

Private Pilot Licence Examinations – 082 Principles of Flight Helicopter

Syllabus Reference	Syllabus details & Associated Learning Objective	Aeroplane		Helicopter	
		PPL	Bridge Course	PPL	Bridge Course
082.00.00.00	PRINCIPLES OF FLIGHT: HELICOPTER				
082.01.01.00	Subsonic aerodynamics				
082.01.01.01	Basic concepts, laws and definitions			X	X
082.01.01.02	Conversion of units			X	X
082.01.01.03	Definitions and basic concepts about air:			X	X
	(a) the atmosphere and International Standard Atmosphere;			X	X
	(b) density;			X	X
	(c) influence of pressure and temperature on density.			X	X
082.01.01.04	Newton's laws:			X	X
	(a) Newton's second law: Momentum equation;			X	X
	(b) Newton's third law: action and reaction.			X	X
082.01.01.05	Basic concepts about airflow:			X	X
	(a) steady airflow and unsteady airflow;			X	X
	(b) Bernoulli's equation;			X	X
	(c) static pressure, dynamic pressure, total pressure and stagnation point;			X	X
	(d) TAS and IAS;			X	X
	(e) two-dimensional airflow and three-dimensional airflow;			X	X
	(f) viscosity and boundary layer.			X	X
082.01.01.06	Two-dimensional airflow			X	X
082.01.01.07	Aerofoil section geometry:			X	X
	(a) aerofoil section;			X	X
	(b) chord line, thickness and thickness to chord ratio of a section;			X	X
	(c) camber line and camber;			X	X
	(d) symmetrical and asymmetrical aerofoils sections.			X	X
082.01.01.08	Aerodynamic forces on aerofoil elements:			X	X
	(a) angle of attack;			X	X
	(b) pressure distribution;			X	X
	(c) lift and lift coefficient			X	X
	(d) relation lift coefficient: angle of attack;			X	X
	(e) profile drag and drag coefficient;			X	X
	(f) relation drag coefficient: angle of attack;			X	X
	(g) resulting force, centre of pressure and pitching moment.			X	X
082.01.01.09	Stall:			X	X
	(a) boundary layer and reasons for stalling;			X	X
	(b) variation of lift and drag as a function of angle of attack;			X	X
	(c) displacement of the centre of pressure and pitching moment.			X	X
082.01.01.10	Disturbances due to profile contamination:			X	X

	(a) ice contamination;			x	x
	(b) ice on the surface (frost, snow and clear ice).			x	x
082.01.01.11	The three-dimensional airflow round a wing and a fuselage			x	x
082.01.01.12	The wing:			x	x
	(a) planform, rectangular and tapered wings;			x	x
	(b) wing twist.			x	x
082.01.01.13	Airflow pattern and influence on lift:			x	x
	(a) span wise flow on upper and lower surface;			x	x
	(b) tip vortices;			x	x
	(c) span-wise lift distribution.			x	x
082.01.01.14	Induced drag: causes and vortices			x	x
082.01.01.15	The airflow round a fuselage:			x	x
	(a) components of a fuselage;			x	x
	(b) parasite drag;			x	x
	(c) variation with speed.			x	x
082.02.01.00	Transonic aerodynamics and compressibility effects				
082.02.01.01	Airflow velocities			x	x
082.02.01.02	Airflow speeds:			x	x
	(a) speed of sound;			x	x
	(b) subsonic, high subsonic and supersonic flows.			x	x
082.02.01.03	Shock waves:			x	x
	(a) compressibility and shock waves;			x	x
	(b) the reasons for their formation at upstream high subsonic airflow;			x	x
	(c) their effect on lift and drag.			x	x
082.02.01.04	Influence of wing planform: sweep-angle			x	x
082.03.01.00	Rotorcraft types			x	x
082.03.01.01	Rotorcraft			x	x
082.03.01.02	Rotorcraft types:			x	x
	(a) autogyro;			x	x
	(b) helicopter.			x	x
082.03.01.03	Helicopters			x	x
082.03.01.04	Helicopters configurations: the single main rotor helicopter			x	x
082.03.01.05	The helicopter, characteristics and associated terminology:			x	x
	(a) general lay-out, fuselage, engine and gearbox;			x	x
	(b) tail rotor, fenestron and NOTAR;			x	x
	(c) engines (reciprocating and turbo shaft engines);			x	x
	(d) power transmission;			x	x
	(e) rotor shaft axis, rotor hub and rotor blades;			x	x
	(f) rotor disc and rotor disc area;			x	x
	(g) teetering rotor (two blades) and rotors with more than two blades;			x	x
	(h) skids and wheels;			x	x
	(i) helicopter axes and fuselage centre line;			x	x
	(j) roll axis, pitch axis and normal or yaw axis;			x	x
	(k) gross mass, gross weight and disc loading.			x	x
082.04.01.00	Main rotor aerodynamics			x	x
082.04.01.01	Hover flight outside ground effect			x	x
082.04.01.02	Airflow through the rotor discs and round the blades:			x	x
	(a) circumferential velocity of the blade sections;			x	x
	(b) induced airflow, through the disc and downstream;			x	x

	(c) downward fuselage drag;			x	x
	(d) equilibrium of rotor thrust, weight and fuselage drag;			x	x
	(e) rotor disc induced power;			x	x
	(f) relative airflow to the blade;			x	x
	(g) pitch angle and angle of attack of a blade section;			x	x
	(h) lift and profile drag on the blade element;			x	x
	(i) resulting lift and thrust on the blade and rotor thrust;			x	x
	(j) collective pitch angle changes and necessity of blade feathering;			x	x
	(k) required total main rotor-torque and rotor-power;			x	x
	(l) influence of the air density.			x	x
082.04.01.03	Anti-torque force and tail rotor:			x	x
	(a) force of tail rotor as a function of main rotor-torque;			x	x
	(b) anti-torque rotor power;			x	x
	(c) necessity of blade feathering of tail rotor blades and yaw pedals.			x	x
082.04.01.04	Maximum hover altitude OGE:			x	x
	(a) total power required and power available;			x	x
	(b) maximum hover altitude as a function of pressure altitude and OAT.			x	x
082.04.01.05	Vertical climb			x	x
082.04.01.06	Relative airflow and angles of attack:			x	x
	(a) climb velocity VC, induced and relative velocity and angle of attack;			x	x
	(b) collective pitch angle and blade feathering.			x	x
082.04.01.07	Power and vertical speed:			x	x
	(a) induced power, climb power and profile power;			x	x
	(b) total main rotor power and main rotor torque;			x	x
	(c) tail rotor power;			x	x
	(d) total power requirement in vertical flight.			x	x
082.04.01.08	Forward flight			x	x
082.04.01.09	Airflow and forces in uniform inflow distribution:			x	x
	(a) assumption of uniform inflow distribution on rotor disc;			x	x
	(b) advancing blade (90°) and retreating blade (270°);			x	x
	(c) airflow velocity relative to the blade sections, area of reverse flow;			x	x
	(d) lift on the advancing and retreating blades at constant pitch angles;			x	x
	(e) necessity of cyclic pitch changes;			x	x
	(f) compressibility effects on the advancing blade tip and speed limitations;			x	x
	(g) high angle of attack on the retreating blade, blade stall and speed limitations;			x	x
	(h) thrust on rotor disc and tilt of thrust vector;			x	x
	(i) vertical component of the thrust vector and gross weight equilibrium;			x	x