Control and Prevention. Alcohol and Public Health, Frequently Asked Questions
www.cdc.gov/alcohol/faqs.htm - heavyDrinking
 - 14 US Centers for Disease Control and Prevention, Fact Sheets – Binge Drinking
www.cdc.gov/alcohol/fact-sheets/binge-drinking.htm
 - 15 Johns Hopkins Medicine, Health Library: Hangover Headache
www.hopkinsmedicine.org/healthlibrary/conditions/adult/nervous_system_disorders/Hangover_Headache_22, HangoverHeadache/
 - 16 National Institute on Alcohol Abuse and Alcoholism No. 28 PH 356 April 1995
<https://pubs.niaaa.nih.gov/publications/aa28.htm>
 - 17 Human Intervention Motivation Study (HIMS)
www.himsprogram.com/
 - 18 National Institute on Alcohol Abuse and Alcoholism. Alcohol Use Disorder
www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders
 - 19 Mitchell S, Lillywhite M. Medical cause fatal commercial air transport accidents: analysis of UK CAA worldwide accident database 1980-2011. Aerospace Medical Association 81st Scientific Meeting, 2011. Abstract.



CHAPTER 4

WHAT WE KNOW ABOUT CANCER

Summary Guide

to preventing cancer (1)

☑ **STOP SMOKING**

If needed, ask for help from your doctor.

☑ **EAT A HEALTHY DIET**

Your diet should include a wide variety of foods, in the right proportions (not just low in calories or sugar).

☑ **MAINTAIN A HEALTHY WEIGHT**

which requires a balance between food intake (energy in) and exercise (energy out).

☑ **CUT BACK ON ALCOHOL**

In relation to cancer, there is no “safe” amount of alcohol that can be consumed.

☑ **AVOID SUNBURN**

by staying in the shade, covering up and using sunscreen.

☑ **GET ACTIVE!**

Aim for a minimum of 150 minutes per week of moderate intensity exercise, or 75 minutes per week of vigorous exercise.

☑ **REDUCE THE RISK OF CERTAIN INFECTIONS**

(e.g. human papillomavirus; hepatitis; parasitic worms)

☑ **DISCUSS WITH A HEALTH PROFESSIONAL**

which cancer screening tests you should undergo.

WHAT IS CANCER?

Cancer develops from apparently normal cells in the body. However, unlike normal cells whose growth and division is controlled, cancer cells continuously grow and divide in an uncontrolled way. These abnormal cells invade and destroy normal cells (i.e. they are “malignant”) and can sometimes spread to distant parts of the body, a process called “metastasis”. **Once metastasis has occurred, the cancer becomes harder to treat.**

There are many different types of cancer and they behave in different ways. Mostly, they form tumours (lumps or growths) but not always (e.g. cancers of the blood). **There are many tumours that are not cancerous** (i.e. they don’t invade healthy cells or spread). These are said to be “benign” tumours (e.g. warts, moles). However, although benign tumours are not malignant (by definition) they can still cause symptoms by pressing on adjacent organs as they enlarge. In such situations, surgery can often be helpful.

The chance of getting cancer is partly inherited from our parents. This **inherited risk can be modified during life due to exposure to different substances such as chemicals in tobacco smoke and ultraviolet (UV) rays from the sun.**

Although studies have found cancer incidence to be generally lower in professional pilots than in the general population, **an increased rate of malignant melanoma, a cancer of the skin, is consistently found in professional pilots** (2, 3) and has also been reported in air traffic controllers. (4) Excessive exposure to UV from sunlight during layovers and free time has been proposed as a possible cause, (3, 4) although exposure to UV during flight has also been postulated as a potential risk. (2)

In the United States, about 38 per cent of men and women will be diagnosed with cancer during their lifetime. Over half of these diagnoses will be made in the 55–74 age range. (5) But two thirds of those affected will not die from the disease.

WHO estimates that **between 30 and 50 per cent of all cancers could be prevented by lifestyle changes.** (6) About one third of cancer deaths are caused by the five leading lifestyle risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use and alcohol use.

EIGHT PRACTICAL WAYS TO MINIMIZE THE RISK OF CANCER

1 Stop smoking

Cigarette smokers run twice to four times the risk of developing heart disease or stroke than the non-smoking population. And the risk of developing lung cancer is 25 times that of non-smokers.

Tobacco use is the world’s leading cause of preventable death and there is no safe level of exposure. On average, those who stop smoking before age 40 reduce their risk of a smoking-related death by 90 per cent over those who continue to smoke. (7) This is a risk factor, not only for lung cancer and cardiovascular disease, but also for other respiratory diseases such as lung infections and emphysema/chronic bronchitis. WHO states that tobacco kills one third to half of all those who use it, on average 15 years prematurely. (8)



The main challenge for smokers to stop smoking is the addiction to nicotine. Nicotine withdrawal has a variety of unpleasant effects such as feeling irritable, angry or anxious; having trouble thinking; craving tobacco products and feeling more hungry than usual. (9) Fortunately, for most people, **the effects of nicotine withdrawal are greatly diminished within a month of smoking cessation.**

In the United States, **over half of those who smoked in the past have successfully quit and two thirds or more of these stopped smoking without assistance.** (10, 11) While some may recommend gradual withdrawal, perhaps with the support of medication, there is evidence that a “cold turkey” approach (abrupt cessation) may be equally effective. (12)

If on your own you cannot manage to stop smoking, your doctor can recommend some “talking therapies” (joining a group is often helpful) **and/or nicotine-replacement products,** some of which are readily available over the counter.

Non-nicotine prescription-only medication can also help. As with any medication, you should discuss its use with a doctor experienced in aviation medicine, and give the medication a trial on the ground before flying. Some medication for smoking cessation may be unsuitable for pilots.

If you are a non-smoker, avoid breathing second-hand smoke. This is smoke from tobacco products that are burning, or exhaled smoke from a smoker. The risk from second-hand smoke is not small — in the United States, exposure to second-hand smoke increases the risk of developing lung cancer by 20–30 per cent, compared with those not exposed. Risk of cardiovascular disease is also increased. (13)

E-cigarettes (electronic cigarettes) were invented in 2003 and are battery-powered devices that contain a liquid composed of nicotine, flavourings and some other chemicals. A heating mechanism converts the liquid into a vapour, which is inhaled. The use of e-cigarettes is called “vaping”. In the United States, e-cigarettes are the most commonly used tobacco product among youths and young adults. (14)

E-cigarettes contain nicotine, which is addictive, but does not cause cancer. Smoke from conventional tobacco products contains a cocktail of over 5,000 chemicals, at least 70 of which may cause cancer. E-cigarettes do not contain these chemicals.

It has been reported that e-cigarettes are much safer than regular cigarettes — 95 per cent safer according to some estimates (15). **For smokers of regular cigarettes, there is therefore likely to be a health benefit from switching completely to e-cigarettes.** Passive breathing of vapour from e-cigarettes is unlikely to be harmful.

While e-cigarettes present a much lower health risk than regular cigarettes, there are still several unknown factors. They contain chemicals that may, in the long term, be shown to be harmful. Also, as different devices use a variety of products, their effects may not be the same across users of different devices. **So, if you are a smoker, the best health advice remains the same: quit smoking.** However, if you cannot do this, change to using e-cigarettes is an option.

There are many online sources of information on smoking and how to quit. One such site is: <http://whyquit.com>

2 Eat a healthy diet

Eating a healthy diet has benefits for maintaining or improving cardiovascular health. This can also help reduce the risk of developing cancer, primarily by helping to maintain a healthy body weight. After smoking, **obesity is the second biggest preventable cause of cancer in Europe and North America.** (16)

HEALTHY DIET TO PREVENT CANCER

EAT PLENTY OF FIBRE



Fruit and vegetables



Oats, barley
flax seeds



Wholemeal
bread



Cereals
and nuts

CUT BACK ON RED AND PROCESSED MEAT



Some meat-free
days per week



Serve smaller
portions



Substitute with
chicken/fish

REDUCE SALT INTAKE

Don't go over
6g per day
= **2.4g sodium**



Use low sodium
products



Cook with less
added salt

What is contained in your diet is also important, as is the number of calories. Three recommendations regarding specific items in the diet are believed to have a significant beneficial effect on reducing cancer risk:

a. Eat plenty of fibre

Fibre is the part of food derived from plants that the body cannot digest. It passes through the body relatively unchanged, and is also called “roughage”. It is only found in plants (not in meat, fish, poultry and dairy products) and is probably best known for its prevention of constipation. It also reduces the risk of bowel cancer.

Fibre is found in fruit and vegetables, oats, barley, rye, flax seeds (golden linseeds), other seeds, wholemeal bread, bran, cereals and nuts. Those with a low tolerance to fibre or with a bowel disorder may need to adjust their fibre intake in consequence and should consider seeking medical advice.

b. Eat red and processed meat sparingly

Both red meat and processed meat increase the risk of bowel cancer (although the risk is considered to be small). Processed meat has about double the risk of red meat. (17) Red meat includes: beef, lamb, pork, veal, venison and goat. Processed meat has been “processed” to improve the flavour by smoking, salting, curing or adding preservatives (e.g. sausages/hotdogs, bacon, ham, salami and pâtés). Dietary guidance varies between countries, but public health authorities recommend that cutting back is likely to be beneficial. Ways how you can cut back (18) are:

- have some meat-free days per week
- eat smaller portions of meat
- substitute with chicken or fish

- use plant products (e.g. beans, pulses) instead of meat.

See [Chapter 6](#) for additional guidance on diet.

c. Reduce salt intake

An estimated 24 per cent of stomach cancer in the United Kingdom is caused by a salt (sodium chloride) intake of over 6 g per day. (19) Six grams of salt contains 2.4 g of sodium — it is the sodium that causes the effects. Food labels may provide information on the amount of salt (sodium chloride) or sodium in the product. In order to reduce your salt intake, look for lower salt/lower sodium versions, cook with less added salt, and reduce intake of processed meat (which often contains a lot of salt).

3 Maintain a healthy weight

Worldwide, it is estimated that **5.4 per cent of all new cancer cases in adult women and 1.9 per cent of all new cases in adult men are due to a high Body Mass Index (BMI) (25 or greater).** (20) See [Chapter 6](#) for a description of BMI.

Excess fat can lead to the production of certain hormones and growth factors that affect cell behaviour. The cancers that are more common in the overweight/obese are:

breast (post menopause), bowel, womb and ovary, oesophagus, pancreas, kidney; liver, stomach, gall bladder, thyroid, myeloma (a blood cancer) and meningioma (a tumour in a lining of the brain). See Figure 2.

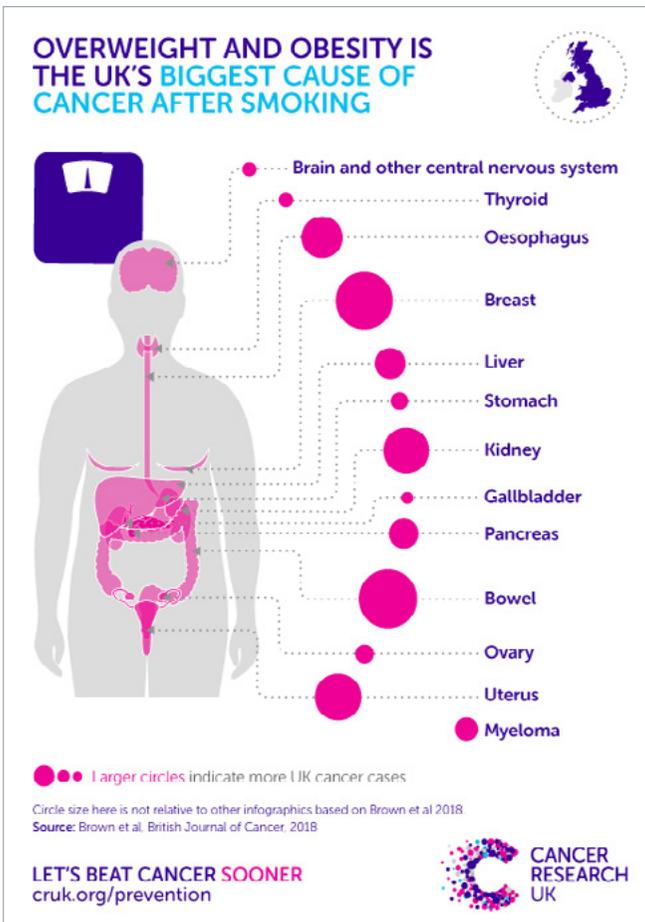


Figure 2.
Cancer caused by overweight/obesity (21)
Reproduced with permission.

4 Cut back on alcohol

Chapter 3 provides guidelines on risk reduction from alcohol. The next portion of text is taken from Chapter 3:

"Heavy drinking has been linked to an increased risk of several different types of cancer and, unlike cardiovascular disease and Type 2 diabetes, there appears to be no protective effect from consuming small amounts of alcohol.

In general, for those who have light to moderate drinking patterns (up to three drinks per day for men and half this

amount for women), any increased cancer risk is likely to be minimal. **However, for women, the risk of alcohol-related breast cancer increases with only one alcoholic drink per day.** (3) For women in the United Kingdom, it is estimated that if alcohol consumption was reduced to less than one drink per week, the number of reported breast cancers could be reduced by 6 per cent. (4)"

See Figure 3 for alcohol-related cancers.

5 Avoid sunburn by staying in shade, covering up and using sunscreen

For professional pilots (and to a lesser degree, air traffic controllers for whom the risk is somewhat lower) the advice to avoid excessive exposure to the sun is particularly important since skin cancer, in particular malignant melanoma, has an increased frequency compared with the general population. Ultraviolet (UV) light, which causes the skin to darken and develop a sun-tanned look, is what increases the risk of skin cancer. UV is part of the sun's radiation spectrum and is also the radiation used in sunbeds.

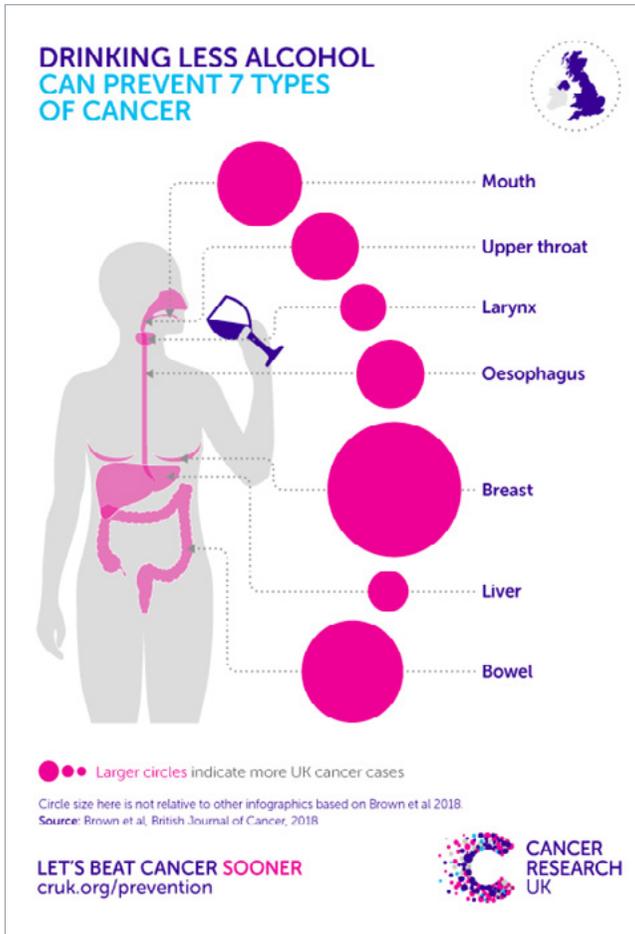


Figure 3. Cancers that can be caused by drinking alcohol (22) Reproduced with permission.

For pilots, it is believed that **increased exposure to sunlight (e.g. on layovers or vacations) may be the most likely reason for the increased incidence of melanoma.** The incidence of all types of skin cancer has been increasing in recent decades in the general population.

Globally, one in three diagnosed cancers is a skin cancer. One in every five Americans will develop skin cancer in their lifetime. In the United States, skin cancer is the most common type of cancer, in the United Kingdom it is the fifth most common. There are two main types of skin cancer: melanoma and non-melanoma. Non-melanoma skin cancers (primarily basal cell carcinoma and squamous cell carcinoma) spread locally and invade other cells (i.e. they are malignant) but

they do not metastasise (spread to distant parts of the body). They rarely cause death, but surgical treatment can be disfiguring (as can the growth itself). They typically occur on sun-exposed parts of the body — ears, face, neck, forearms.

Malignant melanomas are a far less common skin cancer than non-melanoma types, but of all skin cancers, they are the most lethal, because they metastasise. Strangely, although risk is increased by sunlight exposure, malignant melanomas tend to occur most frequently in non-sun exposed parts of the body. Risk factors include:

- Large number of skin moles (strongest risk factor in fair skinned people);
- Pale complexion, blue eyes and red/fair hair;

SKIN CANCER CHECKLIST

To reduce the risk of developing skin cancer

Do not deliberately sunbathe



Stay in the shade when the sun is highest



Wear clothing that covers as much of your skin as possible



Protect your head,

face and back of the neck (e.g. wear a hat with a wide brim)



Use sunscreen with factor (SPF) of 15 or higher

It should protect you against both UVA and UVB



Avoid using a tanning bed,

booth or sunlamp



- Occasional exposure to intense sunlight;
- History of sunburn, especially at an early age;
- Living close to the equator (e.g. rates in Australia are 10–20 times those of Europe);
- History of non-melanoma skin cancers.

There is some evidence that use of sunbeds also increases risk. The WHO International Commission on Non-Ionizing Radiation Protection has classified exposure to UV-emitting tanning devices as carcinogenic to humans and states that **“the use of sunbeds for cosmetic purposes is not recommended”**. WHO advises that if sunbed exposure is undertaken, regular exposure should not exceed two sessions per week, with a maximum of 30 sessions per year. (23) According to WHO, those with any of the following risk factors should “never” use sunbeds: very fair skin; who burn easily/tan poorly; have lots of freckles or moles; have a personal or family history of skin cancer; use sensitizing medication (some medications increase the effect of UV on the skin); already have extensive sunlight damage; are under 18 years of age.

To reduce the risk of developing skin cancer:

- do not deliberately sunbathe;
- if possible, stay in the shade during the six hours when the sun is highest (i.e. 09:00–15:00 hrs — modified for local time adjustments) ;
- wear clothing that covers as much of your skin as possible — ideally long trousers and long-sleeved shirts;
- protect your head, face and back of the neck (e.g. wear a hat with a wide brim);
- use sunscreen with a sun protection factor (SPF) of 15 or higher and that protects against both UVA and UVB. In strong sunlight, consider using this underneath thin/open weave clothing (which may not adequately block sunlight);
- avoid using a tanning bed, booth or sunlamp.

Early treatment of malignant melanoma is usually curative with simple day surgery. However, if the melanoma has metastasized, the disease can be fatal. To encourage early detection, regularly look at your skin spots and use the following A-E guide below for suspicious changes.

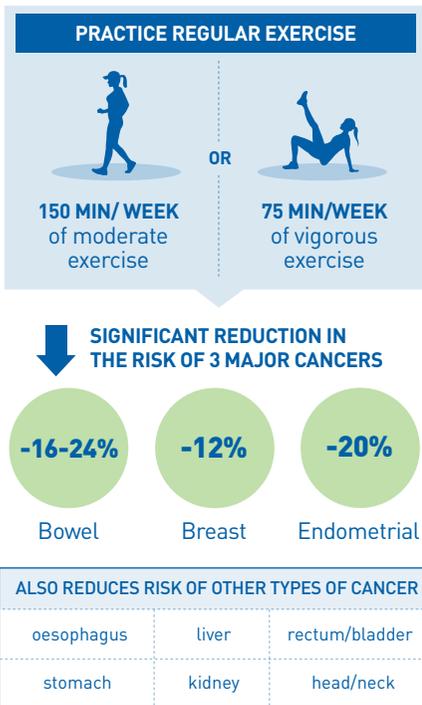
Seek medical advice early if you observe any of the following:

- **A - Asymmetry:**
If one half of the birthmark or mole does not mirror the other half, this makes it more likely it is a melanoma, rather than a benign birthmark or mole.
- **B - Border:**
The edge of a melanoma is irregular – the edge of a benign mole is smooth.
- **C - Colour:**
The colour of a melanoma is irregular, with different shades seen. A benign mole usually has a similar shade throughout.
- **D - Diameter:**
A malignant melanoma is usually more than 6 millimeters (¼ inch) across, although melanomas can sometimes be smaller than this, especially in the early stages.
- **E - Evolving:**
A malignant melanoma changes with time. A change in size, shape, colour or increased protrusion above the skin is a warning, as is any new symptom such as bleeding, crusting or itching.

Ask your regulatory medical examiner to check your skin for any abnormal findings during your periodic examinations. He or she may not routinely do this since it might not be considered a requirement by the regulatory authority. If there is any doubt (it can sometimes be hard to tell between a melanoma and a mole), have the spot checked by a dermatologist (skin specialist) as it is critical for your future health that if you have a malignant melanoma, it is diagnosed as early as possible.

6 Get active!

This is the same advice as provided in Chapters 1 and 2. Taking regular exercise (150 minutes per week of moderate exercise or 75 minutes of vigorous exercise) is the single most important lifestyle action that you can take to improve your health and reduce the risk to your licence of becoming medically unfit. **Although most people think about exercising in order to prevent heart disease, cancer risks are also reduced.**



The US National Cancer Institute (NCI) (24) provides a review of the benefits of physical exercise with respect to cancer prevention in an analysis of many different studies. For three of the major cancers, risk reduction is given as:

- bowel cancer: 16–24 per cent reduction
- breast cancer: 12 per cent reduction
- endometrial (womb) cancer: 20 per cent reduction.

Physical exercise has also been linked to a reduced risk of having a number of other cancer types, but the evidence is less marked (i.e. oesophagus, liver, stomach, kidney, certain blood cancers, and cancers of the head and neck, rectum and bladder).

7 Reduce the risk of certain infections

Some infectious agents, including viruses, bacteria and parasites, can increase the risk of getting cancer. **Risk can be reduced by vaccination and avoiding unprotected sex.** Three of the main agents are discussed below.

◆ Human papillomaviruses (HPVs)

HPVs are easily spread from person to person by vaginal, anal and oral sex. They have the potential to cause skin warts around the genitals, and cancer of the cervix, vulva, vagina, penis or anus. However, although studies in the US show that nearly all men and women are infected with HPV at some point in their lives, in nine out of ten cases it does not cause symptoms or health problems and simply disappears from the body within two years. (25) **Most people with an HPV infection do not realize they are infected** and can therefore unknowingly transmit it to another person.

Vaccination is effective at preventing most cancers caused by HPV. However, vaccination policy varies between countries. In the United Kingdom, HPV vaccination is routinely offered to girls aged 12–13 years up to the early or mid-twenties. In the United States, boys are vaccinated as well. After the early to mid-twenties, vaccination is no longer offered since many individuals will have already had an HPV infection. If you have not been vaccinated and are under 30 years of age, you should check on the vaccination policy in your country, and get vaccinated if appropriate.

For adult women after their mid-twenties, cervical screening (“Pap test”) is used to detect abnormal cells on the cervix. If they are found, treatment to stop cancer developing can be provided. Women should follow the screening recommendations in their country.

Using a condom during sex can help to prevent an HPV infection. However, since HPV can be spread through skin-to-skin contact in the genital area, a condom will not provide 100 per cent protection. (26)

◆ **Hepatitis**

Hepatitis means “inflammation of the liver”. Hepatitis can be caused by a number of viruses, named A to E. Hepatitis B virus (HBV) and C virus (HCV) can be spread through unprotected sex, especially sex between males, and by blood transfusion (and by sharing needles used to inject drugs). It is more common in sub-Saharan Africa and in Southeast Asia.

Although most adults recover from the HBV and HCV disease with no ill effects after a few

weeks, a small number can develop chronic (long-lasting) hepatitis, which can cause scarring of the liver (cirrhosis) and eventually liver cancer. **An HBV vaccine is available and is recommended for professional pilots who travel overseas** — who may be treated by blood transfusion in a hospital in a developing country where the blood might not be adequately screened, or who may indulge in unprotected sex when overseas. There is no vaccine for HCV. There are several reasons why unprotected sex when overseas is inadvisable and risk reduction for Hepatitis B and C, with its potential to cause liver cancer, is one. See [Chapter 8](#) for more information on staying healthy when travelling.

◆ **Human Immunodeficiency Virus (HIV)**

HIV is the virus that causes the acquired immunodeficiency syndrome (AIDS). It does not cause cancer itself, but reduces the ability of the body’s immune system to fight off other infections that can cause cancer (such as HPV and Hepatitis B and C). This makes the individual with HIV much more susceptible to a variety of different cancers.

Human papilloma viruses (HPVs)

Can potentially cause certain types of cancer

 If you are a women under 30, get vaccinated

 Use condom during sex

 Take a routine “Pap Test” to detect **abnormal cells**

▼

If they are found, follow a treatment

Hepatitis

Bigger risk for pilots who travel



Apply the HBV vaccine



Avoid unprotected sex

REDUCE THE RISK OF INFECTIONS

Parasitic worms

Some can cause diseases



Avoid swimming in freshwater lakes and rivers



Sub-Saharan Africa presents the biggest risk for travelers

Human Immunodeficiency Virus (HIV)

Reduces the immune system’s ability to fight off infections

 Always use a condom during sex

 Limit the number of sexual partners

 Take **post-exposure prophylaxis** if you think you may have been exposed

 Get informed

While abstinence from oral, vaginal or anal sex is the only 100 per cent effective way to avoid risk of HIV infection, the majority of adults are sexually active, so the question of how to reduce risk becomes important. Risk reduction methods include the use of condoms (the most important method), limiting the number of your sexual partners, taking post-exposure prophylaxis (if you think you may have been exposed within the last 72 hours to HIV), or taking pre-exposure prophylaxis if you are at high risk. There are a number of excellent on-line information sites (e.g. the US Centers for Disease Control and Prevention (27) and the United Kingdom’s National Health Service). (28)

Remember that **while there is no cure for HIV, the infection can be effectively treated**, adding many years to life expectancy. Such treatment, when approved and monitored by the regulatory authority, may be acceptable for continued flying. Seek medical advice early if you may have been infected.

◆ **Parasitic worms**

One type of parasitic worm causes a disease called “schistosomiasis” (also known as “bilharzia”) and is found in freshwater lakes, canals, rivers, streams, ponds (but not in the sea or in chlorinated swimming pools) in Africa, the Middle East, South America, Asia and (at

low risk) the Caribbean. Sub-Saharan Africa presents the greatest risk for travellers. Globally, schistosomiasis affects over 230 million people.

The disease is caught by swimming, bathing or wading in contaminated freshwater. Worms in the water penetrate the skin. Symptoms include a rash or itchy skin within days of infection, followed, after 1–2 months, by flu-like symptoms. **Chronic infection can cause bladder cancer.** If you think you may have been exposed, see your doctor. An effective treatment is available.

8 Discuss with a health professional which cancer screening tests you should undergo

In many countries, screening for certain cancers is offered and/or recommended to asymptomatic individuals, since **early detection usually enables more effective treatment to be provided.** The cancers for which screening is commonly undertaken are bowel (colon and rectum, i.e. “colorectal”), and breast and cervical cancer in women. Screening is age related, since the risk of the disease in question often varies with age. However, policies on screening (which diseases, how often) differ among countries and there is no “one size fits all”.

CANCER SCREENING TESTS
TO DISCUSS WITH YOUR DOCTOR

Early detection enables a more effective treatment

Types of cancer for which screening is commonly undertaken



Bowel:
colon and rectum



In women:
breast and
cervical cancer

Some tests can be “false positive” or could be potentially harmful

Discuss with your doctor
the benefits and risks

Consider:



Genetic risk



Age



Lifestyle



There are some risks involved with screening, and assessing the balance of risks and benefits can be complex. The balance is determined, in part, by the chance of the screening process discovering a disease that was previously unknown in a particular group of people. If the likelihood of finding a cancer is low (e.g. bowel cancer in younger adults in whom the diagnosis is rare) a positive test result is likely to be incorrect, known as a “false positive”. A test that has a false positive result indicates that the disease is present when in fact it is not – an “over-diagnosis”, which will need to be revised after additional tests.

All positive screening tests (true positives and false positives) need to be followed up with additional confirmatory investigations such as biopsies or tests involving radiation exposure, etc. Some of these tests have potential to generate some harm, as well as causing anxiety for the individual involved. **It is the potential for harm from such follow-up after a false positive screening test** (when there is in fact no disease present), **that is the main concern of undertaking screening in a low risk population.** This applies to all screening tests, not only for cancer.

It is recommended that you make an appointment to discuss the benefits and risks of screening with a health professional. You can jointly take into account your individual circumstances, such as genetic risk, age, lifestyle and your own preferences in order to decide which screening tests to undertake.

ADDITIONAL INFORMATION

A great deal of information exists concerning cancer and cancer prevention. While susceptibility to cancer is partly inherited, WHO indicates that 30–50 per cent of

cancers are preventable. (29) The periodic medical examination can be used by medical examiners to educate pilots on risks. Early diagnosis is also important for improving prognosis for those who have developed or are developing cancer. (30)

The US Preventive Services Task Force (USPSTF) has reviewed the evidence for and against screening (of asymptomatic individuals) for different types of cancer or pre-cancerous conditions. (31) USPSTF recommendations are set out in [Table 4 on page 80](#).

Note that in relation to screening guidelines, USPSTF provides a United States view — public health authorities in other countries may recommend different strategies. However, what follows provides a reasonable basis for a discussion with a health professional on which screening activities should be undertaken in an individual’s case.

The website <https://healthfinder.gov/> is a website of the United States Department of Health and Human Services and provides up-to-date guidance on preventive services recommended by USPSTF and others. By inserting your age and sex, you can see a list of age and gender-specific preventive services recommended for the US population. USPSTF recommendations are regularly updated and revised. Such revisions may result in significant recommendation amendments and readers should therefore consult the USPSTF website for the latest information.

Note that USPSTF recommendations in Table 4 refer to individuals without any signs and symptoms. If any signs or symptoms of a cancer are noticed, such as those listed in the table, medical advice should be sought as soon as possible and action should be taken in accordance with that advice.

Table 4. List of various cancers and pre-cancers, common signs and symptoms and screening recommendations from the United States Preventive Services Task Force (30, 31)

Note

USPSTF Final Recommendation Summaries and Grades (© United States Preventive Services Task Force) were adapted and reprinted with permission.

SITE OF CANCER/ PRE-CANCEROUS STAGE	COMMON SIGNS & SYMPTOMS	USPSTF SCREENING RECOMMENDATION - FOR INDIVIDUALS <i>WITHOUT</i> SYMPTOMS	RECOMMENDATION GRADE
Breast	Lump in the breast, asymmetry, skin retraction, recent nipple retraction, blood stained nipple discharge, eczematous changes in areola.	Biennial (every two years) screening mammography for women aged 50 to 74 years.	B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.
BRCA-related cancer. (1) Women who have family members with breast, ovarian, tubal, or peritoneal cancer		(Recommendation in early revision) The USPSTF recommends that primary care providers screen women who have family members with breast, ovarian, tubal, or peritoneal cancer with one of several screening tools designed to identify a family history that may be associated with an increased risk for potentially harmful mutations in breast cancer susceptibility genes (BRCA1 or BRCA2). Women with positive screening results should receive genetic counseling and, if indicated after counseling, BRCA testing.	B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.
BRCA-related cancer. (2) Women whose family history is not associated with an increased risk		(Recommendation in early revision) The USPSTF recommends against routine genetic counseling or BRCA testing for women whose family history is not associated with an increased risk for potentially harmful mutations in the BRCA1 or BRCA2 genes.	D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.
Cervix	Post coital bleeding, excessive vaginal discharge.	(Recommendation in late stage of revision) The USPSTF recommends screening for cervical cancer in women age 21 to 65 years with cytology (Pap smear) every 3 years or, for women age 30 to 65 years who want to lengthen the screening interval, screening with a combination of cytology and human papillomavirus (HPV) testing every five years.	A - The USPSTF recommends the service. There is high certainty that the net benefit is substantial.
Colon and rectum	Change in bowel habits, unexplained weight loss, anaemia, blood in the stool (rectal cancer).	The USPSTF recommends screening for colorectal cancer starting at age 50 years and continuing until age 75 years.	A - The USPSTF recommends the service. There is high certainty that the net benefit is substantial.
Hepatitis B and C	Fatigue, nausea, poor appetite, abdominal pain, a mild fever, or yellow skin or eyes (jaundice).	(Recommendation in early stage of revision) The USPSTF recommends screening for hepatitis B virus (HBV) infection in persons at high risk for infection.* The USPSTF also recommends offering 1-time screening for HCV infection to adults born between 1945 and 1965.	B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.
Human Immunodeficiency Virus (HIV)	Short, flu-like illness that occurs 2–6 weeks after infection: fever, sore throat, body rash. After this there may be no symptoms for several years.	The USPSTF recommends that clinicians screen for HIV infection in adolescents and adults aged 15 to 65 years. Younger adolescents and older adults who are at increased risk should also be screened.	A - The USPSTF recommends the service. There is high certainty that the net benefit is substantial.

* Those undertaking unprotected sex, especially sex between males, by blood transfusion (and by sharing needles used to inject drugs).

Table 4. List of various cancers and pre-cancers, common signs and symptoms and screening recommendations from the United States Preventive Services Task Force (30, 31)

SITE OF CANCER/ PRE-CANCEROUS STAGE	COMMON SIGNS & SYMPTOMS	USPSTF SCREENING RECOMMENDATION - FOR INDIVIDUALS <i>WITHOUT</i> SYMPTOMS	RECOMMENDATION GRADE
Lung		The USPSTF recommends annual screening for lung cancer with low-dose computed tomography in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.	B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.
Prostate	Difficulty (long time) in urination, frequent nocturnal urination.	(Recommendation in late stage of revision) The U.S. Preventive Services Task Force (USPSTF) recommends against prostate-specific antigen (PSA) –based screening for prostate cancer.	D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.
Skin: Counseling. Children, adolescents, and young adults aged 10 to 24, fair skinned	Melanoma - brown itchy lesion that is growing with irregular borders or areas of patchy colouration that may itch or bleed. Other skin cancers - lesion or sore on skin that does not heal.	(Recommendation in late stage of revision) The U.S. Preventive Services Task Force (USPSTF) recommends counseling children, adolescents, and young adults aged 10 to 24 years who have fair skin about minimizing their exposure to ultraviolet radiation to reduce risk for skin cancer.	B - The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.
Skin: Counseling. Adults older than 24		(Recommendation in late stage of revision) The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of counseling adults older than age 24 years about minimizing risks to prevent skin cancer.	I - The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.
Testis	Swelling of one testicle (asymmetry).	The USPSTF recommends against screening for testicular cancer in adolescent or adult men.	D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.
Urinary bladder	Pain, frequent and uneasy urination, frequent nocturnal urination.	The USPSTF concludes the current evidence is insufficient to assess the balance of benefits and harms of screening for bladder cancer in asymptomatic adults.	I - The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.
Oral cavity	White lesions (leukoplakia) or red lesions (erythroplakia), growth or ulceration in mouth.	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for oral cancer in asymptomatic adults.	I - The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.
Ovary	Feeling constantly bloated, swollen abdomen, abdominal or pelvic discomfort, feeling full quickly when eating, loss of appetite, needing to pass urine more often or more urgently than normal.	The USPSTF recommends against screening for ovarian cancer in women.	D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.
Thyroid	Painless lump or swelling in the front of the neck; swollen glands in the neck; unexplained hoarseness that doesn't get better after a few weeks; a sore throat that doesn't get better; difficulty swallowing.	The USPSTF recommends against screening for thyroid cancer in asymptomatic adults.	D - The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.

AVIATION CONCERNS

From the information in Part A of this guide, it can be seen that cancer was the second most common reason (behind “mental/nervous” causes) for a lump sum “loss of licence” payout by an insurance company. However, although a common cause of “loss of licence”, in-flight incapacitations caused by cancer are very rare.

Most cancers develop relatively slowly and the risk of sudden incapacitation is usually quite low. The safety risk can be estimated and it may be possible for some pilots to continue flying with certain cancers, as long as they feel well enough. What often causes a pilot to cease flying is either the symptoms from the cancer, or the side effects of treatment. Both vary from person to person and an individual fitness assessment needs to be made. However, sometimes the cancer can pose a significantly increased risk of incapacitation (e.g. malignant melanoma in certain circumstances).

Malignant melanoma requires a specific mention because it is the only cancer consistently found to have an increased prevalence in the professional pilot community. It is also a common type of cancer in the general population, and it is preventable (see ["Avoid sunburn by staying in shade, covering up and using sunscreen"](#) on page 73). Treatment is simple and almost always curative as long as the base of the melanoma has not extended much below the surface of the skin (less than 1 mm) and lymph nodes or other remote sites are not involved (i.e. the melanoma has not metastasised). If the melanoma has metastasised the prognosis is poorer.

Once the melanoma is considered to have reached a thickness whereby it is likely to have spread to another part of the body, regulatory authorities are concerned because a metastasis could be sited in the brain and grow there undetected – this, in turn, could cause a seizure without warning. It may not be possible to detect a metastasis that is very small, just a few cells for example.

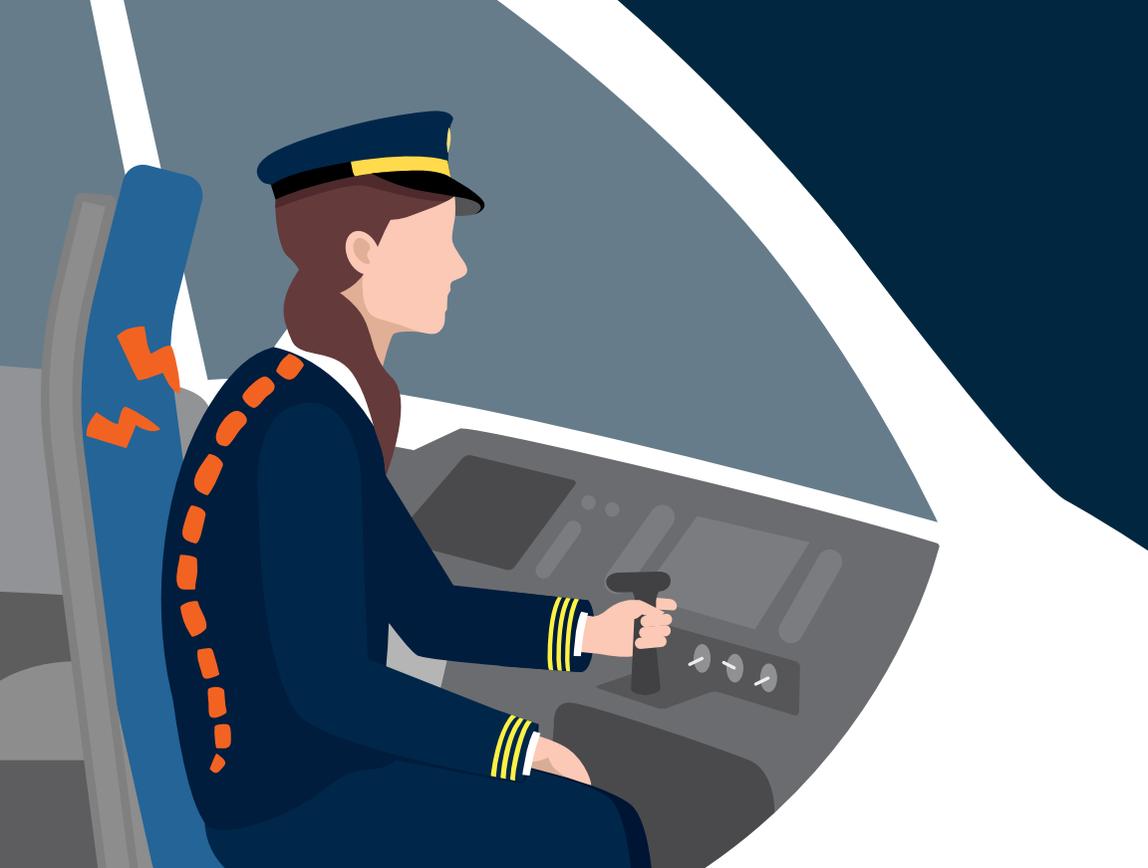
Even if the skin melanoma has been removed, it might take some years before a pilot can be medically recertified (if the disease has metastasised), because of the increased incapacitation risk due to potential symptoms from the metastasis.

References

- 1 Cancer Research UK. About cancer. Can cancer be prevented?
<http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/can-cancer-be-prevented>
- 2 Sanlorenzo M, Wehner MR, Linos E et al. The risk of melanoma in airline pilots and cabin crew: a meta-analysis. *JAMA Dermatol* 2015 Jan;151(1):51-8. doi: 10.1001/jamadermatol.2014.1077
www.ncbi.nlm.nih.gov/pubmed/25188246
- 3 Hammer GP, Auvinen A, De Stavola BL et al. Mortality from cancer and other causes in commercial airline crews: a joint analysis of cohorts from 10 countries. *Occup Environ Med*. 2014 May;71(5):313-22. doi: 10.1136/oemed-2013-101395. Epub 2014 Jan 3
www.ncbi.nlm.nih.gov/pubmed/24389960
- 4 dos Santos Silva I, De Stavola B, Pizzi C, Evans AD, Evans SA. Cancer incidence in professional flight crew and air traffic control officers: Disentangling the effect of occupational versus lifestyle exposures. *Int. J. Cancer* 2013; 132, 374–384
<http://onlinelibrary.wiley.com/doi/10.1002/ijc.27612/pdf>
- 5 National Cancer Institute, Surveillance Epidemiology, and End Results Programme
<https://seer.cancer.gov/statfacts/html/all.html>
- 6 World Health Organization Cancer Fact Sheet, February 2017
www.who.int/mediacentre/factsheets/fs297/en/
- 7 Jha P, Ramasundarahettige C, Landsman V, Rostron B, Thun M, Anderson RN, McAfee T, Peto R. 21st-Century Hazards of Smoking and Benefits of Cessation in the United States. *N Engl J Med* 2013;368:341-50
www.nejm.org/doi/pdf/10.1056/NEJMsa1211128
- 8 WHO Report on the Global Tobacco Epidemic, 2008: The MPOWER package. Geneva, World Health Organization, 2008
http://apps.who.int/iris/bitstream/10665/43818/1/9789241596282_eng.pdf
- 9 US Centers for Disease Control and Prevention. Smoking and Tobacco Use. Quitting Smoking
www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/index.htm

-
- 10 US Surgeon General, 2010: How Tobacco Smoke Causes Disease...what it means to you www.cdc.gov/tobacco/data_statistics/sgr/2010/consumer_booklet/pdfs/consumer.pdf
 - 11 Chapman S, MacKenzie R. The global research neglect of unassisted smoking cessation: causes and consequences. PLoS Med 2010;7(2): e1000216. doi:10.1371/journal.pmed.1000216
<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000216>
 - 12 Ussher M, Brown J, Rajamanoharan A. et al. How do prompts for attempts to quit smoking relate to method of quitting and quit success? Ann Behav Med. 2014 Jun;47(3):358-68. doi: 10.1007/s12160-013-9545-z
www.ncbi.nlm.nih.gov/pubmed/24046150
 - 13 US Centers for Disease Control and Prevention. Smoking and Tobacco Use. Health Effects of Secondhand Smoke
www.cdc.gov/tobacco/data_statistics/fact_sheets/secondhand_smoke/health_effects/index.htm
 - 14 US Centers for Disease Control and Prevention. Smoking and Tobacco Use. 2016 Surgeon General's Report: E cigarette Use Among Youth and Young Adults
www.cdc.gov/tobacco/data_statistics/sgr/e-cigarettes/index.htm
 - 15 Public Health England. E-cigarettes: an evidence update A report commissioned by Public Health England, 2015
www.gov.uk/government/uploads/system/uploads/attachment_data/file/457102/E-cigarettes_an_evidence_update_A_report_commissioned_by_Public_Health_England_FINAL.pdf
 - 16 Cancer Research UK. Let's beat cancer sooner (Oct 2016)
<http://scienceblog.cancerresearchuk.org/2016/10/11/the-second-biggest-preventable-cause-of-cancer-being-overweight/>
 - 17 World Health Organization. Q&A on the carcinogenicity of the consumption of red meat and processed meat (October 2015)
www.who.int/features/qa/cancer-red-meat/en/
 - 18 Cancer Research UK. About Cancer. How to enjoy a healthy diet
www.cancerresearchuk.org/about-cancer/causes-of-cancer/diet-and-cancer/how-to-enjoy-a-healthy-diet

-
- 19 Parkin DM. 7. Cancers attributable to dietary factors in the UK in 2010: IV. Salt. British Journal of Cancer. 2011;105(Suppl 2):S31-S33. doi:10.1038/bjc.2011.480
www.ncbi.nlm.nih.gov/pmc/articles/PMC3252061/
 - 20 Arnold M, Pandeya N, Byrnes G, et al. Global burden of cancer attributable to high body-mass index in 2012: a population-based study. Lancet Oncology 2015; 16(1):36-46
www.ncbi.nlm.nih.gov/pubmed/25467404
 - 21 Cancer Research UK. About Cancer. How being overweight causes cancer
www.cancerresearchuk.org/about-cancer/causes-of-cancer/bodyweight-and-cancer/how-being-overweight-causes-cancer
 - 22 Cancer Research UK. About Cancer. How alcohol causes cancer
www.cancerresearchuk.org/about-cancer/causes-of-cancer/alcohol-and-cancer/how-alcohol-causes-cancer
 - 23 World Health Organization. Ultraviolet Radiation (UV). Sunbeds
www.who.int/uv/faq/sunbeds/en/index5.html
 - 24 National Cancer Institute, Physical Activity and Cancer
www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet
 - 25 US Centers for Disease Control and Prevention, Human Papilloma Virus (HPV)
www.cdc.gov/hpv/parents/whatishpv.html
 - 26 NHS Choices. Can genital HPV infection be prevented?
www.nhs.uk/chq/Pages/2346.aspx
 - 27 US Centers for Disease Control and Prevention, HIV/AIDS, Prevention
www.cdc.gov/hiv/basics/prevention.html
 - 28 NHS Choices, HIV and AIDS - Prevention
www.nhs.uk/Conditions/HIV/Pages/Preventionpg.aspx
 - 29 World Health Organization Cancer Fact Sheet, February 2017
www.who.int/mediacentre/factsheets/fs297/en/
 - 30 World Health Organization, Cancer, Early Diagnosis
www.who.int/cancer/prevention/diagnosis-screening/en/
 - 31 US Preventive Services Task Force
www.uspreventiveservicestaskforce.org/Page/Name/home



CHAPTER 5

HOW TO REDUCE YOUR HEALTH RISKS FROM MUSCULOSKELETAL INJURY

Summary Guide

how to reduce musculoskeletal risks

☑ **GET ACTIVE!**

Include regular aerobic exercise, strength and stretching/balance exercises

☑ **BUILD UP LEVELS OF PHYSICAL ACTIVITY SLOWLY**

☑ **AVOID EXERCISE WHEN FEELING UNWELL**

☑ **ADOPT AN ERGONOMICALLY NEUTRAL POSTURE**

☑ **KEEP YOUR BACK STRAIGHT (NOT TWISTED) WHEN LIFTING**

☑ **MAINTAIN A HEALTHY WEIGHT**

which requires a balance between food intake (energy in) and exercise (energy out).

☑ **TAKE CARE TO AVOID ACCIDENTS OR FALLS
– ESPECIALLY WHEN TIRED**

☑ **STOP SMOKING**

If you are a smoker, take steps to stop and ask for help from your doctor if needed.

☑ **SIT LESS, MOVE MORE**

Reduce risks from a sedentary lifestyle.

HOW COMMON ARE MUSCULOSKELETAL INJURIES?

In professional pilots, musculoskeletal problems (those that affect the muscles, tendons, ligaments and bones) consistently rank among the most common reasons for unfitness, both temporary and long term. Low back pain is a major health risk that can result in long-term unfitness. Back pain also has the potential to create a flight safety risk due to distraction and performance decrements.

Back pain is very common in the general population. During a 3-month monitoring period in the United States, a quarter of adults experienced at least one day of back pain. (1) Fortunately, most of the time, symptoms resolve within a few days or weeks, but recurrence is common. In about 10 per cent of those affected, the back pain will become chronic (ongoing).

In a study of various occupational groups, which involved sitting for long periods, helicopter pilots were found to be the most likely to be affected by back pain. This is thought to be caused by their exposure to a combination of whole body vibration and their sitting posture, involving a forward

leaning, slightly hunched position. (2) Civilian rotary wing pilots were found to have about the same likelihood of back pain as rotary wing pilots in the military, at just over 80 per cent in a 12-month period. (3) Fixed wing pilots have lower rates of back pain — they are subjected to less whole-body vibration and have a more symmetrical and more upright sitting posture. However, all pilots, as in the general population, include back pain as a major cause of disability and discomfort.

While back pain is the single most important musculoskeletal problem in pilots, there are other types of musculoskeletal conditions that should be considered (e.g. those related to sports injuries and home-based activities).

Regular physical exercise is of clear benefit to physical and mental health, and studies have shown that overall medical costs for those in the United States are almost 30 per cent higher for people who are physically inactive than for those who are active. (4)

However, physical activity itself generates its own set of injuries, and a survey in Germany found that 3.1 per cent of all adults sustained a sports-related injury in the previous 12 months (representing 5.6 per cent of those undertaking regular physical activity).

MOST COMMON MUSCULOSKELETAL INJURIES

Back pain

10% of the population per year

Major cause of discomfort for pilots



Helicopter pilots are most affected

Domestic injuries/ accidents

3.7% of the population per year



Sports injuries

3.1% of the population per year



Of those injured, 62 per cent needed time off work and the period of occupational disability was over 14 days in one third of these cases. (5) Pilots suffering a sports-related injury might be expected to need more time off work than the general population, since the required level of fitness to fly.

In the German study, domestic/home accidents were slightly more common than sports injuries (3.7 per cent vs 3.1 per cent per year) but traffic accidents and pedestrian accidents were lower, 1.8 per cent and 0.8 per cent respectively. Overall, **the chance of sustaining some kind of injury in any year, with the potential to require time off work for recovery, is significant.**

NINE PRACTICAL WAYS TO REDUCE MUSCULOSKELETAL INJURY RISKS

1 Get active!

Include regular aerobic exercise, strength and stretching/balance exercises.

This recommendation (Get Active!) has been made in three of the four previous chapters. It is widely recognized as desirable for good health and is the single most important action that can be taken towards this goal (except, perhaps, for quitting smoking). Aim for a minimum of 150 minutes per week of moderate intensity exercise or 75 minutes per week of vigorous exercise (or a mixture of the two). An increase in physical activity below these levels is beneficial to a lesser degree.

Almost all types of aerobic exercise will improve back strength and flexibility to some extent and will therefore help reduce the likelihood of developing back pain. In one scientific review, leisure time physical activity was shown to decrease the risk of chronic low back pain by 11–16 per cent. (6) However, risk reduction for low back pain is most effective when focused on “core” muscles (see [section 'b'](#) on page 90).

As with any exercise programme, it is wise **to seek advice on appropriate exercises from a health professional before starting**, particularly if you have had a prior episode of back pain, as some exercises may not be suitable. If you have had a prior injury and are returning to activity, don't exercise beyond the onset of pain (although feeling sore immediately after exercising is normal, as long as you feel generally well, with no deterioration by the next day).

There are many exercise programmes available to improve your aerobic fitness levels. The United Kingdom NHS Choices has a programme called “Couch to 5K” designed to get non-exercisers off the couch and running 5 kilometres (or for half an hour) over a period of nine weeks: www.nhs.uk/Livewell/c25k/Pages/get-running-with-couch-to-5k.aspx

If you prefer to design your own exercise schedule, you'll find plenty of information on the web. The ideal programme combines a number of different types of exercise, such as the following five (7):

- a. Aerobic fitness** – any physical activity that uses large muscle groups and increases your heart and breathing rate. Follow the 150/75 minutes per week guideline. Such exercise will improve cardiovascular fitness. (See [Chapter 1](#) for more information on cardiovascular fitness.)

GET ACTIVE!

Including exercise in your regular routine is the most important action you can take to improve your overall health.

A GOOD EXERCISE PROGRAMME SHOULD INCLUDE:



You can also improve aerobic fitness by walking rather than taking motorized transport (e.g. get off a bus or metro a stop or two earlier than needed and walk the rest of the way; walk or cycle to the local shops for small purchases, rather than driving. Use stairs rather than an elevator or escalator).

Activities for improving aerobic fitness generally focus on leg exercises (walking, running, cycling). However, to reduce risk of musculoskeletal injury related to back problems, it is important to develop muscle strength in other parts of the body, particularly in the core (abdomen, back and pelvis).

b. Core exercises – muscles of the abdomen, lower back and pelvis need to be developed to reduce the risk of back injury. As an example, an abdominal “crunch”¹ strengthens abdominal muscles. Other exercises can strengthen the back and pelvic muscles.

c. Strength training – body weight can be used to place resistance to muscle activity in exercises such as push-ups, squats and abdominal crunches. Hand-held weights and resistance bands can be used at home, or gym facilities can be used if more extensive training is desired. For increased back protection, ensure that you include training of your core muscles in any strength-training programme (i.e. don’t just focus on arms, shoulders, chest and legs).

d. Balance training – anyone can benefit, but balance training is particularly useful with increasing age. Practising standing on one leg is one type – with your eyes closed if you find this too easy with your eyes open.

e. Flexibility and stretching – it is useful to do stretching exercises after exercise when the muscles are warmed up. Yoga exercises are particularly good at promoting improved stretching.

1

An abdominal crunch involves lying on your back with knees bent and heels a few inches from the buttocks. Bring your arms across your chest and lift your head and shoulder blades off the ground. The abdominal muscles will tense. Hold for a second then lower the upper body until the shoulders are touching the ground. The movement should be repeated to build up the abdominal muscles.

All of these five elements should be included in an exercise programme, although you do not need to include each of them in every exercise session. If you are not familiar with these kinds of exercises, you might consider enlisting a personal trainer to help you design a personalized programme. **A suitable programme for a professional pilot is one that is flexible enough to be continued during a layover, as well as at home.**

When away from home, if you stay in accommodation that has limited (or no) suitable gym or pool facilities, it is possible to devise an effective exercise session that combines aerobic exercise (e.g. brisk walking or running) with the other types of exercise mentioned without requiring any equipment and which can be done in your own room, or in an open space outside. Once the exercise basics are in place, you could set goals and monitor your improved fitness over time. The important point is to **develop an exercise regime that suits you and can become part of your routine lifestyle.**

There are several resources available on the web that can assist in helping you to develop a healthy lifestyle and monitor your progress (e.g. MyFitnessPal www.myfitnesspal.com/). If

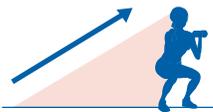
you have a “Fitbit” watch, this has a specific app for monitoring exercise. Other apps may be useful in particular circumstances (e.g. one British app helps you to find a local gym that can be used on a single occasion at a reduced cost without having to pay enrolment fees).

2 Build up levels of physical activity slowly, and warm up before undertaking sporting activities

When starting an activity or increasing your level of exertion, there is benefit to monitoring heart rate to ensure that you are not overdoing it, or not doing enough. **Depending on your age, heart rate can give an indication of how to exercise for different goals** (e.g. having goals of fat burn, or for cardiovascular fitness). For a given exercise intensity, heart rate reduces with training and, therefore, exercise level can be increased over time for a given heart rate as fitness improves. Counting steps is a good way to counter a sedentary lifestyle with an aim of at least 10,000 steps a day (over 15,000 is a good target).

Warming up refers to exercise immediately prior to undertaking an activity. However,

BUILD UP LEVELS OF EXERCISE SLOWLY



Exercise can be **increased over time** as fitness improves



Aim of at least **10,000 steps a day**
+15,000 is a good target



Depending on your age, **heart rate** can indicate how to exercise for different goals

WARM UP BEFORE EXERCISING



Warm-up activities to increase body temperature, heart rate and breathing



Follow with stretching exercises with the range of movement you will perform during the activity



5-10 minutes of warm up is enough (longer in cold weather)

proper preparation also includes consideration of the last time the intended activity was undertaken. For example, many sports have a season (e.g. skiing, tennis, sailing, golf), and if it is some months (or more) since you last participated, a graded programme of training over a number of weeks is recommended before restarting the activity.

Warm-up activities consist of increasing the body temperature, heart rate and breathing rate followed by stretching exercises that require the full range of movement that will be demanded during the activity itself. For most people, 5–10 minutes is sufficient (longer in cold weather).

Remember that a post activity cool-down period, including stretching exercises, is also important.

There is much advice on the web (e.g. [8](#)), for general guidance). Sporting associations often provide fitness-training guidelines for their specific sport. **If you are not sure how to best prepare, it is a good idea to seek advice from a trainer.**

Ideally, even if not participating in your chosen sport throughout the year, you will have kept generally active doing other exercise (in line with the 150/75 minutes per week aerobic fitness guidelines). If this is the case, preparing to start playing again will be much easier, requiring some “tuning up”.

When you do get to start playing again after a period of non-participation, begin gently and gradually build up. Don't immediately start off with the local tennis club tournament or with challenging downhill ski runs. Start with shorter periods of low-intensity activity and gradually build up. It takes time for your muscles to “remember” the complex coordination routines that sporting activities demand. **Good preparation is beneficial for everyone but becomes more important as**

you get older or when the time since you last exercised is increased.

Coaching and training guidance from a professional can be invaluable in helping to avoid injury when starting any new activity or going back after a significant break, particularly if you have changed fitness levels, body shape, (e.g. after pregnancy, or following a long period of illness or injury). Such advice will also ensure not only that you do sufficient exercise to obtain optimum benefit, but also that you do not overdo it. Signs of overtraining include trouble sleeping, joint pain, moodiness and fatigue.

In many sports, it may be possible to significantly reduce risk of injury by wearing protective equipment or by following specific protocols without detracting from your enjoyment of the sport (e.g. wearing a helmet when skiing or cycling), or by following the recommended safety requirements specific to the sport (check the web page of the relevant sports association). Consider if you can reduce the risk in your chosen sport.

Be aware of the “PRICE” method of treatment for injuries that do not require medical involvement: sprains/strains for example. This will limit swelling and start healing earlier. The letters stand for: protection, rest, ice, compression and elevation. More information is available on the web at: www.nhs.uk/Conditions/Sports-injuries/Pages/Treatment.aspx. In the case of such minor injuries, it is recommended to seek medical advice if there is no improvement after two or three days.

3 Avoid exercise when feeling unwell

There are likely to be no ill effects from exercise when you are suffering from a

Signs you should cut back or avoid exercising

You feel more fatigued than usual after exercise

You are more aware of your heartbeat than usual after exercise

You have a chest or lower respiratory infection

Your body temperature is above 38C/100.44 F



common cold, with the caveat that **if you feel different from usual afterwards (e.g. more fatigued, more aware of your heartbeat), this is an indication to cut back on your exercise level or to stop exercising for a few days.** Often, your own body will give you the information you need to decide if you can exercise or not. If you feel miserable, it is a good idea to wait until you feel better.

There is also a difference between a common cold, with symptoms restricted to the head and neck, and symptoms in the rest of the body. Whereas a common cold, an upper respiratory infection, may have little effect, a chest infection, a lower respiratory infection, is different. For the latter, take a rest. Also, **if your body temperature is raised (if you have a temperature above 38°C/100.4°F) do not exercise.** Exercise increases body temperature and your body may find it difficult to cope with the extra heat load. If you are not sure, monitor your heart rate — if it is more than 10 bpm above normal for a given level of exercise, wait until you are back to normal.

4 Adopt an ergonomically neutral posture

An ergonomically neutral posture is one in which the body is aligned and balanced, thereby placing minimal stress on the joints, muscles and tendons. It is one in which the joints are maintained near the middle of their normal range. It is important to consider this for all activities, but since we spend a great deal of time sitting, this activity is considered in more detail below.

When sitting, compared to standing, the forward curve in the lumbar region at the bottom of the spine, the “lordosis”, is reduced, and low back muscle activity and pressure inside the intervertebral discs (the shock absorbers between each of the bones in your spine) is raised, which tends to increase the risk of low back pain. As a professional pilot, you have no control over the seat you sit in. However, you should adjust it as best you can so that it conforms to the best settings for your back and comfort. Make the following adjustments as necessary:

Adjust the height so that your knees are slightly lower than your hips, and when not manually flying, rest your feet on the floor. If you use a computer on the flight deck (or at home), if you are able, try to arrange things so your forearms and wrists are level with the floor. Rest your wrists on the front of the table. Keep your elbows at your sides.



If you wear spectacles, ensure you have the appropriate lenses so that reading the screens is easy, day and night and you don't need to unnecessarily bend your neck in order to see the instruments properly. You may need to take some measurements (from your eye to the instruments) and discuss the best option with your eye specialist.

For those who have developed back pain, some pilots report a benefit from using a lumbar support. Even a rolled-up blanket has been shown to be of some benefit.

(9) An inflatable lumbar support has the advantage of being easily adjustable, although it is not likely to be practicable on the flight deck unless it can be used for a good length of time in the cruise portion of flight (due to pressure changes when climbing/descending).

A specially moulded support that is specifically designed for your size and shape may be more helpful. Seek advice from your medical examiner or family doctor as to whether an in-flight support may be useful in your case, and if so, where you can obtain information on acquiring one.

5 Keep your back straight and not twisted when lifting

As with sitting, aim to adopt an ergonomically neutral posture when lifting. The basic requirements are reproduced below. They are based on the British website "NHS Choices". (10)

- Whether you are at work or at home, think about how to protect your back. Lifting a weight when the spine is twisted can cause back problems (e.g. placing or lifting your flying bag next to your seat on the flight deck while leaning over and twisting the spine). Where possible,

keep your bags light, use rolling bags for those that don't need to be lifted off the ground and use a back pack when they do. Avoid heavy bags that are mainly supported by one shoulder.

- If you need to lift a heavy weight, plan ahead. Get assistance, or use a lifting aid where appropriate. Ensure you have a safe path and factor in a change of grip during the process, if necessary.
- Keep the heaviest part of the load closest to the body. If appropriate, move the load to bring it closer to the body before lifting.
- When lifting, adopt a stable position, one foot slightly forward and alongside the load, if it is on the floor, to maintain balance. Be ready to move your feet to maintain balance — wear suitable footwear (do not wear slippers or high heels, or go barefoot, for example).
- Ensure a good hold on the load. You may need to raise the load a few centimetres in order to get your fingers under the bottom of the load — but think about how you will put the load down at the end of the lift without crushing your fingers.
- Avoid stooping (bending your knees), or bending backwards. Check to ensure



you don't bend forward any more when starting to lift.

- Don't twist the spine when lifting. Keep the shoulders in line with the hips. Move your feet to turn your whole body.
- Look ahead and move smoothly.
- Know your limits. Stay within them.

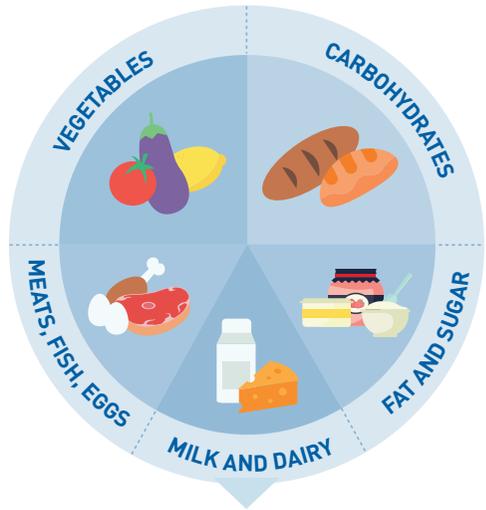
The following are some symptoms to specifically watch out for if you suffer from back pain:

- numbness/tingling in the buttocks or genital area
- difficulty passing urine
- loss of bladder or bowel control
- chest pain
- body temperature above 38°C/100.4°F
- unexplained weight loss
- spinal deformity
- swelling in the back.

If there's no improvement with rest and symptoms become worse at night, or symptoms started after a serious accident, seek medical attention urgently.

6 Maintain a healthy weight

Being overweight or obese is associated with increased risk of developing musculoskeletal problems as it increases the stress on muscles and joints, particularly in the legs (although recent evidence indicates that back pain per se is not more likely). ⁽¹⁾ **The overweight/obese have more occurrences of musculoskeletal symptoms and take longer to recover from such episodes.** However, health and nutrition are not only about maintaining a body mass index within the normal range. A suitable balance of nutrients is also needed for good health. Being underweight can also be associated with health problems. See [Chapter 6](#) for tips on managing your diet and weight.



A suitable **balance of nutrients** is needed to keep your good health.

7 Take care to avoid accidents or falls

The home is where accidents are most likely to occur and there are many websites which provide guidance on reducing risk (e.g. UK Royal Society for the Prevention of Accidents www.rospa.com/ and the US Centers for Disease Control and Prevention www.cdc.gov/homeandrecreationalafety/index.html).

Use of ladders is worthy of special mention.

Home accidents	Accidents from driving
are the most likely to occur	are a big risk for pilots
	
<ul style="list-style-type: none"> • Always keep 3 points of contact • Keep your body near the centre of the ladder • Face the ladder when climbing 	<ul style="list-style-type: none"> • Be very careful when driving fatigued • Consider taking a nap before driving • Don't drink alcohol before driving

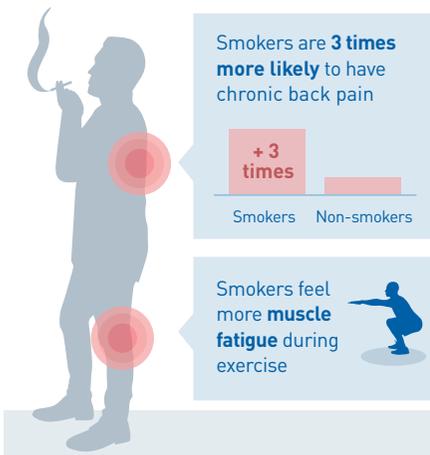
A study in the US demonstrated that, over a 16-year period, 1990–2005, 136,118 ladder injuries were treated annually in emergency rooms, almost 50 per 100,000 population. Of these, 97.3 per cent occurred in non-occupational settings. (12)

Before using a ladder, make sure you understand the risks and know how to use it safely. **Always maintain three points of contact (two hands and a foot or two feet and a hand), keep your body near the centre of the ladder, and face the ladder when climbing.**

Accidents from driving are also important health risks for pilots. Be particularly careful when driving when fatigued (e.g. driving home after an overnight flight, or driving to work in the early hours). It may be prudent to take a nap before driving, or sleep near the airport prior to a flight when the alternative is to drive when tired. Consider taking an advanced driving skills course. Don't drink alcohol before driving.

8 Stop smoking

Recent evidence shows that **smokers are three times more likely than non-smokers**



to develop chronic (ongoing) back pain. (13) However, there is little evidence that stopping smoking relieves back pain (for those who already have it). Muscle fatigue during exercise is also reported as being increased by smoking.

9 Sit less, move more - reduce risks from a sedentary lifestyle

In recent years, it has emerged that **reducing the amount of time spent in sedentary activities may also have health benefits**, independent of the amount of moderate to vigorous physical activity (MVPA) undertaken. (14, 15) Sedentary time involves activities sitting (including during travel), lying down or viewing a TV or computer screen.

Studies have shown that increased sedentary time is associated with an increased risk of cardiovascular disease, cancer and Type 2 diabetes.

Average adults in the US spend almost eight hours per day undertaking sedentary activities. It appears that a reduction of this time by a small percentage, even by less than 10 per cent, could have a positive health benefit. Replacing sedentary activity with light exercise (e.g. standing, walking, cooking) appears to have useful health advantages. This shows that **there are benefits to exercise that does not involve going to the gym or playing a sport.**

The American Heart Association believes that while there is evidence to suggest that sedentary behaviour could contribute to ill health, there is not yet sufficient evidence to provide specific preventive guidelines. However, the evidence is strong enough for the general recommendation of **“Sit Less, Move More”.** (15)

The following, more detailed guidance is based on information from the British Heart Foundation: (16)

- **Avoid looking at a computer screen for long periods.**
On a turnaround, take a brief walk for a couple of minutes even if you are not doing the external check. At home, take a brief walk away from your computer screen or TV every 20 - 60 minutes.
- **When flying (and when feasible), stand for short periods instead of sitting.**
Take opportunities to stand or walk, even if only for short distances, during flight. When on the ground, try standing for a short period while watching television, while at your computer, while on the phone or while in meetings, when the opportunity arises.
- **Stand up when undertaking activities that are normally undertaken when seated.**
If your job involves office work as well as flying, walk over to colleagues instead of emailing or phoning them.

- **Choose an activity rather than sitting or lying.**

For example, consider going for a walk or playing with your children.

- **Limit time spent being sedentary.**

Consider limiting time spent watching television. Reduce time spent sitting at your computer.

ADDITIONAL INFORMATION

Active Ageing

WHO has set forth the concept of “Active Ageing”, which it describes as “the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age”. Active ageing is a lifelong process that maintains functional capacity throughout life, not something to be applied only in later life (see [Figure 4](#), on page 98).

REDUCE THE RISKS FROM A SEDENTARY LIFE

Average adults in the US spend almost 8 hours a day on sedentary activities. Reducing this time by 10% could have a positive effect on health.



Avoid looking at a computer screen for long periods. Take a break every 20-60 minutes



Choose an activity rather than sitting or lying



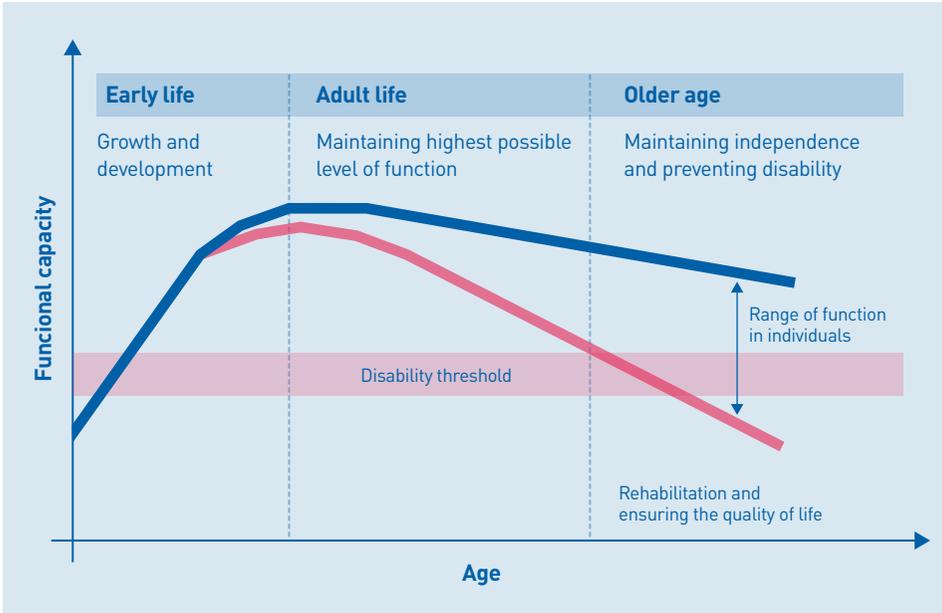
During flight, try to stand or walk, if only for short distances



Try to stand up when undertaking activities that are normally done while sitting

Figure 4. Active Ageing

Maintaining functional capacity throughout life. The blue line represents those with increased functional capacity (increased muscular strength and cardiac output) in comparison with those without such capacity (orange line) (17)



After early adulthood, functional capacity (muscular strength and cardiac output) declines with increasing age at a rate that is, in part, determined by lifestyle factors. The decline may be slowed or even reversed by lifestyle adjustments.

Preventing low back pain

In 2016, a major review of the literature concerning prevention of low back pain concluded that exercise — either alone or in combination with education on how to avoid it — is effective for preventing low back pain. Education alone, back belts and shoe insoles did not appear to be effective. (18)

AVIATION CONCERNS

The ICAO guide on the format for a periodic medical examination of the musculoskeletal system advises the examiner to note the “range of movements, abnormalities of joints”. The aim, as with other systems, is to identify any issues that may have a detrimental effect on flight safety.

Problems with the musculoskeletal system are not likely to result in a sudden incapacitation: rather the issues usually concern restriction of movement, lack of power, or pain sufficient to cause distraction. When there is doubt concerning functionality, a “medical flight test” may be undertaken to check the abilities on the aircraft. Further guidance is available from the ICAO Manual of Civil Aviation Medicine. (19)

References

- 1 National Institute of Arthritis and Musculoskeletal and Skin Diseases. Back pain
www.niams.nih.gov/Health_Info/Back_Pain/default.asp
- 2 Lis AM, Black KM, Korn H, Nordin M. Association between sitting and occupational Low Back Pain. *European Spine Journal* 2007;16(2):283-298. doi:10.1007/s00586-006-0143-7
www.ncbi.nlm.nih.gov/pmc/articles/PMC2200681/
- 3 Cunningham LK, Docherty S, Tyler AW. Prevalence of low back pain (LBP) in rotary wing aviation pilots. *Aviat Space Environ Med.* 2010 Aug;81(8):774-8
www.ncbi.nlm.nih.gov/pubmed/20681238
- 4 Carlson SA, Fulton JE, Pratt M, Yang Z, Adams EK. Inadequate physical activity and health care expenditures in the United States. *Progress in Cardiovascular Diseases* 2015; 57; 315–323
www.cdc.gov/nccdphp/dnpao/docs/carlson-physical-activity-and-healthcare-expenditures-final-508tagged.pdf
- 5 Schneider S, Seither B, Tönges S, Schmitt H. Sports injuries: population based representative data on incidence, diagnosis, sequelae, and high risk groups. *Br J Sports Med* 2006;40:334–339. doi: 10.1136/bjsm.2005.022889
www.ncbi.nlm.nih.gov/pmc/articles/PMC2586164/pdf/334.pdf
- 6 Shiri R, Falah-Hassani K. Does leisure time physical activity protect against low back pain? Systematic review and meta-analysis of 36 prospective cohort studies. *Br J Sports Med.* Published online: 14 June 2017. doi: 10.1136/bjsports-2016-097352
<http://bjsm.bmj.com/content/51/19/1410>
- 7 Mayo Clinic, Healthy Lifestyle, Fitness, Fitness Training: elements of a well-rounded routine
www.mayoclinic.org/healthy-lifestyle/fitness/in-depth/fitness-training/art-20044792?pg=1
- 8 Australian Sports Commission, The warm up and cool down
www.ausport.gov.au/participating/coaches/tools/the_training_session
- 9 Bridger RS, Groom MR, Jones HT, Pethybridge RJ, Pullinger N., Task and postural factors are related to back pain in helicopter pilots. *Aviat Space Environ Med* 2002; 73:805-11
<http://europepmc.org/abstract/med/12182222>
- 10 NHS Choices, safe lifting tips
www.nhs.uk/livewell/workplacehealth/pages/safe-lifting-tips.aspx

- 11 Laura Viester, Evert ALM Verhagen, Karen M Oude Hengel, Lando LJ Koppes , Allard J van der BeekI, and Paulien M Bongers. The relation between body mass index and musculoskeletal symptoms in the working population. BMC Musculoskeletal Disorders 2013, 14:238
www.ncbi.nlm.nih.gov/pmc/articles/PMC3751130/
- 12 Viester L, Verhagen EA, Hengel KMO, Koppes LL, van der Beek AJ, Bongers PM. The relation between body mass index and musculoskeletal symptoms in the working population. BMC Musculoskeletal Disorders. 2013;14:238. doi:10.1186/1471-2474-14-238
[www.ajpmonline.org/article/S0749-3797\(07\)00041-4/fulltext](http://www.ajpmonline.org/article/S0749-3797(07)00041-4/fulltext)
- 13 Petre B, Torbey S, Griffith JW etal. Smoking increases risk of pain chronification through shared corticostriatal circuitry Human Brain Mapping 2015;36:683–694
<http://onlinelibrary.wiley.com/doi/10.1002/hbm.22656/full>
- 14 Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults – a systematic review and meta-analysis. Biswas A, Oh PI, Faulkner GE, Bajaj RR, et al. Ann Intern Med. 2015;162:123-132. doi:10.7326/M14-1651
[www.unm.edu/~lkravitz/Sports Physiology/SedentaryLifestyle.pdf](http://www.unm.edu/~lkravitz/Sports%20Physiology/SedentaryLifestyle.pdf)
- 15 Young D, Hivert M-F, Alhassan S, et al. Sedentary behavior and cardiovascular morbidity and mortality. A science advisory from the American Heart Association. Circulation. 2016; 136;(23)
<http://circ.ahajournals.org/content/early/2016/08/12/CIR.0000000000000440>
- 16 British Heart Foundation. 5 tips for reducing sedentary behaviour
www.bhf.org.uk/heart-matters-magazine/activity/sitting-down/5-tips-for-reducing-sedentary-behaviour
- 17 World Health Organization. WHO Global Report on Falls Prevention in Older Age, 2007
www.who.int/ageing/publications/Falls_prevention7March.pdf
- 18 Steffens D, Maher CG, Pereira LSM, et al. Prevention of low back pain. A systematic review and meta-analysis. JAMA Intern Med. 2016;176(2):199-208. doi:10.1001/jamainternmed.2015.7431
<http://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2481158>
- 19 ICAO Manual of Civil Aviation Medicine, Doc 8984, 2012, Part I, Chapter 2, I-2-15 and Part III, Chapter 8
www.icao.int/publications/Documents/8984_cons_en.pdf



CHAPTER 6

NUTRITION AND WEIGHT MANAGEMENT

Summary Guide

of ways to maintain good nutrition and successfully manage body weight

✔ **CONSUME THE NUMBER OF CALORIES REQUIRED**

to obtain and maintain a healthy weight.

✔ **MINIMIZE INTAKE OF FOOD WITH HIGH REFINED SUGAR CONTENT**

(e.g. biscuits/cookies, sweets/candy, cakes, sugary soft drinks and ice cream).

✔ **EAT A BALANCED DIET**

Most calories should be derived from a mixture of fresh fruits and vegetables, whole grains, legumes (e.g. beans, peas, lentils), nuts and lean protein. Fibre is also important.

✔ **REDUCE SALT (SODIUM CHLORIDE) INTAKE**

less than 5–6 g (one teaspoon) per day (equivalent to 2–2.4 g sodium per day)

✔ **MAKE HEALTHY CHOICES WHEN EATING AWAY FROM HOME**

✔ **TAKE AN INTEREST IN READING AND UNDERSTANDING FOOD LABELS**

✔ **LOWER YOUR RISK OF DEVELOPING TYPE 2 DIABETES**

THE IMPORTANCE OF NUTRITION AND WEIGHT MANAGEMENT IN AVIATION

The World Health Organization states that “noncommunicable diseases” (NCDs) (i.e. those that are not infectious), account for 40 million deaths globally per year. The most common of these is cardiovascular (causing 17.7 million deaths per year); followed by cancers (8.8 million), respiratory diseases (3.9 million) and diabetes (1.6 million). These four groups comprise the majority (over 80 per cent) of all premature deaths from noncommunicable diseases.

The main health risks arise from: exposure to tobacco smoke, physical inactivity, harmful use of alcohol and unhealthy diets. (1) Earlier chapters in this guide addressed the first three of these risks. This chapter will consider the fourth, dealing with a healthy diet and its close associate, a healthy weight. Since Type 2 diabetes is also linked to diet and weight, it will also be considered in this chapter. **Diabetes is among the top ten diseases that cause long-term unfitness in professional pilots.** (See [Table 2, page 13](#))

SEVEN WAYS TO MAINTAIN GOOD NUTRITION AND SUCCESSFULLY MANAGE BODY WEIGHT

- 1 **Consume the number of calories required to obtain and maintain a healthy weight**

Body Mass Index

Being aware of the number of calories in your diet is a major step towards successful

Table 5. Body Mass Index (BMI) classification

BMI CLASSIFICATION	
Underweight	< 18.5
Normal range	18.5-24.9
Overweight	≥ 25.0
Obese	≥ 30.0

weight management and minimizing your risk of developing Type 2 diabetes.

Overweight and obesity can be monitored by the Body Mass Index (BMI). Your BMI is calculated from your body weight in kilograms divided by the square of your height in metres (kg/m^2). For example, the BMI of a person 1.8 metres tall (about five feet 11 inches) whose weight is 75 kg would be $75/1.8^2 = 75/3.24 = 23.1$, which is within the normal range. (see Table 5 above.)

Most regulatory authorities do not set an upper limit on BMI for professional pilots. However, **medical certification difficulties can arise for those who develop health problems related to raised BMI (e.g. diabetes, cardiovascular disease and certain cancers).**

The BMI is a convenient way of roughly determining your weight category. However, although widely used, it has some limitations in determining normal body weight (e.g. if you frequently undertake strength training, you are likely to have a high muscle mass with a relatively low percentage of body fat). This may give an erroneously high BMI (especially as muscle weighs about 15 per cent more per unit volume than fat). To address this and other limitations, **another measurement of body fat content has been developed, the “waist/hip ratio”,** which is the circumference around the abdomen divided by the circumference around the buttocks.

The lower the ratio the better. This measurement provides an indication of fat distribution, which is important because those who carry fat around the waist and abdomen have an increased risk of cardiovascular disease in comparison with those who tend to store fat primarily around the buttocks and thighs. More information on waist/hip ratios, including calculators, is available on the web.

The body can be considered similar to a combustion engine. In an engine, fuel enters the engine, air (containing oxygen) is added and energy and heat are produced in a combustion process, with carbon dioxide being a waste product. The body works in a similar way — fuel (food) reacts with oxygen in the body’s cells to produce energy and heat, with carbon dioxide being expelled from the lungs.

In an engine, if too much fuel is added, it is simply not burned. **With the body, excess fuel (excess calories) in the diet is converted into fat, which is stored. Therefore, weight increases.** On the other hand, if more energy is expended than food energy is consumed, this stored body fat is used to provide energy, and weight decreases. This is the principle behind all weight loss programmes.

Energy from food and drink is measured in kilocalories (kcal). However, the “kilo” is often dropped so we talk (strictly speaking, incorrectly) about “calories” when we mean kilocalories. **When you read about “calories” on food labels, it will be referring to “kilocalories”.** Sometimes a kilocalorie is written “Calorie” (with a capital “c”). In some countries, you may see a different unit used: the kilojoule (kJ). There are 4.2 kilocalories in one kJ.

There are about 3,500 kcal contained in one pound (450g) of body fat. As a rough guide, eating 140 kcal per day more than required (equivalent to two digestive wheat biscuits/cookies) could result in a weight increase of 140/3,500 pounds per day, or $365 \times 140/3,500 = 14.6$ pounds (6.6 kg) in a year. This calculation can be affected by several variables, but the principle is **that a relatively small daily excess of calorie intake over calories expended can, over a period measured in years, result in significant weight gain.**

When the intention is to lose weight, a similar calculation can be made — eat 140 kcal per day less than is required and lose 14.6 pounds

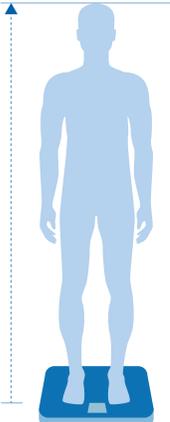
BODY MASS INDEX (BMI)

Body weight in kilograms

Height (in metres)²

Although widely used, it has some limitations

Alternative measurement: **“waist/hip ratio”**



Health problems related to raised BMI:



Diabetes



Cardiovascular disease



Certain types of cancer

 **Pilots need to keep a healthy weight for safety reasons (escape in an emergency)**



in a year. However, this calculation is not exact and is also affected by a number of factors.

It is not very difficult to increase energy output by 140 kcal per day — e.g. 30 minutes of walking at an average pace. This is why weight management is more effective if a balanced diet is supplemented by regular exercise (which also has benefits in addition to helping to lose weight, as discussed in other chapters of this guide).

Water loss from the body in the early weeks of dieting is greater than later on — especially in a low carbohydrate (carb) diet, because the body breaks down stored carbohydrate to compensate for a low intake, and carbohydrate is chemically bound with water. As stored carbohydrate is used for energy, the water that is chemically bound to it is released and is passed out of the body in urine, causing weight loss. This effect diminishes over time as carbohydrate stores in the body are depleted. Returning to an increased intake of carbohydrate would result in an increase in weight, even if the same number of calories are consumed because carbohydrate (and associated water) stores are replenished. This is why (along with good initial motivation) advertisements for weight loss diets are keen to emphasize that their particular method promotes early weight loss.

The faster weight is lost, the more likely it is that muscle is broken down to provide energy (as well as fat and carbohydrate). This is something to be avoided, hence the advice to **reduce weight gradually and make sure that enough nutrients are eaten to stay healthy.**

As for the so-called “yo-yo” diets, or “weight cycling” (the repeated loss and regain of body weight), there is some evidence that this kind of dieting may be detrimental to health, increasing the risk of conditions such

as high blood pressure and depression. Experts agree that the best way to lose weight, if required, is to **adopt a lifestyle of diet and exercise that results in a modest weight loss: 1–2 pounds (approximately 0.5–1 kg) per week, which can be sustained over a period long enough to reach the desired weight, and which does not need to be greatly modified when this is achieved.**

There are thousands of books and other information sources on healthy diets and how to lose weight. As US Centers for Disease Control and Prevention say on their website:

“Healthy weight loss isn’t about a ‘diet’ or ‘programme’. It’s about lifestyle changes in daily eating and exercise habits.” (2)

Despite the advertising hype, there is no “quick fix”. If you wish to lose weight, follow the guidelines from reputable sources (e.g. public health authorities). They will often have recommended guidelines for weight loss on their websites:

United Kingdom: www.nhs.uk/livewell/loseweight/Pages/Loseweighthome.aspx

United States: www.cdc.gov/healthyweight/index.html

While overweight is a major public health challenge, underweight can also be a problem. According to the Centers for Disease Control and Prevention, it affects about 1.7 per cent of adults in the United States. More common in women than men, the causes of underweight are varied, including an inadequate diet, excessive exercise and certain medical conditions. If you are underweight or overweight, discuss this with your doctor to see what corrective action might be needed.

Obstructive sleep apnoea (repeated pauses in breathing during sleep, typically lasting 20–40 seconds caused by a temporary collapse of the upper airway) **is strongly associated with overweight/**

obesity and/or with a neck size of 17 inches/43.2 cm or more (in men) or 16 inches/40.6 cm (in women), although not all patients with sleep apnoea are overweight.

It is more common in snorers and is a risk factor for a number of diseases (mainly cardiovascular and diabetes) but, importantly for pilots, **it is also a major risk factor for fatigue**. This is because the apnoea episodes (breathing pauses) result in repeated awakening. Sleep is disturbed and fatigue is the result.

Losing weight is one way of treating sleep apnoea, but there are others which are also effective and can usually be undertaken without any long-term adverse effect on medical certification. You can self-test your level of daytime sleepiness using a scale (see [Chapter 7](#) for more information).

2 Minimize intake of food with high refined sugar content (e.g. biscuits/cookies, sweets/candy, cakes, sugary soft drinks and ice cream)

These foods are often high in fat and salt as well as refined sugar (called “simple carbohydrates”) and are not needed in a healthy balanced diet. The organization Diabetes.co.uk states that rather than cutting out fat or saturated fat from the diet, it is far better to remove refined sugar as part of a strategy for managing weight. (3)

The difference between “simple” and “complex” carbohydrates:

- **Simple carbohydrates** are found in some naturally occurring foods but most are added as sweeteners to the diet. Such added sugars are often described as providing “empty calories” since they provide calories, but have little other

CARBOHYDRATES	
<p>SIMPLE </p> <p>Most are added as sweeteners to the diet</p> <p>Tend to cause rapidly rising blood sugar levels, which peak and fall back</p> <p>Provide calories, but have little nutritional value</p> <p> TRY TO REDUCE THE INTAKE</p>	<p>COMPLEX </p> <p>Found in food that has more nutrients</p> <p>Digested more slowly</p> <p>=more filling</p> <p>Help maintain steady blood sugar levels</p> <p> TRY TO INCREASE THE INTAKE</p>

nutritional value. **They tend to cause rapidly rising blood sugar levels** which peak and then fall back as insulin production is increased and the sugar is taken out of the blood and into cells.

- **Complex carbohydrates** are found in food that has more nutrients. They are digested more slowly, which makes them more filling and therefore a good option to help with weight management. **Their relatively slow digestion helps maintain steady blood sugar levels.** When possible, while maintaining an overall intake of one third of the diet from carbohydrate, try to increase the intake of complex carbohydrates (e.g. potatoes, bread, rice, pasta) and reduce the intake of simple carbohydrates, particularly added sugar.

The “glycaemic index” (GI) provides guidance on different foods and the extent to which they increase the blood sugar level after consumption. Foods with a high GI are carbohydrates that are digested and absorbed rapidly, causing a sharp rise in blood sugar level and in insulin secretion.

Adopting a diet that results in smaller fluctuations in blood sugar levels reduces the risk of developing Type 2 diabetes.

3 Eat a balanced diet

A balanced diet contains a wide variety of different foods with the optimum ratio of protein, fat and carbohydrate, and an adequate amount of vitamins and minerals. It is important both for maintaining good health and for feeling good. **Benefits to physical health from a good diet have been widely recognized for some time**, but a relatively new subject of nutritional psychiatry is developing that shows that a healthy diet can help prevent certain psychiatric illnesses, especially depression, and may also be used to treat such conditions. See section "[Additional Information](#)" on page 115 for further information.

The method of cooking can affect the content of cooked food, especially for vitamins and minerals that tend to be concentrated in fruit and vegetables. In general, to reduce loss, minimize the cooking time and the amount of water used, and use the lowest feasible cooking temperature. With this in mind, methods that are useful include microwaving (very short cooking time and requires little or no

added water), steaming (liquid within the food itself helps the cooking process) and stir frying (short cooking time). Note that pre-prepared food often contains a high salt and sugar content to help preserve the food, as well as preservatives themselves.

In general, most people do not appear to eat a balanced diet. See Figure 5 below (United States data).

Food Groups

There are five different groups of food, discussed below, based on UK government recommendations:

◆ Group 1 | Fruit and vegetables:

This group should comprise at least one third of our food. **Eat at least 400 g (i.e. five portions of 80 g) of a variety of fruit and vegetables every day. This reduces the risk of heart disease, stroke and some cancers.** In the UK, fewer than one in three adults are thought to meet the target of 400 g per day. If you

Food group or dietary component

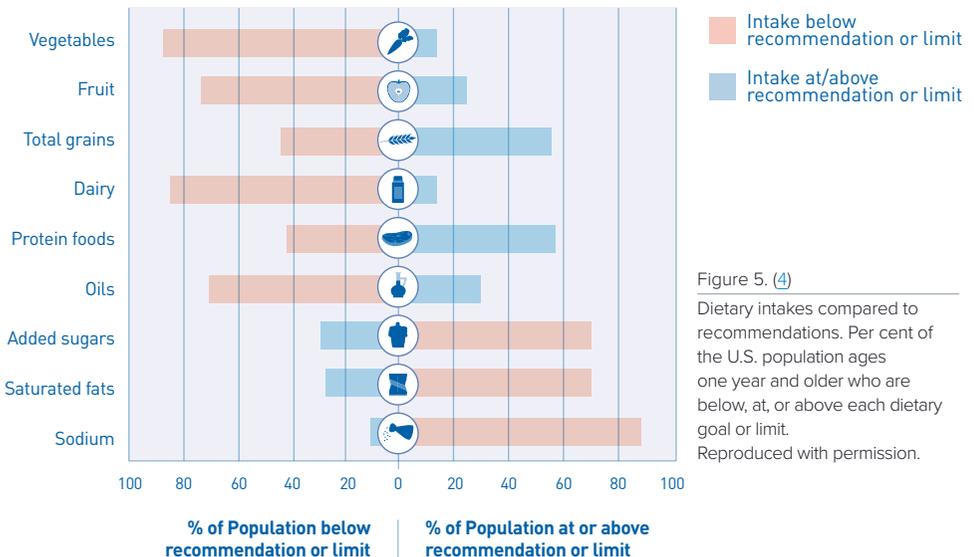


Figure 5. (4) Dietary intakes compared to recommendations. Per cent of the U.S. population ages one year and older who are below, at, or above each dietary goal or limit. Reproduced with permission.

can eat ten portions per day, the benefit is significantly increased. If you do not do so already, **eat some fruit and/or vegetables at every meal.**

The fruit and vegetables can be fresh, frozen, tinned, dried or juiced. However, fresh or frozen products are preferable as they contain fewer additives. Vegetables are favoured over fruit as fruit-based products (including fruit juices and smoothies) contain more calories.

One “portion” is:

- 80 g of fresh, canned or frozen fruit and vegetables
- 30 g of dried fruit
- 150 ml fruit juice, vegetable juice or smoothie
- 80 g beans and pulses — these only count as one portion (even if you consume more than 80 g) because they contain fewer nutrients than other fruit and vegetables.

A review published in 2017 compared the benefits of eating 200 g and 800 g of fruit and vegetables daily.

This is clearly illustrated in Table 6 below.

◆ **Group 2 | Potatoes, bread, rice, pasta and other starchy (“complex”) carbohydrate:**

This group is a good source of energy, fibre, calcium, iron and B vitamins. As with

the fruit and vegetables food group, this group should also account for at least one third of your daily food intake. Choose whole grain (grain that is in its natural state, not “refined”) or higher fibre options, with less added fat, salt and sugar.

There are three types of carbohydrate (“carbs”): sugar (simple carbohydrate), starch (complex carbohydrate) and fibre.

- **Refined sugar** is found in candy/ sweets, cakes, biscuits/cookies, chocolates, pastries and sugary soft drinks and can lead to weight gain and tooth decay. **Try to reduce or cut out such sugar intake** (see “[glycaemic index](#)” on page 106).
- **Starch** is a carbohydrate made up of sugar molecules linked together — starch is a “complex” carbohydrate. It provides a steady and relatively slow (compared to simple carbohydrates) release of energy and a reduced increase in blood sugar level, which is beneficial. **Starchy carbohydrate should make up at least one third of the diet.**
- **Fibre** is a carbohydrate that cannot be digested and therefore provides no calories (although there is some dispute about this). It helps prevent heart disease, diabetes, some cancers and can improve digestive health. It helps reduce weight because it encourages a “full” feeling. **Most people do not eat enough fibre.** Aim for at least 30 g per day. The amount

Table 6. Benefits of Eating Fruits and Vegetables Daily

DISEASE CATEGORY	RISK REDUCTION	
	2.5 PORTIONS PER DAY (200G)	10 PORTIONS PER DAY (800 G)
Heart disease	16%	24%
Cardiovascular disease	13%	28%
Stroke	18%	33%
All cancers	4%	13%
Premature death	15%	31%

of fibre varies greatly between foods but some examples are:

- › 200 g baked beans — 9.8 g
- › Small handful of nuts — 3 g
- › Apple — 1.2 g
- › Portion of whole grain rice — 2.8 g.

◆ **Group 3 | Beans, pulses** (e.g. beans, lentils, chickpeas – edible seeds that grow in a pod), **fish, eggs, meat and other proteins:**

In general, eat more beans and pulses and less red and processed meat. **Aim for two portions (140 g/4.9 oz per portion) of fish per week, one of which is oily (e.g. salmon, fresh tuna, herring).**

This group supplies protein, necessary for the body to grow and repair itself as well as B vitamins and minerals such as iron and zinc.

- Eat lean cuts of meat and skinless poultry to cut down on fat (which is high in calories).
- **Red meat and processed meat increase the risk of bowel cancer. So, as a primary source of dietary protein, use other foods in this group.**
- Cook food from animals thoroughly (to kill any bacteria or viruses that may be lurking in the raw product) but avoid charring or burning meat as there is evidence this can increase cancer risks.
- Oily fish contains omega-3 fatty acids, which are good for the heart. However, oily fish can contain low levels of pollutants that can accumulate in the body over time — hence the recommendation to restrict oily fish to just one portion per week.
- Shellfish (e.g. prawns/shrimps, mussels, scallops, squid, langoustine) are low in fat, and a good source of minerals (e.g. zinc, copper). They also contain omega-3 fatty acids (although less than oily fish).

◆ **Group 4 | Dairy and alternatives:**

These are good sources of calcium (keeps bones healthy) and protein.

- Dairy products can contain a lot of fat (high in calories). **Choose lower fat varieties where possible but be careful to keep total sugar down.** Low fat foods may have high concentrations of refined sugar. If you tend to have a high sugar diet, it may be better to eat high fat products but in smaller quantities, in order to reduce the sugar load.
- Cheeses are usually high in fat (e.g. over 17.5 g fat per 100 g cheese) and may also be high in salt (e.g. over 1.5 g salt/0.6 g sodium per 100 g cheese).
- Soya-based products (milk, yoghurt, cheese) are good alternatives to dairy products. Soya products contain fewer calories, less fat and protein but more complex (good) carbohydrate than dairy equivalents.

◆ **Group 5 | Oils and spreads:**

Choose mono- and polyunsaturated oils.

- “Trans” fat adversely affects cholesterol levels, raising LDL cholesterol (“bad” cholesterol) and decreasing HDL cholesterol (“good” cholesterol). This increases cardiovascular risk. Trans fats are disappearing from food products due to health concerns about them. **Avoid “trans” fats completely.**
- While advice to avoid trans fats is consistent in the scientific literature, guidance concerning saturated fat is more controversial. However, current standard dietary guidance is that most people eat too much saturated fat and therefore increase their risk of heart disease and stroke and they should **try to cut back on saturated fats.**
- Mono- and polyunsaturated fats are plentiful in the Mediterranean diet which is linked to good cardiovascular health. They are liquids at room temperature. **Choose mono- and polyunsaturated fats, rather than trans or saturated fats, when possible.**



- Try to replace foods high in saturated fat (e.g. fatty cuts of meat and processed meat, butter, cream, hard cheeses, cakes and biscuits/cookies) with food containing unsaturated fat (e.g. oily fish, nuts, seeds, avocados, vegetable oils and spreads). **Use any fat sparingly**, however, because of its high calorie value (which is more than twice that of carbohydrate or protein).

◆ **Other components of a balanced diet:**

Drink sufficient fluids. Most people adequately meet their requirements for fluid intake by following their thirst demands (note that about 20 per cent of water intake is derived from food) but physical activity and exposure to warmer climates increase requirements. Recommendations for daily fluid intake vary widely between countries but the urine colour can help. Pale yellow urine

is normal and indicates an adequate fluid intake. **Dark yellow or brown urine usually indicates too little fluid intake.**

Note that cabin air in aircraft flying at high altitudes is dry. Most people are comfortable with a relative humidity of 40–60 per cent, while air in a pressurized aircraft cabin can drop to 20 per cent relative humidity or less. Although this does not result in dehydration (a medical condition), it can give rise to symptoms of dry eyes, dry throat and nose, which may cause discomfort. **Maintaining a normal or increased fluid intake during flight can help reduce any discomfort from dry air.** Note that caffeine containing drinks cause an increase in urination and fluid loss, so caffeine-free drinks are better from this viewpoint.

Check the calorific value of drinks. It is relatively easy to consume more calories than intended from drinks (e.g. smoothies,

fruit juices, specialty coffees, sugary soft drinks often have a very high calorific value). Note that beer and wine are relatively high in calories. Weight for weight, alcohol contains more calories than carbohydrate or protein (but less than fat).¹ Alcoholic drinks may also contain a lot of sugar.

In addition to alcohol being relatively calorie dense, it also stimulates the appetite (an alcoholic aperitif prior to a meal has been a menu item for centuries). (6) This is clearly a consideration for those wishing to lose weight. Water, sparkling water, unsweetened tea and coffee (milk/cream free), contain no calories.

There are a number of interactive websites and apps on which the content (including calorie content) of different foods and drinks can be compared: e.g. www.twofoods.com

Vitamins and minerals. These are required by the body only in tiny amounts, but are essential for good health. Adults eating a balanced diet are not likely to develop any deficiencies, although at times of illness or pregnancy additional intake may be advised. Be guided by your doctor, as taking too many can sometimes be harmful to your health.

4 Reduce salt intake

Reducing salt intake has been identified as one of the most cost-effective measures that can be taken to improve population health outcomes. Most adults consume too much salt, about 9–12 g per day on average, and WHO estimates that 2.5 million deaths

could be prevented each year if global salt consumption were reduced to the recommended level, under 5 g per day.

Here are five ways to reduce the amount of sodium in your diet:

- Don't add salt during food preparation.
- Don't have a salt shaker on the table at home.
- Limit the consumption of salty snacks.
- Purchase products with reduced salt content.
- Choose lower salt options when eating away from home.

5 WAYS TO REDUCE THE AMOUNT OF SODIUM IN YOUR DIET

The infographic features a central illustration of a salt shaker. Five numbered tips are arranged around it, each with a corresponding icon:

- 1** Don't add salt during food preparation: Icon of a salt shaker with a red slash through it.
- 2** Don't have a salt shaker on the table at home: Icon of a salt shaker with a red slash through it.
- 3** Buy products with reduced salt content: Icon of a product with a red arrow pointing downwards.
- 4** Choose lower salt options when eating away from home: Icon of a magnifying glass over a salt shaker.
- 5** Limit the consumption of salty snacks: Icon of a bag of chips with a red slash through it.

Food is likely to initially taste different, but taste buds become accustomed to reduced salt levels in the diet. “Sea salt” or other

¹ There are four sources of calories in the diet: carbohydrate, protein, fat and alcohol. Carbohydrate and protein contain about 4 kcal per gram; alcohol has 7 kcal and fat 9 kcal per gram. A high fat diet is therefore not usually recommended for achieving weight loss.

types of salt have no health advantage over regular salt – it is the sodium that causes the effect, wherever it is sourced. **It is very difficult to eat too little salt since it is contained in so many everyday foods.** (7)

Processed meat (bacon, ham, salami, smoked meat) bread and snacks (potato chips/crisps, salted nuts) are often high in salt. **In the United States, the majority (over 70 per cent) of salt consumed comes from processed food and restaurant meals.** (8)

Useful tips on reducing the amount of salt in the diet can be found on websites such as: www.nhs.uk/Livewell/Goodfood/Pages/cut-down-salt.aspx

www.cdc.gov/salt/pdfs/Sodium_Dietary_Guidelines.pdf

Routinely check the labels of food you buy.

The United Kingdom has developed a “traffic lights” system for judging whether or not foods are high in particular substances — overall fat content, saturated fats, sugar and salt.

A diet with a low salt component has been specifically designed to lower high blood pressure, called “Dietary Approaches to Stop Hypertension” (DASH). (9)

Potassium in the diet can help to lower blood pressure (it “counteracts” the effect of sodium) and WHO recommends an increased intake of potassium-rich food (along with a decrease in salt consumption) to reduce blood pressure and its risk of cardiovascular disease. (10) Lists of foods that are high in potassium are widely available on the web. **Unless under a doctor’s direction, do not take potassium supplements as it is possible to overdose.**

5 Make healthy choices when eating away from home

Professional pilots (and others) often find themselves in situations where they cannot directly control the components of the food they eat (e.g. in restaurants, canteens, onboard aircraft).

The following are some tips on avoiding eating more than you want, or eating foods that have more saturated fat, salt and sugar than you would choose: (11)

- Check the menu to see if the number of calories in a food item is included. An average woman needs about 2,000 kcal per day; a man about 2,500 kcal.
- Avoiding a starter and/or a dessert is one way to keep the calorie count down.
- If you take a starter, consider choosing a salad (lower in calories).
- Avoid bread or other nibbles before your food arrives as they will increase the number of calories you eat.

Check the calories on your chosen dish

CALORIES NEEDED →  **2000** kcal/day  **2500** kcal/day

Ask that **salt is not added** to your food 

Ask for **low fat dressing** on the side 

Choose **standard or small portions** 

 **Avoid desserts with refined sugar** →  **Choose fruits or yoghurt instead**



- Consider asking for salt not to be added to your food during preparation, especially if you have high blood pressure.
- Check the volume of what you are ordering (e.g. ask about the actual size of a “medium” pizza). Perhaps a small size would be enough.
- Choose standard, or smaller, portions.
- If a salad or vegetables does not come with your meal, order a side dish.
- Don’t order a dessert until you have finished your main course. You may feel full and not want one.
- Consider fruits or low fat/sugar yoghurt for dessert. Try to avoid desserts with a high refined sugar content.

6 Take an interest in reading and understanding food labels

Take some time to look at food labels and consider if the contents of the container are providing you with what you need for a healthy diet. There are websites that provide guidance on what to look for. Here are two examples:

www.eatforhealth.gov.au/sites/default/files/files/eatingwell/efh_food_label_example_130621.pdf

www.diabetes.ca/diabetes-and-you/healthy-living-resources/diet-nutrition/understanding-the-nutrition-label

7 Lower your risk of developing Type 2 diabetes

Diabetes is a relatively common reason for long-term medical unfitness as a professional pilot, ranking ninth most common in a list of conditions resulting in a payout from a large insurance company in the United States. Some of these cases may have resulted from

diseases associated with diabetes (heart disease, stroke, some cancers) rather than from diabetes itself. **According to WHO, in 2014, some 8.5 per cent of the global population had diabetes, up from 4.7 per cent in 1980.** [\(12\)](#)

Diabetes is a medical condition that is characterized by blood sugar levels (a term used interchangeably with blood glucose levels) that are higher than normal. It has been included in this chapter for discussion because it is strongly associated with diet and obesity.

The methods for reducing the risk of Type 2 diabetes are discussed in other parts of this guide, as well as in this chapter:

- Healthy eating
- Weight management
- Smoking cessation
- High blood pressure management
- Physical activity

For weight loss, it usually helps to join a group, either online or face-to-face.

If your airline or pilot association has a support group, this is particularly helpful for weight loss, exercise or general motivation. Consider asking your family to support your efforts and discuss your progress with them.

Diabetes can be divided into two main types: Type 1 and Type 2. Both types result in high blood sugar levels. Type 1 diabetes results from a lack of insulin, a hormone produced by the pancreas (an organ found in the upper abdomen) that reduces blood sugar by helping the process of transporting sugar out of the blood and into the body’s cells. Type 1 diabetes usually develops quite quickly (over weeks) in childhood or young adulthood and needs treatment with insulin injections. Based on current medical knowledge, it cannot be prevented. About 5–10 per cent of all those with diabetes have Type 1 diabetes.

Type 2 diabetes usually begins in adulthood and can take years to develop. There may be no symptoms initially. **In Type 2 diabetes, the body's cells are unable to utilize insulin in the normal way. Excess weight appears to cause the body to become resistant to the effects of insulin** and sugar cannot be transported out of the blood and into cells as usual. Blood sugar is raised as a consequence. About 90–95 per cent of persons with diabetes have Type 2.

In Type 2 diabetes, the pancreas **responds to the increased blood sugar levels by producing more insulin, which for a time, can largely overcome the insulin resistance**, but eventually the pancreas becomes unable to produce sufficient insulin to combat the gradually increasing insulin resistance, resulting in a relative insulin deficiency and a significant rise in blood sugar levels. In this situation, like Type 1 diabetic persons, Type 2 diabetics may also need insulin injections.

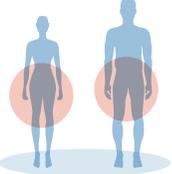
Type 2 diabetes can be prevented, or its onset can be delayed, with a healthy lifestyle (i.e. following a balanced diet, especially eating carbohydrates that have a low “glycaemic index”, exercising regularly and maintaining a healthy weight).

See a doctor if you have symptoms of diabetes — excessive excretion of urine, feeling very thirsty, weight loss, loss of muscle bulk, blurred vision, itching around the penis or vagina or frequent episodes of “thrush”, and excessive fatigue. A urine check (part of a periodic regulatory medical examination) will detect if there is any sugar in the urine, but some damage may already have been done by the time the test is positive.

Because a urine test for diabetes may not detect early Type 2 diabetes, it may be useful to have a blood test to detect “pre-diabetes” if you are at increased risk. Risk factors include: BMI 25 or more (especially if fat is accumulated around your waist and you therefore have a

SYMPTOMS OF DIABETES

You should see your doctor if you have **the following symptoms**

 <p>Feeling very thirsty</p>	 <p>Excessive excretion of urine</p>	<p>Loss of muscle bulk</p> 	<p>Blurred vision</p> 
 <p>Excessive fatigue</p>	<p>Weight loss</p> 	<p>Itching around the penis or vagina</p>	

high waist/hip circumference ratio), male, over 40 years of age, taking little exercise, having high blood pressure, having a parent or sibling with diabetes, being part of a higher risk ethnic group (South Asian, African Caribbean, black African) and, for women, having a baby weighing more than 9 pounds (4.1 kg) or developing diabetes during pregnancy.

There are online tests for assessing your risk of developing Type 2 diabetes, such as the American Diabetes Association's www.diabetes.org/?loc=bb-dorg

Discuss with your doctor whether or not you should have a blood test for diabetes.

ADDITIONAL INFORMATION

The first global report on diabetes was published by WHO in 2016. (13) It states:

“Type 1 diabetes cannot be prevented with current knowledge. Effective approaches are available to prevent Type 2 diabetes [the most common type] and to prevent the complications and premature death that can result from all types of diabetes.”

The WHO goes on to say that prevention of Type 2 diabetes requires those practices “that contribute to good health for everyone, regardless of whether they have diabetes” (i.e. exercising regularly; eating healthy;

avoiding smoking; controlling blood pressure; controlling blood fats).

The benefits of a healthy diet to mental health (*nutritional psychiatry*) as well as physical health are becoming better recognized. There is evidence that a “healthy diet”, comprising high intakes of fruit, vegetables, whole grains, poultry, fish and reduced-fat dairy products, may be associated with reduced depression risk, although the underlying mechanisms are still under debate. (14)

A study of 3,486 participants (74 per cent male), average age 56 years, identified two dietary patterns: the “whole food” pattern (heavily loaded with vegetables, fruits and fish), and the “processed food” pattern (heavily loaded with sweetened desserts, fried food, processed meat, refined grains and high-fat dairy products).

The paper concluded that, in middle-aged participants, a processed food dietary pattern was a risk factor for depression (5 years later), whereas a whole food pattern was protective. (15)

In a randomized trial of 7,447 male and female subjects in Spain aged 55–80 years, with Type 2 diabetes or other cardiovascular risks, a Mediterranean diet² supplemented with nuts was found to lower the risk of depression in the group with diabetes. (16)

A meta-analysis of 22 papers found that the Mediterranean diet was consistently associated with reduced risk of stroke, depression and cognitive impairment. (17)

2

A Mediterranean diet is one that is based on the dietary patterns of European countries bordering the Mediterranean Sea (i.e. France, Italy, Greece and Spain). The main components are: high intake of olive oil (replaces butter and margarine), vegetables, fresh fruit, cereals, nuts and legumes (plants with seeds in pods, beans, peas, lentils, etc.); a moderate intake of fish and other seafood, poultry, dairy products and red wine, and a low intake of eggs, red meat, processed meats and desserts; replacing salt with herbs and spices.

In a study of three different types of diet, the Mediterranean diet, the Diet to Stop Hypertension (DASH) and a diet combining both (the MIND diet) were found to be associated with a decreased rate of development of Alzheimer’s disease in participants aged 58–98 years. (18)

A randomized controlled trial provided preliminary evidence that dietary improvement can be an effective treatment strategy for major episodes of depression. (19)

In conclusion, **evidence is rapidly increasing to show that, in addition to exercise, a healthy diet is also likely to help prevent the onset of mental health illnesses as well as physical diseases** and may therefore reduce the risk of pilots (and their medical certificates) being adversely affected. **Understanding the benefits and problems concerning fat** in the diet is also becoming important. “Good fats” from the health viewpoint are monounsaturated and polyunsaturated fats, trans fats are bad and saturated fats are in-between, although this view has been challenged – see below.

A fat is termed saturated or unsaturated based on the number of hydrogen atoms surrounding each carbon atom in a chain of carbon atoms. In saturated fat, each carbon atom is linked to the maximum number of hydrogen atoms – the carbon atoms are “saturated”. An unsaturated fat is not linked to the maximum number of hydrogen atom – it is “unsaturated”.

Trans (meaning “across”) fat molecules have different health properties due to their specific geometric shape. Trans fats are made by an industrial process that adds hydrogen to the carbon chain, which converts oils into solids and helps preserve the product.

Trans fat increases the level of LDL (bad) cholesterol and for every 2 per cent of calories in the diet from trans fats, risk of heart disease increases by 23 per cent. (20) There is no known health benefit from trans fat and it is best avoided. Fortunately, because of its adverse health effects, it is quite rapidly being removed from food products.

Unsaturated (i.e. good) fats are liquid at room temperature. They are either “monounsaturated” or “polyunsaturated”. Monounsaturated fats have one double bond between two carbon atoms in the carbon chain. Since there are two bonds between these carbon atoms, there is one fewer bond available for a hydrogen atom, and the fat is therefore “unsaturated” (the carbon atoms are not linked to the maximum possible number of hydrogen atoms). **Good sources are olive oil, avocados and nuts.** It is used in the “Mediterranean diet” and it is recommended that these be used together with polyunsaturated fats, as a replacement for trans and saturated fats.

Polyunsaturated fats have more than one double bond between carbon atoms in the carbon chain. There are two main types: omega-3 fatty acids and omega-6 fatty acids, the numbers referring to where the double bond is placed in the carbon chain. They reduce levels of blood LDL (bad) cholesterol, raise HDL (good) cholesterol and reduce triglycerides (another type of fat). Omega-3 fatty acids may help prevent heart disease and stroke and help prevent abnormal heart rhythms. They are found (e.g. in **fatty fish such as salmon and mackerel, and walnuts and soya beans**). Omega-6 fatty acids may also protect against heart disease and can be found in certain **vegetable oils (safflower), nuts and seed** (e.g. walnuts, sesame seeds, brazil nuts).

Saturated (i.e. bad) fats are solid at room temperature (e.g. butter and other types of fat from animal products that has liquefied during cooking and has solidified when cooled). They increase blood cholesterol and raise LDL cholesterol levels. For those who need to lower their cholesterol, the American Heart Association recommends reducing saturated fat to no more than 5–6 per cent of total daily calories.

For a good review of the different types of fat in the diet, refer to the Harvard Health publication in the reference list. (20)

There is some controversy concerning the appropriate guidance on saturated fats in the diet, and two recent large studies came to different conclusions. The first, a meta-analysis published in 2015, concluded that saturated fats are not associated with all-cause mortality, cardiovascular disease or Type 2 diabetes. (21) The second, which came to a different view, was published in 2016 and involved two prospective, longitudinal cohort studies of 73,147 women (1984–2012) and 42,635 men (1986–2010) and concluded that higher dietary intakes of major saturated fatty acids are associated with an increased risk of coronary heart disease. (22)

In the light of the uncertainty, this guide has taken the approach that is currently indicated by the health authorities in the United States and the United Kingdom. However, readers should note that this debate continues.

AVIATION CONCERNS

The traditional regulatory approach to diet and body weight management focuses on the medical problems that are associated with increased weight. Thus, regulatory authorities generally do not have an upper (or lower) BMI limit for pilots, except as a guide as to when additional testing may be required. For example, since a raised BMI is associated with increased cardiovascular risk, blood checks and an exercise treadmill test may be required in the obese with the aim of uncovering previously undetected cardiovascular disease.

It is therefore **the secondary effect of increased risk of cardiovascular disease that is the main flight safety concern**, rather than the increased weight itself. However, sometimes a check may be required to ensure that increased physical size associated with increased weight does not cause **any problems with manipulating the controls**. The European Aviation Safety Agency (EASA) requires additional health and control checks to be undertaken when the BMI is over 35. (23) Another relevant aspect for large pilots concerns **the ability to execute an emergency egress through flight deck window openings**.

Type 2 diabetes is associated with an increased BMI. Type 2 diabetes increases the risk of developing cardiovascular disease, and pilots with diabetes are likely to be reviewed for cardiovascular risk (e.g. with periodic exercise treadmill testing).

Type 2 diabetes can be treated in the early stages with diet and exercise, which has no implications for medical certification. Oral medications to lower blood sugar levels are



Palpitations



Anxiety



Tremor



Irritability

INSULIN EFFECTS

Insulin induced hypoglycaemia has undesirable effects for pilots



If not treated (by consuming a sugary food or beverage) can progress to:

Blurred vision



Seizures



also normally acceptable if they are unlikely to cause hypoglycaemia (low blood sugar).

If the diabetes progresses and insulin becomes necessary (which occurs when the blood sugar cannot be adequately controlled with diet/exercise and/or oral medication). This is a **concern because the risks of hypoglycaemia are increased** (since insulin is a potent reducer of blood sugar levels).

Insulin induced hypoglycaemia results in a number of effects which are undesirable in a pilot (e.g. palpitations, anxiety, tremor and irritability), which if not treated, typically by consuming a sugary food or beverage, can progress to confusion, blurred vision and seizures. However, as a better understanding of diabetes and its treatment is developed, several regulatory authorities are now permitting the use of insulin for those diabetic pilots and air traffic controllers who have been investigated and found to be at sufficiently low risk of hypoglycaemia. ([23](#), [24](#))

References

- 1 World Health Organization Media Centre. Noncommunicable diseases, June 2017
www.who.int/mediacentre/factsheets/fs355/en/
- 2 US Centers for Disease Control and Prevention, National Center for Health Statistics. Prevalence of underweight among adults aged 20 years and over: United States, 1960–1962 through 2007–2010
www.cdc.gov/nchs/data/hestat/underweight_adult_07_10/underweight_adult_07_10.htm
- 3 Is fat unhealthy? Diabetes.co.uk
www.diabetes.co.uk/diet/is-fat-unhealthy.html
- 4 U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th edition. December 2015
<http://health.gov/dietaryguidelines/2015/guidelines/>
- 5 Eating more fruits and vegetables may prevent millions of premature deaths. Imperial College, London, 23 February 2017
www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_22-2-2017-16-38-0
- 6 Agrp neuron activity is required for alcohol-induced overeating. Cains S, Blomeley C, Kollo M, Rácz R, Burdakov D. Nature Communications 2017:8, Article number: 14014 (2017), doi:10.1038/ncomms14014
<https://www.nature.com/articles/ncomms14014>
<https://europepmc.org/abstract/med/28524848> (corrigendum)
- 7 World Health Organization Media Centre. Salt reduction fact sheet, June 2016
www.who.int/mediacentre/factsheets/fs393/en/
- 8 Centers for Disease Control and Prevention. Salt. Sodium and Food Sources
www.cdc.gov/salt/food.htm

-
- 9 National Heart, Lung, and Blood Institute. Your guide to lowering your blood pressure with DASH
www.nhlbi.nih.gov/health/resources/heart/hbp-dash-index
 - 10 World Health Organization. Guideline: Potassium intake for adults and children. Geneva, World Health Organization (WHO), 2012
http://apps.who.int/iris/bitstream/10665/77986/1/9789241504829_eng.pdf?ua=1
 - 11 NHS Choices, healthy eating out
www.nhs.uk/Livewell/Goodfood/Pages/healthy-eating-out.aspx
 - 12 World Health Organization. Diabetes Fact Sheet, November 2017
www.who.int/mediacentre/factsheets/fs312/en
 - 13 World Health Organization. Global Report on Diabetes, 2016
http://apps.who.int/iris/bitstream/10665/204871/1/9789241565257_eng.pdf
 - 14 Lai JS, Hiles S, Bisquera A, Hure AJ, McEvoy M, Attia J. A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. *Am J Clin Nutr.* 2014(99) no.1:181-197
<http://ajcn.nutrition.org/content/99/1/181.long>
 - 15 Akbaraly TN, Brunner EJ, Ferrie JE, Marmot MG, Kivimaki M, Singh-Manoux A. Dietary pattern and depressive symptoms in middle age. *Brit J Psych.* 2009;195 (5) 408-413; DOI: 10.1192/bjp.bp.108.058925
<http://bjp.rcpsych.org/content/195/5/408>
 - 16 Sánchez-Villegas A, Martínez-González MA, Estruch R, et al. Mediterranean dietary pattern and depression: the PREDIMED randomized trial. *BMC Medicine.* 2013;11:208. doi:10.1186/1741-7015-11-208
www.ncbi.nlm.nih.gov/pmc/articles/PMC3848350/
 - 17 Psaltopoulou T, Sergentanis TN, Panagiotakos DB et al. Mediterranean diet, stroke, cognitive impairment, and depression: a meta-analysis. *Ann Neurol.* 2013 Oct;74(4):580-91. doi: 10.1002/ana.23944. Epub 2013 Sep 16
www.ncbi.nlm.nih.gov/pubmed/23720230

-
- 18 Morris MC, Tangney CC, Wang Y et al. MIND diet associated with reduced incidence of Alzheimer's disease. *Alzheimers Dement*. 2015 Sep;11(9):1007-14. doi: 10.1016/j.jalz.2014.11.009. Epub 2015 Feb 11
www.ncbi.nlm.nih.gov/pubmed/25681666
 - 19 Jacka FN, O'Neil A, Opie R, et al. A randomised controlled trial of dietary improvement for adults with major depression (the 'SMILES' trial). *BMC Medicine* 2017 (15):23
<https://doi.org/10.1186/s12916-017-0791-y>
 - 20 The truth about fats: the good, the bad, and the in-between. Harvard Health Publishing, Feb 2015, updated Aug 2017
www.health.harvard.edu/staying-healthy/the-truth-about-fats-bad-and-good
 - 21 de Souza RJ, Mente A, Maroleanu A, Cozma AI et al. Intake of saturated and trans unsaturated fatty acids and risk of all-cause mortality, cardiovascular disease, and Type 2 diabetes: systematic review and meta-analysis of observational studies. *BMJ* 2015; 351 :h3978
www.bmj.com/content/351/bmj.h3978
 - 22 Geng Z, Li Y, Wanders AJ, Alsema M, Zock PL, et al. Intake of individual saturated fatty acids and risk of coronary heart disease in US men and women: two prospective longitudinal cohort studies. *BMJ* 2016; 355 :i5796
www.bmj.com/content/355/bmj.i5796?utm_source=TrendMD&utm_medium=cpc&utm_campaign=TBMJ_UK_TrendMD-O
 - 23 UK Civil Aviation Authority. Metabolic and endocrinology guidance material
[www.caa.co.uk/Aeromedical-Examiners/Medical-standards/Pilots-\(EASA\)/Conditions/Metabolic-and-endocrinology/Metabolic-and-endocrinology-guidance-material-GM/](http://www.caa.co.uk/Aeromedical-Examiners/Medical-standards/Pilots-(EASA)/Conditions/Metabolic-and-endocrinology/Metabolic-and-endocrinology-guidance-material-GM/)
 - 24 Federal Aviation Administration. Guide for Aviation Medical Examiners, Decision Considerations, Disease Protocols - Diabetes Mellitus Type I and Type II - Insulin Treated
www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/dec_cons/disease_prot/diabetes_insulin/



CHAPTER 7

SLEEP AND THE IMPACT OF MEDICAL CONDITIONS

Summary Guide

for improving sleep quality and quantity

☑ **MAINTAIN A HEALTHY WEIGHT**

☑ **GET ACTIVE!**

Aim for a minimum of 150 minutes per week of moderate intensity exercise, or 75 minutes per week of vigorous exercise.

☑ **AVOID DRINKING ALCOHOL BEFORE BEDTIME**

☑ **STOP SMOKING**

☑ **USE SLEEP OPPORTUNITIES WISELY**

☑ **AVOID CAFFEINE AND OTHER STIMULANTS BEFORE BEDTIME**

☑ **REVIEW THE FREQUENTLY ASKED QUESTIONS**

concerning personal strategies for fatigue management in flight crew (see appendix to this chapter).

MEDICAL CAUSES AND EFFECTS OF LACK OF SLEEP

Most of the scientific work involving sleep issues and professional pilots has concerned the effect of fatigue on alertness and performance. Guidance on minimizing sleep loss and risk of fatigue from circadian rhythm disruption and jet lag is available from a number of reliable sources. (1, 2, 3)

Here, however, we will focus on the medical causes and health effects of lack of sleep, and on how to prevent them. You will also find general guidance on managing your sleep in the section on “Frequently Asked Questions” at the end of this chapter.

An occasional night without sleep will not harm your health, although it may make you feel irritable the next day. However, **sustained poor sleep patterns increase the risk for a number of medical conditions, such as obesity, cardiovascular disease, diabetes and some cancers, notably breast cancer in women and prostate cancer in men.** Obesity can itself be a cause of poor sleep.

While professional pilots are a healthy group compared with the general population, **medical unfitness can be related to or caused by lack of sleep.** It is therefore recommended to manage and minimize sleep loss when possible.

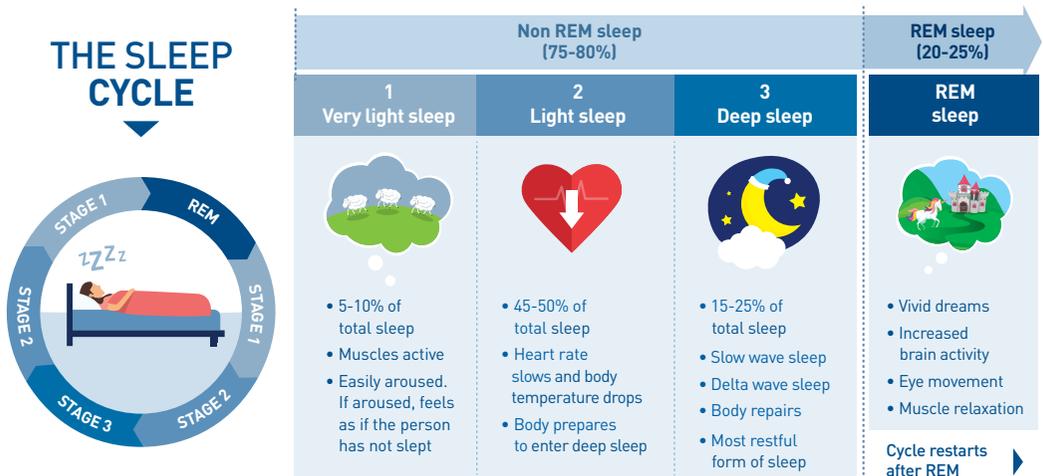
PHYSIOLOGY OF SLEEP

People vary greatly in the amount of sleep they need. Adults 18–64 years of age, need between 7 and 9 hours per night on average (older adults a little less). Individuals can usually decide for themselves if they are getting enough sleep. **If you feel tired or find yourself napping during the day, you are probably not getting enough sleep.** The only way to recover from lack of sleep is to obtain additional sleep.

The two main components of sleep

Sleep involves a complex physiological process including two main components: rapid eye movement (REM) sleep (when the eyeballs move rapidly around under closed

Figure 6. The non-REM/REM cycle across the night, for a healthy young adult.



eyelids) and non-rapid eye movement (non-REM) sleep.

Normally, about a quarter of the time spent asleep is REM sleep (which is light sleep). If awoken from REM sleep, individuals can often recall vivid dreaming. Non-REM sleep is divided into three different stages, with Stage 3 being deep sleep. During the night, the brain cycles through different sleep stages, from REM sleep to Stage 3 sleep every 90 minutes or so. **(2) Disruption to the normal sleep rhythm can result in less restful sleep, even if the total amount of time spent asleep is unchanged.**

SIX SIMPLE WAYS TO REDUCE THE RISK OF MEDICAL CAUSES OF POOR SLEEP

1 Maintain a healthy weight

The main sleep-related health effect of overweight/obesity is Obstructive Sleep Apnoea (OSA). **Although OSA was not recognized as an important medical diagnosis until the 1990s, experience has shown that it is probably the most common medical cause of poor sleep in pilots.**

◆ What is OSA?

OSA consists of repeated pauses in breathing during sleep, typically lasting 20–40 seconds but sometimes longer. It is caused when muscles in the back of the throat and surrounding areas relax during deep periods of sleep, so the throat narrows causing a temporary but complete obstruction of the airway. It is often associated with loud snoring

and gasping/choking breathing episodes, which can be very worrying for a bed partner.

Cessation of breathing in OSA results in a fall of normal blood oxygen levels, which is sensed by the brain. After a number of seconds, sometimes up to a minute or two, the brain interrupts the normal sleep cycle to bring about a change to a lighter stage of sleep or an awakening, during which more regular breathing re-commences. Although obvious to a bed partner, it is usually unnoticed at the time by the affected individual. Rather, the **effects of OSA are seen when awake, with the individual feeling very tired the next day due to repeatedly disturbed sleep.**

In the United States, 3–7 per cent of the male population (2–7 per cent of females) are estimated to suffer from OSA. **(4)** Most cases of OSA in the general population are undiagnosed — this is likely to be the case for pilots as well. The most important risk factor in adults is increased body weight, although not all persons suffering from OSA are overweight.

OSA can result in a number of unwanted effects that are related to flight safety:

excessive daytime sleepiness and poor decision-making are those most relevant to flight safety. But abnormal heart rhythms, high blood pressure and stroke also have medical flight safety implications because they can result in incapacitation.

There is evidence of an association between OSA and Type 2 diabetes, and with depression. **(5, 6)**

The following are risk factors for OSA:

- **Obesity** — increases risk by four times
- **Large neck size** — over 17 inches (43.2 cm) for men, 16 inches (40.6 cm) for women
- **Cigarette smoking** — smokers are more

likely to have OSA than those who have never smoked, due to inflammation and swelling in the upper airway from smoke effects

- **Alcohol use** — especially just before sleep: relaxes the muscles in the upper airway
- **Male gender** — men are twice as likely to have OSA
- **Age over 40 years**
- **Family history of OSA**
- **Menopause** — risk rises after the menopause
- **Certain facial bone structures and features of the throat** (e.g. short lower jaw, large tongue, narrow throat).

At a periodic regulatory medical examination, a medical examiner will consider the risk of OSA by reviewing those risk factors. As part of an assessment for OSA, the pilot may be asked to complete a sleepiness scoring chart

such as the “Epworth Sleepiness Scale” (ESS). This asks a number of questions concerning the pilot’s likelihood of dozing or sleeping, ranging from “never” to “high chance” during a number of common daily activities, such as “sitting and reading” and “being a passenger in a motor vehicle for an hour or more”. A score is given for each of the eight questions and a score of ten or more is an indicator for further assessment and likely deferral of medical certificate issuance pending additional investigations.

More information about the ESS and the scale itself is available at:

<http://epworthsleepinessscale.com/about-the-ess/>

A relatively new screening tool for OSA is the “Stop-Bang Questionnaire”:

www.stopbang.ca/osa/screening.php

THE FOLLOWING ARE RISK FACTORS FOR OSA:



OBESITY

Increases risk by 4 times.



LARGE NECK SIZE

Over 17 inches for men and 16 inches for women



CIGARETTE SMOKING

Inflammation and swelling in upper airway



MALE GENDER

Men are twice as likely to have OSA



ALCOHOL USE



AGE OVER 40 YEARS

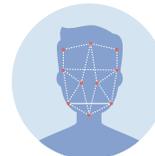


MENOPAUSE

Risk rises after menopause



FAMILY HISTORY OF OSA



CERTAIN FACIAL BONE STRUCTURE

(e.g. short lower jaw, large tongue)

The United States Federal Aviation Administration advises its medical examiners to consider the risk of OSA in pilots with reference to guidance from a task force established by the American Academy of Sleep Medicine. (7) On the basis of a clinical examination, risk factors for OSA and reported daytime sleepiness, further investigations may be requested so that the diagnosis and extent of OSA can be confirmed. Investigation may include a period of monitored sleep in a “sleep laboratory”.

Treatment of Obstructive Sleep Apnoea

A variety of effective treatments are available, including “continuous positive airway pressure” (CPAP). **Treatment is usually compatible with continued medical certification.** It is the treatment of choice for all severities of OSA, and involves supplying mildly compressed air via a hose to a mask, which forms a seal with the face. The compressed air (at a low pressure, typically less than 0.3 pounds per square inch) provides sufficient pressure to keep the upper airway open and prevent it from collapsing.

Other treatments include oral devices that fit inside the mouth and move the jaw or tongue, and methods to discourage sleeping on the back, when airway obstruction is more common (e.g. strapping a tennis ball to the back when sleeping, making it uncomfortable to lie on). Sometimes surgery is recommended if other methods fail.

Weight loss and increased exercise are routinely advised, when appropriate. A scientific review of several studies showed that regular physical exercise reduced the severity of OSA by 32 per cent, even without a change in body mass index.

Obstructive Sleep Apnoea could be largely prevented in pilots if they exercised regularly, maintained a healthy weight and,

particularly, avoided obesity during their careers. (8)

2 Get active! Aim for a minimum of 150 minutes per week of moderate intensity exercise, or 75 minutes per week of vigorous exercise

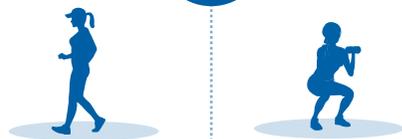
Exercise is widely regarded as beneficial for sleep. However, in those who are already good sleepers, it seems to have only a modest beneficial effect on subsequent sleep. (9)

The benefits of regular exercise are best seen in those who have some form of sleep problem, in whom changes in sleep patterns have the most potential for improvement. In such groups, it appears that improvements are seen after a period of training (e.g. four months), and that single episodes of exercise that are not part of a regular exercise regime

EXERCISE IS BENEFICIAL FOR SLEEP

Minimum recommended time per week

moderate		vigorous
150 MIN		75 MIN



- Better rest
- Sufficient sleep = less anxiety and depression

may not be of great value.

Although the evidence is mixed, it is probably a good idea to avoid vigorous exercise within an hour or two of going to bed, as this can cause physiological effects (e.g. increased body temperature) that have not fully

dissipated when it is time to sleep and which may increase the time taken to fall asleep. However, exercise before sleep is something that can be individually tailored (duration, intensity, time before sleep) depending on personal preferences and individual effects. Low intensity exercise (walking, stretching, etc.) is often recommended as being helpful in promoting sleep if undertaken as part of a pre-sleep routine (a “ritual”) shortly before retiring to bed. Such mild exercise should not cause any adverse effects on sleep.

It is well known that anxiety and depression are strongly linked to lack of sufficient sleep. Almost everyone will have experienced the effect on sleep of an anxious, racing mind or inability to “switch off” at bedtime, causing difficulty in getting to sleep and/or early waking. Depression is a feature of insomnia, typically associated with early morning waking and inability to get back to sleep. In addition, **while anxiety and depression can cause insomnia, insomnia can also cause anxiety and depression, and getting out of the cycle can be challenging.**

Self-help can be useful. Relaxation techniques, yoga and mindfulness training are certainly worth trying as they work very well for some. But if self-help is insufficient, seek help from a health-care professional if you feel excessively tired for a prolonged period.

Regular exercise is probably the single most important action you can take to protect your health and prolong your career. It has numerous benefits in preventing (and treating) both physical and mental illness. It also helps in maintaining a healthy body weight, which reduces the risk of overweight/obesity, and which in turn reduces the risk of developing OSA.

While there is interest in the benefits of exercise as a treatment for insomnia, it is

clearly better if it can be used to help prevent problems occurring in the first place, by incorporating it into a lifestyle that can be followed throughout life.

3 Avoid drinking alcohol before bedtime

For professional pilots, who at times may be sleep deprived and for whom alertness is an essential part of their work, **alcohol consumption, even when within regulatory and company limits, can be a flight safety risk** if taken before a sleep period, since it can increase the likelihood of sleep loss and fatigue.

Alcohol speeds up the process of falling asleep. Surveys have shown it is used extensively as a sleep aid in the general population. However, alcohol is metabolized during the night, generally resulting in low to zero blood alcohol concentrations after some hours of sleep, and this results in adverse

Alcohol consumed before a sleep period can be a flight safe risk



Alcohol increases fatigue and speeds up the process of falling asleep, but the quality of sleep is poor



Disruption in sleep patterns **reduces daytime alertness**



Muscles of the throat relax, increasing the **risk of sleep apnoea**

effects for those who have had more than one drink before bedtime.

After taking alcohol, a deeper sleep is observed in the early part of the night, whereas in the latter part the sleep is lighter, with more awakenings than usual.

(2) Rapid Eye Movement (REM) sleep is more common and is often associated with vivid dreams or nightmares. The disruption in normal sleep patterns and reduced overall sleep duration in turn reduces daytime alertness.

In addition, alcohol is a muscle relaxant and can relax the muscles of the throat and surrounding areas. **Those who are already at risk of OSA can have OSA induced if they have a raised blood alcohol concentration during sleep.** For those already with OSA, its severity can be increased.

4 Stop smoking

Nicotine, found in tobacco products, is a mild stimulant, so it is not surprising that in

smokers who smoke just before bedtime, sleep is lighter in the early part of the night compared with for non-smokers. After about two hours, as the sleep period progresses, the effect of nicotine diminishes and a withdrawal stage develops. These two effects, causing disruption to the normal sleep pattern, are probably the reason why **smokers are more likely to report feeling less rested after a sleep period.** (10)

After taking account of body mass index, gender, age and number of alcoholic drinks per week, **current smokers were found to be 2.5 times more likely to have obstructive sleep apnoea than former smokers and non-smokers.** Encouragingly, research shows that for those who quit smoking, there is no difference in risk of having OSA compared with those who have never smoked. (11) However, there is a period of poorer sleep immediately after quitting smoking, a withdrawal effect, which starts to diminish after about two weeks.

5 Use sleep opportunities wisely

When on duty, a professional pilots' routines are determined by their roster. Opportunities for sleep on layovers are often limited and/or available at periods when circadian rhythms are not conducive to sleep. **It is therefore important to maximize the benefit from sleep opportunities in order to reduce the subsequent risk of fatigue.** This requires some knowledge of circadian rhythms, sleep physiology and your own preferences so that you are, when possible, trying to go sleep at a time you are most likely to fall asleep. However, effective management of fatigue may sometimes entail prolonging a period awake in order to avoid delay in getting to sleep when a subsequent sleep opportunity arises. (12)



Know your **circadian rhythms**



Try to go to sleep at a time you are most likely to drop off



MAXIMIZE THE BENEFIT FROM SLEEP OPPORTUNITIES

24h

It takes a day to fully adapt to each hour of time zone shift

Napping is a useful mitigation for lack of sleep



even for 10-20 minutes

Circadian rhythms are biological rhythms that are based on the daily cycle of light and dark, meal times and other cues. For example, body temperature decreases during nighttime and urine output is restricted. Circadian rhythms usually result in difficulties when attempting to sleep during the day, or when the body's rhythms "think" it is daytime (e.g. when local night corresponds with daytime hours at home base). **As a rough guide, it takes one day to fully adapt to each hour of time-zone shift.** For this reason, during short layovers in a different time zone, up to two or three days, there is little purpose in attempting to adapt to local time.

Napping can be a useful mitigation for lack of sleep, even if the available time is only 10–20 minutes. In flight, if napping is permitted, do not miss an opportunity to do so for a short period. But remember that sleep is followed by a period of "sleep inertia" (feeling groggy after awakening), which needs to be managed (e.g. by a period of recovery prior to returning to duty).

In addition, when the time for sleep is restricted on the ground, consider your sleep requirements before deciding to socialize or

watch a late movie and keep alcohol intake to a minimum before sleeping.

6 Avoid caffeine and other stimulants before bedtime

Caffeine is a psychoactive substance and is found in many beverages and some foods (e.g. coffee, tea, soft drinks and chocolate). It is contained in a number of over-the-counter medications for colds and headache.

Caffeine promotes vigilance and reduces sleepiness, which can sometimes be a benefit. In one study, nighttime driving performance (during 02:00–03:30) was significantly improved by 125 ml (half a cup) of coffee (containing 200 mg caffeine) taken 30 minutes before driving, with errors reduced by 75 per cent in those aged 20–25 years, and by 90 per cent in those aged 40–50 years, when compared with a placebo. (13)

On the other hand, sleep is detrimentally affected by caffeine, although there are individual differences (age, sex, weight, and genetic predisposition) in its effects.

AVOID CAFFEINE BEFORE BEDTIME

Caffeine is a psychoactive substance



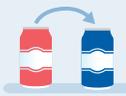
Caffeine detrimentally affects sleep

- Promotes vigilance
- Reduces sleepiness
- Disrupts your normal sleeping pattern

Avoid drinking beverages with caffeine within 4-6 hours of a sleep period



If you habitually drink such beverages with meals, switch to a non-caffeine variety



CAFFEINE FREE

One study observed that in a random sample of a middle aged urban population, with a mean age of 63.9 years, caffeine level at bedtime was at a concentration that could be expected to delay sleep onset and reduce slow wave sleep. In another study, EEG (brainwave) changes could be measured during sleep following ingestion of the equivalent of one or two double espressos up to 16 hours before sleep. [\(14\)](#)

If you drink caffeine-containing beverages, consider the effects on sleep. **In general, avoid drinking such beverages within 4–6 hours of a sleep period**, but also be aware that if you are particularly susceptible to the effect of caffeine, a longer period of abstinence may be necessary. If you habitually drink a caffeine-containing beverage with a meal, consider switching to a non-caffeinated variety.

Some other medications can cause insomnia (e.g. over the counter cold and sinus treatments that contain pseudoephedrine). **Always check any medications you are taking to see if insomnia is a side effect.**

ADDITIONAL INFORMATION

Fatigue management in aviation

The aviation community has been very active in recent years in applying the science of sleep and circadian rhythms to the management of fatigue. ICAO organized an international task force to review the scientific evidence and to combine this with operational experience to provide guidance in four separate manuals on fatigue management written for different groups: airline operators; general aviation operators of large and turbojet aeroplanes; air traffic control providers; and regulators. The first three of these manuals were written in collaboration with IATA and IFALPA.

In each of these manuals, Chapter 2 is entitled “Scientific Principles for Fatigue Management” and here, the main areas related to fatigue in aviation are covered under section headings of: “The need for sleep”; “Sleep loss and recovery”; “Circadian effects on sleep and performance”; and “The influence of workload”. **All four manuals are available free of charge on the ICAO website:** www.icao.int/safety/fatiguemanagement/Pages/Resources.aspx

Additional medical reasons for fatigue (15)

The most likely medical causes of fatigue in professional pilots that can potentially be prevented or mitigated have been described above. However, there are some other medical causes of fatigue that are primarily the result of medical conditions, which pilots should be aware of. Seek medical advice if you recognize such symptoms in yourself. Most of the conditions can be successfully treated or the symptoms mitigated.

1. Coeliac disease

Also called “gluten sensitive enteropathy”, this is caused by an adverse reaction to gluten, a dietary protein found in grains of wheat, barley and rye. It begins in childhood or in adults aged 40–60 years. It causes abdominal symptoms such as diarrhoea, abdominal pain and bloating. About 1 per cent of the population in the United Kingdom and in the United States have coeliac disease. It can cause fatigue because insufficient nutrients are absorbed from the intestine. Symptoms can be greatly diminished or avoided by eating a gluten-free diet. A blood test confirms the diagnosis.

2. Anaemia

There are several different types of anaemia, but iron deficiency is the most common. Anaemia decreases the amount of oxygen the blood can carry, resulting in fatigue. Iron deficient anaemia affects 1 in 20 men and postmenopausal women in the United Kingdom. Pre-menopausal women are at higher risk. Common symptoms include tiredness and lack of energy; shortness of breath; heart palpitations (noticeable heartbeats); and a pale complexion. The main causes are: blood loss (e.g. menstrual periods), pregnancy, bleeding into the intestine, kidney disease and coeliac disease. One significant cause of anaemia (with its potential to cause fatigue) in the developing world is malaria, which pilots might be exposed to during the performance of their duties. A blood test confirms the diagnosis of anaemia and its cause. Treatment depends on the cause.

3. Chronic fatigue syndrome

Chronic fatigue syndrome is also called “ME” (myalgic encephalomyelitis). It is a disabling fatigue that lasts at least 6 months, which develops in the 20–30 age range.

The main symptom is extreme tiredness, although this varies from day to day. It is diagnosed from the symptoms and by excluding other causes. There is no blood test for it. Management includes psychological treatment, exercise and medication. Most people suffering from it will improve over time.

4. Underactive thyroid

An underactive thyroid (a small gland in the front of the neck) produces too little thyroid hormone, which causes feelings of tiredness. Hypothyroidism also results in weight gain, depression, and sensitivity to cold temperatures. It often occurs slowly (over years), so changes may not be noticed. A blood test confirms the diagnosis and treatment depends on the underlying cause. Hormone replacement therapy is usually very successful and returns the individual to a normal life, including flying.

5. Diabetes

One of the features of diabetes, before treatment, is feeling very tired. Other symptoms include extreme thirst, considerable urination, and weight loss. The diagnosis is made with a blood test.

6. Glandular fever

This is a viral infection (also known as infectious mononucleosis “mono” or “the kissing disease”) that causes fatigue, together with fever, sore throat and swollen glands in the neck. It usually affects teenagers and young adults and typically clears up in 2–3 weeks, although fatigue can last longer, but this also eventually clears up. There is no specific treatment apart from support (i.e. over-the-counter painkillers and plenty of fluids). The symptoms, a physical exam (and sometimes a blood test) help to confirm the diagnosis.

7. Restless legs syndrome

Restless legs occur when you get uncomfortable sensations (like crawling or creeping) in the legs, associated with an urge to move the legs, which keep you awake at night. An aching or spontaneous jerking of the legs may be felt. There is usually no obvious cause. Up to 1 in 10 people are affected at some point in their lives – it is more common in women. Treatment includes adopting good sleep hygiene (i.e. following a regular bedtime routine); sleeping regular hours (when possible); avoiding alcohol, quitting smoking and exercising regularly. Sometimes, it is associated with iron deficiency, and restoring normal iron levels is curative. Unfortunately, the symptoms in some of those affected deteriorate over time.

MEETING AVIATION MEDICAL STANDARDS

Crew member and air traffic controller fatigue is recognized as a flight safety hazard, which can contribute to aviation accidents, and there are a number of accident reports citing fatigue as a contributory cause.

For example, in 2013 at 04:47 local time, an Airbus A300-600 crashed short of the runway during a localizer non-precision approach to runway 18 at Birmingham-Shuttlesworth International Airport, Alabama, United States. The flight management computer had been incorrectly configured such that vertical profile guidance was not available to the flight crew. The aircraft descended below decision altitude with the autopilot in vertical speed mode until it hit the ground one nautical mile short of the runway.

The US National Transportation Safety Board's (NTSB) review of the first officer's use of her off-duty time indicated that she was likely experiencing fatigue, primarily due to improper off-duty time management. Even though the first officer was aware that she was very tired, she did not call in and report that she was fatigued. The NTSB also concluded that for the captain, fatigue due to circadian factors may have been present at the time of the accident and the "probable cause" of the accident included performance deficiencies that were at least partly due to fatigue-related factors. (16)

In an industry that operates during a 24-hour day, 365 days a year, it is inevitable that fatigue can occur in those directly involved in providing operational services. **Fatigue must therefore be managed, since it cannot be entirely prevented.** This is done primarily through procedures that are specifically focused on the prevention of excessive fatigue, by setting limits on the number of nights and hours that can be worked, and by establishing suitable rest periods in between periods of duty.

ICAO defines fatigue as:

"A physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase, and/or workload (mental and/or physical activity) that can impair a person's alertness and ability to perform safety related operational duties". (2)

It is therefore not regarded primarily as a medical condition. Rather, it is considered physiological (i.e. a condition usually affecting healthy individuals who are subjected to

fatigue-inducing circumstances). **However, it is clear that medical conditions can also cause fatigue** (and in some circumstances can result from fatigue), and that aviation medical examiners are in a good position to discuss the topic with licence holders. They can provide guidance on personal fatigue management strategies when pilots attend for renewal of their medical certificate.

Unfortunately, there is no medical test for fatigue and an assessment of its presence and severity is based, to a large extent, on information that is provided by the licence holder. A good rapport between the medical examiner and the licence holder facilitates a frank discussion. Even so, an individual's tolerance for fatigue and willingness to discuss the subject with a medical examiner is variable, and a degree of subjectivity, when assessing the degree of fatigue, is inevitable.

One aspect of fatigue that is in the domain of the medical examiner **concerns the use of hypnotics and other medications that can cause drowsiness.** In private pilots in the United States, diphenhydramine, a widely available antihistamine which is used to treat allergies and skin rashes, is also sedating (sometimes it is used as a sleep aid) and can impair performance. It is the most common drug found during pilot autopsies of those who have died in aviation accidents. (17)

The drug may be obtained with or without a prescription. Medical examiners can help educate pilots about the risks of taking medications (including herbal medications) with performance-impairing properties without guidance from an aviation medicine specialist.

APPENDIX

From the ICAO *Manual of Civil Aviation Medicine* (1)

Frequently Asked Questions concerning personal strategies for fatigue management in flight crew:

1 How do I predict when I am most likely to be fatigued?

Your level of fatigue at any point in a duty is influenced by a few major factors:

- Time since last major sleep – the longer it is, the more likely you are to be fatigued.
- Time on duty – the longer it is, the more likely you are to be fatigued.
- Time of day (according to your body clock) – see below.

There are also some further factors including your workload during the duty, environmental factors (such as temperature, noise, etc.) and whether you already were short of sleep prior to starting the duty. This last factor is important and you may need to manage your activities prior to a duty to ensure that you are adequately rested.

The effect of most of these factors is reasonably obvious. However, “Time of day” requires further explanation:

2 How does the body clock work? Is it important?

Most physical and mental functions vary throughout the 24-hour day, and most, especially mental functions, are worst between the hours of 0100 and 0500, which is the time one naturally feels most sleepy. These daily or “circadian” (which

means “about a day”) rhythms are controlled by brain chemicals which are regulated by exposure to sunlight. Note that there is a second sleepy period during the day, which occurs in the mid-afternoon. This latter period of sleepiness is sometimes called the “post-lunch dip”, although it occurs whether or not lunch has been eaten. When you cross time zones, adjustment of your “body clock” to local time takes a few days to achieve, or longer when many time zones are crossed. If you have only been away from home base for two or three days, you can consider your body clock to be still on home time. This means your naturally sleepy periods will correspond to 0100-0500 and mid-afternoon at home time. These are the hours that you should target for sleep.

3 Can I train myself to require less sleep?

No. The only effective remedy for fatigue is sleep. Although the amount of sleep required per day varies between people, we cannot sustain sleep deficit for long periods without our performance and safety being compromised. Missing a few hours of sleep each night will cause significant impairment of performance after two or three days.

4 What can I do to help me get to sleep?

- Timing – the sleep should be timed to coincide with the naturally sleepy periods, as mentioned above; if it is daytime sleep, time it for the afternoon sleepy period.
- Light – sunlight should be blocked out, using blackout curtains or eyeshades or both.
- Sound – use earplugs, with or without background “white noise” (such as a fan or air conditioning) to mask external noises which might disturb you.

- Temperature – most people sleep better if the temperature is close to 21°C (70°F).
- Anxiety – ensure that there are reliable alarms set so that you will not oversleep. Ensure you are not under time pressure and have had a period to “wind down” from undertaking any stressful activities before resting.
- Exercise – it will help to be physically fit, and exercise can improve sleep. However, do not undertake vigorous and prolonged aerobic exercise within two hours before resting.
- Stimulants – avoid caffeine, tobacco (and food) for a few hours before bed. Caffeine can take 4–6 hours to disappear from the system.
- Alcohol – although alcohol can help you fall asleep, it disrupts the normal sleep cycle of the brain and causes sleep to be restless. Any more than one drink has the potential to impair your sleep.
- Expectation – follow a routine or ritual prior to going to bed; if you are sleeping during the day, the routine should match your normal night-time routine, this provides the brain with an expectation of sleep.
- Diet – eat before sleep to avoid waking due to hunger but avoid overeating (> 20 per cent of daily energy intake) 1–2 hours prior to the main sleep episode.

5 Surely naps are a bad idea, because I feel worse afterwards?

Naps can have a powerful effect on restoring alertness and improving safety. Even after 10 minutes, a nap can produce an improvement in alertness and help maintain performance, although this cannot be sustained indefinitely. Note that naps beyond about 45 minutes will result in a sleepy feeling on waking, known as “sleep inertia” which can impair your performance for 20 minutes or longer. Beware of this effect.

Some States permit pilots to nap in the cockpit (often referred to as controlled flight deck rest). If so, State rules and airline procedures will refer to the procedure. Typically there will be restrictions on when it may occur and for how long, requirements for the briefing beforehand and the handover afterward, and limitations on the tasks that can be undertaken by the non-napping pilot. There will also be a consideration of measures to check on the wakefulness of the non-napping pilot, and in some cases there may be a requirement to report the event.

6 What about sleeping tablets?

As a crew member, you should only use sleeping tablets on the advice of a doctor who understands the medical considerations of aviation. In some countries, pilots are not allowed to use such medications within 24 hours before flying. Medication needs to be of an approved type, taken in accordance with the prescribed instructions. It can be habit forming, so should not ever be used more than three or four times per week. The time required between taking a sleeping tablet and reporting for duty (to make sure there are no persistent effects) depends on the tablet used and requires advice of an aviation medicine doctor. As with any medication, a ground trial (i.e. when not required to operate afterwards), needs to be done before using the sleeping tablet prior to a flight, to ensure there are no unwanted side effects. Sleeping tablets should not be used together with alcohol. Do not use sleeping tablets that have been bought “over-the-counter” when away from home.

7 Doesn't melatonin fix jet lag?

Melatonin is a hormone produced by the brain at night which regulates the body's

circadian rhythms. Studies have shown that taking it can help synchronize circadian rhythms to a new time zone. However, for pilots or cabin crew, adjusting to local time is very often not achievable or desirable. In these cases, melatonin is usually not useful. Further, melatonin can have differing effects depending on your body clock. If crossing several time zones, taking melatonin at the wrong time can make matters worse. However, it may sometimes be helpful for adjusting when back at home base. Note that the quality of melatonin tablets and the quantity of active ingredient in tablets bought from a local store without a prescription is usually unknown and is therefore not recommended. You should only use it if advised by a doctor who understands the medical considerations of aviation, and the quality of the melatonin prescribed can be assured.

8 How about caffeine and other stimulants?

Caffeine can sustain wakefulness, but most people use it so regularly that much of this benefit is lost because they develop tolerance to it. If you are serious about using caffeine to remain alert, use it only when it is necessary to be awake and avoid using it at other times. Be aware that it may take 4–6 hours for the stimulant effect to wear off. Note that stimulant medication (including caffeine tablets) should only ever be used when prescribed by an aviation medicine doctor.

9 Wouldn't the problem be fixed if the flying schedules were well-designed?

The interaction between fatigue and sleep is complicated and affects people

in different ways. In commercial flying operations, there are many different schedules and their circadian rhythm effects are difficult to reliably predict in an individual; this is an area of detailed scientific study. Further, even the best efforts to establish well-designed flying schedules can be stymied by unexpected events and delays. You should learn about the subject and apply the principles to your own circumstances to develop your own personal coping strategies.

10 Why do some people use an air pump device to help them sleep?

There are a few medical conditions that affect sleep. One of these is called “sleep apnoea” which literally means that breathing stops during sleep. When breathing stops for a period, brain oxygen levels decrease until the individual wakes slightly; this can have harmful effects, including a high level of daytime sleepiness. Since the problem can develop slowly, and tiredness is common in aviation operations, the affected person may not be aware that there is a problem. If you are feeling more tired during the day than colleagues working similar schedules, especially if you are overweight and a snorer, you should ask your doctor about sleep apnoea.

The bed partner of an individual suffering the effects of sleep apnoea is more likely to be aware of the situation than the sufferer. If your partner comments that you're breathing repeatedly stops for several seconds when you are asleep, you should mention this to your aviation medicine doctor so that tests can be undertaken, usually involving a night in a sleep laboratory to monitor your breathing pattern. If you are found to be suffering from sleep apnoea, it is likely you will be given a “CPAP” pump device to provide you with

additional oxygen while you sleep; this treatment is virtually 100 per cent successful and does not normally affect medical certification.

11 What's the most important thing I can do?

Sleep! Although stimulants like caffeine can produce some short-term benefits, the only thing that really remedies fatigue is sleep. Make it a priority to get some sleep during the day prior to working all night. Ensure you use the best techniques to get night-time sleep prior to duty, but also catch extra naps when this is feasible. Become skilled at napping. Some sleep is always better than none.

References

- 1 ICAO Manual of Civil Aviation Medicine, Doc 8984, third edition, 2012, chapter 17
www.icao.int/publications/pages/publication.aspx?docnum=8984 (versions in all official languages)
[www.icao.int/safety/fatiguemanagement/FRMS Tools/FMG for Airline Operators 2nd Ed %28Final%29 EN.pdf](http://www.icao.int/safety/fatiguemanagement/FRMS%20Tools/FMG%20for%20Airline%20Operators%202nd%20Ed%28Final%29%20EN.pdf) (English version)
- 2 ICAO, IATA and IFALPA. Fatigue Management Guide for Airline Operators, second edition, Chapter 2, 2015
[www.icao.int/safety/fatiguemanagement/FRMS Tools/FMG for Airline Operators 2nd Ed %28Final%29 EN.pdf](http://www.icao.int/safety/fatiguemanagement/FRMS%20Tools/FMG%20for%20Airline%20Operators%202nd%20Ed%28Final%29%20EN.pdf)
- 3 International Air Transport Association, Medical Manual, 9th edition, February 2017
www.iata.org/publications/Documents/medical-manual.pdf
- 4 Punjabi NM. The Epidemiology of Adult Obstructive Sleep Apnea. Proc Am Thorac Soc. 2008 Feb 15; 5(2): 136–143. doi:10.1513/pats.200709-155MG
www.ncbi.nlm.nih.gov/pmc/articles/PMC2645248/
- 5 Cass AR, Alonso WJ, Islam J, Weller SC. Risk of obstructive sleep apnea in patients with Type 2 diabetes mellitus. Fam Med. 2013 Jul-Aug; 45(7): 492-500
www.ncbi.nlm.nih.gov/pubmed/23846968
- 6 Ejaz SM, Khawaja IS, Bhatia S, Hurwitz TD. Obstructive sleep apnea and depression: a review. Innov Clin Neurosci. 2011 Aug;8(8):17-25
www.ncbi.nlm.nih.gov/pubmed/21922066
- 7 Epstein LJ, Kristo D, Strollo PJ et al. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med. 2009; 5(3):263-276
www.aasmnet.org/Resources/clinicalguidelines/OSA_Adults.pdf
- 8 Iftikhar IH, Kline CE, Youngstedt SD. Effects of exercise training on sleep apnea: a meta-analysis. Lung. 2014;192(1):175-184. doi:10.1007/s00408-013-9511-3
www.ncbi.nlm.nih.gov/pmc/articles/PMC4216726/

-
- 9 Youngstedt SD, Kline CE. Epidemiology of exercise and sleep. *Sleep Biol Rhythms*. 2006 Aug;4(3):215-221
www.ncbi.nlm.nih.gov/pubmed/25374476/
 - 10 Zhang L, Samet J, Caffo B, Bankman I, Punjabi NM. Power spectral analysis of EEG activity during sleep in cigarette smokers. *Chest*. 2008 Feb;133(2):427-32. Epub 2007 Oct 9
www.ncbi.nlm.nih.gov/pubmed/17925420?dopt=Abstract
 - 11 Kashyap R1, Hock LM, Bowman TJ. Higher prevalence of smoking in patients diagnosed as having obstructive sleep apnea. *Sleep Breath*. 2001 Dec;5(4):167-72
www.ncbi.nlm.nih.gov/pubmed/11868156
 - 12 Caldwell, JA (2016): Aviator fatigue and relevant fatigue countermeasures. In: Gradwell DP and Rainford DJ (Eds), *Ernsting's Aviation and Space Medicine*, (5th ed. Ch 36), CRC Press, Taylor and Francis Group, Boca Raton, London and New York
 - 13 Sagaspe P, Taillard J, Chaumet G, Moore N, Bioulac B, Philip P. Aging and nocturnal driving: better with coffee or a nap? A randomized study. *Sleep*. 2007;30(12):1808-1813
www.ncbi.nlm.nih.gov/pmc/articles/PMC2276135/(section METHODS)
 - 14 Clark I, Landolt HP. Coffee, caffeine, and sleep: a systematic review of epidemiological studies and randomized controlled trials. *Sleep Medicine Reviews*, Volume 31, 70 – 78
[www.smr-journal.com/article/S1087-0792\(16\)00015-0/fulltext](http://www.smr-journal.com/article/S1087-0792(16)00015-0/fulltext)
 - 15 NHS Choices. 10 medical reasons for feeling tired
www.nhs.uk/Livewell/tiredness-and-fatigue/Pages/medical-causes-of-tiredness.aspx
 - 16 National Transportation Safety Board Accident Report: NTSB/AAR-14/02, PB2014-107898
www.skybrary.aero/bookshelf/books/2945.pdf
 - 17 Drugs and alcohol in civil aviation accident pilot fatalities from 2004-2008. Federal Aviation Administration, DOT/FAA/AM-11/13 Office of Aerospace Medicine, Washington, DC 20591, September 2011
www.faa.gov/data_research/research/med_humanfacs/oamtechreports/2010s/media/201113.pdf



CHAPTER 8

TRAVEL HEALTH

Summary Guide

for persons travelling abroad

- ☑ **KEEP YOUR VACCINATIONS UP TO DATE**
- ☑ **CHECK RISKS FROM INSECTS AND TAKE PREVENTIVE ACTION AS NECESSARY**
(e.g. mosquitos (malaria/yellow fever/zika))
- ☑ **BE CAREFUL ABOUT FOOD AND WATER HYGIENE**
Avoid contaminated water, contaminated food, keep hands clean.
- ☑ **REDUCE TRANSPORT, RECREATIONAL (ESPECIALLY WATER BASED) AND ASSAULT RISKS**
- ☑ **KNOW YOUR BLOOD GROUP**
Reduce risks from any post-accident transfusion.
- ☑ **AVOID UNNECESSARY EXPOSURE TO SUNLIGHT**
- ☑ **DO NOT USE MEDICATIONS FROM UNRELIABLE SOURCES**
- ☑ **AVOID SEX WITH CASUAL PARTNERS, OR TAKE STEPS TO REDUCE RISKS**
- ☑ **STAY AWAY FROM ANIMALS**

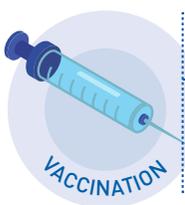
RISKS TO PILOTS

Due to the nature of the work and their access to private travel opportunities, professional pilots travel a lot, often abroad, and are therefore exposed to a number of increased health risks. There is reliable guidance on the web (1, 2, 3) and from travel health clinics.

The information that follows in this chapter is largely based on WHO recommendations (1) and will highlight some of the important issues. For more comprehensive guidance, **consult one of the references to this chapter or other reliable sources of advice, or visit a travel medicine clinic several weeks in advance of departure.**

Risks to pilots are relatively low for those staying in good quality accommodation (with air conditioning, if in a hot climate; as this reduces the risk of mosquito bites when sleeping) and in major cities, such as on most layovers.

However, **especially in developing countries, risks increase substantially with increased distance from quality accommodation and when eating outside hotel restaurants — street food being particularly risky.** Road transport accidents and accidents when undertaking outdoor activities such as swimming, especially when under the influence of alcohol (or drugs), are other risks that are relatively high travelling abroad.



- Highly effective to prevent diseases
- Before travelling, get advice from your doctor to make sure you know the vaccination requirements
- Professional pilots should maintain a record and carry it when travelling

NINE WAYS TO REDUCE MEDICAL RISKS WHEN TRAVELLING ABROAD

1 Keep your vaccinations up to date

Vaccination/immunization is a highly effective method of preventing diseases, some of which might otherwise be fatal. It is generally very safe but rarely 100 per cent effective. Additional ways to reduce risk should therefore be found, when feasible.

It is a challenge to keep fully abreast of all the recommended vaccinations for different parts of the world, and advice from a travel clinic is therefore strongly recommended. In Chapter 6 of its guide: International Travel and Health (1), WHO lists 13 diseases that travellers should be vaccinated against on a “routine” basis, and an additional eight vaccinations that may be given depending on the destination. Although these vaccinations are for the benefit of the traveller, three additional vaccinations (yellow fever, meningococcal disease and polio) are required in order to gain entry into certain countries.

In deciding which vaccines should be given, a number of factors should be discussed with a travel health adviser:

- risk of exposure to the disease,
- age, health status, vaccination history,
- reactions to previous vaccine doses, allergies,
- risk of infecting others should you become infected from the disease in question,
- cost.

Professional pilots should maintain a record of their vaccinations, carry it when travelling and ensure that it is kept up to date. **When travelling to a country for the first time, seek health**

advice in the 4–8 week period before travel.

If your work pattern is unpredictable, such that you are uncertain in advance of which countries you will be operating into, seek specialist advice on appropriate vaccinations.

It is not uncommon to feel some soreness or redness around a vaccine injection site, but this is short lived. For this reason, it would be prudent for professional pilots not to operate on the same day they receive a vaccination (unless they have received it before and know that they will not be not significantly affected). Rarely, a severe allergic reaction occurs in response to a vaccination — this happens within a few minutes of the injection and vaccination staff are trained to deal with it.

2 Check risks from insects (e.g. mosquitos (malaria/yellow fever/zika)) and take preventive action as necessary.

Mosquitos are the best known insects that transmit disease from animals to humans (such insects are called “vectors”). The following paragraphs provide examples of vector-borne disease but there are many others, too numerous to cover in this guide.

Different vector-borne diseases can appear in different areas at different times, and often their appearance is unpredictable. Travellers should be aware that such risks exist and use reputable sources of information when assessing these risks, such as those of WHO or national public health authorities. For serious disease outbreaks that have particular relevance to air travellers, including crew, ICAO and IATA often provide useful guidance on their websites.

Malaria

Over half of all countries in the world have a risk of malaria transmission and over 10,000 international travellers (possibly an underestimate) are reported to become ill with the disease after returning home. Most medical officers involved in aviation have treated or are aware of aircrew that have become unwell or even died after contracting malaria when abroad. **If you develop a fever within three months of leaving a malarial country, seek urgent medical advice. Don't delay!** The most severe form of malaria — falciparum — can cause death within 24 hours of the first symptoms.

Malaria is transmitted by a mosquito bite, which is most likely to occur at dusk and dawn, and overnight. It takes sevendays or longer to develop the first sign of illness — a fever.

While it is possible to identify the general geographical regions where malaria can be found (e.g. sub-Saharan Africa is a high-risk area), the risk for travellers varies greatly from country to country and even between different regions within a country. Risk in one place can change over time.

Malaria can sometimes be found in the main urban areas of Africa and India, but otherwise, the risk in urban areas is low. In general, if you are staying in a good hotel in a city, the risk is likely to be low, but **outside the urban area, the risk is greatly increased.**

Altitude above 1,500 m (malarial mosquitos do not thrive in cool or cold temperatures) is generally protective, but you need to go to 3,000 m or more to ensure a zero risk. Risk is greatest around the end of the rainy season and there may be a “transmission season”. Before you visit a potential malarial area, find out the risk for your particular stay.

There are two ways of reducing the risk of malaria if you are visiting a malarial country: **avoid being bitten and take antimalarial drugs.** However, remember that drugs could affect flight performance and certain types of antimalarial drugs might not have been authorized for use by pilots.

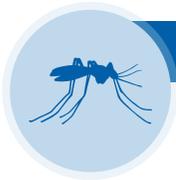
To avoid mosquito bites, follow the advice available on the web (see references [1](#), [2](#), [3](#), [4](#)). The following advice is from the United Kingdom NHS Choices: ([4](#))

◆ **Preventing bites**

It's not possible to avoid mosquito bites completely, but the less you're bitten, the less likely you are to get malaria.

To avoid being bitten:

- Stay somewhere that has effective air conditioning and screening on doors and windows. If this isn't possible, make sure doors and windows close properly.
- If you're not sleeping in an air-conditioned room, sleep under an intact mosquito net that has been treated with insecticide.

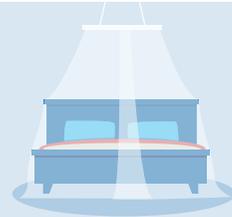


PREVENTING BITES

It's not possible to avoid mosquito bites completely, but the less you're bitten, the less likely you are to get malaria.



Stay somewhere that has effective air conditioning and screening on doors and windows. If this isn't possible, make sure doors and windows close properly.



If you're not sleeping in an air-conditioned room, sleep under an intact mosquito net that has been treated with insecticide.



Use insect repellent on your skin and in sleeping environments. Remember to reapply it frequently. The most effective repellents contain diethyltoluamide (DEET) and are available in sprays, roll-ons, sticks and creams.



Wear light, loose-fitting trousers rather than shorts, and wear shirts with long sleeves. This is particularly important during early evening and at night and dawn, when mosquitoes prefer to feed.

- Use insect repellent on your skin and in sleeping environments. Remember to reapply it frequently. The most effective repellents contain diethyltoluamide (DEET) and are available in sprays, roll-ons, sticks and creams.
- Wear light, loose-fitting trousers rather than shorts, and wear shirts with long sleeves. This is particularly important during early evening and at night and dawn, when mosquitoes prefer to feed.

There's no evidence to suggest homeopathic remedies, electronic buzzers, vitamins B1 or B12, garlic, yeast extract spread (such as Marmite), tea tree oils or bath oils offer any protection against mosquito bites.

There is no vaccine for malaria. Antimalarial drugs can be taken (with the usual precaution that on first use, give the drug a trial on the ground for two or three days to check for side effects). As such drugs are not 100 per cent effective, it is important to avoid being bitten even if taking them.

Most antimalarial drugs are acceptable for pilots, but with the following caveats:

- Because there are occasionally serious psychiatric and other side effects (e.g. dizziness, vertigo), regulatory authorities do not usually permit mefloquine for prophylaxis.
- If you need to travel to malarial areas frequently, discuss any possible long-term side effects of antimalarial drugs with a specialist in travel medicine. Retinal (back of the eye) problems can develop after several years of regular use of chloroquine, for instance. Long-term use of other drugs is probably safe. However, when use is prolonged, it may be better to use prophylactic drugs only in high-risk areas, and at other times, concentrate on avoiding bites, while carrying a stand-by

emergency treatment pack. Discuss the options with your airline medical advisor or, if not available, with a specialist in travel medicine.

- If you are taking an antimalarial drug for the first time, watch out for side effects. Have a back-up plan in case you find you are intolerant of them (e.g. certain anti-malarials have significant gastrointestinal side effect in susceptible individuals).

Women who are pregnant or who may become pregnant should seek specialist advice before visiting a malarial area. IFALPA has published a useful briefing leaflet on malaria. [\(5\)](#)

Yellow fever

Yellow fever is a viral disease caused by the bite of an infected mosquito, with the greatest risk being in Africa and Central/South America. Generally, it causes flu-like symptoms three to six days after being bitten. Full recovery after a few days is the norm, but in a small number of cases it is more serious and can lead to death.

One of the more severe signs is jaundice (yellowing of the skin and eyes). There is no specific treatment, but vaccination is effective and safe for most people and needed only once in a lifetime. **Some countries require proof of vaccination before entry into that country is permitted.**

Zika

Another disease spread by mosquitos is the Zika virus. It can also be transmitted through sexual intercourse by people who have been infected. Symptoms are usually mild, flu-like and last for two to seven days. However in 2015, Brazil reported a link

between the virus and certain diseases of the nervous system, including Guillain-Barré syndrome, and “microcephaly” in the newborn (when a newborn has a head size smaller than expected) following infection of the mother during pregnancy. There is no specific treatment and no vaccine.

The mainstay of prevention is to avoid mosquito bites (see guidance under “Malaria” above). Note that the mosquito that carries the Zika virus is different from that for malaria in that it tends to bite during the day, with risk peaking in late afternoon or early evening.

Ticks and fleas

Ticks are not insects (they have eight legs compared with the six of an insect) but are included here as examples of important vectors that “bite” humans. Ticks can transmit a variety of diseases, one of the most common being Lyme disease, which is found in many countries around the world.

The disease is characterized by flu-like symptoms 3–30 days after infection and often mistaken for influenza. A skin rash may occur. Later, the disease can affect many parts of the body and cause serious health problems. However, treatment with antibiotics in the early stages is usually curative.

Ticks live in woody areas and find their hosts when they fall onto them as they brush past. **To avoid direct contact with ticks, avoid wooded, leafy areas and walk in the centre of trails.** If risk of contact cannot be avoided, use a repellent such as DEET (as for prevention of mosquito bites). A chemical called “permethrin” can be used as a repellent on clothing.

After potential exposure, look for ticks on the skin and kill any that might remain on clothes

by washing in hot water or tumble drying at a hot temperature. If you should find a tick attached to the skin, the US Centers for Disease Control and Prevention recommend removing it with tweezers, pulling it gently straight out, then cleaning the bite area with alcohol then soap and water. Keep the tick and if, up to 30 days later, you develop a fever and/or a rash, see your doctor and take the tick with you — it will help in making a diagnosis. More detailed guidance is available on the web. (2)

Fleas are insects that are found worldwide and, like ticks, can cause a variety of diseases. Their hosts include cats, dogs, rabbits, rats, mice and birds. Flea bites in humans usually cause small, itchy, red spots, but sometimes a generalized rash can occur. Although most flea bites cause irritation rather than serious illness, sometimes serious diseases can be spread by flea bites. The most well-known is the “plague” (e.g. the “Black Death” in the 14th century). Outbreaks of plague continue to occur — for instance, the recent outbreak in Madagascar (2017), with 1,800 suspected or confirmed cases, including 127 deaths. Despite its grim history, plague can today be easily treated with antibiotics. (6)

3 Be careful about food and water hygiene

Gastrointestinal symptoms (food poisoning) is consistently found to be the most common cause of in-flight incapacitation, whether operating overseas or domestically. However, the risk is greater in developing countries where hygiene standards may not be as high as in developed countries. Traveller’s diarrhoea can affect up to 80 per cent of travellers to high-risk areas. It can be accompanied by nausea, vomiting, abdominal cramps and fever. Bacteria that

are ingested in food or water are the most common culprits.

The most important aspect of treatment for food poisoning is to stay hydrated.

Your company may provide rapid access to medical care when overseas, but if not, you should have available some simple self-treatment items as part of a first aid kit. These would include:

- anti-diarrhoeal medication
- oral rehydration powder
- antibiotics targeting the most frequent infections (not always advised).

Most cases of diarrhoea last only a few days. Medical help should be sought if symptoms last longer than three days and have not responded to simple treatment.

More serious symptoms include: very frequent and watery bowel movements, frequent vomiting, presence of a fever, and

blood in the stools. If you seek medical help, ensure your health professional is aware of your travel history.

The following scenarios and guidance are based on an article on food poisoning on the SKYbrary website. www.skybrary.aero/index.php/Food_Poisoning_-_Accidents_26_Incidents

◆ **Two scenarios**

1. The crew eat together during their rest period. Several crew members experience stomach problems prior to reporting for duty. The captain seeks medical advice from a doctor qualified in aviation medicine and, after discussion with the company, the flight is cancelled.
2. During a flight, the captain feels unwell and is forced to leave the flight deck for protracted periods of time. The co-pilot begins to experience similar symptoms and has difficulty performing routine actions. The crew initiate a diversion to the nearest suitable aerodrome.

HOW TO PREVENT FOOD POISONING

When eating out while on a layover/ night-stop away from home base



If in doubt about the hygiene of a cafe or restaurant, **don't eat there**



Don't eat "street food", as hygiene standards are often poor



Always eat **freshly cooked food**



In a location where water is not drinkable, **avoid salads, fruit, and ice**



Ensure all meat and fish are completely cooked



Avoid shellfish

During a flight



Operating flight crew should **eat different dishes** when in-flight meals are served

Pilots at the controls should eat at different times

A separation of **at least 30 minutes** is advisable.



◆ Defences

- **Good Health** – The human body encounters potentially harmful bacteria and toxins on a continuous basis and the body's digestive and immune systems usually manage these without there being any adverse effects. However, people with pre-existing health problems and those with weak immune systems are more vulnerable.
- **Food Hygiene** – Observing food safety principles reduces the likelihood of food poisoning:
 - › prevent contaminating food with pathogens spreading from people, pets, and pests;
 - › separate raw and cooked foods to prevent contaminating the cooked foods;
 - › cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens;
 - › store food at the proper temperature;
 - › use safe water for cooking.
- **Personal Hygiene** – Always wash hands before handling food. If this is not possible, a good alternative is to use an alcohol hand sanitizer. Ensure it contains at least 60 per cent alcohol.

◆ Solutions

Crews often suffer from food poisoning when eating out while on a layover/night-stop away from home base:

- If in doubt about the hygiene of a cafe or restaurant, don't eat there.
- Don't eat "street food". Hygiene standards are often poor.
- In a location where water is not drinkable, avoid salads, fruit, and ice.
- Always eat freshly cooked food. Avoid rice that is left at room temperature for prolonged periods.
- Ensure all meat and fish are completely cooked.
- Avoid shellfish.
- Pilots should eat different meals.

In Flight:

- Operating flight crew should eat different dishes when in-flight meals are served.
- Pilots at the controls should eat at different times. A separation of at least 30 minutes is advisable.

4 Reduce transport, recreational and assault risks

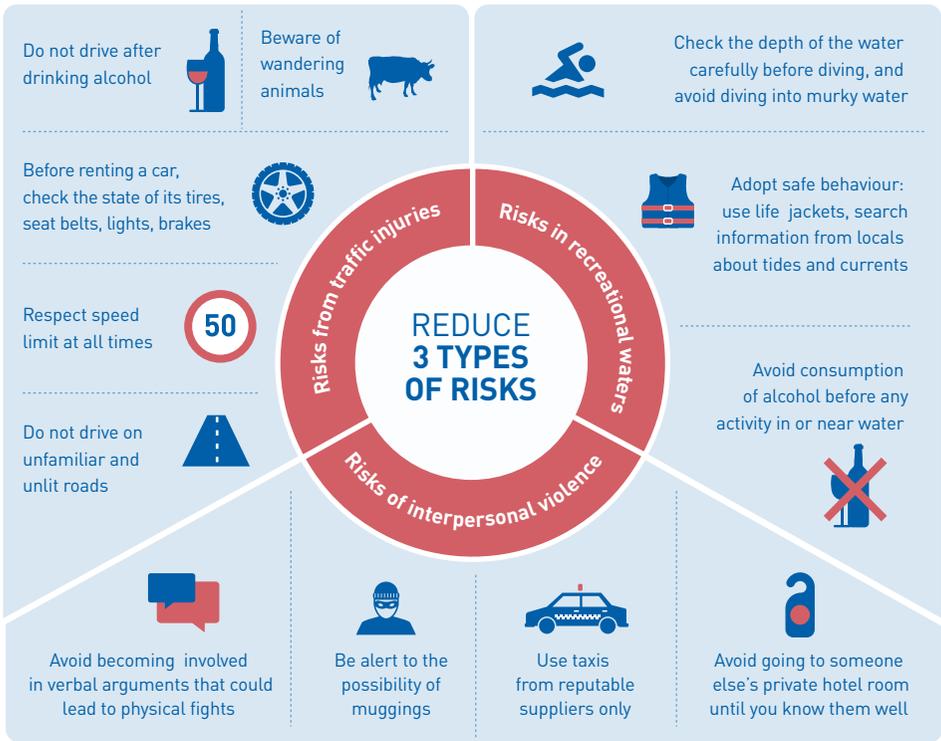
Accidental injury is the most common cause of short-term medical unfitness in professional pilots, and although data

are not available, experience shows that a number of such injuries occur when abroad. Road traffic collisions are the most common cause of death among travellers, especially in developing countries. A serious road traffic accident may be more likely than infection by an exotic disease.

The following lists of precautions are based on WHO guidance for those who are driving themselves when abroad. (1)

Precautions for reducing risks from road traffic injuries:

- Obtain information on the regulations governing traffic and vehicle maintenance, and on the state of the roads, in the countries to be visited.
- Before renting a car, check the state of its tires, seat belts, spare wheels, lights, brakes, etc.
- Know the informal rules of the road. In some countries, for example, it is customary to sound the horn or flash the headlights before overtaking.
- Be particularly vigilant in a country where the traffic drives on the opposite side of the road to that used in your country of residence.
- Do not drive after drinking alcohol.



- Drive within the speed limit at all times.
- Always wear a seatbelt where these are available.
- Do not drive on unfamiliar and unlit roads.
- Do not use a moped, motorcycle, bicycle or tricycle.
- Beware of wandering animals.
- Make sure you carry your personal driving licence and, if necessary, an international driving permit.
- Ensure you have full insurance cover for medical treatment of injuries.

If you are provided with a company driver who is driving in an unsafe manner, ask the person to slow down. Consider reporting the matter to your company agent if the driver does not react appropriately.

Precautions for reducing risks in recreational waters

Another relatively frequent setting for accidental injuries is in areas for water sports. Drowning and impact injuries (particularly head and spinal injuries) are the most frequently reported events. “Non-fatal drownings” occur more frequently than fatal drownings, often with lifelong effects on health due to brain damage from prolonged hypoxia. Accidents at swimming pools (e.g. “slip-trip-fall”) can result in drowning if a head injury results in loss of consciousness. Hitting underwater obstructions is a particular hazard for divers. Note that drowning and impact injuries are frequently associated with alcohol intake, which impairs judgement and the ability to react effectively. To reduce risk:

- Adopt safe behaviour in all recreational waters: use life jackets where

appropriate, pay attention to, and seek information from local residents regarding, tides and currents, and avoid outlets in spas and swimming pools.

- Avoid consumption of alcohol before any activity in or near water.
- Check the depth of the water carefully before diving, and avoid diving or jumping into murky water as submerged swimmers or objects may not be visible.

Precautions for reducing risks of interpersonal violence

Personal security is an increasing problem in many developing countries. Of the 600,000 murders globally each year, 90 per cent occur in low- and middle-income countries. For every murder, there are scores of people who sustain non-fatal injuries. To reduce risks:

- Moderate consumption of alcohol and avoid illicit drugs.
- Avoid becoming involved in verbal arguments that could escalate into physical fighting.
- Leave the scene if you feel threatened by the mood and tone set by other people's behaviour.
- Avoid going to someone else's private home or hotel room until you know them well or have verified their status.
- Be alert to the possibility of muggings during the day as well as at night.
- Keep jewellery, cameras and other items of value out of sight and do not carry large sums of money on your person.
- Avoid isolated beaches and other remote areas.
- Use taxis from reputable suppliers only.
- Avoid driving at night and don't travel alone.
- Keep car doors locked and windows shut.
- Be particularly alert when waiting at traffic lights.

- Park in well-lit areas and do not pick up strangers.
- Employ the services of a local guide/interpreter or local driver when travelling to remote areas.
- Vehicle hijacking is a recognized risk in a number of countries. If stopped by armed robbers, make no attempt to resist and keep your hands where the attackers can see them at all times.

5 Know your blood group

For travellers, the need for a blood transfusion is likely to arise as a result of a blood loss from an accident (e.g. road traffic accident) or another type of medical emergency. Although blood transfusions can be life-saving, in developing countries there is a risk of transfusing blood that is infectious or incompatible.

To reduce the risk, try to avoid situations in which injury can occur, especially road traffic accidents. **Keep a card with you on which is marked your blood group and any medical treatment you are undergoing. If feasible, encourage your medical attendants to use alternatives to blood (e.g. other intravenous solutions).**

6 Avoid unnecessary exposure to sunlight

There are a variety of unwanted effects of exposure to the ultraviolet radiation found in sunlight. In general, the closer you are to the equator the greater the effects. Such effects include: sunburn, photokeratitis ("snow blindness") and skin cancer. Information on precautions to take is readily available. (1-3). Familiarize yourself with the advice offered.

Malignant melanoma is the only serious disease that is consistently found more commonly in professional pilots than in the general population. The likely cause is exposure to ultraviolet radiation, probably from ground-based exposure, although in-flight exposure to UV “A” has been suggested. (7) Note that tanning (without sunburn) has been shown to have detrimental effects that could potentially increase the risk of malignant melanoma. In addition to avoiding unnecessary exposure to sunlight and protecting those areas of skin that are exposed, keep an eye on any skin moles you have for any changes and seek medical advice early if you notice any. **Treatment is usually curative if undertaken early.** When you are having your periodic medical examination, ask your examiner to look for any potential skin problems. Exposure to sunlight ultraviolet radiation in flight and on the ground may cause certain eye-related problems (See [Chapter 9](#)).

7 Do not use medications from unreliable sources

Medicines purchased in a developing country may not be subject to the same controls as those in a developed country and should not be purchased unless you are sure the source is reliable. **If you need to buy medical supplies when abroad, for anything other than simple analgesics, seek advice from the company’s medical adviser or another reliable source.**

8 Avoid sex with casual partners (or take steps to reduce the risks)

Sexual infections are passed from one person to the next through unprotected

sexual intercourse, — anal, vaginal or oral. Such infections include human immunodeficiency virus (HIV), hepatitis B, syphilis, gonorrhoea and genital herpes. **Sex workers are likely to have higher rates of infection than the general population.** A vaccine is available for hepatitis B and post-exposure prevention is available for hepatitis B and HIV.

If you have casual sex when abroad, use a condom. Proper use of a condom greatly reduces the risk of contracting HIV or other sexually transmitted disease, but does not provide 100 per cent protection. Only abstinence or a long-term mutually monogamous relationship with an uninfected partner will do that. The US Centers for Disease Control and Prevention has a fact sheet on condom effectiveness. (8)

If you think you may have casual sex when abroad, spend some time finding out how best to protect yourself before travelling.

9 Stay away from animals

Undomesticated animals can be aggressive and those with rabies (the main risk is from dogs) may attack without provocation. Animal bites may cause both serious injury and infection. **If there is a significant risk of rabies following a bite, post-exposure rabies treatment should be started (requiring several injections over a two-to four-week period), even if there is some doubt as to whether the animal was rabid.**

For those who know they may be exposed to rabies, a pre-departure vaccine is available. This does not eliminate the need for post-exposure treatment, but it reduces the number of post-exposure injections.

MEETING AVIATION STANDARDS

The most important aspect for pilots regarding travel health is to be aware of the risks from contaminated food and water, since gastrointestinal upset (“food poisoning”) is the most common cause of in-flight incapacitation. It can occur during domestic operations, but the risks are greater when operating overseas. Usually, symptoms are short-lived but they can be severe, including temporary loss of consciousness, as shown in the report below, taken from an Australian Transport Safety Bureau Report. [\(9\)](#)

This text is an extract from an Australian Transport Safety Bureau Report. [\(9\)](#)

Incapacitation from gastroenteritis and dehydration

A Fokker F28 aircraft departed West Angelas mine site in Western Australia on a flight to Perth with two flight crew. During cruise, the first officer reported feeling a stabbing pain in their lower abdomen, which increased in intensity over half an hour. The pain continued after using the toilet so the first officer took paracetamol [acetaminophen] for pain relief. The first officer also advised the captain and the aircraft operator they were experiencing abdominal pain. A short time after, the first officer’s pain increased significantly. They advised the captain that they were unable to continue with their flight duties. The first officer then reclined their seat, and began to feel faint and advised the captain. They then became unconscious for about 10 seconds. As the captain was

completing the PAN call, the first officer regained consciousness and reported still feeling pain and feeling ‘groggy and nauseous’. The captain then called the senior cabin crew member to the cockpit who assisted by administering oxygen to the first officer, locking their shoulder harness in place, and moving their seat rearwards. The first officer’s pain and nausea persisted for the remainder of the flight. Although conscious, the first officer did not resume flight duties. After landing, the first officer received medical treatment from ambulance personnel and was transported to hospital. The Designated Aviation Medical Examiner (DAME) determined the first officer had most likely suffered from an acute gastric event aggravated by dehydration and the food consumed.

References

- 1 World Health Organization. International Travel and Health, World Health Organization, 2012
www.who.int/ith/en/
- 2 US Centers for Disease Control and Prevention. Travellers' Health
www.cdc.gov/
- 3 UK Foreign Travel Advice
www.gov.uk/foreign-travel-advice
- 4 NHS Choices. Malaria. Prevention
www.nhs.uk/conditions/Malaria/pages/prevention.aspx
- 5 IFALPA Medical briefing leaflet. Malaria information for pilots
<https://ifalpa.org/media/2045/10medbl01-malaria-information-for-pilots.pdf>
- 6 World Health Organization. Emergencies preparedness, response
www.who.int/csr/disease/plague/en/
- 7 Sanlorenzo M, Wehner MR, Linos E, et al. The risk of melanoma in airline pilots and cabin crew a meta-analysis. JAMA dermatol. 2015;151(1):51-58. doi:10.1001/jamadermatol.2014.1077
www.ncbi.nlm.nih.gov/pmc/articles/PMC4482339/
- 8 US Centers for Disease Control and Prevention. Condom fact sheet in brief
www.cdc.gov/condomeffectiveness/docs/condomfactsheetinbrief.pdf
- 9 Australian Transport Safety Bureau. Pilot incapacitation occurrences 2010–2014. Report no. AR-2015-096, 2016
www.atsb.gov.au/media/5768970/ar-2015-096-final.pdf



CHAPTER 9
**HEARING
AND
VISION**

Summary Guide

HEARING

HOW TO PROTECT YOUR EARS

PROTECT YOUR HEARING FROM:

- long duration background noise at a level where you need to raise your voice in conversation.
- short duration loud noises (fireworks, gunshots).
- exposure to noises that cause subsequent “ringing” in the ears (rock concerts, discos).

KEEP THE VOLUME DOWN

when listening to music on a personal device.

USE EAR PROTECTORS

on the pre-flight walk-round and when using noisy power tools.

DON'T FLY IF YOU HAVE AN UPPER RESPIRATORY INFECTION

DON'T FLY IF YOU CANNOT PERFORM A VALSALVA MANOEUVRE

KNOW FIRST AID TREATMENT

for an upper respiratory infection that arises in flight.

SEE YOUR DOCTOR IF YOU NOTICE ANY HEARING LOSS

VISION

HOW TO PROTECT YOUR VISION

REDUCE EXPOSURE TO ULTRAVIOLET RADIATION (UV)

WEAR EYE PROTECTION

when undertaking risky activities.

EAT A HEALTHY, BALANCED DIET

one that is rich in green, leafy vegetables and fish.

REDUCE RISK FROM DIABETES

TREAT HIGH BLOOD PRESSURE

MANAGE BLOOD CHOLESTEROL LEVELS

QUIT SMOKING

HEARING

A reduction in hearing reduces the ability to communicate with other crew members and with air traffic control, and to identify radio-navigation aids. Other ear-related problems include tinnitus (hearing sound when there is none) and barotrauma (injury due to pressure changes).

In a survey in Norway, ear, nose and throat problems were the fifth most common cause of “permanently unfit” aeromedical decisions made by the regulatory authority. They were also the eleventh most common cause for a “loss of licence” payout from a major insurance company. In a survey by a regulatory authority, 6 per cent of all unfitness decisions, temporary and long term, were noted as being due to ear, nose and throat problems.

Hearing loss, tinnitus and barotrauma are relatively common medical problems in professional pilots and are potentially preventable. They are discussed below.

Hearing loss

Hearing is an important sense for pilots. With increasing age, hearing loss becomes more common. **A significant proportion of hearing loss in the general population is due to excessive noise exposure.** In the United States, 24 per cent of the population aged 20–69 years have features of noise-induced hearing loss on a hearing test. ⁽¹⁾

Experience shows that civilian pilots with a military background can have more hearing problems than pilots with an all civil career due to increased noise exposure in previous military operations.

For civilian pilots, ICAO sets the international standards for audiometry, and most regulatory authorities require an audiogram to be undertaken every five years (every two years for those aged over 40 years). Although the human ear is capable of hearing frequencies between 20 and 20,000 Hz (cycles per second), ICAO indicates testing for those frequencies in the range approximating that of the human voice (i.e. 500–3,000 Hz), which includes the most important frequencies used in aviation. The unit of sound measurement is the decibel (dB).¹

As well as a requirement to hear the human voice, audio identification of navigation aids is also important, and historically, these utilize frequencies approximately within the range of 400–3,000 Hz (e.g. non-directional beacon = 1,020 Hz; Instrument Landing System outer marker = 3,000 Hz, middle marker = 1,300 Hz, inner marker = 400 Hz).

To reduce the risk of noise-induced hearing loss (NIHL), many countries have adopted an occupational exposure limit of 85 dB(A) for up to 8 hours of exposure. A level of 85dB(A) requires the voice to be raised to speak to someone about a metre away. **If you cannot communicate with someone two metres away without shouting, the noise level could be damaging. Do not remain exposed to that environment without ear protection.**

1

The measurement of sound and of hearing is complex. In the decibel (dB) scale (which is logarithmic) the lowest sound pressure level (SPL) that is just detectable by the average healthy/young human ear (i.e. near silence) is given a level of 0 dB. ICAO requires the ability to hear an SPL of 35 dB at 500, 1,000 and 2,000 Hz, and 50 dB at 3,000 Hz, which represent an SPL approximately equivalent to a whisper (a whisper test can be used by medical examiners as a check of hearing at a regulatory periodic medical examination). When measuring sound, because the subjective perception of “loudness” for a given SPL depends on the sound’s frequency, a weighting is given to a measured SPL depending on the frequency. The dB(A) scale is almost always chosen for monitoring human exposure to noise. An increase of 3 dB represents a doubling in sound pressure level.

NOISE LEVEL REGULATION



An increase of 3 dB **DOUBLES** the sound pressure level



An increase of 3 dB doubles the sound pressure level. If 85 dB(A), the usual occupational limit, is acceptable for eight hours, 88 dB(A) is acceptable for four hours, and 82 dB(A) for 16 hours. Such levels are usually not reached in large civil jet aircraft, but might be in propeller driven aircraft and helicopters. **If you are operating noisy aircraft, the risk of NIHL is increased, so be particularly careful about protecting your hearing, both at work and during leisure time.**

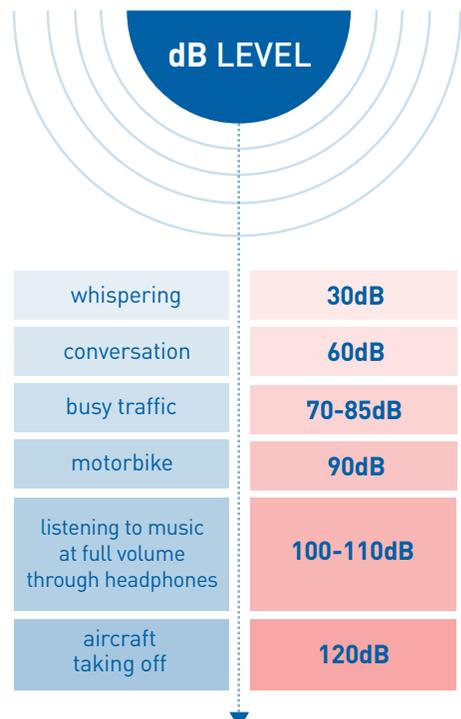
Some individuals are more susceptible to NIHL than others and can be affected by noise exposures of less than 85 dB(A). However, as there is no test to determine who is more susceptible, everyone should protect their hearing as much as is feasible. **Exposure to short but intense noises (e.g. from fireworks, gunshots) can have the same effect as longer exposure to lesser sounds.**

Professional pilots at work are not only exposed to noise from the aircraft in which they are flying. The airport apron can be noisy (e.g. during the pre-flight inspection) and leisure time exposure can expose an individual to noise levels much higher than 85 dB(A) (e.g. personal listening devices, music concerts, hobbies that involve working with power tools, hunting, or shooting competitions with guns).

If you leave a noisy environment (e.g. a concert or nightclub) with a “ringing” sensation in your ears (a temporary “tinnitus”), it indicates that you have likely suffered a temporary hearing loss, called a “temporary threshold shift”, which will typically recover over the next few hours. However, repeated exposures to this level will eventually result in a hearing loss which is permanent. Some evidence shows that some long-term damage is done from such noise exposures even when hearing has appeared to return to normal after a noise exposure.

Examples of some sounds and the equivalent dB level are: (2)

- whispering — 30dB
- conversation — 60dB
- busy traffic — 70-85dB
- motorbike — 90dB
- listening to music on full volume through headphones — 100–110dB
- aircraft taking off — 120dB.



Even without exposure to noise, individuals can suffer hearing loss as part of the normal ageing process (“presbycusis”), so it is important to protect hearing as much as possible and avoid adding to the risk by unnecessary exposure to loud sounds.

Hearing can be protected in many ways. The first is to keep noise levels from devices you control at moderate/low levels. **If sound (e.g. music) is uncomfortable (or painful) to listen to, then it is obviously too loud.** Do not allow yourself to be exposed to such noise levels.

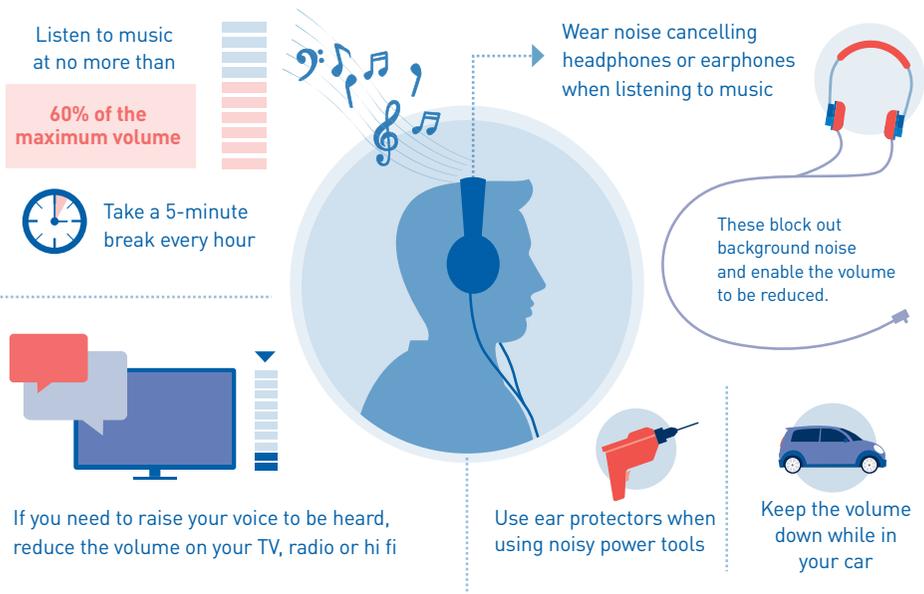
If others can hear music you are listening to on your earphones, it is too loud. Turn the volume down. You should avoid proximity to loudspeakers (e.g. at nightclubs/discos, concerts); any area where the sound levels are high. If this is not possible, then take regular breaks (e.g. every 15 minutes) away from the loudest areas and allow about 18 hours for recovery.

Ear plugs are cheap and simple to wear, and can provide useful protection against noise (15-35 dB reduction). They are easy to carry and can be used when exposed to aircraft noise (e.g. the pre-flight walk-round). They can be taken to events in which the noise level may be high, where they can be used if necessary. Earmuffs do the same job, but are bulky.

Other tips on protecting hearing: (2)

- Listen to music at no more than 60 per cent of the maximum volume. Take a five-minute break every hour.
- Wear noise cancelling headphones or earphones when listening to music. These block out background noise and enable the volume to be reduced.
- If you need to raise your voice to be heard, reduce the volume on your TV, radio or hi fi. Small reductions significantly reduce risk of NIHL.

OTHER TIPS ON PROTECTING HEARING: (2)



- Use ear protectors if you are using noisy power tools.
- Keep the volume down in the car. Hearing effects are greater in a confined space.

Noise-induced hearing loss results in permanent damage or death to sensory cells in the “cochlea”, the inner ear. (1) However, there are other causes of deafness, some of which may be treatable (e.g. ear infections or earwax build-up). **If you notice a loss of hearing, see your doctor about treatment options.**

Professional pilots may have their ears tested regularly for regulatory purposes but the audiogram can also be used as an early indicator of possible NIHL. While ICAO requires the frequency range of 500–3,000 Hz to be tested, most audiometers will measure hearing at frequencies above and below this range. There is therefore an opportunity to use the audiogram test as an early indicator of ear problems (e.g. in NIHL, a reduction of auditory acuity at 4,000 Hz outside the range required for regulatory purposes is typical).

If your regulatory authority does not require audiograms to be undertaken (some authorities rely on the “whisper test” and do not routinely require audiograms), it is recommended that you undergo an audiogram from time to time when aged over 40 years, especially if there is a history of deafness in the family (there is a genetic component to risk of hearing loss). If you are aware of a deterioration in hearing, this will enable you to take additional care to protect it.

Tinnitus

Tinnitus is the sensation of hearing a sound when there is none present. It can be simply a nuisance but may affect concentration and sleeping. It is described in various ways as

ringing, roaring, clicking, hissing or buzzing, with a high or low pitch. Ten per cent of adult Americans report having experienced at least 5 minutes of tinnitus in the previous year. (1)

Noise-induced hearing loss is one of the most common causes of tinnitus. Sometimes tinnitus is the first indication of hearing loss. There are a number of other causes, some of which can be relatively simple to treat (removal of ear wax, treatment of infection). Tinnitus is not usually a sign of a serious health problem but it may not be possible to cure it, and it then needs to be managed: hearing aids and sound generators to mask the tinnitus are examples of treatments that help reduce the effects. Although tinnitus alone can result in an “unfit for flying” decision, this is based on subjective effects that are described by the affected individual. It is not possible to objectively measure tinnitus (since it is the subjective perception of a sound when none exists).

Barotrauma

Barotrauma is an injury caused by pressure changes. In pilots, the most common types affect the middle ear and the sinuses. **In a survey of Danish professional civil pilots, 37.6 per cent reported having had symptoms of ear barotrauma during their career and 19.5 per cent reported a prior episode of sinus barotrauma.** (3)

The middle ear and sinuses are air-filled spaces, and as long as the pressure within them remains the same as ambient, there is no problem. The most common reason why the flow of air in and out of these spaces may be obstructed is an upper respiratory infection, which results in swelling of the lining of the passages that vent them. Generally, there is little difficulty with balancing the

pressures when the aircraft is climbing, even with the effects of an upper respiratory infection. Air escapes down the Eustachian tube into the back of the throat (from the middle ear cavity) and through the openings into the nose cavity (from the sinuses).

If problems occur, they usually arise during descent (90 per cent of cases) when swelling of the passages tends to cause their collapse, or an inability to open, when subjected to an external increase in pressure. If air is unable to enter the air spaces, a pressure differential is established which causes pain that can be severe enough to cause incapacitation and may be accompanied by bleeding. In addition, if pressure is equalized in only in one ear, it may produce strong rotational vertigo and loss of spatial orientation. If the tympanic membrane (ear drum) ruptures, pain is suddenly relieved as the middle ear pressure equalizes with ambient pressure, but hearing is adversely affected. The frontal sinuses (in the forehead) and those behind the cheekbones (maxillary sinuses) are the sinuses most frequently affected.

Rehabilitation after barotrauma can require several weeks off flying – longer, if complications develop (e.g. infection), or if surgery is needed.

Most pilots know that flying with an upper respiratory infection is risky. Those who decide to fly may be able to cope with some discomfort or temporary mild loss of hearing on descent. However, the incidence of barotrauma in civil pilots indicates that a misjudgment of the risk occurs frequently enough to re-emphasize the advice that you should call in sick if you have an upper respiratory infection. In addition, you should know how to efficiently perform the Valsalva manoeuvre. **If it is not possible to perform the Valsalva before flight, you should not fly.**

If you misjudge and find yourself suffering from a cold or a blocked nose during flight, treat yourself with decongestants before descent (check what type are available in your company's first aid kit and test them on the ground before you need them in flight to check for side effects). Make sure you perform the Valsalva manoeuvre regularly during descent (every 1,000 feet change of cabin altitude). This is because **once the pressure differential between the air filled middle ear has increased to approximately 100 mmHg, equivalent to about 3,500 feet pressure differential) the Eustachian tube becomes "locked" with consequent increased risk of perforating the ear drum, since in this situation, pressure cannot be equalized no matter what effort is applied to the Valsalva manoeuvre.**

In summary:

- Don't fly with an upper respiratory infection.
- Never use decongestants with the aim of reducing congestion prior to flying. They may not work adequately and the condition itself may worsen during flight.
- Know what decongestants are in the aircraft first aid kit and how to use them.
- Learn how to clear your ears with the Valsalva manoeuvre (your aviation medical examiner can advise).
- Perform the Valsalva manoeuvre frequently on descent so that it becomes routine.
- See a doctor if pain continues after landing, after any severe symptoms or following bleeding from the ears or nose.

VISION

The most frequent eye diseases with the potential to significantly reduce vision in pilots are: cataracts; age-related macular degeneration; diabetic retinopathy, glaucoma and eye injuries. All of these diagnoses can be prevented, or progression delayed. They are discussed in more detail in this section.

It is said that over 80 per cent of flight-related information is acquired visually by pilots (4) and it is self-evident that loss of vision has the potential to cause major medical issues for a pilot. In a survey in Norway, eye disease was the sixth most common reason for “permanent” loss of medical fitness in professional civilian pilots and the twelfth most common for a “loss of licence” payout by a large insurance company. **In one survey 2 per cent of all causes of unfitness, temporary and long-term, were caused by vision problems** (see Tables 1, 2 and 3, on pages 12-15). However, there are ways to protect vision to reduce the risk of running into a significant medical problem involving vision. These will be discussed in this section.

It is estimated by the US Centers for Disease Control and Prevention that **half of all blindness cases could be prevented** (5) and a similar proportion is a reasonable estimate for preventing an important loss of vision in professional pilots.

In the US, over one million people are legally “blind” (i.e. cannot identify the top letter on an eye chart even with the most effective lenses in place) and as many as 12 million (about

5 per cent of the adult population) are “visually impaired” (e.g. distant vision 6/12 (20/40)² or worse) in their best eye. Since ICAO requires distant vision for Class 1 holders to be 6/9 (20/30) or better in each eye separately and 6/6 (20/20) with both eyes together, those 5 per cent who are classified as “visually impaired” would not meet the vision standards for a professional pilot. Visual problems increase dramatically with increasing age. A study in Australia found that 0.8 per cent of persons aged 49 to 54 years were visually impaired, compared with 42 per cent of those over 85 years. (6)

Cataracts

This is clouding of the eye’s lens, which helps focus light from an object onto the light sensitive lining of the back of the eye, the retina. Cataracts are the leading cause of blindness worldwide and by age 80 years, more than half of Americans have a cataract or have had cataract surgery. (7) **Symptoms begin with hazy, blurred vision and typically develop gradually over a period of years.** Surgical treatment is usually successful and compatible with continued operation as a pilot. It consists of removing the affected lens and replacing it with an artificial one. **The risk of a healthy individual developing a cataract increases with age, although diabetes, eye injuries and some medications can cause cataracts.** There is evidence that following the general advice on health in this guide will reduce the risk of developing a cataract:

- Avoid or control diabetes.
- Treat high blood pressure.
- Avoid smoking.

2

Distant visual acuity is measured using an eye chart. A notation of 6/6 indicates normal vision, meaning an individual can read, at a distance of 6 metres, a letter of the same size that an individual with normal vision can read (i.e. while 6/6 is normal vision for an average healthy person, 6/5 is better than the average normal, 6/5 means you can read a letter at 6 metres when the average eye can only read it at 5 metres, and 6/12 is worse etc.). The numbers 20/20 signify the same as 6/6 but refer to feet rather than metres.

- Eat a balanced diet with at least five portions of fruit and vegetables each day.

Another factor is particularly important for pilots:

- Reduce exposure to ultraviolet radiation (UV).³

Protection from UV radiation is important for pilots because of their potentially increased exposure due to increased altitude: UV radiation increases 10–12 per cent with every 1,000 m (3,280 ft) of ascent. Although UV radiation reaching the pilot (particularly UV “B”) is significantly reduced by the majority of flight deck windows, UV “A” is not so well shielded and can exceed international guideline limits. (8) UVA is known to be a contributory factor in the formation of cataracts.

You should use sunglasses when flying and exposed to sunlight, and also when exposed to sunlight on the ground. (Note that total UV radiation exposure is increased by reflection off snow and cloud.) Sunglasses that block virtually all (99–100 per cent) UV radiation should be chosen.

Since there is some evidence that exposure to “blue light” (high energy visible (HEV) radiation) can also cause vision problems, it would be prudent to choose sunglasses that protect against HEV radiation as well, although 100 per cent protection is not feasible because of the significant colour distortion that would accompany it. A balance needs to be struck between colour distortion and protection from blue light exposure. Note that all coloured lenses will distort perceived colour to some extent.

IFALPA produces a useful briefing leaflet on the ocular hazards of UV exposure and on how to choose suitable sunglasses:

<https://ifalpa.org/media/2044/09medbl06-ocular-hazards-of-uv-exposure.pdf>

Age-related macular degeneration

Age-related macular degeneration (AMD) is the leading cause of blindness in the US for those aged 65 years and older, although rates start to increase in individuals over 50 years of age. AMD affects the macula, which is part of the lining at the back of the eye (the retina), causing a slow deterioration in vision over a number of years. The macula is responsible for seeing objects in sharp focus, and it follows that problems with it result in blurred vision. Objects may also look less bright. AMD affects central vision. Peripheral vision is usually unaffected.

There are two types of AMD, “dry” and “wet”. Dry AMD is the most common kind, and progresses very slowly, whereas wet AMD is more serious and vision can sometimes deteriorate over a number of days. **If you are aware of a deterioration in your vision (from any cause), you should have your eyes checked by an eye care specialist as soon as possible because it can often be treated, and some problems are time-critical.** Those who know they have AMD should have a detailed annual check-up with a vision care specialist.

Dry AMD cannot currently be treated, but wet AMD can be. The most common form of treatment aims to prevent the growth of tiny new blood vessels that form under

3

Ultraviolet (UV) radiation makes up a portion of the sun’s rays. It is divided into three bands, based on wavelength: UVA: 315 - 400 nm; UVB: 280-315 nm; UVC: 180-180 nm. UVC is blocked by the ozone layer but UVA and UVB are found at cruising altitudes and on the ground.

SUMMARY

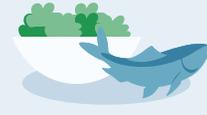
HOW TO PROTECT YOUR VISION



Reduce exposure to ultraviolet radiation (UV)



Wear eye protection when undertaking risky activities



Eat a healthy, balanced diet – one that is rich in green, leafy vegetables and fish



Treat high blood pressure



Reduce risk from diabetes



Manage blood cholesterol levels



Quit smoking

the macula by injecting certain drugs into the eyeball, or destroying those that are already there. There are some new surgical techniques that look promising. However, treatment does not usually result in a return to the previous level of visual acuity.

As mentioned, age is a major risk factor for AMD (as indicated by the name of the disease), but other risk factors include [9](#)):

- Smoking – doubles the risk of AMD.
- Race – more common among Caucasians than African-Americans or Hispanics/Latinos.
- Family history of AMD.

Links (other than smoking) to other risk factors are not certain but there is some evidence that risk of developing AMD may be reduced if you adopt a lifestyle recommended in other chapters of this guide:

- Avoid smoking.

- Exercise regularly.
- Maintain normal blood pressure.
- Manage blood cholesterol levels.
- Eat a healthy, balanced diet – one that is rich in green, leafy vegetables and fish.

Diabetic retinopathy

Diabetes and the risks for developing diabetes are discussed in Chapter 6. Diabetic retinopathy is a disease of the retina (the lining of the back of the eye) that develops in about 40–45 per cent of those with Type 1 or Type 2 diabetes. **It is the most common diabetic eye disease, and because diabetes is common, it is a leading cause of vision problems in working age people.** It results from changes to and increases in the number of tiny blood vessels of the retina, which can leak fluid or bleed, distorting vision and sometimes causing retinal detachment. It is usually a slow process, but over a number of years, vision loss can

occur. It normally affects both eyes.

Prevention or delay in onset of diabetic retinopathy is achieved in those with diabetes by appropriate management of blood sugar, blood pressure and cholesterol. Once retinopathy has occurred, treatment can be used that typically involves injection of drugs into the eye, or by laser surgery. Although diabetic retinopathy is sometimes irreversible, early detection and treatment can reduce the risk of blindness by 95 per cent. **A detailed annual check by a vision care specialist is strongly recommended for all those who have diabetes.** (10)

Glaucoma

Glaucoma is a group of diseases that damage the eye's optic nerve – the nerve that transmits visual information from the back of the eye to the brain. The exact cause of glaucoma is uncertain, but it appears to be due to an abnormality in the optic nerve that is revealed by the effect of pressure inside the eye, the “intraocular pressure” (IOP). **As IOP increases, so does the risk of developing damage to the optic nerve. However, people with normal IOP can also develop glaucoma (although the risk is much lower).**

The first sign of untreated glaucoma is reduced peripheral vision. Central vision is initially spared. Over time, “tunnel vision” (a perception of looking down a tunnel) occurs, but eventually, central vision is also lost.

There is no pain from the most common type of glaucoma, “open angle glaucoma”. However, sometimes it can be associated with sudden, severe pain and nausea. **Such symptoms should be treated as a medical emergency as, without prompt treatment, the eye may become blind.**

Pilots are subject to regular eye examinations

as part of their periodic medical examination.

However, if this is not with an eye care specialist, if your risk is increased, it is worthwhile considering a specialist eye examination specifically to check for glaucoma. Risk factors are:

- Family history of glaucoma
- African or Hispanic descent and aged over 40 years
- Age 60 years and older
- Far or nearsightedness (myopia or hypermetropia)
- Eye injury history
- Diabetes or migraine.

The mainstay of treatment is to lower the eye pressure with medications taken as pills or eye drops. Laser treatment and surgery can also be effective. There is no proven way to prevent glaucoma, but its progress can be slowed with treatment.

Eye injuries

Pilots are an active group and participate in a number of sporting activities that may result in damaged eyes, which in turn may cause a variety of eye problems, such as damage to the cornea (the transparent front part of the eye) or development of a cataract in the lens of the eye. However, all parts of the eye can suffer from injuries, which can lead to problems with medical certification. **In the US, it is estimated that up to 600,000 sports-related eye injuries occur each year, and that 90 per cent of these could be prevented.** (11)

Sports carrying a risk of eye injury have been reported as: (12)

- **High risk**
Squash, cricket, baseball, lacrosse, hockey, racket ball, boxing, full contact

martial arts, air rifle shooting, paintball.

- **Moderate risk**
Badminton, tennis, volleyball, water polo, football, fishing, golf.
- **Low risk**
Swimming, diving, skiing (snow and water), wrestling, bicycling.
- **Eye safe**
Track and field athletics, gymnastics

If you play a sport, you should consider if your eyesight is at risk from injury. Protective eyewear made from polycarbonate plastic is highly impact resistant and is readily available on- or off-prescription. **Consider if such eyewear (or other forms of protective equipment such as goggles, safety shields and eye guards) may be appropriate to your sport.** Note that ordinary eye glasses do not adequately protect against eye injuries. Safety goggles can be worn over them. Those who undertake “do-it-yourself” projects using equipment that could potentially damage eyesight should also take steps to protect their eyes.

Laser illumination

There is little that can be done to avoid flight deck illumination by a laser beam, and such incidents have increased in recent years. **While it is unlikely that a pilot will suffer any long-term effects from an in-flight laser exposure from ground based equipment, temporary reduction in vision may occur and the “startle” effect can be marked.** For those interested in the subject, IFALPA has produced a medical briefing leaflet on the subject. Their guidance on actions to be taken is reproduced below. Those wishing to know more may wish to consult the full leaflet at: <https://ifalpa.org/media/2053/12medbl01-the-effects-of-laser-illumination-of-aircraft.pdf>

“Recommended actions in the event of laser illuminations:

- Look away from the laser beam and shield your eyes if possible.
- Avoid rubbing of eyes so as to reduce the potential for corneal abrasion.
- Determine if other crew members are also exposed. If not, consider handing over the control of the aircraft to the non-exposed crewmember.
- Depending upon the situation and ATC clearance, maneuver to avoid the laser beam. (For instance, if on an approach, the commencement of a missed approach may be appropriate.)
- Consider engaging the autopilot and other relevant flight modes.
- Turn up the cockpit lights to minimize any further illumination effects.
- As soon as flight safety allows, check for dark/disturbed areas in vision, one eye at a time. If either pilot is incapacitated to a degree that may affect the safety of the aircraft, declare an emergency (PAN or MAYDAY as appropriate).
- Inform ATC and, if the situation allows, provide as much information as possible (laser direction, colour, length of exposure, flash or intentional tracking, etc.). The use of the “IDENT” button may assist ATC and authorities in pinpointing the location of origin of a laser attack.
- Fill in an Air Safety Report (ASR).
- If any visual symptoms persist after landing, get an ophthalmologic examination.
- For more information, refer to ICAO Document 9815 *Manual on Laser Emitters and Flight Safety.*”

AVIATION CONCERNS

Hearing

The main concern with hearing loss is the increased chance of missing an ATC call or misunderstanding an ATC instruction. Pilots can usually cope with significant hearing losses by increasing the headset volume. Although hearing aids may be of social benefit, they may not be acceptable for meeting the regulatory hearing requirements because they are not certified for use in aircraft. However, regulatory authorities have different policies on this and some authorities do permit their use during regulatory testing.

For individuals with a hearing loss beyond the limits specified by ICAO (35-50dB), a practical test of hearing may be requested. If in practice, the pilot can perform all necessary hearing related tasks, then the regulatory authority may permit a medical certificate to be issued. For an experienced pilot, the practical test can often be undertaken on an aircraft in flight. An alternative is to have the applicant undertake a ground-based test with background noise simulating that in the aircraft. Since hearing deteriorates with increasing age, for those with hearing acuity outside the usual regulatory levels, practical hearing tests may be required on a periodic basis. More details are available in the ICAO *Manual of Civil Aviation Medicine*. [\(13\)](#)

Vision

As with hearing, some degree of loss of vision below those specified by ICAO is acceptable as long as the pilot can demonstrate that he or she is able to compensate for any deficit. For example, while stereoscopic vision (which requires two functioning eyes) is desirable in a pilot, after some months of practice, loss of vision in one eye can usually be adequately compensated by learning to react to cues available to the good eye. However, the ability to compensate for loss of vision needs to be confirmed by means of a practical test. More information is available from the ICAO *Manual of Civil Aviation Medicine*. [\(13\)](#)

References

- 1 US Department of Health and Human Services, National Institute on Deafness and Other Communication Disorders (NIDCD). Noise-Induced Hearing Loss
www.nidcd.nih.gov/health/noise-induced-hearing-loss
- 2 NHS Choices. 5 ways to prevent hearing loss
www.nhs.uk/Livewell/hearing-problems/Pages/tips-to-protect-hearing.aspx
- 3 Rosenkvist L, Klokke M, K Atholm M. Upper respiratory infections and barotraumas in commercial pilots: a retrospective survey. *Aviat Space Environ Med.* 2008; 79: 960 – 3
www.ingentaconnect.com/content/asma/ asem/2008/00000079/00000010/art00005
- 4 Scott RA, Wright P (2016). Ophthalmology. In: Gradwell DP and Rainford DJ (Eds), *Ernsting's Aviation and Space Medicine*, (5th ed. Chpt 30), CRC Press, Taylor and Francis Group, Boca Raton, London and New York
- 5 US Centers for Disease Control and Prevention. Blindness and Vision Impairment
www.cdc.gov/healthcommunication/toolstemplates/entertainmented/tips/blindness.html
- 6 Attebo K, Mitchell P, Smith W. Visual acuity and the causes of visual loss in Australia: the blue mountains eye study. *Ophthalmology*, Volume 103, Issue 3, March 1996, Pages 357-364
www.sciencedirect.com/science/article/pii/S0161642096306842
- 7 National Eye Institute. Facts about cataract
https://nei.nih.gov/health/cataract/cataract_facts
- 8 Chorley A, Baczynska K, Benwell MJ et al. Occupational ocular UV exposure in civilian aircrew. *Aerosol Med Hum Perform.* 2016; 87(1): 32 – 39
www.researchgate.net/publication/287972639_Occupational_Ocular_UV_Exposure_in_Civilian_Aircrew
- 9 National Eye Institute. Facts about age-related macular degeneration
https://nei.nih.gov/health/maculardegen/armd_facts

- 10 National Eye Institute. Facts about diabetic eye disease
<https://nei.nih.gov/health/diabetic/retinopathy>
- 11 Goldstein MH, Wee D. Sports injuries: an ounce of prevention and a pound of cure. Eye Contact Lens. 2011 May;37(3):160-3. doi: 10.1097/ICL.0b013e31821790db
<https://www.ncbi.nlm.nih.gov/pubmed/21471814/>
- 12 Mishra A, Verma, AK. Sports related ocular injuries. Medical Journal Armed Forces India 68 (2012) 260-266
www.sciencedirect.com/journal/medical-journal-armed-forces-india
- 13 ICAO Manual of Civil Aviation Medicine, Part III
www.icao.int/publications/pages/publication.aspx?docnum=8984

ANNEXES

ANNEX 1

What is the purpose of a regulatory periodic medical examination?

The periodic medical examination, as required for licensing purposes, is undertaken primarily to protect flight safety. The aim is to detect relevant physical or mental medical conditions that are present which could: (a) pose a risk of in-flight incapacitation or (b) may prevent safe aircraft operation (such as poor vision or a muscular disease).

Information on medical conditions may be provided to the aviation medical examiner by the pilot, or the conditions may be found during the medical examination or from a special investigation undertaken (e.g. electrocardiogram, urine test).

The examination is understandably a source of apprehension to many pilots. Although the vast majority of pilots renew their medical certificate without any problem, over a career of several decades, many will develop one or more medical issues that need to be appropriately treated. This will likely involve discussion with an aviation medical examiner, and some conditions may have implications for medical certification. Most aviation medical examiners recognize the potential for anxiety and will try to put pilots at ease.

Even if a medical issue arises, generally it can be adequately managed without any long-term effect on continued medical certification — although periods of temporary unfitness may be necessary (e.g. to stabilize a medical condition and check for potential side effects after beginning a new treatment). For example, most cases of high blood pressure are acceptable with adequate treatment once the pressure has

stabilized and the treatment has been shown to cause no significant side effects.

The medical examiner will be alert to detection of early disease risks so as to provide the pilot with advice on prevention or treatment. Early guidance frequently reduces the likelihood of treatment being required (with its potential for an associated period of grounding).

With a functional deficit (e.g. hearing deficit, a weak eye or an orthopaedic problem), a practical flight test can show that the pilot can compensate for the deficit and operate safely. ICAO has a specific rule for this (called the “flexibility Standard”) that permits those who do not meet the requisite nominal Standards to be certificated by regulatory authorities if flight safety is not compromised. Many pilots have benefited from this Standard.

Medical examination

The physical examination usually takes up the majority of the time at the examiner’s clinic. Each medical system is examined to check that:

- Sufficient functional capability is present for the pilots to undertake their tasks efficiently.
- Risk of physical and mental incapacitation is within acceptable limits.

Sufficient functional capability is present for the pilots to undertake their tasks efficiently

This part of the examination involves checking the eyes, ears, limbs and joints for any medical condition that could affect performance. Many pilots wear spectacles and/or contact lenses, and this is not a problem as long as vision is good when wearing them and a back-up pair of spectacles is carried.

As they age, most pilots will eventually require correction to assist with near vision. In practice, this loss of elasticity in the lens of the eye, “presbyopia”, is often first noted by the pilot when reading in low lighting conditions, when the “depth of field” reduces due to the eye lens becoming less flexible. Bifocal lenses or “lookover” near vision lenses are normally used to manage this.

Hearing is tested routinely with a “whisper” test, checking that the pilot can understand the examiner. An audiogram (not required by all authorities) is an objective test of hearing that is not usually undertaken at every examination. It has the benefit of showing possible problems before they affect medical fitness (by checking hearing acuity at frequencies outside the required range for regulatory requirements) so that necessary hearing protection measures can be put in place, if this is not being done already.

Usually, the pilot is aware of any limb or joint problem. Weakness, restriction of movement or other potential problems in moving the controls or operating switches/buttons, etc. will be considered by the aviation medical examiner. Replacement joints are usually acceptable, and weaknesses may also be acceptable as long as adequate power remains available for the safe operation of controls, including during emergency

operations. In some cases, a practical test may be necessary to check this.

Risk of physical and mental incapacitation is within acceptable limits

Having discussed any relevant items and performed an examination, the examiner will consider the risk of future physical or mental incapacitation and whether the risk is acceptable. Nearly always, the risk is acceptable and a certificate is issued.

However, predicting which medical conditions may cause a flight safety event in the upcoming period of certification can be a challenge and is one reason why a “preventive approach” is encouraged throughout this guide.

One of the most likely causes of a sudden incapacity is from a heart problem, so the examiner will be looking for risk factors that predispose to this (e.g. high blood pressure, rhythm of the pulse and (with a stethoscope), functioning of the heart valves). Experience shows that many cardiac abnormalities that come to light, which might impact medical fitness in the long term, are discovered from anomalies in the tracing from a resting electrocardiogram (ECG).

Other physical systems are examined for a variety of potential issues. Breath sounds in the lungs can be heard with a stethoscope and diseases such as chronic bronchitis and asthma may be identified. Usually, the diagnosis is already known, but a check is made of its severity and to ensure that treatment is effective. The examiner will have to consider if any lung problem could affect the incapacitation risk in the event of a sudden decompression at high altitude, with the attendant sudden exposure to the combined effects of very cold air and hypoxia.

The abdomen is pressed to elicit pain or to identify any lumps or enlarged abdominal organs (e.g. liver or kidney). Any findings may indicate the need for a further investigation to discover the cause. The skin may also be given a quick check for any possible problems, especially early signs of malignant melanoma (since early treatment is usually both simple and curative). If your examiner doesn't check your skin automatically, you could ask for this to be done. The physical part of the exam can be used as a lead-in to the examiner providing tips regarding your lifestyle, with the idea of reducing risk of future medical problems arising.

Regarding mental health, the medical examiner might be able to determine from the pilot's general mood and body language that there could be something on the pilot's mind. He or she will ask the pilot about any possible worries or concerns. The aim is not only to identify any issue that might affect flight safety but also to see if lifestyle could be adjusted early in order to prevent the development of a significant mental health or behavioural problem.

The medical examination is currently designed to detect medical problems that have developed and which could represent a flight safety risk. However, the aviation medical examiner is a resource that you can utilize in order to help protect your health during your career. If you have an option to choose your medical examiner, try to find one with whom you can develop a rapport and with whom you feel comfortable discussing medical issues — one who is willing to spend time discussing with you how to develop or maintain a lifestyle that will help you to complete a full career without any major health issues.

ANNEX 2

Where do I go for more information?

This guide is about preventive medicine, and there is much useful information on the subject to be found on the Internet. Each chapter has a list of references and, for certain topics, gives links to helpful websites. The majority of references have been chosen so as to be useful to the non-medical reader. Many refer to information sources that are written for non-health professionals.

As with any subject being researched on the Internet, it is important to use sources that are reliable. Topics that are addressed by national public health authorities are good places to look for information and this guide has utilized numerous web pages from the United States Centers for Disease Control and Prevention and from the United Kingdom National Health Service. The World Health Organization (WHO) also provides good information that gives an international perspective, much of which is summarized in a way that is clear to the non-specialist. Websites from a national public health authority (as well as from WHO) provide information that has been reviewed by experts and represents the mainstream scientific view, rather than that of an individual (who might benefit financially from promoting a particular approach).

It is helpful to consider, in advance of an actual need, who you would turn to if you needed health-related advice. Even though websites are useful for providing background information and for helping with lifestyle choices, when a medical problem is affecting an individual, then individualized assistance may be needed. There are a variety of sources of help and some are discussed below.

- **General/Family Practitioner**

General practitioners/family doctors can provide general guidance, treatment and access to hospital services. They should be able to help with preventive strategies for minimizing risks of developing diseases during a career. However, they may not have sufficient aviation knowledge to provide specific advice regarding fitness to fly.

- **Aviation Medical Examiner**

An aviation medical examiner (AME) is a good source of guidance regarding the impact of medical conditions on medical certification. They should also be able to provide guidance on preventive strategies for those illnesses that are most important with respect to maintaining a full career. It is good to develop a rapport with your AME in advance of any problem developing.

- **Pilots' representative bodies**

Pilot unions, or equivalent, can provide their members with a variety of services, including aeromedical advice. If they have medical officers, these are often very familiar with the national regulatory system and may be, or may have been, aviation medical examiners. You may be able to speak anonymously to such an individual. A non-medically trained advisor may also be available to answer questions on a confidential basis and can be helpful. Find out what services are provided so that you know to whom you can turn if a medical issue arises.

Consider making an appointment to see an adviser to discuss medical issues in general, even if you don't have a medical problem. This should give you more confidence in the system should a problem develop in the future.

- **Pilot assistance programmes**

Many pilots have access to pilot assistance programmes. Some are independent, some arranged by pilot unions, some by operators, and some by cooperation between unions and operators. These are valuable, especially in psychological or substance abuse issues, but also are able to help in many other issues. The programmes are confidential, and in most cases, run by peer pilots. The peers can also provide preventive advice.



| ICAO



Fitness to Fly - A medical guide for pilots
©International Civil Aviation Organization (ICAO)

ISBN # 978-92-9258-488-7