Toetsmatrijs uitsluitend PPLH en LAPLH: Flight performance and planning (Mass and balance + Performance – helicopters) + Principles of flight – helicopters + Operational procedures

In deze toetsmatrijs staat wat u moet kunnen en kennen. De toetsmatrijs vormt daarom de basis van de opleiding en het examen.

Opgesteld door:	**CBR divisie CCV**

Categoriecode:	LVPHFPP (PPLH, LAPLH)
Toetsvorm:	Digitaal
Totaal aantal vragen:	22 meerkeuzevragen
Cesuur:	75% (17 van de 22 vragen goed)
Bijzonderheden:	Geen

Nr	Eindtermen
030 00 00 00	**FLIGHT PERFORMANCE AND PLANNING**
031 00 00 00	**Mass and Balance**
031 01 00 00	Purpose of mass-and-balance considerations
031 02 00 00	Loading
031 04 00 00	Mass and balance details of aircraft
031 05 00 00	Determination of cg position
031 06 00 00	Cargo Handling
034 00 00 00	**Performance – helicopters**
034 01 00 00	General
034 02 00 00	Performance class 3 - single-engine helicopters
080 00 00 00	**PRINCIPLES OF FLIGHT**
082 00 00 00	**Principles of flight – helicopters**
082 01 00 00	Subsonic aerodynamics

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082 02 00 00	Transonic aerodynamics and compressibility effects
082 03 00 00	Rotorcraft types
082 04 00 00	Main-rotor aerodynamics
082 05 00 00	Main-rotor mechanics
082 06 00 00	Tail rotors
082 07 00 00	Equilibrium, stability and control
082 08 00 00	Helicopter flight mechanics
070 00 00 00	**OPERATIONAL PROCEDURES**
071 02 00 00	Special operational procedures and hazards (general aspects) (alleen 071 02 08 00, 071 02 14 00 en 071 02 15 00)
071 03 00 00	Emergency procedures (helicopter)

Vastgesteld door:	Technische Commissies Helicopter en Flight performance and planning
Beoordeeld door:	Logistiek, Transport en Personenvervoer raad; kamer 3: Luchtvaart <14 september 2018>
Goedgekeurd door:	Divisiemanager CCV <17 september 2018>
Ingangsdatum:	<1 april 2019>

Toelichting

Eindtermen: Dit zijn de hoofdonderwerpen die in het examen voorkomen. Hierin staat 'ruim' omschreven wat er in het examen terug kan komen.
Toetstermen: Dit zijn onderdelen van een eindterm. Hierin staat meer uitgebreid omschreven wat er in het examen terug kan komen.
Tax: Dit is de taxonomiecode van Romiszowski. Deze code geeft aan op welk niveau de vragen over een toetsterm gesteld worden.
F = Feitelijke kennis. De kandidaat kan feiten reproduceren (herkennen of herinneren).
B = Begripsmatige kennis. De kandidaat kan begrippen of principes omschrijven.
R = Reproductieve vaardigheden. De kandidaat kan acties uitvoeren die volgens een vastgelegde procedure verlopen.
P = Productieve vaardigheden. De kandidaat kan acties uitvoeren waarbij hij zijn eigen creativiteit en inzicht nodig heeft.

Eind- en toetstermen		Tax	PPLA	PPLH
030 00 00 00	**FLIGHT PERFORMANCE AND PLANNING**			
031 00 00 00	**MASS AND BALANCE - AEROPLANES/HELICOPTERS**			
031 01 00 00	**Purpose of mass-and-balance considerations**			
031 01 01 00	**Mass limitations**			
031 01 01 01	***Importance with regard to structural limitations***			
(01)	Describe the relationship between aircraft mass and structural stress. *Remark - see also 021 01 01 00.*	B	X	X
(02)	Describe that mass must be limited to ensure adequate margins of strength.	B	X	X
031 01 01 02	***Importance with regard to performance*** *Remark – see also subjects 032/034 and 081/082*			
(01)	Describe the relationship between aircraft mass and aircraft performance.	B	X	X
(02)	Describe that aircraft mass must be limited to ensure adequate aircraft performance.	B	X	X
031 01 02 00	**Centre-of-gravity (CG) limitations**			
031 01 02 01	***Importance with regard to stability and controllability*** *Remark - see also subjects 081/082*			
(01)	Describe the relationship between CG position and stability/controllability of the aircraft.	B	X	X
(02)	Describe the consequences if CG is in front of the forward limit.	B	X	X
(03)	Describe the consequences if CG is behind the aft limit.	B	X	X
031 02 00 00	**Loading**			
031 02 01 00	**Terminology**			
031 02 01 01	***Mass terms***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Define the following mass terms: - basic empty mass; - take-off mass; - landing mass; - ramp/taxi mass; - gross mass (the actual mass of an aircraft at a specified time); - zero fuel mass.	F	X	X
031 02 01 02	***Load terms (including fuel terms)*** *Remark - see also subject 033*			
(01)	Define the following load terms: - block fuel; - taxi fuel; - take-off fuel; - trip fuel; - reserve fuel (contingency, alternate, final reserve fuel); - extra fuel	F	X	X
(02)	Explain the relationship between the various load-and-mass components listed in 031 02 01 01 and 031 02 01 02.	B	X	X
(03)	Calculate the mass of particular components from other given components.	P	X	X
(04)	Convert fuel mass, fuel volume and fuel density given in different units used in aviation.	R	X	X
031 02 02 00	**Mass limits**			
031 02 02 01	***Structural limitations***			
(01)	Define the maximum zero-fuel mass (the maximum permissible mass of an aircraft with no usable fuel).	F	X	X
(03)	Define maximum take-off mass.	F	X	X
(05)	Define the maximum landing mass.	F	X	X
031 02 02 03	**Baggage compartment limitations**			
(p01)	Describe baggage compartment limitations.	B	X	
031 02 03 00	**Mass calculations**			
031 02 03 01	***Maximum masses for take-off and landing***			
(03)	Calculate the allowed mass for take-off.	P	X	X

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Eind- en toetstermen		Tax	PPLA	PPLH
031 04 00 00	**Mass and balance details of aircraft**			
031 04 01 00	**Contents of mass-and-balance documentation**			
031 04 01 01	***Datum, moment arm***			
(01)	State where the datum and moment-arms for aircraft can be found.	F	X	X
(02)	Extract appropriate data from given documents.	R	X	X
(03)	Define 'datum' (reference point), 'moment arm' and 'moment'.	F	X	X
031 04 01 02	***CG position as distance from datum***			
(01)	State where the CG position for an aircraft at basic empty mass can be found.	F	X	X
(02)	State where the CG limits for an aircraft can be found.	F	X	X
(03)	Describe the different forms in presenting CG position as distance from datum or other references.	B	X	X
(04)	Explain the meaning of centre of gravity (CG).	B	X	X
031 04 01 04	***Longitudinal CG limits***			
(01)	Extract the appropriate data from given sample documents.	R	X	X
031 04 01 05	***Lateral CG limits***			
(01)	Extract the appropriate data from given sample documents.	R		X
031 04 01 06	***Details of passenger and cargo compartments***			
(01)	Extract the appropriate data (e.g. seating schemes, compartment dimensions and limitations) from given sample documents.	R	X	X
031 04 01 07	***Details of fuel system relevant to mass-and-balance considerations***			
(01)	Extract the appropriate data (e.g. fuel-tank capacities and fuel-tank positions) from given sample documents.	R	X	X
031 04 03 00	**Extraction of basic empty mass (BEM) and CG data from aircraft documentation.**			
031 04 03 01	***Basic empty mass (BEM)***			
(01)	Extract values for BEM from given documents.	R	X	X
031 04 03 02	***CG position and/or moment at BEM***			
(01)	Extract values for CG position and moment at BEM from given documents.	R	X	X
031 04 03 03	***Deviations from standard configuration***			

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Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Extract values from given documents for deviation from standard configuration as a result of varying crew, optional equipment, optional fuel tanks etc.	R	X	X
031 05 00 00	**Determination of cg position**			
031 05 01 00	**Methods**			
031 05 01 01	***Arithmetic method***			
(01)	Calculate the CG position of an aircraft by using the formula: CG position = sum of moments / total mass.	P	X	X
031 05 01 02	***Graphic method***			
(01)	Determine the CG position of an aircraft by using the loading graphs given in sample documents.	R	X	X
031 05 02 00	**Load and trim sheet**			
031 05 02 02	***Load sheet and CG envelope for light aeroplanes and for helicopters***			
(01)	Add loading data and calculate masses in a sample load sheet.	P	X	X
(02)	Calculate moments and CG positions.	P	X	X
(03)	Check CG position at zero fuel mass and take-off mass to be within CG envelope including last minute changes, if applicable.	R	X	X
031 06 00 00	**Cargo Handling**			
031 06 03 00	**Securement of load**			
031 06 03 01	***Securement of load (reasons and methods)***			
(01)	Explain the reasons to restrain or secure cargo and baggage.	B	X	X

Eind- en toetstermen		Tax	PPLA	PPLH
030 00 00 00	**FLIGHT PERFORMANCE AND PLANNING**			
034 00 00 00	**PERFORMANCE - HELICOPTERS**			
034 01 00 00	**General**			
034 01 02 00	**General performance theory**			
034 01 02 01	***Phases of Flight***			
(01)	Explain the following phases of flight: — take-off; — climb; — level flight; — descent; — approach and landing.	B		X
(02)	Describe the necessity for different take-off and landing procedures.	B		X
034 01 02 02	***Definitions and Terms***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Define the following terms: — CAT A; — CAT B; — Performance Class 1, 2 and 3; — congested area; — elevated heliport; — helideck; — heliport; — hostile environment; — 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 (V_y); — never exceed speed (V_{NE}); — cruising speed and maximum cruising speed.	F		X
(04)	Define the terms 'climb angle' and 'climb gradient'.	F		X
(05)	Define the terms 'flight-path angle' and 'flight-path gradient'.	F		X
(06)	Define $V_{maxRange}$ (speed for maximum range) and V_{maxEnd} (speed for maximum endurance).	F		X
(08)	Explain the terms 'operational ceiling' and 'absolute ceiling'.	B		X
(10)	Explain the difference between hovering in ground effect (HIGE) and hovering out of ground effect (HOGE).	B		X
034 01 02 03	***Power required/power available curves***			
(01)	Understand and interpret the power required/power available versus TAS graphs.	B		X
034 01 02 04	***Height–velocity graphs***			
(01)	Understand and interpret height–velocity graphs.	B		X
034 01 02 05	***Influencing Variables on Performance***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Explain how the following factors affect helicopter performance: — pressure altitude; — humidity; — temperature; — wind; — helicopter mass; — helicopter configuration; — helicopter centre of gravity (CG).	B		X
034 02 00 00	**Performance class 3 - single-engine helicopters**			
034 02 01 00	**Effect of Variables on Single-Engine Helicopter Performance**			
034 02 01 01	***Effect of variables on SE helicopter performance***			
(01)	Determine the wind component, altitude and temperature for hovering, take-off and landing.	B		X
(02)	Explain that operations are to be conducted 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 (point CAT.OP.MPA.137 of the EU Regulation on air operations, except when the helicopter is approved to operate in accordance with point CAT.POL.H.420). (Consider the exception: Operations may be conducted in a hostile environment. Ground level exposure — and exposure for elevated final approach and take-off areas (FATOs) or helidecks in non-hostile environments — is allowed for operations approved under CAT.POL.H.305, during the take-off and landing phases.)	B		X
(03)	Explain the effect of temperature, wind and altitude on climb, cruise and descent performance.	B		X
034 02 02 00	**Take-off and landing**			
034 02 02 01	***Take-off and landing (including hover)***			
(01)	Explain the take-off and landing requirements.	B		X
(02)	Explain the maximum allowed take-off and landing mass.	B		X
(03)	Explain that mas has to be restricted to HIGE.	B		X
(04)	Explain that if HIGE is unlikely to be achieved (for example, blocked by an obstruction), then mass must be restricted to HOGE.	B		X
034 02 04 00	**Use of helicopter performance data**			
034 02 04 01	***Take-off (including hover)***			
(01)	Find the maximum wind component.	F		X
(02)	Find the maximum allowed take-off mass for certain conditions.	F		X

Eind- en toetstermen		Tax	PPLA	PPLH
(03)	Find the height–velocity parameters.	F		X
034 02 04 02	***Climb***			
(01)	Find the time, distance and fuel required to climb for certain conditions.	F		X
(02)	Find the rate of climb under given conditions and the best rate-of-climb speed V_Y.	F		X
034 02 04 03	***Cruise***			
(01)	Find the cruising speed and fuel consumption for certain conditions.	F		X
(02)	Calculate the range and endurance under given conditions.	P		X
034 02 04 04	**Landing (including hover)**			
(01)	Find the maximum wind component.	F		X
(03)	Find the height–velocity parameters.	F		X

Eind- en toetstermen		Tax	PPLA	PPLH
080 00 00 00	**PRINCIPLES OF FLIGHT**			
082 00 00 00	**PRINCIPLES OF FLIGHT - HELICOPTERS**			
082 01 00 00	**Subsonic aerodynamics**			
082 01 01 00	**Basic concepts, laws and definitions**			
082 01 01 01	***International system of units of measurement (SI) and conversion of SI units***			
(01)	List the fundamental quantities and units in SI, such as mass (kg), length (m), time (s).	F		X
(02)	Be able to convert imperial units to SI units and vice versa.	F		X
082 01 01 02	***Definitions and basic concepts of air***			
(01)	Describe air temperature and pressure in function of height.	B		X
(02)	Define the International Standard Atmosphere (ISA).	F		X
(03)	Define air density, and explain the relationship between air density, pressure and temperature.	F		X
(04)	Explain the influence of the moisture content on air density.	B		X
(05)	Define pressure altitude and air density altitude.	F		X
082 01 01 03	***Newton's Laws***			
(01)	State and interpret Newton's three laws of motion.	F		X
(02)	Distinguish between mass and weight, and their units.	R		X
082 01 01 04	***Basic concepts about airflow***			
(01)	Describe steady and unsteady airflow.	B		X
(05)	State Bernoulli's equation and use it to explain and define the relationship between static, dynamic and total pressure.	F		X

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Eind- en toetstermen		Tax	PPLA	PPLH
(06)	Define the stagnation point in the flow round an aerofoil, and explain the pressure obtained at the stagnation point.	F		X
(08)	Define 'TAS', 'IAS' and 'CAS'.	F		X
(09)	Define a two-dimensional airflow and its relationship to an aerofoil of infinite span (i.e. no blade tip vortices and, therefore, no induced drag). Explain the difference between two- and threedimensional airflows.	F		X
(10)	Explain that viscosity is a feature of any fluid (gas or liquid).	B		X
(12)	Describe laminar and turbulent boundary layers and the transition from laminar to turbulent. Show the influence of the roughness of the surface on the position of the transition point.	B		X
082 01 02 00	**Two-dimensional airflow**			
082 01 02 01	***Aerofoil section geometry***			
(01)	Define the terms 'aerofoil section', 'aerofoil element', 'chordline', 'chord', 'thickness', 'thickness to chord ratio', 'camber line', 'camber' and 'leading-edge radius'.	F		X
(02)	Describe symmetrical and asymmetrical aerofoil sections.	B		X
082 01 02 02	***Aerodynamic forces on aerofoil elements***			
(01)	Define the angle of attack (α).	F		X
(02)	Describe: — the resultant force from the pressure distribution and the friction at the element; — the resultant force from the boundary layers and the velocities in the wake; and — the loss of momentum due to friction forces.	B		X
(03)	Resolve the aerodynamic force into the components of lift (L) and drag (D).	B		X
(04)	Define the lift coefficient (C_L) and the drag coefficient (C_D).	F		X
(05)	Show that the C_L is a function of the α.	R		X
(06)	Explain how drag is caused by pressure forces on the surfaces of an aerofoil and by friction in the boundary layers. Define the term ‘profile drag’.	B		X
(07)	Define the L/D ratio.	F		X
(08)	Use the lift and drag equations to show the influence of speed and density on lift and drag for a given α.	R		X

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Eind- en toetstermen		Tax	PPLA	PPLH
(09)	Define the action line of the aerodynamic force and the CP.	F		X
082 01 02 03	***Stall***			
(01)	Explain the boundary layer separation when α increases beyond the onset of stall and the decrease of lift and the increase of drag. Define the 'separation point'.	B		X
082 01 02 04	***Disturbances due to profile contamination***			
(01)	Explain ice contamination, the modification of the section profile and the surfaces due to ice and snow, the influence on L and D and the L-D ratio, the influence on α (at stall onset), and the effect of the increase in weight.	B		X
082 01 03 00	**The three-dimensional airflow round a blade**			
082 01 03 01	***The blade***			
(01)	Describe the various blade planforms.	B		X
(02)	Define aspect ratio and blade twist.	F		X
082 01 03 02	***Airflow pattern and influence on lift (L)***			
(01)	Explain the spanwise flow around a blade and the appearance of blade tip vortices which are a loss of energy.	B		X
(05)	Explain the spanwise L distribution and the way in which it can be modified by twist (washout).	B		X
082 01 03 03	***Induced drag***			
(01)	Explain the induced drag and the influence of α and aspect ratio.	B		X
082 01 03 04	***The airflow round a fuselage***			
(01)	Describe the aircraft fuselage and the external components that cause (parasite) drag, the airflow around the fuselage, and the influence of the pitch angle of the fuselage. Describe fuselage shapes that minimise drag.	B		X
(02)	Define profile drag as the sum of pressure (form) drag and skin friction drag.	F		X
(03)	Define 'interference drag'.	F		X
(04)	Know the drag formula.	F		X
082 02 00 00	**Transonic aerodynamics and compressibility effects**			
082 02 01 00	**Airflow speeds and velocities**			

Eind- en toetstermen		Tax	PPLA	PPLH
082 02 01 01	***Speeds and Mach number***			
(01)	Define the speed of sound in air.	F		X
(06)	Define high subsonic, transonic and supersonic flows in relation to the value of the Mach number.	F		X
082 02 01 02	***Shock waves***			
(01)	Describe shock wave in a supersonic flow and the changes in pressure and speed.	B		X
(02)	Describe the appearance of local supersonic flows on the surfaces of a blade.	B		X
082 03 00 00	**Rotorcraft types**			
082 03 01 00	**Rotorcraft**			
082 03 01 01	***Rotorcraft types***			
(01)	Explain the difference between an autogyro and a helicopter.	B		X
082 03 02 00	**Helicopters**			
082 03 02 01	***Helicopters configurations***			
(01)	Describe (briefly) the single-main-rotor helicopter and the other configurations: tandem, co-axial, side by side, synchropter (with intermeshing blades), the compound helicopter and tilt-rotor.	B		X
082 03 02 02	***The helicopter, characteristics and associated terminology***			
(01)	Mention the tail rotor, the Fenestron, and the no tail rotor (NOTAR).	F		X
(02)	Define the rotor disc area and the blade area.	F		X
(03)	Describe the teetering rotor with the hinge axis on the shaft axis, and rotors with more than two blades with offset hinge axes.	B		X
(04)	Define the fuselage centre line and the three axes, roll, pitch and normal	F		X
(05)	Define gross weight and gross mass (and the units involved), disc and blade loading.	F		X
082 04 00 00	**Main-rotor aerodynamics**			
082 04 01 00	**Hover flight outside ground effect**			
082 04 01 01	***Airflow through the rotor disc and around the blades***			

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Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Based on Newton’s second law (momentum) explain that the upward vertical force from the disc, i.e. the rotor thrust, is the result of vertical downward velocities inside the rotor disc.	B		X
(02)	Explain why the production of the induced flow requires power applied to the shaft, i.e. induced power. Induced power is least if the induced velocities have the same value on the whole disc (i.e. there is uniformity of flow over the disc).	B		X
(03)	Explain why vertical rotor thrust must be higher than the weight of the helicopter because of the vertical drag on the fuselage.	B		X
(04)	Define the pitch angle and the α of a blade element.	F		X
(05)	Explain L and D relating to a blade element (including induced and profile drag).	B		X
(06)	Explain the necessity for collective pitch angles changes, the influence on the α and rotor thrust, and the need for blade feathering.	B		X
(08)	Explain how profile drag on the blade elements generates a torque on the main shaft, and define the resulting rotor profile power.	B		X
(09)	Explain the influence of the air density on the required powers.	B		X
082 04 01 02	***Anti-torque force and tail rotor***			
(01)	Using Newton’s third law (motion), explain the need for tail-rotor thrust, the required value being proportional to main-rotor torque. Show that tail-rotor power is proportional to tail-rotor thrust.	B		X
(02)	Explain the necessity for feathering of the tail-rotor blades and their control by the yaw pedals, and the maximum and minimum values of the pitch angles of the blades.	B		X
082 04 01 03	***Total power required and hover outside ground effect (HOGE)***			
(02)	Define the total power required.	F		X
(03)	Describe the influence of ambient pressure, temperature and moisture on the required power.	B		X
082 04 02 00	**Vertical climb**			
082 04 02 01	***Relative airflow and angles of attack (α)***			
(01)	Describe the dependence of the vertical climb speed on the opposite vertical air velocity relative to the rotor disk.	B		X
(02)	Explain how α is controlled by the collective pitch angle control.	B		X
082 04 02 02	***Power and vertical speed***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Define the total main-rotor power required as the sum of parasite power, induced power, climb power and rotor profile power.	F		X
(02)	Explain why the total main-rotor power required increases when the rate of climb increases.	B		X
082 04 03 00	**Forward flight**			
082 04 03 01	***Airflow and forces in uniform inflow distribution***			
(01)	Explain the assumption of a uniform inflow distribution on the rotor disc.	B		X
(02)	Show the upstream air velocities relative to the blade elements and the different effects on the advancing and retreating blades. Define the area of reverse flow. Explain the influence of forward speed on the circumferential speed of the blade tip.	B		X
(03)	Assuming constant pitch angles and rigid blade attachments, explain the roll moment from the asymmetric distribution of L.	B		X
(04)	Show that through cyclic feathering this imbalance could be eliminated by a low α (accomplished by a low pitch angle) on the advancing blade, and a high α (accomplished by a high pitch angle) on the retreating blade.	R		X
(05)	Describe the high air velocity at the advancing blade tip and the compressibility effects which limit maximum speed.	B		X
(06)	Describe the low air velocity on the retreating blade tip resulting from the difference between the circumferential speed and forward speed, the need for high α, and the onset of stall.	B		X
(08)	Explain the rotor thrust that is perpendicular to the rotor disc and the need for tilting the thrust vector forward.	B		X
(09)	Explain the conditions of equilibrium in steady straight and level flight.	B		X
082 04 03 02	***The flare (powered flight)***			
(01)	Explain the flare in powered flight, the rearward tilt of the rotor disc and the thrust vector. Show the horizontal component that is in the opposite direction to forward velocity.	B		X
(02)	State the increase in thrust due to the upward inflow, and show the modifications in the α.	F		X
(03)	Explain the increase in rotor rpm fora non-governed rotor.	B		X
082 04 03 04	***Power and maximum speed***			
(01)	Explain that the induced velocities and power values decrease as the speed of the helicopter increases.	B		X
(02)	Define profile drag and profile power, and the increase in their values with the speed of the helicopter.	F		X
(03)	Define parasite drag and parasite power and the increase in their values with the speed of the helicopter.	F		X

Eind- en toetstermen		Tax	PPLA	PPLH
(04)	Define total drag and its increase with the speed of the helicopter.	F		X
(05)	Describe the power required for the tail rotor and the power required by ancillary equipment.	B		X
(06)	Define the total power requirement as a sum of the above partial powers, and explain how it varies with the speed of the helicopter.	F		X
(07)	Explain the influence of helicopter mass, the air density and additional external equipment on the partial powers and the total power required.	B		X
(08)	Explain translational lift and show the decrease in required total power as the helicopter increases its speed from the hover.	B		X
082 04 04 00	**Hover and forward flight in ground effect**			
082 04 04 01	***Airflow in ground effect, downwash***			
(01)	Explain how the vicinity of the ground changes the downward flow pattern and the consequences on the lift (thrust) at constant rotor power. Show that ground effect depends on the height of the rotor above the ground and the rotor diameter. Show the required rotor power at constant all-up mass (AUM) as a function of height above the ground. Describe the influence of forward speed.	B		X
082 04 05 00	**Vertical descent**			
082 04 05 01	***Vertical descent, power on***			
(01)	Describe the airflow through the rotor disc in a trouble-free vertical descent, power on, the airflow opposing the helicopter's velocity, the relative airflow, and α.	B		X
(02)	Explain the vortex ring state, also known as settling with power. State the approximate vertical descent speeds that allow the formation of vortex ring, related to the values of the induced velocities.	B		X
(03)	Describe the relative airflow to the blades, the root stall, the loss of lift at the blade tip, and the turbulence. Show the effect of raising the lever and describe the effects on the controls.	B		X
082 04 05 02	***Autorotation***			
(01)	State the need for early recognition and for a quick initiation of recovery. Describe the recovery actions.	F		X
(02)	Explain that the collective lever must be lowered quickly enough to avoid a rapid decay of rotor rpm due to drag on the blades, and explain the influence of rotational inertia of the rotor on the rate of decay.	B		X
(03)	Show the induced flow through the rotor disc, the rotational velocity and relative airflow, the inflow and inflow angles.	R		X

Eind- en toetstermen		Tax	PPLA	PPLH
(04)	Show how the aerodynamic forces on the blade elements vary from root to tip and distinguish three zones: the inner stalled region, the middle driving region, and the driven region.	R		X
(05)	Explain the control of the rotor rpm with collective pitch.	B		X
(06)	Show the need of negative tail-rotor thrust with yaw control.	R		X
(07)	Explain the final increase in rotor thrust caused by raising the collective pitch to decrease the vertical descent speed and the decay in rotor rpm.	B		X
082 04 06 00	**Forward flight – autorotation**			
082 04 06 01	***Airflow at the rotor disc***			
(01)	Explain the factors that affect inflow angle and α, the autorotative power distribution, and the dissymmetry over the rotor disc in forward flight.	B		X
082 04 06 02	***Flight and landing***			
(01)	Show the effect of forward speed on the vertical descent speed.	R		X
(02)	Explain the effects of gross weight, rotor rpm and altitude (density) on endurance and range.	B		X
(03)	Explain the manoeuvers of turning and touchdown.	B		X
(04)	Explain the height-velocity curves.	B		X
082 05 00 00	**Main-rotor mechanics**			
082 05 01 00	**Flapping of the blade in hover**			
082 05 01 03	***Coning angle in hover***			
(01)	Define the tip path plane and the coning angle.	F		X
(02)	Show how the equilibrium of the moments about the flapping hinge of lift (thrust) and of the centrifugal force determine the coning angle of the blade (the blade mass being negligible).	R		X
(03)	Justify the lower limit of rotor rpm.	B		X
082 05 02 00	**Flapping angles of the blade in forward flight**			
082 05 02 01	***Forces on the blade in forward flight without cyclic feathering***			

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Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Assume rigid attachments of the blade to the hub and show the periodic lift, moment and stresses on the attachment, the ensuing metal fatigue, the roll moment on the helicopter and justify the necessity for a flapping hinge.	B		X
(02)	Assume no cyclic pitch and describe the lift on the advancing and retreating blades.	B		X
(03)	State the azimuthal phase lag (90°or less) between the input (applied pitch) and the output (flapping angle). Explain flapback (the rearward tilting of the tip path plane and total rotor thrust).	F		X
082 05 02 02	***Cyclic pitch (feathering) in forward flight***			
(01)	Show that in order to assume and maintain forward flight, the total rotor thrust vector must obtain a forward component by tilting the tip path plane.	R		X
(02)	Show how the applied cyclic pitch modifies the lift on the advancing and retreating blades and produces the required forward tilting of the tip path plane and the total rotor thrust.	R		X
(03)	Show the cone described by the blades and define the virtual axis of rotation. Define the plane of rotation.	R		X
(04)	Define the reference system in which we define the movements: the shaft axis and the hub plane.	F		X
(05)	Describe the swashplates, the pitch links and horns. Explain how the collective lever moves the non-rotating swashplate up or down the shaft axis.	B		X
(06)	Describe the mechanism by which the required cyclic pitch can be produce by tilting the swashplate with the cyclic stick.	B		X
(07)	Explain the transitional lift effect when the speed increases.	B		X
082 05 03 00	**Blade-lag motion in forward flight**			
082 05 03 01	***Forces on the blade in the disc plane (tip path plane) in forward flight***			
(01)	Explain the Coriolis force due to flapping, the resulting periodic moments in the hub plane, and the resulting periodic stresses which make lead-lag hinges necessary to avoid material fatigue.	B		X
(02)	Describe the profile drag forces on the blade elements and the periodic variation of these forces.	B		X
082 05 03 03	***Ground resonance***			
(01)	Explain the movement of the CG of the blades due to lead-lag movements in the multiblade rotor.	B		X
(02)	Show the effect on the fuselage and the danger of resonance between this force and the fuselage and undercarriage when the gear touches the ground.	R		X
082 05 04 00	**Rotor systems**			

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Eind- en toetstermen		Tax	PPLA	PPLH
082 05 04 01	***See-saw or teetering rotor***			
(01)	Explain that a teetering rotor is prone to mast bumping in low-G situations, and that it is difficult to counteract because there is no lift force to provide sideways movement.	B		X
082 05 04 03	***Hingeless rotor, bearingless rotor***			
(01)	Show the forces on the flapping hinges with large offset (virtual hinge) and the resulting moments, compare with other rotor systems.	R		X
082 05 05 00	**Blade sailing**			
082 05 05 01	***Blade sailing and causes***			
(01)	Define blade sailing, the influence of low rotor rpm and of a headwind.	F		X
082 05 05 02	***Minimising the danger***			
(01)	Describe actions that minimise danger and the demonstrated wind envelope for engaging and disengaging rotors.	B		X
082 05 05 03	***Droop stops***			
(01)	Explain the purpose of droop stops, and their retraction.	B		X
082 06 00 00	**Tail rotors**			
082 06 01 00	**Conventional tail rotor**			
082 06 01 02	***Tail rotor aerodynamics***			
(01)	Explain the airflow around the blades in the hover and in forward flight, and the effects of the tip speeds on noise production and compressibility.	B		X
(02)	Explain the effect of wind on tail-rotor aerodynamics and thrust in the hover, and any problems.	B		X
(03)	Explain the tail-rotor thrust and the control through pitch alterations (feathering).	B		X
(04)	Explain tail-rotor flapback, and the effects of Delta 3.	B		X
(05)	Describe the roll moment and drift as side effects of the tail rotor.	B		X
(06)	Explain the effects of tail-rotor failure.	B		X
(07)	Explain the loss of tail-rotor effectiveness (LTE), tail-rotor vortexring state, causes, cross wind, and yaw speed.	B		X

Eind- en toetstermen		Tax	PPLA	PPLH
082 07 00 00	**Equilibrium, stability and control**			
082 07 01 00	**Equilibrium and helicopter attitudes**			X
082 07 01 01	***Hover***			
(01)	Explain why the vector sum of forces and moments must be zero in any acceleration-free situation.	B		X
(02)	Indicate the forces and the moments about the lateral axis in a steady hover.	B		X
(03)	Indicate the forces and the moments about the longitudinal axis in a steady hover.	B		X
(06)	Explain the consequence of the cyclic stick reaching its forward or aft limit during an attempt to take off to the hover.	B		X
082 07 01 02	***Forward flight***			
(01)	Explain why the vector sum of forces and of moments must be zero in unaccelerated flight.	B		X
(02)	Indicate the forces and the moments about the lateral axis in steady straight and level flight.	B		X
(06)	Explain how forward speed influences the fuselage attitude.	B		X
(07)	Describe and explain the inflow roll effect.	B		X
082 07 02 00	**Stability**			
082 07 02 01	***Static longitudinal, roll and directional stability***			
(01)	Define static stability; give an example of static stability and of static instability.	F		X
(03)	Describe the influence of the horizontal stabilizer on static longitudinal stability	B		X
(06)	Describe the influence of the vertical stabilizer on static directional stability.	B		X
082 07 02 03	***Dynamic stability***			
(01)	Define dynamic stability; give an example of dynamic stability and of dynamic instability.	F		X
(02)	Explain why static stability is a precondition for dynamic stability.	B		X
082 07 03 00	**Control**			
082 07 03 01	***Manoeuvre stability***			
(01)	Explain how helicopter control can be limited because of available stick travel.	B		X

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Eind- en toetstermen		Tax	PPLA	PPLH
(02	Explain how the CG position influences the remaining stick travel.	B		X
082 07 03 03	***Static and dynamic rollover***			
(01)	Explain the mechanism which causes dynamic rollover.	B		X
(02)	Explain the required pilot action when dynamic rollover is starting to develop.	B		X
082 08 00 00	**Helicopter flight mechanics**			
082 08 01 00	**Flight limits**			
082 08 01 01	***Hover and vertical flight***			
(01)	Show the power required for HOGE and HIGE, and the power available	F		X
(02)	Explain the effects of AUM, ambient temperature and pressure, density altitude and moisture.	B		X
082 08 01 02	***Forward flight***			
(01)	Compare the power required and the power available as a function of speed in straight and level flight.	B		X
(02)	Define the maximum speed limited by power and the value relative to V_{NE} and V_{NO}.	F		X
(03)	Use the power graph to determine the speeds of maximum rate of climb and the maximum angle of climb.	R		X
(04)	Use the power graph to define true airspeed (TAS) for maximum range and maximum endurance, and consider the case of piston engine and the turbine engine. Explain the effects of tailwind or headwind on the speed for maximum range.	R		X
(05)	Explain the effects of AUM, pressure and temperature, density altitude, humidity.	B		X
082 08 01 03	***Manoeuvering***			
(01)	Define the load factor, the radius and the rate of turn.	F		X
(02)	Explain the relationship between the angle of bank, the airspeed and the radius of turn, and between the angle of bank and the load factor.	B		X
(03)	Explain the influence of AUM, pressure and temperature, density altitude, and humidity.	B		X
082 08 02 00	**Special conditions**			
082 08 02 01	***Operating with limited power***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Explain operations with limited power, use the power graph to show the limitations on vertical and level flight, and describe power checks and procedures for take-off and landing.	B		X
(02)	Describe manoeuvres with limited power.	B		X
082 08 02 02	***Overpitch, overtorque***			
(01)	Describe overpitching and show the consequences.	B		X
(02)	Describe situations likely to lead to overpitching.	B		X
(03)	Describe overtorquing and show the consequences.	B		X
(04)	Describe situations likely to lead to overtorquing.	B		X

Eind- en toetstermen		Tax	PPLA	PPLH
070 00 00 00	**OPERATIONAL PROCEDURES**			
071 02 00 00	**Special operational procedures and hazards (general aspects)**			
071 02 08 00	**Wake turbulence**			
071 02 08 01	***Cause***			
(01)	Define the term ”wake turbulence” (ICAO Doc 4444 4.9).	F	X	X
(02)	Describe tip vortices circulation (ICAO Doc 9426 Part II).	B	X	X
(03)	Explain when vortex generation begins and ends (ICAO Doc 9426 Part II).	B	X	X
(04)	Describe vortex circulation on the ground with and without crosswind (ICAO Doc 9426 Part II).	B	X	X
071 02 08 02	**List of relevant parameters**			
(01)	List the three main factors which, when combined, give the strongest vortices (heavy, clean, slow).	F	X	X
(02)	Describe the wind conditions which are worst for wake turbulence near the ground.	B	X	X
071 02 08 03	**Actions taken when crossing traffic, during take-off and landing**			
(01)	Describe the actions to be taken to avoid wake turbulence, specifically separations.	B	X	X
071 02 14 00	**Rotor downwash**			
071 02 14 01	***Describe downwash***			
(01)	Describe the downwash.	B		X
071 02 14 02	***Effects***			
(01)	Explain its effects: soil erosion, water dispersal and spray, recirculation, damage to property, loose articles.	B		X
071 02 15 00	**Operation influence by meteorological conditions (helicopter)**			
071 02 15 01	***White-out/sand/dust***			
(01)	Give the definition of 'white out'.	F		X
(02)	Describe loss of spatial orientation.	B		X
(03)	Describe take-off and landing techniques.	B		X
071 02 15 02	***Strong winds***			

Eind- en toetstermen		Tax	PPLA	PPLH
(01)	Describe blade sailing.	B		X
(02)	Describe wind operating envelopes.	B		X
(03)	Describe vertical speed problems.	B		X
071 03 00 00	**Emergency procedures (helicopter)**			
071 03 01 00	**Influence by technical problems**			
071 03 01 01	***Engine failure***			
(01)	Describe recovery techniques in the event of engine failure during hover, climb, cruise, approach.	B		X
071 03 01 02	***Fire in cabin/cockpit/engine***			
(01)	Describe the basic actions when encountering fire in cabin, cockpit, flight deck or engine(s).	B		X
071 03 01 03	***Tail/rotor/directional control failure***			
(01)	Describe the basic actions following loss of tail rotor.	B		X
(02)	Describe the basic actions following loss of directional control.	B		X
071 03 01 04	***Ground resonance***			
(01)	Describe recovery actions.	B		X
071 03 01 05	***Blade stall***			
(01)	Describe cause and recovery actions when encountering retreating blade stall.	B		X
071 03 01 06	***Settling with power (vortex ring)***			
(01)	Describe potential conditions and recovery actions when encountering retreating blade stall.	B		X
071 03 01 07	***Overpitch***			
(01)	Describe recovery actions.	B		X
071 03 01 08	***Overspeed: rotor/engine***			
(01)	Describe overspeed control	B		X
071 03 01 09	***Dynamic rollover***			
(01)	Describe potential conditions and recovery action.	B		X
071 03 01 10	***Mast bumping***			
(01)	Describe potential conditions of the 'conducive to' and 'avoidance of' effect.	B		X

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Alleen de onderwerpen die als meest relevant voor privévliegers worden beschouwd zijn uitgewerkt in de leerdoelen. De onderwerpen die niet in de leerdoelen zijn uitgewerkt, maar wel terugkomen in de AMC-syllabus zijn in onderstaand tekstvak onder benoemd:

De volgende onderwerpen uit de AMC-syllabus zijn niet uitgewerkt in bovenstaande leerdoelen:
- **031: Mass calculations**: Use of standard masses for passengers, bagage and crew

Wijzigingen toetsmatrijs LVPHFPP

Wijzigingen leerdoelen versie 26-02-2019 (t.o.v. versie 30-11-2012):

Algemene wijzigingen
- De leerdoelen van de vakken die in één examen worden afgenomen, zijn in één document gevoegd.
- De leerdoelen zijn genummerd.
- De kolom met 'opmerkingen' is verwijderd. Alle informatie die (niet) geldt voor PPL staat (niet) in de LO's.

FPP: Mass&Balance

Grote wijzigingen
- 031 01 01 02: derde LO is verwijderd.
- 031 02 01 02: leerdoel (03) is toegevoegd.
- 031 02 02 01: leerdoel (01) is toegevoegd en derde LO is verwijderd.
- 031 02 02 03: beide leerdoelen zijn verwijderd. Leerdoel (p01) is voor PPLA toegevoegd.
- 031 02 03 01 (03): leerdoel is alleen voor PPLH (was alleen voor PPLA).
- 031 03 00 00: onderdeel is verwijderd.
- 031 04 01 01: leerdoel (03) is toegevoegd.
- 031 04 01 02: derde LO is verwijderd en leerdoel (04) is toegevoegd.
- 031 04 01 04: onderdeel is toegevoegd.
- 031 04 01 05: onderdeel is toegevoegd.
- 031 04 01 06: onderdeel is toegevoegd.
- 031 04 01 07: onderdeel is toegevoegd.
- 031 06 00 00: onderdeel is toegevoegd.

Kleine wijzigingen
- De kolom met 'opmerkingen' is verwijderd. Alle informatie die (niet) geldt voor PPL staat (niet) in de LO's.
- 031 04 01 01 (01): 'name' is aangepast naar 'state'.
- 031 04 01 02 (01) en (02): 'name' is aangepast naar 'state'.

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FPP: Performance – Helicopters

Grote wijzigingen
- 034 01 02 02: tweede LO is toegevoegd.
- 034 01 02 03: dit onderdeel heeft een nieuw nummer gekregen: 034 01 02 05.
- 034 01 02 03 en 034 01 02 04: deze onderdelen zijn toegevoegd.
- 034 02 01 00: dit onderdeel is verwijderd.
- 034 02 04 01 (was 034 02 05 01): derde leerdoel is verwijderd en leerdoel (03) is toegevoegd

Kleine wijzigingen
- 034 01 02 02 (01): 'safe forced landing', 'speed for best rate of climb (V_y)', 'never exceed speed (V_{ne})' en 'cruising speed and maximum cruising speed' toegevoegd.
- 034 01 02 02 (08): 'service ceiling' en 'single engine service ceiling' zijn verwijderd en 'operational ceiling' is toegevoegd.
- 034 01 02 02 (10): 'understand' is aangepast naar 'explain'.
- 034 02 02 00 is 034 01 00 geworden, 034 02 03 00 is 034 02 02 00 geworden en 034 02 05 00 is 034 02 04 00 geworden.
- 034 02 02 00 (was 034 02 03 00): eerste leerdoel is opgesplitst in twee leerdoelen (01) en (02).

Principles of Flight - Helicopters

Grote wijzigingen
- 082 01 01 01: derde en vierde LO zijn verwijderd.
- 082 01 01 03: derde en vierde LO zijn verwijderd.
- 082 01 02 02: leerdoel (08) is toegevoegd.
- 082 01 02 03: tweede en derde LO zijn verwijderd.
- 082 01 03 02: leerdoel (05) is toegevoegd.
- 082 01 03 04: leerdoel (03) is toegevoegd.
- 082 02 01 03: onderdeel is verwijderd.
- 082 03 01 01: tweede leerdoel is verwijderd.
- 082 03 02 02: de definities en het eerste LO zijn verwijderd.
- 082 04 01 01: eerste, tweede, vijfde, zesde, achtste, elfde, dertiende en zestiende LO zijn verwijderd.
- 082 04 02 01: tweede LO is verwijderd.
- 082 04 02 02: derde en vierde LO zijn verwijderd.
- 082 04 03 01: tweede LO is verwijderd.
- 082 04 03 02: vierde LO is verwijderd.
- 082 05 02 02: eerste leerdoel verwijderd en leerdoel (01) toegevoegd.
- 082 05 03 02: onderdeel is verwijderd.
- 082 05 04 01: beide LO's zijn verwijderd en vervangen voor leerdoel (01).
- 082 05 04 02: onderdeel is verwijderd.
- 082 05 06 00: onderdeel is verwijderd.
- 082 06 01 01: onderdeel is verwijderd.
- 082 06 01 02: leerdoel (04) en (05) zijn toegevoegd.
- 082 06 02 00: onderdeel is verwijderd.

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- 082 06 03 00: onderdeel is verwijderd.
- 082 06 04 00: onderdeel is verwijderd.
- 082 07 01 01: leerdoel (07) is toegevoegd.
- 082 07 03 01: onderdeel is toegevoegd.
- 082 07 03 02: onderdeel is verwijderd.
- 082 07 03 03: leerdoel (02) is toegevoegd.
- 082 08 01 02: vijfde LO is verwijderd.
- 082 08 01 03: derde leerdoel is verwijderd en leerdoel (03) is toegevoegd.
- 082 08 02 01: tweede LO is verwijderd.

Kleine wijzigingen

- 082 01 01 01 (02): aanpassing van 'Show and apply the tables of conversion of units' naar 'Be able to convert imperial units to SI units and vice versa'.
- 082 01 01 02 (02): 'use the table' aangepast naar 'define'.
- 082 01 01 03 (01): aanpassing van 'Describe Newton's second law: force equal product of mass and acceleration' naar 'State and interpret Newton's three laws of motion'.
- 082 01 01 03 (02): aanpassing van 'Mass and weight, units' naar 'Distinguish between mass and weight, and their units'.
- 082 01 01 04 (05): aanpassing van 'State Bernoulli's equation in a non-viscous airflow, use this equation to explain and define static pressure, dynamic pressure, total pressure' naar 'State Bernoulli's equation and use it to explain and define the relationship between static, dynamic and total pressure'.
- 082 01 02 02 (02): aanpassing van 'Describe the pressure distribution on the upper and lower surface' naar 'Describe the resultant force from the pressure distribution and the friction at the element, the resultant force from the boundary layers and the velocities in the wake and the loss of momentum due to friction forces'.
- 082 01 03 01 (01): aanpassing van 'Describe the planform of the blade (wing), rectangular and tapered blades, untwisted and twisted blades' naar 'Describe the various blade planforms'.
- 082 01 03 01 (02): aanpassing van 'Define the root chord and the tip chord, the mean chord, the aspect ratio and the blade or wing twist' naar'Define aspect ratio and blade twist'.
- 082 01 03 02 (01): aanpassing van 'Explain the spanwise flow in the case of a wing in a uniform upstream airflow and the appearance of the tip vortices which are a loss of energy' naar 'Explain the spanwise flow around a blade and the appearance of blade tip vortices which are a loss of energy'.
- 082 01 03 04 (01): 'Describe fuselage shapes that minimise drag' is toegevoegd.
- 082 01 03 04 (02): aanpassing van 'Define the parasite drag as the result of the pressure drag and the friction drag' naar 'Define profile drag as the sum of pressure (form) drag and skin friction drag'.
- 082 01 03 04 (04): aanpassing van 'The formula of the parasite drag and explain the influence of the speed' naar 'Know the drag formula'.
- 082 02 01 02 (01): aanpassing van 'Describe the shock wave in a supersonic flow and the pressure and speed variation through the shock' naar 'Describe shock wave in a supersonic flow and the changes in pressure and speed'.
- 082 02 01 02 (02): aanpassing van 'Describe the appearance of local supersonic flows at the upper face of a wing section and the recompression through a shock when the wing section is in an upstream high subsonic flow' naar 'Describe the appearance of local supersonic flows on the surfaces of a blade'.
- 082 03 01 01 (01): aanpassing van 'Define the autogyro and the helicopter' naar 'Explain the difference between an autogyro and a helicopter'.
- 082 03 02 01 (01): 'tilt-wing' is verwijderd.
- 082 04 01 01 (01): 'The values of these induced airspeeds increases as the thrust increases and decreases with increasing rotor diameter. Mention that the velocities some distance downstream are twice the value of the induced speed in the disc plane' is verwijderd.
- 082 04 01 01 (02): 'that' is aangepast naar 'why'.
- 082 04 01 01 (03): 'that' is aangepast naar 'why' en 'in equilibrium with' is aangepast naar 'higher than'.

- 082 04 02 01 (01): aanpassing van ‘Describe the climb speed and the opposite downwards air velocity relative to the blades’ naar ‘Describe the dependence of the vertical climb speed on the opposite vertical air velocity relative to the rotor disk’.
- 082 04 02 02 (02): ‘that’ is aangepast naar ‘why’.
- 082 04 03 01 (09): aanpassing van ‘Explain the vertical equilibrium and the horizontal equilibrium in steady straight level flight’ naar ‘Explain the conditions of equilibrium in steady straight and level flight’.
- 082 04 05 02 (04): ‘Explain the RPM stability at a given collective pitch’ is verwijderd.
- 082 05 01 01: onderdeel is verwijderd.
- 082 05 01 03 (02): aanpassing van ‘Show how the lift (thrust) and the centrifugal force result in the equilibrium of the blade about the plapping hinge’ naar ‘Show how the equilibrium of the moments about the flapping hinge of lift (thrust) and of the centrifugal force determine the coning angle of the blade (the blade mass being negligible)’.
- 082 05 01 03 (03): aanpassing van ‘Explain the influence of the rotor RPM and the lift on the coning angle, justify the lower limit of the rotor RPM, relate the lift on one blade to the gross weight’ naar ‘Justify the lower limit of rotor rpm’.
- 082 05 02 01 (03): ‘Justify the rotor flapback for this situation and the rearwards tilting of the tip path plane. The rotor thrust perpendicular to the tip path plane is also tilted to the rear. Show the resultant rearwards component of the rotor thrust’ verwijderd en vervangen door ‘Explain flapback’.
- 082 05 03 03 (02): aanpassing van ‘Show the effect of this oscillating force on the fuselage and the danger of resonance between this alternating force and the fuselage and undercarriage. State the conditions likely to lead to the ground resonance. Describe the recovery actions’ naar ‘Show the effect on the fuselage and the danger of resonance between this force and the fuselage and undercarriage when the gear touches the ground’.
- 082 07 01 01 (01): ‘in any acceleration-free situation’ is toegevoegd.
- 082 07 01 02 (01): ‘in unaccelerated flight’ is toegevoegd.
- 082 07 02 01 (01): ‘give an example of static stability and of static instability’ is toegevoegd.
- 082 07 02 03 (01): ‘give an example of dynamic stability and of dynamic instability’ is toegevoegd.
- 082 08 01 01 (01): ‘OGE’ en ‘IGE’ aangepast naar ‘HOGE’ en ‘HIGE’.
- 082 08 01 03 (01): ‘when manoeuvering’ is verwijderd.
- 082 08 01 03 (02): ‘when manoeuvering’ is verwijderd.
- 082 08 02 01 (01): ‘and describe power checks and procedures for take-off and landing’ is toegevoegd.

Operational Procedures

Grote wijzigingen
- 071 02 15 03: onderdeel is verwijderd.

Kleine wijzigingen
- 071 02 08 01,071 02 08 02 en 071 02 08 03: verwijzingen zijn verwijderd.