SECTION 1.6 HUMAN FACTORS PRINCIPES (HF)

Unit 1.6.1 PHFC: PPL human factors – all categories

1. Reserved

2. Fitness for flight

2.1 Basic health

2.1.1 Relate the effect on pilot performance of the following factors:

(a) diet, exercise;

(b) coronary risk factors – smoking, cholesterol, obesity, hereditary factors;

(c) upper respiratory tract infection, for example, colds, hay fever, congestion of air passages and sinuses;

(d) food poisoning and other digestive problems;

(e) headaches and migraines;

(f) pregnancy:

(i) when to stop flying;

(ii) impact on cockpit ergonomics;

(g) injuries;

(h) ageing;

(i) alcohol and smoking;

(j) blood donations;

(k) dehydration;

(l) emotional:

(i) anxiety;

(ii) depression;

(iii) fears.

2.1.2 Recall pilot obligations for a medical clearance from a DME when on any medication.

2.1.3 Enumerate the responsibilities of pilots with regard to being medically fit for flight.

2.2 Health and fitness

2.2.1 Medical standards

(a) state the reasons for and frequency of physical examinations and how to locate DAMEs;

(b) describe the process of obtaining a medical examination;

(c) state the role of the CASA with regard to medical fitness and that only those conditions which present a flight safety hazard are disqualifying.

2.2.2 Alcohol:

(a) recall how alcohol is absorbed and excreted;

(b) outline what a ‘hangover’ is;

(c) explain the effect a ‘hangover’ may have on flying performance;

(d) explain the relationship between a ‘hangover’ and level of blood alcohol in a person;

(e) recall the relationship between the level of blood alcohol and the recovery period from a ‘hangover’;

(f) state the factors that affect the elimination of alcohol from the body and describe the effects of illicit drugs and alcohol on judgment, comprehension, attention to detail the senses, coordination and reaction times;

(g) describe the symptoms of dehydration;

(h) list fluids suitable for rehydration, and explain why.

2.2.3 Drugs:

(a) describe why drug abuse is a behavioural problem and is independent of:

(i) dependence (addiction);

(ii) frequent use;

(b) define illicit or non-illicit psychoactive substances;

(c) state the adverse effects of illicit or non-illicit psychoactive substances;

(d) recall the effects and duration of such effects on human performance related to perception, speed of processing information, and reaction time of such drugs as:

(i) cannabis-based substances, for example, marijuana, ganja;

(ii) amphetamine-based substances, for example, ecstasy;

(iii) opium-based substances, for example, codeine, heroin;

(e) state the undesirable effects of over-the-counter and prescription drugs. In particular, the side effects of:

(i) aspirin, antihistamines, nasal decongestants;

(ii) amphetamines, tranquillisers, sedatives, antibiotics.

2.2.4 Blood donations:

(a) state the effect on flying after giving a blood donation;

(b) state the recommended period between giving blood and the next flight and how this period can vary between individuals.

2.3 Hyperventilation

2.3.1 Recognise and state how to combat hyperventilation.

2.3.2 Define hyperventilation and recall its causes.

2.4 Atmospheric pressure changes

2.4.1 Trapped gases:

(a) recall the effect of changes in pressure on gases trapped in the body cavities;

(b) state the effect on normal bodily function;

(c) list measures for prevention and treatment.

2.4.2 Recall the effects of flying after a period of underwater diving and state the precautions to be taken if intending to fly after underwater diving.

2.5 Basic knowledge of the anatomy of the ear

2.5.1 Outline the basic operation.

2.5.2 Explain the purpose of the eustachian tube and effects of atmospheric/cabin pressure changes.

2.5.3 State the effects of noise exposure on:

(a) hearing loss: long- and short-term;

(b) speech intelligibility;

(c) fatigue.

2.6 State recommended methods of hearing protection

2.7 Vision, spatial disorientation, illusions

2.7.1 Outline the anatomy of the eye and its functioning during the day and at night.

2.7.2 State the factors that affect night vision and identify methods of ‘dark adaptation’.

2.7.3 Recall the limitations of the eye in discerning objects at night and the ‘off-centre’ method of identifying objects at night.

2.7.4 Recall the limitations of the eye with respect to:

(a) the ability to discern objects during flight, for example, other aircraft, transmission lines etc.;

(b) empty field myopia;

(c) glare;

(d) colour vision in aviation;

(e) common visual problems, viz:

(i) myopia, hyperopia, astigmatism, presbyopia;

(f) flicker vertigo.

2.7.5 Outline the importance of:

(a) updating spectacle prescriptions;

(b) selecting suitable sunglasses.

2.7.6 Recall the factors which are conducive to mid-air collisions and describe techniques for visual ‘scanning’.

2.7.7 Define the term ‘disorientation’.

2.7.8 Recall the sensory systems involved in maintaining body equilibrium i.e. equilibrium is normally maintained by use of the eyes, inner ear and proprioceptive system (‘seat of pants’).

2.7.9 Recall that these mechanisms do not provide reliable information under all conditions of flight.

2.7.10 Describe illusion(s) that may be associated with the factors listed below:

(a) ‘leans’;

(b) linear and angular accelerations;

(c) unperceived changes in the pitch; roll; yaw;

(d) autokinetic illusions;

(e) ‘graveyard spin’ illusion.

(f) somatogravic illusion.

2.7.11 Explain:

(a) the conditions under which illusions may occur;

(b) the conflict in perception of an artificial reference system and a pilot's senses when illusions are experienced;

(c) the factors that may make a person more susceptible to disorientation;

(d) how to overcome sensory illusions.

2.7.12 Recall the illusions that may result from the following:

(a) false horizontal clues, for example, sloping cloud formations and sloping terrain;

(b) depth perception, for example, flying over water, snow, desert and other featureless terrain effect of fog; haze; dust;

(c) optical characteristics of windscreens;

(d) landing illusions:

(i) approach angles – steep; shallow;

(ii) width and slope of runway;

(iii) slope of (approach);

(iv) terrain approaches over water;

(e) relative motion between objects.

2.8 Motion sickness

2.8.1 State the basic cause of motion sickness.

2.8.2 List factors that may aggravate motion sickness.

2.8.3 List methods of combating motion sickness in flight.

2.9 Acceleration ‘g’ effects

2.9.1 Describe the effects of positive and negative accelerations on:

(a) the cardiovascular systems; and

(b) vision; and

(c) consciousness.

2.10 Toxic hazards

2.10.1 State the sources, symptoms, effects and treatment of carbon monoxide poisoning.

2.10.2 Recall the effect of breathing air contaminated by fuel and other noxious or toxic aviation products.

2.11 The atmosphere and associated problems

2.11.1 State the chemical composition of the atmosphere and recall the variation of temperature and pressure with altitude.

2.11.2 Outline how the circulatory and respiratory systems distribute oxygen and excrete carbon dioxide.

2.11.3 State what is meant by the partial pressure of oxygen.

2.12 Hypoxia

2.12.1 List the causes of hypoxia and describe:

(a) its effect on night vision;

(b) the dangers of behavioural changes, for example, lack of self-criticism, over-confidence and a false sense of security;

(c) state the symptoms and their development as altitude is increased;

(d) list factors which may increase a person's susceptibility to hypoxia;

(e) list methods of combating various forms of hypoxia.

2.13 Human factors considerations

2.13.1 List the basic concepts of information processing and decision making, including:

(a) how sensory information is used to form mental images;

(b) the influence of the following factors on the decision-making process:

(i) personality traits, for example, introvert/extrovert;

(ii) pride, peer pressure;

(iii) the desire to get the flight flown;

(iv) anxiety, overconfidence, boredom, complacency;

(v) types of memory – long- and short-term;

(vi) memory limitations;

(vii) aides memoire, rules of thumb;

(viii) work load/overload;

(ix) skill, experience, currency.

2.13.2 Recall the general concepts behind decision-making and list the methods of enhancing decision-making skills.

2.13.3 Concepts of stress:

(a) recall the interaction between stress and arousal and the effects of short- and long-term stress on pilot performance and health;

(b) recall the symptoms, causes and effects of environmental stress:

(i) working in an excessively hot, cold, vibrating or noisy environment;

(c) state the effects of stress on performance;

(d) describe the effect of stress on human performance;

(e) apply the basic principles of stress management.

2.13.4 Concepts of fatigue:

(a) identify causes of fatigue and describe its effects on pilot performance;

(b) relate coping strategies, for example:

(i) sleep management;

(ii) relaxation;

(iii) fitness and diet;

(c) describe the differences between acute and chronic fatigue.

2.14 Principles of first aid and survival

2.14.1 Recall first aid and survival information contained in ERSA.

2.15 Threat and error management

2.15.1 Describe the basic principles of TEM.

2.15.2 Explain the principles of TEM and detail a process to identify and manage threats and errors during single-pilot operations.

2.15.3 Define ‘threat’ and give examples of threats.

2.15.4 Give an example of a committed error and how action could be taken to ensure safe flight.

2.15.5 Explain how the use of checklists and standard operating procedures can prevent errors.

2.15.6 Give examples of how an undesired aircraft state can develop from an unmanaged threat or error.

2.15.7 Explain what resources a pilot could identify and use to avoid or manage an undesired aircraft, state such as being lost or entering adverse weather.

2.15.8 Explain the importance of ensuring that tasks are prioritised to manage an undesired aircraft state.

2.15.9 Give examples of how establishing and maintaining interpersonal relationships can promote safe flight.

Unit 1.6.2 CHFC: CPL Human factors

1. Reserved

2. Fitness for flight

2.1 Basic health

2.1.1 Explain the effect and importance on pilot performance of the following factors:

(a) diet, exercise;

(b) coronary risk factors – smoking, cholesterol, obesity, hereditary factors;

(c) upper respiratory tract infection, for example, colds, hay fever, congestion of air passages and sinuses;

(d) food poisoning and other digestive problems;

(e) headaches and migraines;

(f) pregnancy:

(i) when to stop flying; and

(ii) impact on cockpit ergonomics;

(g) injuries;

(h) ageing;

(i) alcohol and smoking;

(j) blood donations;

(k) dehydration;

(l) emotional – anxiety, depression, fear.

2.1.2 Explain why a pilot is not to fly when on any medication unless a medical clearance from a DAME has been obtained.

2.2 Health and fitness

2.2.1 Explain the reasons for, and frequency of, physical examinations and that a CASA network of DAMEs exists.

2.2.2 Explain the role of the CASA with regard to medical fitness and that only those conditions which present a flight safety hazard are disqualifying.

2.3 Alcohol

(a) explain how alcohol is absorbed and excreted;

(b) state and explain what a ‘hangover’ is;

(c) explain the effect a ‘hangover’ may have on flying performance;

(d) explain the relationship between a ‘hangover’ and level of blood alcohol in a person;

(e) explain the relationship between the level of blood alcohol and the recovery period from a ‘hangover’;

(f) state the factors that affect the elimination of alcohol from the body and describe the effects of illicit drugs and alcohol on proficiency, for example:

(i) judgment, comprehension, attention to detail; and

(ii) the senses, coordination and reaction times.

2.4 Drugs

2.4.1 Explain that drug abuse is a behavioural problem and is independent of:

(a) dependence (addiction); and

(b) frequent use.

2.4.2 Define illicit or non-illicit psychoactive substances.

2.4.3 Explain the adverse effects of illicit or non-illicit psychoactive substances.

2.4.4 Explain the effects and duration of such effects on human performance related to perception, speed of processing information, and reaction time of such drugs as:

(a) cannabis-based substances, for example, marijuana, ganja; and

(b) amphetamine-based substances, for example, ecstasy; and

(c) opium-based substances, for example, codeine, heroin.

2.5 Blood donations

2.5.1 Explain the effect on flying after giving a blood donation.

2.6 Hyperventilation

2.6.1 Describe the effects of hyperventilation on the human body.

2.7 Atmospheric pressure changes

2.7.1 Trapped gases

(a) describe the effect of changes in pressure on gases trapped in the body cavities; and

(b) describe the effect on normal bodily function; and

(c) state/list measures for prevention/treatment.

2.8 Vision, spatial disorientation, illusions

2.8.1 Describe the limitations of the eye in discerning objects at night and the ‘off-centre’ method of identifying objects at night.

2.8.2 Explain the limitations of the eye with respect to:

(a) the ability to discern objects during flight, for example, other aircraft, transmission lines etc; and

(b) empty field myopia; and

(c) glare; and

(d) colour vision in aviation; and

(e) common visual problems, viz myopia, hyperopia, astigmatism, presbyopia; and

(f) rotor flicker and its effects (helicopters only).

2.8.3 Know of the factors which are conducive to mid-air collisions and describe/practice techniques for visual ‘scanning’.

2.8.4 Describe the sensory systems involved in maintaining body equilibrium i.e. that equilibrium is normally maintained by use of the eyes, inner ear and proprioceptive system (‘seat of pants’).

2.8.5 Describe illusion(s) that may be associated with the factors listed below:

(a) ‘leans’; and

(b) linear and angular accelerations; and

(c) unperceived changes in the pitch roll yaw; and

(d) autokinetic illusions; and

(e) ‘graveyard spin’ illusion; and

(f) somatogravic illusion.

2.8.6 Explain:

(a) that sensory illusions usually occur when external visual clues are poor or ambiguous and that they are predictable; and

(b) the importance of an artificial visual reference system and a pilot’s ability to use the system; and

(c) the factors that may make a person more susceptible to disorientation; and

(d) how to overcome sensory illusions.

2.9 Motion sickness

2.9.1 Describe the cause of motion sickness.

2.9.2 Explain the factors which may aggravate motion sickness.

2.10 Acceleration 'g' effects

2.10.1 Describe the effects of positive and negative accelerations on the human body, include:

(a) on the cardiovascular systems; and

(b) vision; and

(c) consciousness.

2.11 Toxic hazards

2.11.1 Describe the sources, symptoms, effects and treatment of carbon monoxide poisoning.

2.11.2 Explain the effect of breathing air contaminated by fuel and other noxious or toxic aviation products.

2.12 The atmosphere and associated problems

2.12.1 Describe the chemical composition of the atmosphere and recall the variation of temperature and pressure with altitude.

2.12.2 Describe the circumstances where there is a risk of a pilot suffering symptoms associated with the 'bends' (release of nitrogen in the bloodstream), for example, rapid rate of climb in unpressurised aircraft to altitudes in excess of FL180 or continued flight at altitude following failure of the aircraft pressurisation system.

2.12.3 Describe what is meant by the partial pressure of oxygen.

2.13 Hypoxia

2.13.1 Describe the causes of hypoxia and recognise the symptoms of hypoxia particularly:

(a) its effect on night vision; and

(b) the dangers of behavioural changes, for example, lack of self-criticism, overconfidence and a false sense of security; and

(c) know that symptoms are difficult to detect in healthy individuals and can develop much faster at higher altitudes, for example, 14,000 ft; and

(d) list factors which may increase a person's susceptibility to hypoxia; and

(e) state the approximate time of useful consciousness (effective performance time: EPT) at 20,000, 25,000 and 30,000 ft and list factors which affect EPT; and

(f) list methods of combating various forms of hypoxia.

2.14 Human factors considerations

2.14.1 Know the basic concepts of information processing and decision making, including:

(a) how sensory information is used to form mental images; and

(b) the influence of the following factors on the decision-making process:

(i) personality traits, for example, introvert/extrovert;

(ii) pride, peer pressure, employer pressure;

(iii) the desire to get the task done;

(iv) anxiety, overconfidence, boredom, complacency;

(v) types of memory – long- and short-term;

(vi) memory limitations;

(vii) aides memoire, rules of thumb;

(viii) work load/overload;

(ix) skill, experience, currency.

2.14.2 Discuss the general concepts behind decision making and the methods of enhancing decision-making skills.

2.14.3 Concepts of stress:

(a) know the interaction between stress and arousal and the effects of short- and long-term stress on pilot performance and health; and

(b) know the symptoms, causes and effects of environmental stress working in an excessively hot, cold, vibrating or noisy environment; and

(c) know the symptoms and effects of domestic and work-related stress; and

(d) know the effects of stress on performance; and

(e) know the principles of stress management, for example:

(i) cognitive and behavioural techniques; and

(ii) relaxation; and

(iii) time management.

2.14.4 Concepts of fatigue:

(a) identify causes of fatigue and describe its effects on pilot performance; and

(b) differentiate between acute and chronic fatigue; and

(c) discuss coping strategies, for example:

(i) sleep management; and

(ii) relaxation; and

(iii) fitness and diet.

2.14.5 Basic ergonomics:

(a) discuss principles of control design and the design features of conventional and modern displays; and

(b) discuss problems associated with:

(i) poorly designed controls/positioning of controls; and

(ii) interpreting instrument presentations; and

(c) know the following information regarding safety harnesses:

(i) types, how to assess their maintenance; and

(ii) inertia reels, how to assess their maintenance.

2.15 Threat and error management (TEM)

2.15.1 Explain the principles of TEM and detail a process to identify and manage threats and errors during single-pilot operations.

2.15.2 Explain the meaning of ‘threat’ and give examples of threats:

(a) give an example of a committed error and how action could be taken to ensure safe flight;

(b) explain how the use of checklists and standard operating procedures can prevent errors;

(c) describe how an undesired aircraft state can develop from an unmanaged threat or error;

(d) explain what resources a pilot could identify and use to avoid or manage an undesired aircraft, state such as being lost or entering adverse weather;

(e) explain the importance of ensuring that tasks are prioritised to manage an undesired aircraft state;

(f) describe how establishing and maintaining interpersonal relationships can promote safe flight.

2.16 Crew coordination

2.16.1 Explain the basic principles of crew coordination and discuss factors which:

(a) influence verbal and non-verbal communication between flight deck crews;

(b) barriers to communication;

(c) listening skills;

(d) assertion skills.

2.16.2 Discuss factors which affect the decision-making process:

(a) communication – attitude;

(b) personality;

(c) judgment;

(d) leadership style.

2.16.3 Discuss ideal leadership qualities.

2.16.4 Review aircraft accidents which resulted from poor crew coordination.

Unit 1.6.3 AHFC: ATPL human factors

1. Reserved

2. Aviation medicine

2.1 Basic concepts

2.1.1 Metabolism.

2.1.2 Oxygen requirement of tissues.

2.1.3 Composition of the atmosphere.

2.1.4 The gas laws.

2.2 The respiratory system and circulation of the blood

2.2.1 Interrelationship of respiration and circulation.

2.2.2 Composition and function of the blood.

2.2.3 Blood pressure:

(a) control of blood pressure;

(b) hypotension and hypertension;

(c) hemodynamic effects of acceleration.

2.2.4 Functional anatomy of the respiratory system.

2.2.5 Ventilation of the alveolar space, respiratory control.

2.2.6 Hypoxia:

(a) definition and causes of hypoxia;

(b) symptoms of oxygen deficiency and treatment;

(c) time of useful consciousness.

2.2.7 Hyperventilation:

(a) definition and causes of hyperventilation;

(b) symptoms and treatment.

2.3 The pressure cabin

2.3.1 Rapid decompression, effects and counter measures.

2.3.2 Entrapped gases, barotrauma.

3. Human information processing

3.1 The general system

3.1.1 Central and peripheral nervous system.

3.1.2 Sensory threshold, sensitivity, adaptation, habituation.

3.1.3 Reflexes and biological control systems.

3.1.4 Information processing by the central nervous system:

(a) mental set, attention (selective, divided, failure);

(b) channel capacity, filtering;

(c) mechanisms of perception, constancies, selective perception.

3.2 The senses

3.2.1 Vision:

(a) functional anatomy of the eye;

(b) physiology of the visual system;

(c) visual acuity, refraction and refractive errors, presbyopia;

(d) the visual field, scanning of the environment;
(e) binocular vision;
(f) the intraocular pressure, glaucoma;
(g) hypoxia and vision;
(h) night vision (dark adaptation);
(i) defective colour vision.

3.2.2 Hearing:
(a) functional anatomy of the ear;
(b) physiology of hearing;
(c) hearing loss (perceptive, conductive);
(d) flight-related hazards to hearing: noise-related hearing loss, barotrauma.

3.2.3 Equilibrium:
(a) functional anatomy and physiology;
(b) detection of rotary and linear acceleration;
(c) the subjective vertical;
(d) motion sickness.

3.3 Integration of sensory inputs: spatial disorientation and illusions

3.3.1 Basic concepts and definitions.

3.3.2 Categories of disorientation:
(a) flight circumstances;
(b) vertigo coriolis effect, pressure, vertigo, flicker vertigo;
(c) visual illusions (the leans, approach and landing problems);
(d) prevention and handling of disorientation.

3.4 Memory

3.4.1 Functional description.

3.4.2 Information storage and recall:
(a) short-term memory;
(b) long-term memory;
(c) motor memory;
(d) effects of stress and time of day.

4. Human behaviour

4.1 General Concepts

4.1.1 Personality:
(a) characteristics;
(b) individual differences in personality;
(c) self concept;
(d) attitude development;
(e) cognitive dissonance.

4.1.2 Behaviour and skills:
(a) drives;
(b) learning;
(c) motivation and performance.

4.1.3 Human error and reliability:
(a) human error model;

(b) types of errors;
(c) prevention and counter measures;
(d) reliability of human behaviour;
(e) errors induced by external factors (ergonomics, organisations).

4.1.4 Working in an automated cockpit:
(a) advantages;
(b) disadvantages;
(c) coping behaviour.

4.2 Cockpit management

4.2.1 Crew coordination:
(a) distribution of responsibilities;
(b) working with a crew concept.

4.2.2 Crew cooperation:
(a) small group dynamics (norms, atmosphere, pressure, communication, structure);
(b) conflict management.

4.2.3 Leadership, style of management:
(a) concern for performance;
(b) concern for people;
(c) democratic vs autocratic style;
(d) encouraging inputs and feedback;
(e) optimising of crew performance in flight;
(f) correcting crew coordination deficiencies.

4.2.4 Communication:
(a) verbal and non-verbal communication;
(b) one and two-way communication;
(c) effects of different communication styles;
(d) miscommunication (including cultural differences).

4.3 Judgment and decision-making

4.3.1 Pilot judgment concepts:
(a) types of judgment;
(b) motor skills and human factors.

4.3.2 Aeronautical decision-making:
(a) decision-making concepts;
(b) pilot responsibilities;
(c) behavioural aspects.

4.3.3 Identification of hazardous attitudes:
(a) physical factors;
(b) psychological factors;
(c) social influences and interface between people.

4.3.4 Pilot judgment awareness:
(a) risk assessment;
(b) cockpit stress management.

4.3.5 Applying decision-making concepts:
(a) practical application;
(b) managing resources;

(c) safety awareness.

5. Flying and health

5.1 The high-altitude environment (ozone, radiation, humidity)

5.2 Physiological and mental fitness

5.3 Incapacitation

5.3.1 Causes and symptoms:

(a) gastro intestinal;

(b) cardiovascular;

(c) side effects of drug and medication;

(d) migraine;

(e) epilepsy;

(f) brain disorders.

5.3.2 Recognition: insidious and sudden incapacitation.

5.3.3 Procedures for dealing with incapacitation.

5.4 Intoxication

5.4.1 Tobacco.

5.4.2 Alcohol.

5.4.3 Drugs and self-medication.

5.4.4 Various toxic materials.

5.5 Body rhythm disturbances

5.5.1 The biological clock.

5.5.2 Disturbances of circadian rhythms:

(a) causes (shift work, time-zone crossing);

(b) symptoms;

(c) treatment.

5.5.3 Sleep

(a) functions;

(b) patterns;

(c) effects of disturbances and treatment.

5.6 Fatigue

5.6.1 Definition.

5.6.2 Causes.

5.6.3 Types and symptoms.

5.6.4 Prevention and treatment.

5.7 Stress and anxiety

5.7.1 Definition of stress.

5.7.2 Stress components.

5.7.3 Causes, stressors.

5.7.4 Coping behaviour:

(a) identifying and reducing stress;

(b) life stress management.

5.7.5 Effects on performance.

5.7.6 Anxiety.

5.7.7 Defence mechanisms.

5.7.8 Effects of anxiety and defence mechanism.

5.8 General health aspects

5.8.1 Common minor ailments (colds, influenza, gastro-intestinal upsets).

5.8.2 Tropical climates: risk, regulatory aspects.

5.8.3 Personal hygiene: oral, external, internal hygiene.

5.8.4 Diabetes.

5.8.5 Hypotension and hypertension.

5.8.6 Obesitas, lack of exercise.

5.8.7 Epidermic diseases.

6. Threat and error management

6.1 Threat and error management model (TEM)

6.1.1 Explain what is TEM.

6.2 Basic principles of TEM

6.2.1 Explain the principles of TEM.

6.2.2 Explain the components of TEM.

6.3 Threat

6.3.1 Define and explain 'threat'.

6.3.2 Explain types of 'threats' such as 'expected', 'unexpected' and 'latent' threats – recognise and give examples.

6.3.3 Explain categories of 'threats' such as 'environmental' and 'organisational' threats – give examples of these 'threat(s) and recognise the 'threat(s)' in a given scenario.

6.4 Error

6.4.1 Define and explain 'error'.

6.4.2 Explain types of 'errors', such as those independent of 'threat(s)', induced by 'threat(s)' and with the potential to escalate other 'errors' (chain of errors) – recognise and give examples.

6.4.3 Explain categories of 'errors' such as those due to aircraft handling, flight management, procedures and communication – give examples of these 'error(s) and recognise the 'error(s)' in a given scenario.

6.4.4 Describe some measures or practices (for example, use of checklist, SOPs) to prevent occurrence of 'errors'.

6.4.5 Analyse scenarios of crew facing 'error(s)', and how crew may recognise and prevent 'errors' to ensure safe flight.

6.5 Undesired aircraft states (UAS)

6.5.1 Define and explain UAS.

6.5.2 Explain categories of UAS such as those arising from ineffective 'threat' and/or 'error' management, and those spontaneously and directly from a 'threat' – recognise and give examples.

6.5.3 Explain categories of UAS such as those due to aircraft handling, ground navigation and incorrect aircraft configuration – give examples of these UAS and recognise the UAS in a given scenario.

6.5.4 Explain the primacy of UAS management over 'error' or 'threat' management – recognise and give examples of the importance of ensuring that tasks are prioritised to manage a UAS.

6.5.5 Explain what resources an aircraft cockpit crew could identify and use to avoid or manage a UAS.

6.5.6 Analyse scenarios of crew facing UAS, and what should be the recovery action, and what would be the end states (outcomes) if recovery action is not taken.

6.6 Countermeasures

6.6.1 Define and explain 'countermeasures'.

6.6.2 Describe and give examples of types of 'countermeasures' such as systemic-based, individual and team 'countermeasures'.

6.6.3 Describe and give examples of 'countermeasures'.

6.7 TEM in multi-crew operations

6.7.1 Detail a process to identify and manage threats and errors during multi-crew operations, such as data gathering, threat analysis, decision making.

6.7.2 Analyse scenarios of multi-crew operations with regards to TEM.

6.7.3 Give examples of how establishing and maintaining interpersonal relationships in multi-crew operations can promote safe flight.