CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

Note concerning the amendment dated August 2008: The changes are in RED colour

Introduction:

1 - To fully appreciate and understand subject 032 – Performance (Aeroplanes), the applicant will benefit from background knowledge in Subject~~s 080~~ 081 – Principles of Flight (Aeroplanes).

2 – For JAR-FCL standardisation purposes:

Climb angle is assumed to be air mass related.

Flight path angle is assumed to be ground related.

Screen height for take off is the vertical distance between the take off surface and the take off flight path at the end of take off distance.

Screen height for landing is the vertical distance between the landing surface and the landing flight path from witch the landing distance starts.

3- For mass definitions refer to syllabus for subject 031 Mass and Balance

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
030 00 00 00	**FLIGHT PERFORMANCE AND PLANNING**						
032 00 00 00	**PERFORMANCE - AEROPLANES**						
032 01 00 00	**GENERAL**						
032 01 01 00	**Performance Legislation**						
032 01 01 01	Airworthiness Requirements according to CS 23 and CS 25						
LO	Interpret the European airworthiness requirements according to CS 23 relating to aeroplane performance	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Interpret the European airworthiness requirements according to CS 25 relating to aeroplane performance	X					
LO	Name the general differences between aeroplanes as certified under CS 23 and CS 25	X					
032 01 01 02	Operational Regulations						
LO	Interpret the European operating regulations according to JAR-OPS 1 related to aeroplane performance	X	X				
LO	Name and define the performance classes for commercial air transportation according to JAR-OPS 1.470	X	X				
032 01 02 00	**General Performance Theory**						
032 01 02 01	Stages of flight						
LO	Describe the following stages of flight: - Take off, - Climbing flight, - Level flight, - Descending flight, - Approach and landing.	X	X				
032 01 02 02	Definitions, Terms and Concepts						
LO	Define “steady” flight	X	X				
LO	Resolve the forces during steady climbing and descending flight	X	X				
LO	Determine the opposing forces during horizontal steady flight	X	X				
LO	Interpret the ‘thrust/power required’ and ’thrust/power available” curves	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Describe the meaning of excess thrust and power using appropriate graphs	X	X				
LO	Describe the effect of excess thrust and power on speed and/or climb performance	X	X				
LO	Calculate the climb gradient given thrust, drag and aeroplane mass	X	X				
LO	Explain climb, level flight and descent performance in relation to the combination of thrust/power available and required.	X	X				
LO	Explain the difference between angle and gradient	X	X				
LO	Define the terms climb angle and climb gradient	X	X				
LO	Define the terms flight path angle and flight path gradient	X	X				
LO	Define the terms descent angle and descent gradient	X	X				
LO	Explain the difference between climb/descent angle and flight path angle	X	X				
LO	Define service and absolute ceiling	X	X				
LO	Define the terms clearway (CWY) and stopway (STW) according to CS ~~1~~Definitions	X	X				
LO	Define the terms Take-off Run Available (TORA), Take-off Distance Available (TODA), Accelerate Stop Distance Available (ASDA) according to JAR-OPS 1.	X	X				
LO	Define screen height and list its various values	X	X				
LO	Define the terms “Range” and “Endurance”	X	X				
LO	Define aeroplane specific fuel consumption SFC Note: engine specific fuel consumption covered in 021	X	X				
LO	Define aeroplane specific range SR	X	X				
032 01 02 03	Influencing Variables on Performance						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Name and understand the following factors thatwhichever affect the aeroplane performance, particularly: - Temperature - Air density - Wind - Aeroplane mass - Aeroplane configuration - Aeroplane antiskid system status - Aeroplane centre of gravity - Aerodrome runway surface - Aerodrome runway slope	X	X				
032 02 00 00	**PERFORMANCE CLASS B - SINGLE-ENGINE AEROPLANES**						
032 02 01 00	**Definitions of speeds used**						
LO	Define the following speeds according to CS 23: - Stall speeds V_S, V_{S0} and V_{S1} - Rotation speed V_R, - Speed at 50 ft above the take-off surface level, - Reference speed landing V_{REF}.	X	X				
032 02 02 00	**Effect of Variables on Single-Engine Aeroplane Performance**						
LO	Explain the effect of the wind component on take off and landing performance	X	X				
LO	Determine the regulatory factors for take-off and landing according to JAR-OPS 1	X	X				
LO	Explain the effect of temperature, wind and altitude on climb performance	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Explain the effects of altitude and temperature on cruise performance	X	X				
LO	Explain the effect of mass, wind and speed on descent performance	X	X				
032 02 03 00	**Take-off and Landing**						
LO	Interpret the take-off and landing requirements according to JAR-OPS 1	X	X				
LO	Define the following distances: - Take-off distance - Landing distance - Ground roll distance - Maximum allowed take-off mass - Maximum allowed landing mass	X	X				
LO	Explain the effect of flap setting on the ground roll distance	X	X				
032 02 04 00	**Climb, Cruise and Descent**						
LO	Explain the effects of different recommended power settings on range and endurance	X	X				
LO	Explain the effect of wind and altitude on maximum endurance speed	X	X				
032 02 05 00	**Use of Aeroplane Performance data**						
032 02 05 01	Take-off						
LO	Find the minimum or maximum wind component	X	X				
LO	Find the take of distance and ground roll distance	X	X				
LO	Find the maximum allowed take-off mass	X	X				
LO	Find the take-off speed						
032 02 05 02	Climb						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Find the maximum rate of climb speed	X	X				
LO	Find the time, distance and fuel to climb	X	X				
LO	Find the rate of climb	X	X				
032 02 05 03	Cruise						
LO	Find power settings, cruise true airspeed (TAS) and fuel consumption	X	X				
LO	Find range and endurance	X	X				
LO	Find the difference between still air distance (NAM) and ground distance (NM)	X	X				
032 02 05 04	Landing						
LO	Find the minimum or maximum wind component	X	X				
LO	Find the landing distance and ground roll distance	X	X				
032 03 00 00	**PERFORMANCE CLASS B - MULTI-ENGINE AEROPLANES**						
032 03 01 00	**Definitions of terms and speeds**						
LO	Define and explain the following terms: - Critical engine, - Speed for best angle of climb (V_X) - Speed for best rate of climb (V_Y)	X	X				
LO	Explain the effect of the critical engine inoperative on the power required and the total drag	X	X				
LO	Explain the effect of engine failure on controllability under given conditions	X	X				
032 03 02 00	**Effect of Variables on Multi-Engine Aeroplane Performance**						
032 03 02 01	Take-off and Landing						
LO	Explain the effect of flap setting on the ground roll distance	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	For both fixed and constant speed propellers, explain the effect of airspeed on thrust during the take-off run	X	X				
LO	Explain the effect of pressure altitude on performance limited take-off mass	X	X				
LO	Explain the effect of runway conditions on the take-off distance	X	X				
LO	Determine the regulation factors for take-off according to JAR-OPS 1	X	X				
LO	Explain the percentage of accountability for head and tailwind components during take-off and landing calculations	X	X				
LO	Interpret obstacle clearance at take-off	X	X				
LO	Explain the effect of selected power settings, flap settings and aeroplane mass on the rate of climb	X	X				
LO	Describe the effect of engine failure on take-off climb performance	X	X				
LO	Explain the effect of brake release before take off power is set on the take off and accelerate stop distance	X	X				
032 03 02 02	Climb, Cruise and Descent						
LO	Explain the effect of centre of gravity on fuel consumption	X	X				
LO	Explain the effect of mass on the speed for best angle- and best rate of climb	X	X				
LO	Explain the effect of mass on the speed for best angle and best rate of descent	X	X				
LO	Explain the effect of temperature and altitude on the fuel flow	X	X				
LO	Explain the effect of wind on the maximum range speed and speed for maximum climb angle	X	X				
LO	Explain the effect of mass, altitude, wind, speed and configuration on the glide descent	X	X				
LO	Describe various cruise techniques	X	X				
LO	Describe the effect of loss of engine power on climb and cruise performance	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
032 03 02 03	Landing						
LO	Explain the effect of runway conditions on the landing distance	X	X				
LO	Determine the regulatory factors for landing according to JAR-OPS 1	X	X				
032 03 03 00	**Use of Aeroplane Performance data**						
032 03 03 01	Take-off						
LO	Find take off field length data	X	X				
LO	Calculate the field length limited take off mass	X	X				
LO	Find the accelerate go distance as well the accelerate-stop distance data	X	X				
LO	Find the ground roll and take off distance	X	X				
LO	Calculate maximum effort take off data	X	X				
LO	Calculate all engine and critical engine out take off climb data	X	X				
LO	Calculate obstacle clearance take off climb data	X	X				
032 03 03 02	Climb						
LO	Find rate of climb and climb gradient	X	X				
LO	Calculate single engine service ceiling	X	X				
LO	Calculate obstacle clearance climb data	X	X				
032 03 03 03	Cruise and Descent						
LO	Find power settings, cruise true airspeed (TAS) and fuel consumption	X	X				
LO	Calculate range and endurance data	X	X				

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
032 03 03 04	Landing						
LO	Find landing field length data	X	X				
LO	Find landing climb data in the event of balked landing.	X	X				
LO	Find landing distance and ground roll distance	X	X				
LO	Find short field landing distance and ground roll distance	X	X				
032 04 00 00	**PERFORMANCE CLASS ~~A AEROPLANES~~A - AEROPLANES CERTIFICATED UNDER CS 25 ONLY**						
032 04 01 00	**Take – off**						
LO	Explain the essential forces affecting the aeroplane during take-off	X					
LO	State the effects of thrust-to-weight ratio and flap setting on ground roll	X					
032 04 01 01	Definitions of terms used						
LO	Define the terms Aircraft Classification Number (ACN) and Pavement Classification Number (PCN)	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Define and explain the following speeds in accordance with CS 25 and/or CS Definitions: - Reference stall speed - V_{SR} - Reference stall speed in the landing configuration - V_{SR0} - Reference stall speed in a specific configuration - V_{SR1} - One-g stall speed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight) - V_{S1g} - Minimum control speed with critical engine inoperative $V_{MC,}$ - Minimum control speed, on or near ground - V_{MCG} - Minimum control speed take-off climb- V_{MCA} - Engine failure speed - V_{EF} - Take-off decision speed - V_1 - Rotation speed - $V_{R,}$ - Minimum take-off safety speed - V_{2MIN} - Minimum unstick speed - V_{MU} - Lift off speed - V_{LOF} - Max brake energy speed - V_{MBE} - Max tyre speed - $V_{Max\ Tyre}$ - Reference landing speed - V_{REF} - Minimum control speed, approach and landing - V_{MCL}	X					
LO	Explain the interdependence between of the above mentioned speeds if there is any						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Define the following distances in accordance with CS 25: - Take off Run with all engines operating and one engine inoperative. - Take off Distance with all engines operating and one engine inoperative. - Accelerate Stop Distance with all engines operating and one engine inoperative.	X					
LO	Define the Term aeroplane specific fuel consumption (SFC) Note: Engine specific fuel consumption is covered in subject 021.						
032 04 01 02	Take off Distances						
LO	Explain the effects of the following Runway (RWY) variables on take off distances: - RWY slope, - RWY surface conditions, dry , wet and contaminated - RWY elevation.	X					
LO	Explain the effects of the following aeroplane variables on take off distances: - Aeroplane mass, - Take off configuration, - Bleed Air configurations.	X					
LO	Explain the effects of the following meteorological variables on take off distances: - Wind, - Temperature - Pressure altitude.	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Explain the influence of errors in rotation technique on take off distance - early and late rotation - too high and too low rotation angle - too high and too low rotation rate	X					
LO	Explain the take off distances for specified conditions and configuration for all engines operating and one engine inoperative.	X					
LO	Explain the effect of using clearway on the take-off distance required.	X					
LO	Explain the influence of V_1 and V_{2MIN} on take-off distance.	X					
LO	Explain the time interval allowed for between engine failure and recognition when assessing the TOD.	X					
LO	Explain the effect of a miscalculation of V_1 on the take-off distance required	X					
032 04 01 03	Accelerate-stop distance						
LO	Explain the accelerate-stop distance for specified conditions and configuration for all engines operating and one engine inoperative.	X					
LO	Explain the effect of using a stopway on the accelerate-stop distance required	X					
LO	Explain the effect of miscalculation of V_1 on the accelerate-stop distance required	X					
LO	Explain the effect of runway slope on the accelerate-stop distance						
LO	Explain the additional time allowance for accelerate stop distance determination and discuss the deceleration procedure	X					
LO	Explain the use of brakes, antiskid, use of reverse thrust, ground spoilers or lift dumpers, brake energy absorption limits, delayed temperature rise and tyre limitations.	X					
032 04 01 04	Balanced field length concept						
LO	Define the term balanced field length.	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Understand the relationship between take off distance, accelerate stop distance and V_1 when using a balanced field	X					
LO	Describe the applicability of a balanced field length.	X					
032 04 01 05	Unbalanced field length concept						
LO	Define the term unbalanced field length.	X					
LO	Describe the applicability of an unbalanced field length.	X					
LO	Explain the effect of a stopway on the allowed take off mass and appropriate V_1 when using an unbalanced field	X					
LO	Explain the effect of a clear way on the allowed take off mass and appropriate V_1 when using an unbalanced field	X					
032 04 01 06	Runway length Limited Take-Off Mass (RLTOM)						
LO	Define the runway length limited take-off mass for balanced and unbalanced field length	X					
032 04 01 07	Take-off climb						
LO	Define the segments of the actual take-off flight path	X					
LO	Explain the difference between the flat rated and non flat rated part in performance charts	X					
LO	Determine changes in the configuration, power, thrust and speed in the take-off flight path segments	X					
LO	Determine the differences in climb gradient requirements for 2, 3 and 4 engine aeroplanes.	X					
LO	State the maximum bank angle when flying at V_2	X					
LO	Explain the effects of aeroplane and meteorological variables on the take-off climb	X					
LO	Describe the influence of airspeed selection, acceleration and turns on the climb gradients, best rate of climb speed and best angle of climb speed.	X					
LO	Determine the climb limited take-off mass.	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
032 04 01 08	Obstacle-limited take-off						
LO	Describe the operational regulations for obstacle clearance in the net take-off flight path.	X					
LO	Define actual and net take-off flight path with one engine inoperative in accordance with CS 25.	X					
LO	Determine the effects of aeroplane and meteorological variables on determination of obstacle limited take-off mass.	X					
LO	Determine the obstacle limited take-off mass.	X					
032 04 01 09	Performance limited take-off mass						
LO	Define Performance limited take-off mass.	X					
032 04 01 10	Take off performance on wet and contaminated runways						
LO	Explain the differences between the take off performance determination on a wet or contaminated runway and a dry runway	X					
032 04 01 11	Use of Reduced and Derated Thrust						
LO	Explain advantages and disadvantages of using reduced and derated thrust	X					
LO	Explain the difference between reduced and derated thrust	X					
LO	Explain when reduced and derated thrust may and may not be used	X					
LO	Explain the effect of using reduced and derated thrust on take off performance including take-off speeds, take off distance, climb performance and obstacle clearance	X					
LO	Explain the assumed temperature method for determining reduced thrust performance	X					
032 04 01 12	Take off Performance using different take off flap settings						
LO	Explain the advantages and disadvantages of using different take off flap settings to optimise the Performance limited take off mass	X					
032 04 01 13	Take off Performance using increased V2 speeds (“improved climb performance”)						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Explain the advantages and disadvantages of using increased V2 speeds	X					
LO	Explain under what circumstances this procedure can be used.	X					
032 04 01 14	Brake energy and tyre speed limit						
LO	Explain the effects on take off performance of brake energy and tyre speed limits.	X					
LO	Explain under which conditions this becomes limiting.	X					
032 04 01 15	Use of Aeroplane Flight data						
LO	Determine the maximum masses that satisfy all the regulations for take-off from the aeroplane performance data sheets	X					
LO	Determine the relevant speeds for specified conditions and configuration from the aeroplane performance data sheets	X					
032 04 02 00	**Climb**						
032 04 02 01	Climb techniques						
LO	Explain the effect of climbing with constant IAS.	X					
LO	Explain the effect of climbing with constant Mach number.	X					
LO	Explain the correct sequence of climb-speeds for jet transport aeroplanes	X					
LO	Determine the effect on TAS when climbing in and above the troposphere at constant Mach number	X					
032 04 02 02	Influence of variables on climb performance						
LO	Explain the effect of aeroplane mass on the Rate of Climb (ROC).	X					
LO	Explain the effect of meteorological variables on the Rate of Climb (ROC).	X					
LO	Explain the effect of aeroplane acceleration during a climb with constant IAS or Mach number	X					
LO	Explain the effect on the operational speed limit when climbing at constant IAS.	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
032 04 02 03	Use of Aeroplane Flight data						
LO	Explain the term “cross over altitude” which occurs during the climb speed schedule (IAS-Mach number).	X					
LO	Calculate the time to climb.	X					
032 04 03 00	**Cruise**						
032 04 03 01	Cruise techniques						
LO	Define cruise procedures “max endurance” and “max range”	X					
032 04 03 02	Max Endurance						
LO	Explain fuel flow in relation to TAS and thrust	X					
LO	Find speed for max endurance.	X					
032 04 03 03	Max Range						
LO	Define the term maximum range.	X					
032 04 03 04	Long Range Cruise						
LO	Define the term long range cruise	X					
LO	Explain differences in flying the speed for long range and maximum range with regard to fuel flow and speed stability	X					
032 04 03 05	Influence of variables on cruise performance						
LO	Explain the effect and centre of gravity (CG) position and actual mass of aircraft on range and endurance	X					
LO	Explain the effect of altitude on range and endurance	X					
LO	Explain the effect of meteorological variables on range and endurance	X					
032 04 03 06	Cruise altitudes						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Define the term optimum altitude	X					
LO	Explain the factors which affect the choice of optimum altitude	X					
LO	Explain the factors which might affect or limit the maximum operating altitude	X					
LO	Explain the necessity for step climbs	X					
LO	Describe the Buffet Onset Boundary (BOB)	X					
LO	Analyse influence of bank angle, mass and 1.3 g buffet onset factor on a step climb	X					
032 04 03 07	Cost index						
LO	Define the term cost index	X					
LO	Understand the reason for economical cruise speed	X					
032 04 03 08	Use of Aeroplane Flight data						
LO	Determine the all engines operating power settings and speeds from the aeroplane performance data sheets for: - Maximum range, - Maximum endurance, - High speed and normal cruise - High and low speed buffet (speed/Mach number only)	X					
LO	Determine the selection of cruise technique accounting for cost indexing, passenger requirements against company requirements.	X					
LO	Determine the fuel consumption from the aeroplane performance data sheets for various cruise configurations, holding, approach and transit to an alternate in normal conditions and after an engine failure	X					
032 04 04 00	**En-route One Engine Inoperative**						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
032 04 04 01	Drift Down						
LO	Describe the determination of en-route flight path data one engine inoperative in accordance with CS 25.123	X					
LO	Determine the minimum obstacle clearance height prescribed in JAR-OPS 1.500	X					
LO	Define the speed during drift down	X					
LO	Explain influence of deceleration on the drift-down profiles	X					
032 04 04 02	Influence of variables on En-route One Engine Inoperative performance						
LO	Identify factors which affect the en-route net flight path	X					
032 04 04 03	Use of Aeroplane Flight data						
LO	Find one-engine out service ceiling, range and endurance given engine inoperative charts.	X					
LO	Find maximum continuous power/thrust settings given engine inoperative charts	X					
032 04 05 00	**Descent**						
032 04 05 01	Descent techniques						
LO	Explain the effect of descending with constant Mach number.	X					
LO	Explain the effect of descending with constant IAS.	X					
LO	Explain the correct sequence of descent speeds for jet transport aeroplanes	X					
LO	Determine the effect on TAS when descending in and above the troposphere at constant Mach number	X					
LO	Describe the following limiting speeds for descent: - Maximum operating speed V_{MO} - Maximum Mach number M_{MO}	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Explain the effect of a descent at constant Mach number on the margin to low and high speed buffet	X					
032 04 05 02	Influence of variables on descent performance						
LO	Explain the influence of mass, configuration and altitude on rate of descent and glide angle	X					
032 04 05 03	Use of Aeroplane Flight data						
LO	Determine the following information for all engines operating and one engine inoperative from the aeroplane performance data sheets: - Descent rates, - Time and distance for descent, - Fuel used during descent.	X					
032 04 06 00	**Approach and Landing**						
032 04 06 01	Approach requirements						
LO	Describe the CS 25 requirements for the approach climb.	X					
LO	Describe the CS 25 requirements for the landing climb.	X					
LO	Explain the effect of temperature and pressure altitude on approach and landing climb performance	X					
032 04 06 02	Landing field length requirement						
LO	Describe the landing distance determined according CS 25.125 (“demonstrated” landing distance)	X					
LO	Recall the JAR-OPS Landing field length requirements for dry, wet and contaminated runways.	X					
LO	Define the landing distance available (LDA)	X					
032 04 06 03	Influence of variables on landing performance						

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Explain the effect of runway slope, surface conditions and wind on the maximum landing mass for a given runway length in accordance with JAR-OPS 1.	X					
LO	Explain the effect on landing distance and maximum allowable landing mass of the following devices affecting deceleration. reverse anti-skid ground spoilers or lift dumpers auto brakes	X					
LO	Explain the effect of temperature and pressure altitude on the maximum landing mass for a given runway length.	X					
LO	Explain the effect of hydroplaning on landing distance required	X					
032 04 06 04	Quick turnaround limit						
LO	Define the quick turnaround limits and explain their purpose.	X					
032 04 06 05	Use of Aeroplane Flight data						
LO	Determine the JAR-OPS Field length required for landing with a given landing mass from the aeroplane performance data sheets	X					
LO	Determine the landing and approach climb limited landing mass from the aeroplane performance data sheets	X					
LO	Determine the landing field length limited landing mass from the aeroplane performance data sheets	X					
LO	Find the structural limited landing mass from the aeroplane performance data sheets	X					
LO	Calculate the maximum allowable landing mass as the lowest of: - Approach climb and landing climb limited landing mass, - Landing field length limited landing mass, - Structural limited landing mass.	X					

CHAPTER 17: DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LEARNING OBJECTIVES
Subject – 032 – Performance Aeroplane
See Appendix 1 to JAR-FCL 1.470 and JAR-FCL 2.470

		Aeroplane		*Helicopter*			*IR*
Syllabus Reference	**Syllabus and Learning Objectives**	ATPL	CPL	ATPL /IR	ATPL	CPL	
LO	Determine the maximum quick turnaround mass and time under given conditions from the aeroplane performance data sheets	X					
LO	Determine the Limiting landing mass in respect of PCN	X					