

G. SUBJECT 034 — PERFORMANCE (HELICOPTER)

(1) For mass definitions, please refer to Chapter D.

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						
034 00 00 00	PERFORMANCE — HELICOPTER						
034 01 00 00	GENERAL						
034 01 01 00	Performance legislation						
034 01 01 01	Airworthiness requirements						
LO	Interpret the airworthiness requirements in CS-27 and CS-29 as related to helicopter performance.			x	x	x	
LO	Name the general differences between helicopters as certified according to CS-27 and CS-29.			x	x	x	
034 01 01 02	Operational regulations						
LO	State the responsibility to comply with the operational procedures.			x	x	x	
LO	Interpret the European Union regulation on operations.			x	x	x	
LO	Use and interpret diagrams and tables associated with CAT A and CAT B procedures in order to select and develop class 1, 2 and 3 performance profiles according to available heliport size and location (surface or elevated).			x	x		
LO	Use and interpret diagrams and tables associated with CAT B procedures in order to select and develop class-3 single-engine helicopter performance profiles according to available heliport size and location (surface or elevated).					x	
LO	Interpret the charts showing minimum clearances associated with Category A & B procedures.			x	x		
034 01 02 00	General performance theory						

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034 01 02 01	Stages of flight						
LO	Explain the following stages of flight: <ul style="list-style-type: none"> — take-off, — climb, — level flight, — descent, — approach and landing. 			x	x	x	
LO	Describe the necessity for different take-off and landing procedures.			x	x	x	
034 01 02 02	Definitions and terms						
LO	Define the following terms: <ul style="list-style-type: none"> — Category A; — Category B; — Performance Class 1, 2 and 3; — congested area; — elevated heliport; — helideck; — heliport; — hostile environment; — maximum approved passenger seating configuration; — non-hostile environment; — obstacle; — rotor Radius (R); — take-off mass; — Touchdown and Lift-Off Area (TLOF); — safe forced landing; — speed for best rate of climb (Vy); — never exceed speed (VNE); — velocity landing gear extended (VLE); — velocity landing gear operation (VLO); — cruising speed and maximum cruising speed. 			x	x	x	

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LO	Define the following terms: <ul style="list-style-type: none"> — reported headwind component; — Take-off Decision Point (TDP); — Defined Point After Take-Off (DPATO) ; — Take-Off Distance Required (TODR); — Take-Off Distance Available (TODA); — Distance Required (DR); — Rejected Take-Off Distance Required (RTODR); — Rotation Point (RP); — Committal Point (CP); — Defined Point Before Landing (DPBL); — Landing Decision Point (LDP); — Landing Distance Available (LDA); — Landing Distance Required (LDR); — Take-off safety speed (V_1); — Take-off safety speed for Cat A rotorcraft (V_{TOSS})(V_2). 			x	x		
LO	Understand the meaning and significance of the acronyms AEO and OEI.			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 ' $V_{\max\text{Range}}$ ' (speed for maximum range) and $V_{\max\text{End}}$ (speed for maximum endurance).			x	x	x	
LO	Define and calculate the gradient by using power, wind and helicopter mass.			x	x		
LO	Explain the terms 'operational ceiling' and 'absolute ceiling'.			x	x	x	
LO	Explain the term 'service ceiling OEI'.			x	x		
LO	Understand the difference between Hovering In Ground Effect (HIGE) and Hovering out of Ground Effect (HOGE).			x	x	x	

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034 01 02 03	Power required/power available curves						
LO	Understand and interpret the graph power required/power available versus TAS.			X	X	X	
034 01 02 04	Critical height-velocity graphs						
LO	Understand and interpret the critical height-velocity graphs.			X	X	X	
034 01 02 05	Influencing variables on performance						
LO	Explain how the following factors effect helicopter performance: — pressure altitude; — humidity; — temperature; — wind; — helicopter mass; — helicopter configuration; — helicopter CG.			X	X	X	
034 02 00 00	PERFORMANCE CLASS 3 — SINGLE-ENGINE HELICOPTERS ONLY						
034 02 01 00	Effect of variables on single-engine helicopter performance						
LO	Determine wind component, altitude and temperature for hovering, take-off and landing.			X	X	X	
LO	Explain that operations are only from/to heliports and over such routes, areas and diversions contained in a non-hostile environment where a safe forced landing can be carried out. (Consider the exception: Operations may be conducted in a hostile environment when approved).			X	X	X	
LO	Explain the effect of temperature, wind and altitude on climb, cruise and descent performance.			X	X	X	
034 02 02 00	Take-off and landing (including hover)						

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LO	Explain the take-off and landing requirements.			x	x	x	
LO	Explain the maximum allowed take-off and landing mass.			x	x	x	
LO	Explain that mass has to be restricted to HIGE.			x	x	x	
LO	Explain that if HIGE is unlikely to be achieved, then mass must be restricted to HOGE.			x	x	x	
034 02 03 00	Climb, cruise and descent						
LO	State that the helicopter must be capable of flying its intended track without flying below the appropriate minimum flight altitude and be able to perform a safe forced landing.			x	x	x	
LO	Explain the effect of altitude on the maximum endurance speed.			x	x	x	
034 02 04 00	Use of helicopter performance data						
034 02 04 01	Take-off (including hover)						
LO	Find the maximum wind component.			x	x	x	
LO	Find the maximum allowed take-off mass for certain conditions.			x	x	x	
LO	Find the critical height-velocity parameters.			x	x	x	
034 02 04 02	Climb						
LO	Find the time, distance and fuel to climb for certain conditions.			x	x	x	
LO	Find the rate of climb under given conditions and the best rate-of-climb speed V_y .			x	x	x	
034 02 04 03	Cruise						
LO	Find the cruising speed and fuel consumption for certain conditions.			x	x	x	

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		ATPL	CPL	ATPL/IR	ATPL	CPL	
LO	Calculate the range and endurance under given conditions.			x	x	x	
034 02 04 04	Landing (including hover)						
LO	Find the maximum wind component.			x	x	x	
LO	Find the maximum allowed landing mass for certain conditions.			x	x	x	
LO	Find the critical height-velocity parameters.			x	x	x	
034 03 00 00	PERFORMANCE CLASS 2						
	General remark: The LOs for Performance Class 2 are principally identical with those of Performance Class 1. (See 034 04 00 00) Additional LOs are shown below.						
034 03 01 00	Operations without an assured safe forced landing capability						
LO	State the responsibility of the operator in order to assure a safe forced landing.			x	x		
034 03 02 00	Take-off						
LO	State the climb and other requirements for take-off.			x	x		
034 03 03 00	Take-off Flight Path						
LO	State the height above the take-off surface at which at least the requirements for the take-off flight path for Performance Class 1 are to be met.			x	x		
034 03 04 00	Landing						
LO	State the requirements for the climb capability for OEI.			x	x		
LO	State the options for a Performance Class 2 operation in case of critical power-unit failure at any point in the approach path.			x	x		
LO	State the limitations for operations to/from a helideck.			x	x		
034 04 00 00	PERFORMANCE CLASS 1 — HELICOPTERS CERTIFICATED ACCORDING TO CS-29 ONLY						
034 04 01 00	Take-off						

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034 04 01 01	Take-off distances						
LO	Explain the effects of the following variables on the flight path and take-off distances: <ul style="list-style-type: none"> — take-off with HIGE or HOGÉ; — take-off procedure; — obstacle clearances both laterally and vertically; — take-off from non-elevated heliports; — take-off from elevated heliports or helidecks; — take-off from a Touchdown and Lift-Off Area (TLOF). 			x	x		
LO	Explain the effects of the following variables on take-off distances: <ul style="list-style-type: none"> — mass; — take-off configuration; — bleed-air configurations. 			x	x		
LO	Explain the effects of the following meteorological variables on take-off distances: <ul style="list-style-type: none"> — wind; — temperature; — pressure altitude. 			x	x		
LO	Explain the take-off distances for specified conditions and configuration for AEO and OEI.			x	x		
LO	Explain the effect of obstacles on the take-off distance required.			x	x		
LO	Explain the influence of V_1 and V_{TOSS} speeds on the take-off distance.			x	x		
LO	State the assumed reaction time between engine failure and recognition.			x	x		
LO	Explain the effect of calculation of TDP and V_1 on the take-off distance required.			x	x		
LO	Explain that the flight must be carried out visually up to TDP.			x	x		
034 04 01 02	Rejected take-off distance required						

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	LO Explain the rejected take-off distance required for specified conditions and configuration for AEO and OEI.			x	x		
	LO Explain the effect of calculation of V_1 on the rejected take-off distance required.			x	x		
	LO Explain the time-to-decide allowance (decision time) and deceleration procedure.			x	x		
034 04 01 03	Landing distance from TDP with V_1 to a complete stop on the ground						
	LO Understand the relationship of take-off distance and landing distance from TDP with V_1 to a complete ground stop.			x	x		
034 04 01 04	Take-off climb						
	LO Define the segments of the take-off flight path.			x	x		
	LO Explain the effect of changes in the configuration on power and speed in the segments.			x	x		
	LO Explain the climb-gradient requirements for OEI.			x	x		
	LO State the minimum altitude over the take-off path when flying at V_1 to V_{TOSS} .			x	x		
	LO Describe the influence of airspeed selection, acceleration and turns on the climb gradient and best rate-of-climb speed.			x	x		
034 04 01 05	Obstacle-limited take-off						
	LO Describe the operational regulations for obstacle clearance of the take-off flight path in the departure sector with OEI.			x	x		
034 04 01 06	Use of helicopter flight data						

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		ATPL	CPL	ATPL/IR	ATPL	CPL	
	LO Determine from the helicopter performance data sheets the maximum masses that satisfy all the regulations for take-off.			x	x		
034 04 02 00	Climb						
034 04 02 01	Climb techniques						
	LO Explain the effect of climbing with best rate-of-climb speed (V_Y).			x	x		
	LO Explain the influence of altitude on V_Y .			x	x		
034 04 02 02	Use of helicopter flight data						
	LO Find the rate of climb and calculate the time to climb to a given altitude.			x	x		
034 04 03 00	Cruise						
034 04 03 01	Cruise techniques						
	LO Explain the cruise procedures for 'maximum endurance' and 'maximum range'.			x	x		
034 04 03 02	Maximum endurance						
	LO Explain fuel flow in relation to TAS.			x	x		
	LO Explain the speed for maximum endurance.			x	x		
034 04 03 03	Maximum range						
	LO Explain the speed for maximum range.			x	x		
034 04 03 04	Maximum cruise						
	LO Explain the speed for maximum cruise.			x	x		
034 04 03 05	Cruise altitudes						
	LO Explain the factors which might affect or limit the operating altitude.			x	x		
	LO Understand the relation between power setting, fuel consumption, cruising speed and altitude.			x	x		
034 04 03 06	Use of helicopter flight data						

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LO	Determine the fuel consumption from the helicopter performance data sheets in accordance with altitude and helicopter mass.			x	x		
034 04 04 00	En route one engine inoperative						
034 04 04 01	Requirements for en route flights for OEI						
LO	State the flight-path clearance requirements.			x	x		
LO	Explain the drift-down techniques.			x	x		
LO	State the reduction in the flight-path width when navigational accuracy can be achieved.			x	x		
034 04 04 02	Use of helicopter flight data						
LO	Find the single-engine service ceiling, range and endurance from given engine-inoperative charts.			x	x		
LO	Find the maximum continuous power settings from given engine-inoperative charts.			x	x		
LO	Find the amount of fuel to be jettisoned to reduce helicopter mass.			x	x		
LO	Calculate the relevant parameters for drift-down procedures.			x	x		
034 04 05 00	Descent						
034 04 05 01	Use of helicopter flight data						
LO	Find the rate of descent and calculate the time to descent to a given altitude.			x	x		
034 04 06 00	Landing						
034 04 06 01	Landing requirements						
LO	State the requirements for landing.			x	x		
034 04 06 02	Landing procedures						

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LO	Explain the procedure for critical power-unit failure prior to and after the landing decision point.			x	x		
LO	Explain that the portion of flight after the landing decision point must be carried out visually.			x	x		
LO	Explain the procedures and required obstacle clearances for landings on different heliports/helidecks.			x	x		
034 04 06 03	Use of helicopter flight data						
LO	Determine from the helicopter performance data sheets the maximum masses that satisfy all the regulations for landing.			x	x		