E. SUBJECT 032 — PERFORMANCE (AEROPLANE)

(1) For theoretical knowledge examination 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 the take-off distance.

'Screen height for landing' is the vertical distance between the landing surface and the landing flight path from which the landing distance begins.

(2) For mass definitions, please refer to CHAPTER D (SUBJECT 031 — MASS AND BALANCE).

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		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 Union airworthiness requirements according to CS-23 relating to aeroplane performance.	x	x				
LO	Interpret the European Union airworthiness requirements according to CS-25 relating to aeroplane performance.	x					
LO	Name the general differences between aeroplanes as certified according to CS-23 and CS-25.	x					
032 01 01 02	**Operational regulations**						
LO	Interpret the applicable operational requirements related to aeroplane performance.	x	x				
LO	Name and define the performance classes for commercial air transportation according to the applicable operational requirements.	x	x				
032 01 02 00	**General performance theory**						
032 01 02 01	**Stages of flight**						

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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				
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 from 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				

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Define the terms 'clearway (CWY)' and 'stopway (STW)' according to CS-Definitions.	x	x				
LO	Define the terms: — Take-Off Run Available (TORA); — Take-Off Distance Available (TODA); — Accelerate-Stop Distance Available (ASDA); according to the applicable operational requirements.	x	x				
LO	Define 'screen height' and list its various values.	x	x				
LO	Define the terms 'range' and 'endurance'.	x	x				
LO	Define the aeroplane's 'Specific Fuel Consumption (SFC)'. *Remark: Engine specific fuel consumption is covered in 021.*	x	x				
LO	Define the aeroplane's 'Specific Range (SR)'.	x	x				
032 01 02 03	**Variables influencing performance**						
LO	Name and understand the following factors that affect aeroplane performance, particularly: — temperature; — air density; — wind; — aeroplane mass; — aeroplane configuration; — aeroplane anti-skid 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**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 the applicable operational requirements.	x	x				
LO	Explain the effects of temperature, wind and altitude on climb performance.	x	x				
LO	Explain the effects of altitude and temperature on cruise performance.	x	x				
LO	Explain the effects 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 the applicable operational requirements.	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 the different recommended power settings on range and endurance.	x	x				

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Explain the effects 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-off distance and ground-roll distance.	x	x				
LO	Find the maximum allowed take-off mass.	x	x				
LO	Find the take-off speed.	x	x				
032 02 05 02	**Climb**						
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				

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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				
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 the applicable operational requirements.	x	x				
LO	Explain the percentage of accountability for headwind 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**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Explain the effect of CG 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 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 glide descent.	x	x				
LO	Describe the various cruise techniques.	x	x				
LO	Describe the effect of loss of engine power on climb and cruise performance.	x	x				
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 the applicable operational requirements.	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 the maximum effort take-off data.	x	x				
LO	Calculate all engine and critical engine-out take-off climb data.	x	x				

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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				
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 CERTIFIED ACCORDING TO 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					

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Define and explain the following speeds in accordance with CS-25 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}); — 1-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 the ground (V_{MCG}); — minimum control speed at 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.	x					
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					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Define the term 'Aeroplane-Specific Fuel Consumption (ASFC)'. *Remark: Engine-specific fuel consumption is covered in subject 021.*	x					
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					
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					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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.	x					
LO	Explain the additional time allowance for accelerate-stop distance determination and discuss the deceleration procedure.	x					
LO	Explain the use of brakes, anti-skid, 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					
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					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 clearway 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 RLTOM 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 the 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 two, three and four-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					
032 04 01 08	**Obstacle-limited take-off**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 the 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 on a dry runway.	x					
032 04 01 11	**Use of reduced and derated thrust**						
LO	Explain the 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					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 V_2 speeds ('improved climb performance')**						
LO	Explain the advantages and disadvantages of using increased V_2 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					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 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					
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 the cruise procedures 'maximum endurance' and 'maximum range'.	x					
032 04 03 02	**Maximum endurance**						
LO	Explain fuel flow in relation to TAS and thrust.	x					
LO	Find the speed for maximum endurance.	x					
032 04 03 03	**Maximum range**						
LO	Define the term 'maximum range'.	x					
032 04 03 04	**Long-range cruise**						
LO	Define the term 'long-range cruise'.	x					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Explain differences between 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 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**						
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 the influence of bank angle, mass and 1.3G buffet onset factor on a step climb.	x					
032 04 03 07	**Cost Index (CI)**						
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**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 considering cost indexing and 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**						
032 04 04 01	**Drift down**						
LO	Describe the determination of en route flight path data with one engine inoperative in accordance with CS 25.123.	x					
LO	Determine the minimum obstacle-clearance height prescribed in the applicable operational requirements.	x					
LO	Define the speed during drift down.	x					
LO	Explain the influence of deceleration on the drift-down profiles.	x					
032 04 04 02	**Influence of variables on the en route one engine inoperative performance**						
LO	Identify the factors which affect the en route net flight path.	x					
032 04 04 03	**Use of aeroplane flight data**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
LO	Find one-engine-out service ceiling, range and endurance from given engine inoperative charts.	x					
LO	Find the maximum continuous power/thrust settings from given engine inoperative charts.	x					
032 04 05 00	**Descent**						
032 04 05 01	**Descent techniques**						
LO	Explain the effect of descending at constant Mach number.	x					
LO	Explain the effect of descending at 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					
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**						

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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 to CS 25.125 (‘demonstrated’ landing distance).	x					
LO	Recall the landing field-length requirements for dry, wet and contaminated runways in the applicable operational requirements.	x					
LO	Define the ‘Landing Distance Available (LDA)’.	x					
032 04 06 03	**Influence of variables on landing performance**						
LO	Explain the effect of runway slope, surface conditions and wind on the maximum landing mass for a given runway length in accordance with the applicable operational requirements.	x					

Syllabus reference	Syllabus details and associated Learning Objectives	*Aeroplane*		*Helicopter*			*IR*
		ATPL	CPL	ATPL/ IR	ATPL	CPL	
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; — autobrakes.	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 field length required for landing with a given landing mass from the aeroplane performance data sheets in accordance with the applicable operational requirements.	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					

Syllabus reference	**Syllabus details and associated Learning Objectives**	*Aeroplane*		*Helicopter*			*IR*
		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					