

JAA Administrative & Guidance Material
Section Five: Licensing, Part Two: Procedures

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES

Subject – 040 – Human Performance

See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
040 00 00 00	HUMAN PERFORMANCE					
040 01 00 00	HUMAN FACTORS: BASIC CONCEPTS					
040 01 01 00	Human Factors in aviation					
040 01 01 01	Becoming a competent pilot					
	LO State that competency is based on the knowledge, skill, and ability of an individual pilot	x	x	x	x	x
	LO Outline the factors in training that will ensure the future competency of the individual pilot	x	x	x	x	x
040 01 02 00	Accident statistics					
	LO Give an estimate of the accident rate in commercial aviation in comparison to other means of transport	x	x	x	x	x
	LO State in general terms the percentage of aircraft accidents which are caused by human factors	x	x	x	x	x
	LO Summarise the accident trend in modern aviation	x	x	x	x	x
	LO Identify the role of accident statistics in developing a strategy for future improvements to flight safety	x	x	x	x	x
040 01 03 00	Flight safety concepts					
	LO Explain the three components of the Threat and Error Management Model (TEM).	X	X	X	X	X
	LO Explain and give examples of latent threats	x	x	x	x	x
	LO Explain and give examples of Environmental Threats	x	x	x	x	x
	LO Explain and give examples of Organizational Threats	x	x	x	x	x
	LO Explain and give a definition of Error according the TEM-model in ICAO Annex 1.	x	x	x	x	x
	LO State the three major categories of error that TEM recognises					

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Explain and give examples of Procedural Error	X	X	X	X	X	X
LO	Explain and give examples of "Undesired Aircraft States"	X	X	X	X	X	X
LO	Give examples of different countermeasures which may be used to manage Errors and Undesired Aircraft States						
LO	Describe and compare the elements of the SHELL model	X	X	X	X	X	X
LO	Summarise the relevance of the SHELL model to work in the cockpit	X	X	X	X	X	X
LO	Analyse the interaction between the various components of the SHELL model	X	X	X	X	X	X
LO	Explain how the interaction between individual crew members can affect flight safety	X	X	X	X	X	X
LO	Identify and explain the interaction between flight crew and management as a factor in flight safety	X	X	X	X	X	X
040 02 00 00	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE						
040 02 01 00	Basics of flight physiology						
040 02 01 01	The Atmosphere						
LO	State the units used in measuring total and partial pressures of the gases in the atmosphere	X	X	X	X	X	X
LO	State in terms of % and mm Hg the values of Oxygen, Nitrogen and other gases present in the atmosphere	X	X	X	X	X	X
LO	State that the volume percentage of the gases in ambient air will remain constant for all altitudes at which conventional aircraft operate	X	X	X	X	X	X
LO	State the physiological significance of the following laws: - Boyle's Law - Dalton's Law - Henry's Laws - The General Gas Law	X	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the ICAO standard temperature at Mean Sea Level and the Standard Temperature Lapse Rate	X	X	X	X	X	X
LO	State at what approximate altitudes in the standard atmosphere the atmospheric pressure will be ¼, ½ and ¾ of MSL pressure	X	X	X	X	X	X
LO	State the effects of increasing altitude on the overall pressure and partial pressures of the various gases in the atmosphere	X	X	X	X	X	X
LO	Explain the differences in gas expansion between alveolar and ambient air when climbing	X	X	X	X	X	X
LO	State the condition required for human beings to be able to survive at any given altitude	X	X	X	X	X	X
LO	State and explain the importance of partial pressure	X	X	X	X	X	X
040 02 01 02	Respiratory and circulatory systems						
LO	List the main components of the respiratory system and their function	X	X	X	X	X	
LO	Identify the different volumes of air in the lungs and state the normal respiratory rate	X	X	X	X	X	
LO	State how oxygen and carbon dioxide are transported throughout the body	X	X	X	X	X	
LO	Explain the process by which oxygen is transferred to the tissues and carbon dioxide is eliminated from the body and the oxygen requirement of tissues	X	X	X	X	X	
LO	Explain the role of carbon dioxide in the control and regulation of respiration	X	X	X	X	X	
LO	Describe the basic processes of external respiration and internal respiration	X	X	X	X	X	
LO	List the factors determining pulse rate	X	X	X	X	X	
LO	Name the major components of the circulatory system and describe their function	X	X	X	X	X	
LO	State the values for a normal pulse rate and the average cardiac output (heart rate x stroke volume) of an adult at rest	X	X	X	X	X	
LO	Name the four chambers of the heart and state the function of the individual chambers	X	X	X	X	X	
LO	Differentiate between arteries, veins, and capillaries in their structure and function	X	X	X	X	X	

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the functions of the coronary arteries and veins	X	X	X	X	X	
LO	Define 'systolic' and 'diastolic' blood pressure	X	X	X	X	X	
LO	State the normal blood pressure ranges and units of measurement	X	X	X	X	X	
LO	State that in an average pilot blood pressure will rise slightly with age as the arteries lose their elasticity	X	X	X	X	X	
LO	List the main constituents of the blood and describe their functions	X	X	X	X	X	
LO	Stress the function of haemoglobin in the circulatory system	X	X	X	X	X	
LO	Define 'anaemia' and state its common causes	X	X	X	X	X	
LO	Indicate the effect of increasing altitude on haemoglobin oxygen saturation	X	X	X	X	X	X
	<i>Hypertension and Hypotension</i>						
LO	Define 'hypertension' and 'hypotension'	X	X	X	X	X	
LO	List the effects that high and low blood pressure will have on some normal functions of the human body	X	X	X	X	X	
LO	State that both hypotension and hypertension may disqualify the pilot from obtaining a medical clearance to fly	X	X	X	X	X	
LO	List the factors which can lead to hypertension in an individual	X	X	X	X	X	
LO	State the corrective actions that may be taken to reduce high blood pressure	X	X	X	X	X	
LO	Stress that hypertension is the major factor of 'strokes' in the general population	X	X	X	X	X	X
	<i>Coronary artery disease</i>						
LO	Differentiate between 'angina' and 'heart attack'.	X	X	X	X	X	
LO	Explain the major risk factors for coronary disease.	X	X	X	X	X	

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the role played by physical exercise in reducing the chances of developing coronary disease	X	X	X	X	X	
	Hypoxia						
LO	Define the two major forms of hypoxia (hypoxic and anaemic) and the common causes of both	X	X	X	X	X	X
LO	State the symptoms of Hypoxia	X	X	X	X	X	X
LO	State why living tissues require oxygen	X	X	X	X	X	X
LO	State that healthy people are able to compensate for altitudes up to approximately 10,000 - 12,000 ft	X	X	X	X	X	X
LO	Name the three physiological thresholds and allocate the corresponding altitudes for each of them	X	X	X	X	X	X
LO	State the altitude at which short term memory begins to be affected by hypoxia	X	X	X	X	X	X
LO	Define the terms 'Time of Useful Consciousness' (TUC)	X	X	X	X	X	X
LO	State the TUC varies between individuals but the approximate values are: For a person seated (at rest) For a person moderately active 20,000 ft 30min 5min 30,000 ft 1-2min not required 35,000 ft 30-90sec not required 40,000 ft 15-20sec not required	X	X	X	X	X	X
LO	Explain the dangers of flying above 10,000 ft without using additional oxygen or being in a pressurized cabin	X	X	X	X	X	X
LO	List the factors determining the severity of hypoxia	X	X	X	X	X	X
LO	State the precautions to be taken when giving blood	X	X	X	X	X	X
LO	State the equivalent altitudes when breathing ambient air and 100% oxygen for MSL and approximately 10,000 ft, 30,000 ft and 40,000 ft	X	X	X	X	X	X
	Hyperventilation						

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Describe the role of carbon dioxide in hyperventilation	X	X	X	X	X	X
LO	Define the term 'hyperventilation'	X	X	X	X	X	X
LO	List the factors causing hyperventilation	X	X	X	X	X	X
LO	State that hyperventilation may be caused by psychological or physiological reasons	X	X	X	X	X	X
LO	List the signs and symptoms of hyperventilation	X	X	X	X	X	X
LO	Describe the effects of hyperventilation on muscular coordination	X	X	X	X	X	X
LO	List measures which may be taken to counteract hyperventilation	X	X	X	X	X	X
	<i>Decompression Sickness/Illness</i>						
LO	State the normal range of cabin pressure altitude in pressurised commercial aircraft and describe its protective function for aircrew and passengers	X	X	X	X	X	X
LO	Identify the causes of decompression sickness in flight operation	X	X	X	X	X	X
LO	State how decompression sickness can be prevented	X	X	X	X	X	X
LO	State the threshold for the onset of decompression sickness in terms of altitude	X	X	X	X	X	X
LO	State the approximate altitude above which DCS is likely to occur	X	X	X	X	X	X
LO	List the symptoms of decompression sickness	X	X	X	X	X	X
LO	Indicate how decompression sickness may be treated	X	X	X	X	X	X
LO	List the vital actions the crew has to perform when cabin pressurisation is lost	X	X	X	X	X	X
LO	Define the hazards of diving and flying and give the recommendations associated with these activities	X	X	X	X	X	X
	<i>Acceleration</i>						
LO	Define 'linear', 'angular' and 'radial acceleration'	X	X	X	X	X	

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Describe the effects of acceleration on the circulation and blood volume distribution	X	X	X	X	X	
LO	List the factors determining the effects of acceleration on the human body	X	X	X	X	X	
LO	Describe measures which may be taken to increase tolerance to positive acceleration	X	X	X	X	X	
LO	List the effects of positive acceleration with respect to type, sequence and the corresponding G-load	X	X	X	X	X	
	Carbon Monoxide						
LO	State how carbon monoxide may be produced	X	X	X	X	X	X
LO	State how the presence of carbon monoxide in the blood affects the distribution of oxygen	X	X	X	X	X	X
LO	List the signs and symptoms of carbon monoxide poisoning	X	X	X	X	X	X
LO	Indicate how carbon monoxide poisoning can be treated and counter-measures that can be adopted	X	X	X	X	X	X
040 02 01 03	High altitude environment						
	Ozone						
LO	State how an increase in altitude may change the proportion of ozone in the atmosphere	X		X	X		
LO	List the possible harmful effects of ozone	X		X	X		
	Radiation						
LO	State the sources of radiation at high altitude	X		X	X		
LO	List the effects of excessive exposure to radiation	X		X	X		
LO	State the effect of sun storms on the amount of radiation at high altitude	X		X	X		
LO	List the harmful effects that may result from the extra radiation that may be generated as the result of a sun storm (solar flares)	X		X	X		
LO	List methods of reducing the effects of extra radiation that may be generated as the result of a sun storm (solar flares)	X		X	X		

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		ATPL	CPL	ATPL/IR	ATPL	
	<i>Humidity</i>					
LO	Define the terms 'humidity' and 'relative humidity'	X		X	X	
LO	List the factors which affect the relative humidity of both the atmosphere and cabin air	X		X	X	
LO	State the methods of reducing the effects of insufficient humidity	X		X	X	
LO	List the physiological effects of dry cabin air on the human body and indicate measures to diminish these effects. Stress the effects that low humidity can have on the efficient functioning of the eye	X		X	X	
	<i>Extreme Temperatures</i>					
LO	Explain the change in the need for oxygen of the human body when exposed to extreme environmental temperatures	X		X	X	
040 02 02 00	Man and Environment: the sensory system					
LO	List the different senses	X	X	X	X	X
LO	State the multi-sensory nature of human perception	X	X	X	X	X
040 02 02 01	Central, peripheral and autonomic nervous systems					
LO	Name the main parts of the central nervous system	X	X	X	X	X
LO	State the basic functions of the Central Nervous System (CNS), the Peripheral Nervous System (PNS) and the Autonomic (Vegetative) System (ANS)	X	X	X	X	X
LO	Discuss broadly how information is processed by the nervous systems and the role of reflexes	X	X	X	X	X
LO	Define the division of the peripheral nerves into sensory and motor nerves	X	X	X	X	X
LO	State that a nerve impulse is an electro-chemical phenomenon	X	X	X	X	X
LO	Define the term 'sensory threshold'	X	X	X	X	X
LO	Define the term 'sensitivity', especially in the context of vision	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL	
LO	Give examples of sensory adaptation	X	X	X	X	X
LO	Define the term 'habituation' and state its implication for flight safety	X	X	X	X	X
LO	Define biological control systems as neuro-hormonal processes that are highly self regulated in the normal environment	X	X	X	X	X
040 02 02 02	Vision					
	<i>Functional anatomy</i>					
LO	Name the most important parts of the eye and the pathway to the visual cortex	X	X	X	X	X
LO	State the basic functions of the parts of the eye	X	X	X	X	X
LO	Define 'accommodation'	X	X	X	X	X
LO	Distinguish between the functions of the rod and cone cells	X	X	X	X	X
LO	Describe the distribution of rod and cone cells in the retina and explain their relevance on vision	X	X	X	X	X
	<i>Visual foveal and peripheral vision</i>					
LO	Explain the terms 'visual acuity', 'visual field', 'central vision', 'peripheral vision', 'fovea' and explain their function in the process of vision	X	X	X	X	X
LO	List the factors which may degrade visual acuity and the importance of 'lookout'	X	X	X	X	X
LO	State the limitations of night vision and the different scanning techniques by both night and day (regularly spaced eye movements each covering an overlapping sector of about 10°)	X	X	X	X	X
LO	Explain the adaptation mechanism in vision to cater for reduced and increased levels of illumination	X	X	X	X	X
LO	State the time necessary for the eye to adapt both to the dark and bright light	X	X	X	X	X
LO	State the effect of hypoxia and smoking on night vision	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Explain the nature of colour blindness and the significance of the 'blind spot' on the retina in detecting other traffic in flight	X	X	X	X	X	X
	<i>Binocular and monocular vision</i>						
LO	Distinguish between monocular and binocular vision	X	X	X	X	X	
LO	Explain the basis of depth perception and its relevance to flight performance	X	X	X	X	X	
LO	List possible monocular cues for depth perception	X	X	X	X	X	
LO	State the problems of vision associated with higher energy blue light and ultra violet rays	X	X	X	X	X	
	<i>Defective vision</i>						
LO	Explain long sightedness, short sightedness and Astigmatism	X	X	X	X	X	X
LO	List the causes of and the precautions that may be taken to reduce the probability of vision loss due to: <ul style="list-style-type: none"> • Presbyopia • Cataracts • Glaucoma 	X	X	X	X	X	X
LO	List the types of sunglasses which could cause perceptual problems in flight	X	X	X	X	X	X
LO	List the measures which may be taken to protect oneself from flash-blindness	X	X	X	X	X	
LO	State the possible problems associated with contact lenses	X	X	X	X	X	
LO	State the current rules/regulations governing the wearing of corrective spectacles and contact lenses when operating as a pilot	X	X	X	X	X	
040 02 02 03	Hearing						
	<i>Descriptive and functional anatomy</i>						
LO	State the audible range of the human ear	X	X	X	X	X	

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		ATPL	CPL	ATPL/IR	ATPL	
LO	State the unit of measure for the intensity of sound	X	X	X	X	X
LO	Name the most important parts of the ear and the associated neural pathway	X	X	X	X	X
LO	State the basic functions of the different parts of the auditory system	X	X	X	X	X
LO	Differentiate between the functions of the vestibular apparatus and the cochlea in the inner ear	X	X	X	X	X
LO	State the role of the Eustachian tube in equalizing pressure between the middle ear and the environment	X	X	X	X	X
LO	Indicate the effects of colds or flu on the ability to equalize pressure in the above	X	X	X	X	X
	Hearing loss					
LO	Define the main causes of the following hearing defects /loss: - 'Conductive deafness' - 'Noise Induced Hearing Loss' (NIHL) - 'Presbycusis'	X	X	X	X	X
LO	Summarise the effects of environmental noise on hearing	X	X	X	X	X
LO	State the decibel level of received noise that will cause NIHL	X	X	X	X	X
LO	Indicate the factors, other than noise level, which may lead to NIHL	X	X	X	X	X
LO	Identify the potential occupational risks which may cause hearing loss	X	X	X	X	X
LO	List the main sources of hearing loss in the flying environment	X	X	X	X	X
LO	List the precautions that may be taken to reduce the probability of onset of hearing loss	X	X	X	X	X
040 02 02 04	Equilibrium					
	Functional Anatomy					

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	List the main elements of the vestibular apparatus	X	X	X	X	X	X
LO	State the functions of the vestibular apparatus on the ground and in flight	X	X	X	X	X	X
LO	Distinguish between the component parts of the vestibular apparatus in the detection of linear and angular acceleration as well as on gravity	X	X	X	X	X	X
LO	Explain how the semicircular canals are stimulated	X	X	X	X	X	X
	<i>Motion sickness</i>						
LO	Describe air-sickness and its accompanying symptoms	X	X	X	X	X	X
LO	Indicate that vibration can cause undesirable human responses because of the resonance of the skull and the eyeballs.	X	X	X	X	X	X
LO	List the causes of motion sickness	X	X	X	X	X	X
LO	Describe the necessary actions to be taken to counteract the symptoms of motion sickness	X	X	X	X	X	X
040 02 02 05	Integration of sensory inputs						
LO	State the interaction between vision, equilibrium, proprioception and hearing to obtain spatial orientation in flight	X	X	X	X	X	X
LO	Define the term 'illusion'	X	X	X	X	X	X
LO	Give examples of visual illusions based on shape constancy, size constancy, aerial perspective, atmospheric perspective, the absence of focal or ambient cues, autokinesis, vectional false horizons and surface planes	X	X	X	X	X	X
LO	Relate these illusions to problems that may be experienced in flight and identify the danger attached to them	X	X	X	X	X	X
LO	State the conditions which cause the 'black hole' effect and 'empty field myopia'	X	X	X	X	X	X
LO	Give examples of approach and landing illusions, state the danger involved and give recommendations to avoid or counteract these problems	X	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the problems associated with flickering lights (strobe-lights, anti-collision lights, etc.)	X	X	X	X	X	X
LO	Give examples of vestibular illusions such as Somatogyral (the Leans), Coriolis, Somatogravic and g- effect illusions	X	X	X	X	X	X
LO	Relate the above mentioned vestibular illusions to problems encountered in flight and state the dangers involved	X	X	X	X	X	X
LO	List and describe the function of the proprioceptive senses ('Seat-of-the Pants-Sense')	X	X	X	X	X	X
LO	Relate illusions of the proprioceptive senses to the problems encountered during flight	X	X	X	X	X	X
LO	State that the 'Seat-of-the-Pants-Sense' is completely unreliable when visual contact with the ground is lost or when flying in IMC or poor visual horizon	X	X	X	X	X	X
LO	Differentiate between Vertigo, Coriolis effect and spatial disorientation	X	X	X	X	X	X
LO	Explain The Flicker Effect (Stroboscopic Effect) and discuss counter measures	X	X	X	X	X	X
LO	Explain how spatial disorientation can result from a mismatch in sensory input and information processing	X	X	X	X	X	X
LO	List the measures to prevent and/or overcome spatial disorientation	X	X	X	X	X	X
040 02 03 00	Health and hygiene						
040 02 03 01	Personal hygiene						
LO	Summarise the role of personal hygiene as a factor in human performance	X	X	X	X	X	
040 02 03 02	Body rhythm and sleep						
LO	Name some internal body rhythms and their relevance to sleep	X	X	X	X	X	
LO	Explain the term 'circadian rhythm'.	X	X	X	X	X	
LO	State the approximate duration of a 'free-running' rhythm	X	X	X	X	X	
LO	Explain the significance 'the internal clock' in regulating the normal circadian rhythm	X	X	X	X	X	

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the effect of the circadian rhythm of body temperature on an individual's performance standard and the effect on an individual's sleep patterns	X	X	X	X	X	
LO	List and describe the stages of a sleep cycle	X	X	X	X	X	
LO	Differentiate between REM and non-REM sleep	X	X	X	X	X	
LO	Explain the function of sleep and describe the effects of insufficient sleep on performance	X	X	X	X	X	
LO	Explain the simple calculations for the sleep/wake credit/debit situation	X	X	X	X	X	
LO	Explain how sleep debt can become cumulative	X	X	X	X	X	
LO	State the time formula for the adjustment of body rhythms to the new local time scale after crossing time zones	X	X	X	X	X	
LO	State the problems caused by circadian dysrhythmia (jet-lag) on an individual's performance and sleep	X	X	X	X	X	
LO	Differentiate between the effects of westbound and eastbound travel	X	X	X	X	X	
LO	Explain the interactive effects of circadian rhythm and vigilance on a pilot's performance during flight as the duty-day elapses	X	X	X	X	X	
LO	Describe the main effects of lack of sleep on an individual's performance	X	X	X	X	X	
LO	List possible coping strategies for jet-lag	X	X	X	X	X	
040 02 03 03	Problem areas for pilots						
	Common Minor Ailments						
LO	State the role of the Eustachian tube in equalizing pressure between the middle ear and the environment	X	X	X	X	X	X
LO	State that the in-flight environment may increase the severity of symptoms which may be minor while on the ground	X	X	X	X	X	X
LO	List the negative effects of suffering from colds or flu on flight operations especially with regard to the middle ear, the sinuses, and the teeth	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Indicate the effects of colds or flu on the ability to equalize pressure between the middle ear and the environment	X	X	X	X	X	X
LO	State when a pilot should seek medical advice from an AME, and when the Aeromedical Section of an authority should be informed.	X	X	X	X	X	X
LO	Describe the measures to prevent and/or clear problems due to pressure changes during flight	X	X	X	X	X	X
	<i>Entrapped gases and barotrauma</i>						
LO	Define Barotrauma	X	X	X	X	X	X
LO	Differentiate between otic, sinus, gastro-intestinal and aerodontalgia (of the teeth) barotraumas and explain avoidance strategies	X	X	X	X	X	X
LO	Explain why the effects of otic barotrauma can be worse in the descent	X	X	X	X	X	X
	<i>Gastro-intestinal upsets</i>						
LO	State the effects of gastro-intestinal upsets that may result during flight	X	X	X	X	X	X
	List the precautions that should be observed to reduce the occurrence of gastro-intestinal upsets	X	X	X	X	X	X
LO	Indicate the major sources of gastro-intestinal upsets	X	X	X	X	X	X
	<i>Obesity</i>						
LO	Define 'obesity'	X	X	X	X	X	X
LO	State the cause of obesity	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the harmful effects of obesity on: - Possibility of developing coronary problems - Increased chances of developing diabetes - Ability to withstand g forces - The development of problems with the joints of the limbs - General circulatory problems - Ability to cope with Hypoxia and/or Decompression Sickness	X	X	X	X	X	X
LO	State the relationship between obesity and Body Mass Index (BMI)	X	X	X	X	X	X
LO	Calculate the BMI of an individual (given weight in Kg and height in metres) and state whether this BMI indicates that the individual is underweight, overweight, obese or within the normal range of body weight	X	X	X	X	X	X
	Food Hygiene						
LO	Explain the significance of food hygiene with regards to general health	X	X	X	X	X	X
LO	Stress the importance of and methods to be adopted by aircrew especially when travelling abroad to avoid contaminated food and liquids	X	X	X	X	X	X
LO	List the major contaminating sources in foodstuffs	X	X	X	X	X	X
LO	State the major constituents of a healthy diet	X	X	X	X	X	X
LO	State the measure to avoid hypoglycaemia	X	X	X	X	X	X
LO	State the role vitamins and trace elements are playing in a healthy diet	X	X	X	X	X	X
LO	State the importance of adequate hydration	X	X	X	X	X	X
	Tropical climates						
LO	List the problems associated with operating in tropical climates	X	X	X	X	X	

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	State the possible causes/sources of incapacitation in tropical or poorly developed countries with reference to: <ul style="list-style-type: none"> - Standards of hygiene - Quality of water supply - Insect-borne diseases - Parasitic worms - Rabies or other diseases that may be spread by contact with animals - Sexually transmitted diseases 	X	X	X	X	X	
LO	State the precautions to be taken to reduce the risks of developing problems in tropical areas	X	X	X	X	X	
	<i>Infectious diseases</i>						
LO	State the major infectious diseases that may kill or severely incapacitate individuals	X	X	X	X	X	
LO	State which preventative hygienic measures, vaccinations, drugs, and other measures, reduce the chances of catching these diseases	X	X	X	X	X	
LO	State the precautions which must be taken to ensure that disease carrying insects are not transported between areas	X	X	X	X	X	
040 02 03 04	Intoxication						
	<i>Tobacco</i>						
LO	State the harmful effects of tobacco on: <ul style="list-style-type: none"> - The respiratory system - The cardio-vascular system - The ability to resist hypoxia - The ability to tolerate g forces - Night vision 	X	X	X	X	X	X
	<i>Caffeine</i>						
LO	Indicate the level of caffeine dosage at which performance is degraded	X	X	X	X	X	X
LO	Besides coffee, indicate other beverages containing caffeine	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
	<i>Alcohol</i>					
LO	State the JAA maximum acceptable limit of alcohol for flight crew	X	X	X	X	X
LO	State the effects of consuming alcohol on: <ul style="list-style-type: none"> - Ability to reason - Inhibitions and self control - Vision - Sense of balance and sensory illusions - Sleep patterns - Hypoxia 	X	X	X	X	X
LO	State the effects alcohol may have if consumed together with other drugs	X	X	X	X	X
LO	List the signs and symptoms of alcoholism	X	X	X	X	X
LO	List the factors which may be associated with the development of alcoholism	X	X	X	X	X
LO	Define the 'unit' of alcohol and state approximate elimination rate from the blood	X	X	X	X	X
LO	State the maximum daily and weekly intake of units of alcohol which may be consumed without causing damage to organs and systems in the body	X	X	X	X	X
LO	Discuss the actions that might be taken if a crew member is suspected of being an alcoholic	X	X	X	X	
LO	State the reasons why the aviation profession is particularly vulnerable to the excessive use of alcohol	X	X	X	X	X
	<i>Drugs and self-medication</i>					
LO	State the dangers associated with the use of non prescription drugs	X	X	X	X	X
LO	State the side affects of common non prescription drugs used to treat colds, flu, hay fever and other allergies especially medicines containing anti-histamine preparations	X	X	X	X	X
LO	Interpret the rules relevant to using drugs (prescriptive or not prescriptive) that the pilot has not used before.	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Interpret the general rule that 'if a pilot is so unwell that he/she requires any medication then he/she should consider him/herself unfit to fly	X	X	X	X	X	X
	Toxic materials						
LO	List those materials present in an aircraft which may, when uncontained, cause severe health problems	X	X	X	X	X	X
LO	List those aircraft component parts which if burnt may give off toxic fumes	X	X	X	X	X	X
040 02 03 05	Incapacitation in flight						
LO	State that incapacitation is most dangerous when its onset is insidious	X	X	X	X	X	X
LO	List the major causes of in-flight incapacitation.	X	X	X	X	X	X
LO	State the importance of crew to be able to recognize and promptly react upon incapacitation of other crew members, should it occur in flight	X	X	X	X	X	X
LO	Explain coping methods and procedures	X	X	X	X	X	X
040 03 00 00	BASIC AVIATION PSYCHOLOGY						
040 03 01 00	Human information processing						
040 03 01 01	Attention and vigilance						
LO	Differentiate between 'attention' and 'vigilance'	X	X	X	X	X	X
LO	Differentiate between 'selected' and 'divided' attention	X	X	X	X	X	X
LO	Define 'hypovigilance'	X	X	X	X	X	X
LO	Identify the factors which may affect the state of vigilance	X	X	X	X	X	X
LO	List the factors that may forestall hypovigilance during flight	X	X	X	X	X	X
LO	Indicate signs of reduced vigilance	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
	LO Name factors that affect a person's level of attention	X	X	X	X	X	X
040 03 01 02	Perception						
	LO Name the basis of the perceptual process.	X	X	X	X	X	X
	LO Describe the mechanism of perception ('bottom-up'/'top down' process)	X	X	X	X	X	X
	LO Illustrate why perception is subjective and state the relevant factors which influence interpretation of perceived information	X	X	X	X	X	X
	LO Describe some basic perceptual illusions	X	X	X	X	X	X
	LO Illustrate some basic perceptual concepts	X	X	X	X	X	X
	LO Give examples where perception plays a decisive role in flight safety	X	X	X	X	X	X
	LO Stress how persuasive and believable mistaken perception can manifest itself both on an individual and a group	X	X	X	X	X	X
040 03 01 03	Memory						
	LO Explain the link between the types of memory (to include sensory, working/short term and long term memories)	X	X	X	X	X	X
	LO Describe the differences between the types of memory in terms of capacity and retention time	X	X	X	X	X	X
	LO Justify the importance of sensory store memories in processing information	X	X	X	X	X	X
	LO State the average maximum number of separate items that may be held in working memory.	X	X	X	X	X	X
	LO Stress how interruption can effect the short-term/working memory	X	X	X	X	X	X
	LO Give examples of items that are important for pilots to hold in working memory during flight.	X	X	X	X	X	X
	LO Describe how the capacity of the working memory store may be increased.	X	X	X	X	X	X
	LO State the sub-divisions of long term memory and give examples of their content	X	X	X	X	X	X
	LO Explain that skills are kept primarily in the long term memory	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Explain amnesia and how it effects memory	X	X	X	X	X	X
LO	Name the common problems with both the long and short-term memories and the best methods to try and counter-act them	X	X	X	X	X	X
040 03 01 04	Response selection						
	<i>Learning principles and techniques</i>						
LO	Explain and distinguish between the following basic forms of learning: <ul style="list-style-type: none"> - Classical and operant conditioning (behaviouristic approach) - Learning by insight (cognitive approach) - Learning by imitating (modeling) 	X	X	X	X	X	X
LO	Find pilot related examples for each of these learning forms	X	X	X	X	X	X
LO	State factors which are necessary for and promote the quality of learning	X	X	X	X	X	X
LO	Explain ways to facilitate the memorisation of information by the following learning techniques : <ul style="list-style-type: none"> - Mnemonics - Mental training 	X	X	X	X	X	X
LO	Describe the advantage of planning and anticipation of future actions <ul style="list-style-type: none"> - Define the term 'skills' - State the 3 phases of learning a skill (ANDERSON) 	X	X	X	X	X	X
LO	Explain the term 'motor-programme' or 'mental schema'	X	X	X	X	X	X
LO	Describe the advantages and disadvantages of mental schemata	X	X	X	X	X	X
LO	Explain the model by Rasmussen which describes the guidance of a pilot's behaviour in different situations	X	X	X	X	X	X
LO	State possible problems or risks associated with skill-based, rule-based, and knowledge-based behaviour	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Explain the following phases in connection with the acquisition of automated behaviour - Cognitive phase - Associative phases - Automatic phase	X	X	X	X	X	X
	Motivation						
LO	Define motivation	X	X	X	X	X	X
LO	Explain the influences of different levels of motivation on performance taking into consideration task difficulty	X	X	X	X	X	X
LO	Explain the 'Model of Human Needs' (Maslow) and relate this to aviation	X	X	X	X	X	X
LO	Explain the relationship between motivation and learning	X	X	X	X	X	X
LO	Explain the problems of over-motivation especially in the context of extreme need of achievement	X	X	X	X	X	X
040 03 02 00	Human error and reliability						
040 03 02 01	Reliability of human behaviour						
LO	Name and explain factors which influence human reliability	X	X	X	X	X	X
040 03 02 02	Mental models and situation awareness						
LO	Define the term 'situation awareness'	X	X	X	X	X	X
LO	List cues which indicate the loss of situation awareness and name the steps to regain it	X	X	X	X	X	X
LO	List factors which influence one's Situational Awareness both positively and negatively and stress the importance of Situational Awareness in the context of flight safety	X	X	X	X	X	X
LO	Define the term 'mental model' in relation to a surrounding complex situation	X	X	X	X	X	X
LO	Describe the advantage/disadvantage of mental models	X	X	X	X	X	X
LO	Explain the relationship between personal 'mental models' and the creation of cognitive illusions	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
040 03 02 03	Theory and model of human error					
		X	X	X	X	X
	LO Explain the concept of the 'error chain'	X	X	X	X	X
	LO Differentiate between an isolated error and an error chain	X	X	X	X	X
	LO Distinguish between the main forms/types of errors (i.e. slips, faults, omissions and violations)	X	X	X	X	X
		X	X	X	X	X
	LO Distinguish between an active and a latent error and give examples	X	X	X	X	X
040 03 02 04	Error generation					
	LO Distinguish between internal and external factors in error generation	X	X	X	X	X
	LO Identify possible sources of internal error generation	X	X	X	X	X
	LO Define and discuss the two errors associated with motor programmes	X	X	X	X	X
	LO List the three main sources for external error generation in the cockpit	X	X	X	X	X
	LO Give examples to illustrate the following factors in external error generation in the cockpit : - Ergonomics - Economics - Social environment	X	X	X	X	X
	LO Name major goals in the design of human centered man-machine interfaces	X	X	X	X	X
	LO Define the term 'error tolerance'	X	X	X	X	X
		X	X	X	X	X
040 03 03 00	Decision making					

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
040 03 03 01	Decision-making concepts					
LO	Define the term 'deciding' and 'decision making'	X	X	X	X	X
LO	Describe the major factors on which a decision-making should be based during the course of a flight	X	X	X	X	X
LO	Describe the main human attributes with regard to decision making	X	X	X	X	X
LO	Discuss the nature of bias and its influence on the decision making process	X	X	X	X	X
LO	Describe the main error sources and limits in an individual's decision making mechanism	X	X	X	X	X
LO	State the factors upon which an individual's risk assessment is based	X	X	X	X	X
LO	Explain the relationship between risk assessment, commitment, and pressure of time on decision making strategies	X	X	X	X	X
LO	Describe the positive and negative influences exerted by other group members on an individual's decision making process	X	X	X	X	X
LO	Explain the general idea behind the creation of a model for decision making based upon: definition of the aim, collection of information, risk assessment, development of options, evaluation of options, decision, implementation, consequences, review and feedback	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
040 03 04 00	Avoiding and managing errors: cockpit management					
040 03 04 01	Safety awareness					
	LO Justify the need for being aware of not only one's own performance but that of others before and during a flight and the possible consequences and/or risks	X	X	X	X	X
	LO Stress the over-all importance of constantly and positively striving to monitor for errors and thereby maintaining situation awareness	X	X	X	X	X
040 03 04 02	Co-ordination (multi-crew concepts)					
	LO Name the objectives of the multi-crew concept	X		X	X	
	LO State and explain the elements of multi-crew concepts	X		X	X	
	LO Explain the concept "Standard Operating Procedure" (SOP)	X		X	X	
	LO Illustrate the purpose and procedure of crew briefings	X		X	X	
	LO Illustrate the purpose and procedure of checklists	X		X	X	
	LO Describe the function of communication in a coordinated team	X		X	X	
040 03 04 03	Co-operation					
	LO Distinguish between co-operation and co-action	X		X	X	
	LO Define the term 'group'	X		X	X	
	LO Illustrate the influence of interdependence in a group	X		X	X	
	LO List the advantages and disadvantages of team work	X		X	X	
	LO Explain the term 'synergy'	X		X	X	
	LO Define the term 'cohesion'	X		X	X	
	LO Define the term 'groupthink'	X		X	X	

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		ATPL	CPL	ATPL/IR	ATPL	
LO	State the essential conditions for good teamwork	X		X	X	
LO	Explain the function of role and norm in a group	X		X	X	
LO	Name the different role patterns which occur in a group situation	X		X	X	
LO	Explain how behaviour can be affected by the following factors: - Persuasion - Conformity - Compliance - Obedience	X		X	X	
LO	Distinguish between status and role	X		X	X	
LO	Stress the inherent dangers of a situation where there is a mix of role and status within the cockpit	X		X	X	
LO	Explain the terms 'leadership' and 'followership'	X		X	X	
LO	Describe the trans-cockpit authority gradient and its affiliated leadership styles. (i.e. Autocratic, Laissez- faire and Synergistic)	X		X	X	
LO	Name the most important attributes for a positive leadership style	X		X	X	
040 03 04 04	Communication					
LO	Explain the function of 'information'	X	X	X	X	X
LO	Define the term 'communication'	X	X	X	X	X
LO	List the most basic components of interpersonal communication	X	X	X	X	X
LO	Explain the advantages of two-way communication as opposed to one-way communication	X	X	X	X	X
LO	Explain the statement by Watzlawick "One cannot not communicate."	X	X	X	X	X
LO	Distinguish between verbal and non-verbal communication	X	X	X	X	X
LO	Name the functions of non-verbal communication	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Describe general aspects of non-verbal communication	X	X	X	X	X	X
LO	Describe the advantages/disadvantages of implicit and explicit communication	X	X	X	X	X	X
LO	State the attributes and possible problems of using 'professional' language	X	X	X	X	X	X
LO	Name and explain major obstacles to effective communication	X	X	X	X	X	X
LO	Give examples of aircraft accidents arising from poor communications	X	X	X	X	X	X
LO	Explain the difference between intra and interpersonal conflict	X	X	X	X	X	X
LO	Describe the escalation process in human conflict	X	X	X	X	X	X
LO	List typical consequences of conflicts between crew members	X	X	X	X	X	X
LO	Explain the following terms as part of communication practice in regard to preventing or solving conflicts : - Inquiry - Active listening - Advocacy - Feedback - Metacommunication - Negotiation	X	X	X	X	X	X
040 03 05 00	Human behaviour						
040 03 05 01	Personality, attitude and behaviour						
LO	Describe the factors which determine an individual's behaviour	X	X	X	X	X	X
LO	Define and distinguish between personality, attitude, and behaviour	X	X	X	X	X	X
LO	State the origin of personality and attitudes	X	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL		CPL
	LO State that with behaviours good and bad habits can be formed	X	X	X	X	X	X
	LO Explain how behaviour is generally a product of personality and attitude	X	X	X	X	X	X
	LO Discuss some effects that personality and attitudes may have on flight crew performance	X	X	X	X	X	X
040 03 05 02	Individual differences in personality and motivation						
	LO Describe the individual differences in personality by the mean of a common trait model (e.g.Eysenck's personality factors) and use it to describe today's ideal pilot	X	X	X	X	X	X
	Self-concept						
	LO Define the term 'self-concept' and the part it plays in any change of personality	X	X	X	X	X	X
	LO Explain how a self- concept of under-confidence may lead to an outward show of aggression and self- assertiveness	X	X	X	X	X	X
	Self-discipline						
	LO Define 'self-discipline' and justify its importance for flight safety	X	X	X	X	X	X
040 03 05 03	Identification of hazardous attitudes (error proneness)						
	LO Summarise examples of attitudes and behaviour which, if prevalent in a crew member, might represent a hazard to flight safety and their signs	X		X	X		
	LO Describe the personality attitude and behaviour patterns of an ideal crew member	X		X	X		
	LO Summarise how a person's attitude influences his work in the cockpit	X		X	X		
040 03 06 00	Human overload and underload						
040 03 06 01	Arousal						
	LO Explain the term 'arousal'	X	X	X	X	X	X
	LO Describe the relationship between arousal and performance	X	X	X	X	X	X

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		ATPL	CPL	ATPL/IR	ATPL	
LO	Explain the circumstances under which underload may occur and its possible dangers	X	X	X	X	X
040 03 06 02	Stress					
LO	Explain the term 'homeostasis'	X	X	X	X	X
LO	Explain the term 'stress'. Why is stress a natural human reaction	X	X	X	X	X
LO	State that the physiological response to stress is generated by the 'fight or flight' response	X	X	X	X	X
LO	Describe the function of the autonomic nervous system (ANS) in stress response	X	X	X	X	X
LO	Explain the biological reaction to stress by means of the 'general adaptation syndrome' (GAS)	X	X	X	X	X
LO	Explain the relationship between arousal and stress	X	X	X	X	X
LO	State the relationship between stress and performance	X	X	X	X	X
LO	State the basic categories of stressors	X	X	X	X	X
LO	List and discuss the major environmental sources of stress in the cockpit	X	X	X	X	X
LO	Discuss the concept of 'break-point' with regards to stress, overload and performance	X	X	X	X	X
LO	Name the principal causes of domestic stress	X	X	X	X	X
LO	State that the stress experienced as a result of particular demands varies between individuals	X	X	X	X	X
LO	Explain the factors which lead to differences in the levels of stress experienced by individuals	X	X	X	X	X
LO	List factors influencing the tolerance of stressors	X	X	X	X	X
LO	Explain a simple model of stress	X	X	X	X	X
LO	Explain the relationship between stress and anxiety	X	X	X	X	X
LO	Describe the effects of anxiety on human performance	X	X	X	X	X
LO	State the general effect of acute stress on the human system	X	X	X	X	X
LO	Name the 3 phases of the GAS	X	X	X	X	X

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CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES

Subject – 040 – Human Performance

See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Name the symptoms of stress relating to the different phases of the GAS	X	X	X	X	X	X
LO	Describe the relationship between stress, arousal and vigilance	X	X	X	X	X	X
LO	State the general effect of chronic stress on the human system	X	X	X	X	X	X
LO	Explain the differences between psychological, psychosomatic and somatic stress reactions	X	X	X	X	X	X
LO	Name typical common physiological and psychological symptoms of human overload	X	X	X	X	X	X
LO	Describe effects of stress on human behaviour	X	X	X	X	X	X
LO	Explain how stress is cumulative and how stress from one situation can be transferred to a different situation	X	X	X	X	X	X
LO	Explain how successful completion of a stressful task will reduce the amount of stress experienced when a similar situation arises in the future	X	X	X	X	X	X
LO	Describe the effect of human under/overload on effectiveness in the cockpit	X	X	X	X	X	X
LO	List sources and symptoms of human underload	X	X	X	X	X	X
040 03 06 03	Intentionally left blank						
040 03 06 04	Intentionally left blank						
040 03 06 05	Fatigue and stress management						
LO	Explain the term 'fatigue' and differentiate between the two types of fatigue	X	X	X	X	X	X
LO	Name causes for both types	X	X	X	X	X	X
LO	Identify symptoms and describe the effects of fatigue	X	X	X	X	X	X
LO	List strategies which prevent or delay the onset of fatigue and hypovigilance	X	X	X	X	X	X
LO	List and describe coping strategies for dealing with stress factors and stress reactions	X	X	X	X	X	X
LO	Distinguish between short-term and long-term methods of stress management	X	X	X	X	X	X

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR	
		ATPL	CPL	ATPL/IR	ATPL		CPL
LO	Give examples of short term methods of stress management	X	X	X	X	X	X
LO	Give examples of long-term methods of coping with stress	X	X	X	X	X	X
040 03 07 00	Advanced cockpit automation						
040 03 07 01	Advantages and disadvantages						
LO	Define and explain the basic concept of automation	X	X	X	X	X	X
LO	List the advantages/disadvantages of automation in the cockpit in respect of level of vigilance, attention, workload, situation awareness and crew coordination	X	X	X	X	X	X
LO	State the advantages and disadvantages of the two components of the man-machine system with regard to information input and processing, decision making, and output activities	X	X	X	X	X	X
LO	Explain the 'ironies of automation'	X	X	X	X	X	X
LO	Give examples of methods to overcome the disadvantages of automation	X	X	X	X	X	X
040 03 07 02	Automation complacency						
LO	State the main weaknesses in the monitoring of automatic systems	X	X	X	X	X	X
LO	Explain the following terms in connection with automatic systems : <ul style="list-style-type: none"> - Passive monitoring - Blinkered concentration - Confusion - Mode awareness 	X	X	X	X	X	X
LO	Give examples of actions which may be taken to counteract ineffective monitoring of automatic systems	X	X	X	X	X	X
LO	Define 'complacency'	X	X	X	X	X	X
040 03 07 03	Working concepts						

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Syllabus Reference	Syllabus and Learning Objectives	Aeroplane		Helicopter		IR
		ATPL	CPL	ATPL/IR	ATPL	
LO	Analyse the influence of automation on crew communication and describe the potential disadvantages	X		X	X	
LO	Summarise how the negative effects of automation on pilots may be alleviated	X		X	X	
LO	Interpret the role of automation with respect to flight safety	X		X	X	