**Appendix 1.0**

**COMBINED SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PRIVATE PILOT LICENCE (AEROPLANE) AND (HELICOPTER)**

A list of publications which applicants for pilot licence examinations may find helpful is provided at the end of this document

| Ref. | ITEM DESCRIPTION | PPL-A | PPL-H |
|---|---|---|---|
| | AIR LAW AND OPERATIONAL PROCEDURES | X | X |
| | ICAO | X | X |
| 1. | The Convention on International Civil Aviation | X | X |
| 2. | The International Civil Aviation Organisation | X | X |
| 3. | Articles of the Convention | X | X |
| 3.1 | Sovereignty | X | X |
| 3.2 | Territory | X | X |
| 3.5 | Flight over territory of Contracting States | X | X |
| 3.10 | Landing at customs airports | X | X |
| 3.11 | Applicability of air regulations | X | X |
| 3.12 | Rules of the air | X | X |
| 3.13 | Entry and clearance regulations of Contracting States | X | X |
| 3.14 | Search of aircraft | X | X |
| 3.22 | Facilitation of formalities | X | X |
| 3.23 | Customs and immigration procedures | X | X |
| 3.25 | Customs duty | X | X |
| 3.29 | Documents to be carried in aircraft | X | X |
| 3.30 | Use of aircraft radio equipment | X | X |
| 3.31 | Certificate of airworthiness | X | X |
| 3.32 | Licences of personnel | X | X |
| 3.33 | Recognition of certificates and licences | X | X |
| 3.34 | Journey log books | X | X |
| 3.35 | Cargo restrictions | X | X |
| 3.36 | Restrictions on use of photographic equipment | X | X |
| 3.37 | Adoption of international standards and procedures | X | X |
| 3.39 | Endorsement of certificates and licences | X | X |
| 3.40 | Validity of endorsed certificates and licences | X | X |
| 4.0 | *Annex 14 Aerodrome data* | X | X |
| | – definitions | X | X |
| | – conditions of the movement area and related facilities | X | X |
| *4.1* | *Visual aids for navigation* | X | X |
| | – indicators and signalling devices | X | X |
| | – markings | X | X |
| | – lights | X | X |
| | – signs | X | X |
| | – markers | X | X |
| | – signal area | X | X |
| *4.2* | *Visual aids for denoting obstacles* | X | X |

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|---|---|---|---|
| | – marking of objects | X | X |
| | – lighting of objects | X | X |
| *4.3* | *Visual aids for denoting restricted use of areas* | X | X |
| *4.4* | *Emergency and other services* | X | X |
| | – fire and rescue service | X | X |
| | – apron management service | X | X |
| *4.5* | *Aerodrome ground lights and surface marking colours* | X | X |
| | – colours for aeronautical ground lights | X | X |
| | – colours for surface markings | X | X |
| 5.0 | SOUTH AFRICAN REGULATIONS | X | X |
| | Civil Aviation Regulations (CAR) and Technical Standards (CATS) | X | X |
| 5.1 | PART 1: DEFINITIONS AND ABBREVIATIONS | X | X |
| | Definitions | X | X |
| | Abbreviations | X | X |
| 5.2 | PART 12: AVIATION ACCIDENTS AND INCIDENTS | | |
| | 12.02.1 – Notification of accidents | X | X |
| | 12.02.2 – Notification of incidents | X | X |
| | 12.02.3 – Notification of accidents and incidents outside the Republic | X | X |
| | 12.02.4 – Particulars of notification | X | X |
| | 12.04.1 – Guarding of aircraft involved in accident | X | X |
| | 12.04.4 – Interference with objects and marks at scene of accident | X | X |
| 5.3 | PART 61: FLIGHT CREW LICENSING | X | X |
| 5.3.1 | Subpart 61.01 – General requirements | X | X |
| | 61.01.2 – Pilot licences | X | X |
| | 61.01.3 – Ratings for pilots | X | X |
| | 61.01.5 – Maintenance of competency | X | X |
| | 61.01.6 – Medical fitness | X | X |
| | 61.01.7 – Language | X | X |
| | 61.01.8 – Logging of flight time (1 – 11, 17) | X | X |
| | 61.01.9 – Crediting of flight time & Theoretical knowledge examinations (1 – 5, 7, 12, 13, 14, 24, 25, 26) | X | X |
| | 61.01.11 – Suspension and withdrawal of privileges and appeal | X | X |
| | 61.01.17 – Payment of currency fee | X | X |
| | 61.01.19 – Endorsements and record keeping | X | X |
| 5.3.2 | Subpart 61.03 (A) 61.04 (H) – Private pilot licence | X | X |
| | 61.03.1/61.04.1 – Requirements | X | X |
| | 61.03.2/61.04.2 – Application for private pilot licence | X | X |
| | 61.03.3/61.04.3 – Experience | X | X |
| | 61.03.4/61.04.4 – Skill test | X | X |
| | 61.03.5/61.04.5 – Issuing of private pilot licence | X | X |
| | 61.03.6/61.04.6 – Validity of private pilot licence | X | X |
| | 61.03.7/61.04.7 – Privileges and conditions | X | X |
| | 61.03.8/61.04.8 – Ratings for special purposes | X | X |
| | 61.03.9/61.04.9 – Maintenance of competency | X | X |
| 5.3.3 | Subpart 61.13 – Class and Type Ratings | X | X |
| | 61.13.1 – Requirements for issue of class and type ratings (1 - | | |

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|---|---|---|---|
| | 7, 9) | X | X |
| | 61.13.2 – Training | X | X |
| | 61.13.3 – Skill Test | X | X |
| | 61.13.8 – Validity, revalidation and renewal | X | X |
| 5.3.4 | Subpart 61.14 – Night Rating | X | X |
| | 61.14.1 – Requirements for night rating | X | X |
| | 61.14.2 – Experience | X | X |
| | 61.13.3 – Skill test standard | X | X |
| 5.4 | PART 67: MEDICAL CERTIFICATION | X | X |
| | 67.00.2 Classes of medical certificates | X | X |
| | 67.00.6 Period of validity of medical certificates | X | X |
| | 67.00.9 Duties of holder of medical certificate | X | X |
| | 67.00.10 Foreign medical assessments | X | X |
| 5.5 | PART 91 – GENERAL OPERATING AND FLIGHT RULES | X | X |
| 5.5.1 | SUBPART 1: GENERAL PROVISIONS | X | X |
| | 91.01.1 Applicability | X | X |
| | 91.01.2 Authority of pilot-in-command | X | X |
| | 91.01.3 Authorisation of personnel to taxi aeroplanes | X | N/A |
| | 91.01.4 Search and rescue information | X | X |
| | 91.01.5 Information on emergency and survival equipment carried | X | X |
| | 91.01.9 Portable electronic devices | X | X |
| | 91.01.10 Endangering safety | X | X |
| | 91.01.11 Preservation of documents | X | X |
| 5.5.2 | SUBPART 2: FLIGHT CREW | X | X |
| | 91.02.1 Composition of flight crew | X | X |
| | 91.02.2 Flight crew member emergency duties | X | X |
| | 91.02.3 Flight crew member responsibilities | X | X |
| | 91.02.4 Recency | X | X |
| | 91.02.5 Flight crew members at duty stations | X | X |
| | 91.02.6 Laws, regulations and procedures | X | X |
| | 91.02.7 Duties of pilot-in-command regarding flight preparation | X | X |
| | 91.02.8 Duties of pilot-in-command regarding flight operations | X | X |
| 5.5.3 | SUBPART 3: DOCUMENTATION AND RECORDS | X | X |
| | 91.03.1 Documents to be carried on board | X | X |
| | 91.03.2 Aircraft flight manual | X | X |
| | 91.03.3 Aircraft checklists | X | X |
| | 91.03.4 Air traffic service flight plan | X | X |
| | 91.03.5 Flight folio | X | X |
| | 91.03.6 Fuel and oil record | X | X |
| | 91.03.7 Certificate of release to service | X | X |
| 5.5.4 | SUBPART 4: INSTRUMENTS AND EQUIPMENT | X | X |
| | 91.04.1 Use of instruments and equipment by pilot | X | X |
| | 91.04.2 Circuit protection devices | X | X |
| | 91.04.3 Aircraft operating lights | X | X |
| | 91.04.4 Flight, navigation and associated equipment for aircraft operated under VFR | X | X |
| | 91.04.14 Seats, seat safety belts, harnesses and child restraint devices | X | X |
| | 91.04.15 Stowage of articles, baggage and cargo | X | X |
| | 91.04.16 Standard first aid kit | X | X |
| | 91.04.19 Supplemental oxygen in the case of non-pressurised aircraft | X | X |
| | 91.04.21 Hand-held fire extinguishers | X | X |

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| 5.5.5 | SUBPART 6: RULES OF THE AIR – FLIGHT RULES | X | X |
| | 91.06.1 Landing on roads | X | X |
| | 91.06.2 Dropping objects spraying or dusting | X | X |
| | 91.06.3 Picking up objects | X | X |
| | 91.06.4 Towing | X | X |
| | 91.06.6 Proximity and formation flights | X | X |
| | 91.06.7 Right of way | X | X |
| | 91.06.8 Following line features | X | X |
| | 91.06.9 Aircraft speed | X | X |
| | 91.06.10 Lights to be displayed by aircraft | X | X |
| | 91.06.11 Taxi rules | X | X |
| | 91.06.12 Operation on and in the vicinity of aerodrome | X | X |
| | 91.06.13 Signals | X | X |
| | 91.06.15 Reporting position | X | X |
| | 91.06.16 Mandatory radio in controlled airspace | X | X |
| | 91.06.17 Mandatory radio in advisory airspace | X | X |
| | 91.06.18 Compliance with air traffic control clearance and instructions | X | X |
| | 91.06.19 Prohibited areas | X | X |
| | 91.06.20 Restricted areas | X | X |
| | 91.06.21 Visibility and distance from cloud | X | X |
| | 91.06.22 Special VFR weather minima | X | X |
| | 91.06.23 Responsibility to ascertain whether VFR flight is permitted | X | X |
| | 91.06.28 Foreign military aircraft | X | X |
| | 91.06.29 Identification and interception of aircraft | X | X |
| | 91.06.30 Air traffic service procedures | X | X |
| | 91.06.31 Priority | X | X |
| | 91.06.32 Minimum heights | X | X |
| | 91.06.33 Semi-circular rule | X | X |
| 5.5.6 | SUBPART 7: FLIGHT OPERATIONS | X | X |
| | 91.07.1 Routes and areas of operation | X | X |
| | 91.07.2 Minimum flight altitudes | X | X |
| | 91.07.3 Use of aerodromes | X | X |
| | 91.07.4 Helicopter landings and take-offs | N/A | X |
| | 91.07.9 Meteorological conditions | X | X |
| | 91.07.10 VFR operating minima | X | X |
| | 91.07.11 Mass and balance | X | X |
| | 91.07.12 Fuel and oil supply | X | X |
| | 91.07.13 Re-fuelling and de-fuelling with passengers on board | X | X |
| | 91.07.14 Smoking in aircraft | X | X |
| | 91.07.17 Submission of air traffic service flight plan | X | X |
| | 91.07.18 Seats, safety belts and harnesses | X | X |
| | 91.07.19 Passenger seating | X | X |
| | 91.07.20 Passenger briefing | X | X |
| | 91.07.23 Use of supplemental oxygen | X | X |
| | 91.07.26 In-flight simulation of emergency situations | X | X |
| | 91.07.27 Turning helicopter rotors | N/A | X |
| | 91.07.28 Starting of engines | X | X |
| | 91.07.29 Acrobatic flights | X | X |
| | 91.07.32 Simulated instrument flight in aircraft | X | X |
| 5.6 | PART 139: AERODROMES AND HELIPORTS | X | X |
| | 139.01.1 Applicability | X | X |
| | 139.01.2 Use of military aerodromes and heliports | X | X |
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|---|---|---|---|
| | 139.01.5 Flights by night | X | X |
| | 139.01.10 Safety measures against fire | X | X |
| 5.7 | OPERATIONAL PROCEDURES | X | X |
| 5.7.1 | ICAO Annex 12 – Search and rescue | X | X |
| | – definitions | X | X |
| | – alerting phases | X | X |
| | – procedures for pilot-in-command (para 5.8 and 5.9) | X | X |
| | – search and rescue signals (para 5.9 and Appendix A) | X | X |
| 5.7.2 | ICAO Annex 13 – Aircraft accident investigation | X | X |
| | – definitions | X | X |
| | – national procedures | X | X |
| 6.0 | AIRCRAFT GENERAL KNOWLEDGE | X | X |
| 6.1 | Airframe | X | X |
| 6.1.1 | Airframe structure (aeroplane) | X | N/A |
| | – components | X | N/A |
| | – fuselage, wings, tailplane, fin | X | N/A |
| | – primary flying controls | X | N/A |
| | – trim and flap/slat systems | X | N/A |
| | – landing gear | X | N/A |
| | – nose wheel, including steering | X | N/A |
| | – tyres, construction, markings, limitations and condition | X | N/A |
| | – braking systems and precautions in use | X | N/A |
| | – retraction systems | X | N/A |
| 6.1.2 | Airframe structure (helicopter) | N/A | X |
| | – Fuselage (types of construction, structural components, materials) | N/A | X |
| | – Rotors | N/A | X |
| | *blades, construction* | N/A | X |
| | *rotor heads (fully articulated, semi-rigid, rigid, swashplate)* | N/A | X |
| | – Helicopter drive systems | N/A | X |
| | *gearboxes (main rotor and tail rotor)* | N/A | X |
| | *clutch systems (sprag/freewheel clutch, electric and mechanical clutches)* | N/A | X |
| | – Controls | N/A | X |
| | *collective* | N/A | X |
| | *cyclic* | N/A | X |
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| | *yaw pedals* | N/A | X |
| | – Landing gear (skids, wheels and tyres, braking systems and shock absorbers) | N/A | X |
| 6.1.3 | Airframe loads (A & H) | X | X |
| | – static strength | X | X |
| | – limiting loads | X | X |
| | – safety factor | X | X |
| | – control locks and use | X | X |
| | – ground/flight precautions | X | X |
| 6.2 | Powerplant | X | X |
| 6.2.1 | Engines – general | X | X |
| | – design types and principles of the four stroke internal combustion engine | X | X |
| | – basic construction and component | X | X |
| | – causes of pre-ignition and detonation | X | X |
| | – power output as a function of RPM | X | X |
| 6.2.2 | Engine cooling | X | X |
| | – air cooling | X | X |
| | – cowling design and cylinder baffles | X | X |
| | – design and use of cowl flaps | X | X |
| | – cylinder head temperature gauge | X | X |
| 6.2.3 | Engine lubrication | X | X |
| | – function and methods of lubrication | X | X |
| | – lubrication systems | X | X |
| | – methods of oil circulation | X | X |
| | – oil pump and filter requirements | X | X |
| | – qualities and grades of oil | X | X |
| | – oil temperature and pressure control | X | X |
| | – oil cooling methods | X | X |
| | – recognition of oil system malfunctions | X | X |
| 6.2.4 | Ignition systems | X | X |
| | – principles of magneto ignition | X | X |
| | – construction and function | | |

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|---|---|---|---|
| | | X | X |
| | – purpose and principle of impulse coupling | X | X |
| | – serviceability checks, recognition of malfunctions | X | X |
| | – operational procedures to avoid spark plug fouling | X | X |
| 6.2.5 | Carburation | X | X |
| | – principles of float type carburettor | X | X |
| | – construction, components and function | X | X |
| | – methods to maintain correct mixture ratio | X | X |
| | – operation of metering jets and accelerator pump | X | X |
| | – effect of pressure/density altitude | X | X |
| | – performance as a function of pressure and temperature | X | X |
| | – manual mixture control | X | X |
| | – maintenance of correct mixture ratio | X | X |
| | – limitation on use at high power | X | X |
| | – avoidance of detonation | X | X |
| | – idle cut-off valve | X | X |
| | – air induction system | X | X |
| | – alternate air induction systems (turbocharger & supercharger) | X | X |
| | – carburettor icing, use of hot air | X | X |
| | – injection systems, principles and operation | X | X |
| 6.2.6 | Aero engine fuel | X | X |
| | – classification of fuels | X | X |
| | – types, grades and identification by colour | X | X |
| | – quality requirements | X | X |
| | – additives | X | X |
| | – inspection for contamination (water content & ice formation) | X | X |
| | – fuel density | X | X |
| | – alternate fuels, differences in specifications, limitations | X | X |
| | – use of fuel strainers and drains | | |

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|---|---|---|---|
| | | X | X |
| | – re-fuelling precautions | X | X |
| 6.2.7 | Engine handling | X | X |
| | – starting procedures and precautions | X | X |
| | – recognition of malfunctions | X | X |
| | – warming up, power and system checks | X | X |
| | – oil temperature and pressure limitations | X | X |
| | – cylinder head temperature limitations | X | X |
| | – ignition and other system checks | X | X |
| | – power settings and limitations | X | X |
| | – avoidance of rapid power changes | X | X |
| | – use of mixture control | X | X |
| | – action in the event of detonation or pre-ignition | X | X |
| 6.2.8 | Engine Operational Criteria | X | X |
| | – maximum and minimum RPM | X | X |
| | – (induced) engine vibration and critical RPM | X | X |
| | – remedial action by abnormal engine start, run-up and in-flight | X | X |
| | – type related items | X | X |
| 6.3 | Propellers | X | N/A |
| | – propeller nomenclature | X | N/A |
| | – conversion of engine power to thrust | X | N/A |
| | – design and construction of fixed pitch propeller | X | N/A |
| | – forces acting on propeller blade | X | N/A |
| | – variation of RPM with change of airspeed | X | N/A |
| | – thrust efficiency with change of speed | X | N/A |
| | – design and construction of variable pitch propeller | X | N/A |
| | – constant speed unit operation | X | N/A |
| | – effect of blade pitch changes | X | N/A |
| | – windmilling effect | X | N/A |
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| 6.4 | Systems | X | X |
| 6.4.1 | Electrical system | X | X |
| | – construction and operation of alternators/generators | X | X |
| | – direct current supply | X | X |
| | – batteries, construction, capacity and charging | X | X |
| | – voltmeters and ammeters | X | X |
| | – circuit breakers and fuses | X | X |
| | – electrically operated services and instruments | X | X |
| | – recognition of malfunctions | X | X |
| | – procedure in the event of malfunctions | X | X |
| 6.4.2 | Vacuum system | X | X |
| | – components | X | X |
| | – pumps | X | X |
| | – regulator and gauge | X | X |
| | – filter system | X | X |
| | – recognition of malfunction | X | X |
| | – procedures in the event of malfunctions | X | X |
| 6.4.3 | Hydraulic system | X | X |
| | – components of a simple system | X | X |
| | – reservoir | X | X |
| | – pressure pump | X | X |
| | – accumulator | X | X |
| | – actuator | X | X |
| | – pressure relief and bypass valves | X | X |
| | – filters | X | X |
| | – types of fluid | X | X |
| | – operation, indication, warning systems | X | X |
| | – auxiliary systems | X | X |
| 6.4.4 | Fuel systems | X | X |
| | – fuel tanks, structural components, types and supply lines | X | X |
| | | | |

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|---|---|---|---|
| | – venting system | X | X |
| | – mechanical and electrical pumps | X | X |
| | – gravity feed | X | X |
| | – tank selection | X | X |
| | – system management | X | X |
| 6.5 | Instruments | X | X |
| 6.5.1 | Pitot/static system | X | X |
| | – pitot tube, function | X | X |
| | – pitot tube, principles and construction | X | X |
| | – static source | X | X |
| | – alternate static source | X | X |
| | – position error | X | X |
| | – system drains | X | X |
| | – heating element | X | X |
| | – errors caused by blockage or leakage | X | X |
| 6.5.2 | Airspeed indicator | X | X |
| | – principles of operation and construction | X | X |
| | – relationship between pitot and static pressure | X | X |
| | – definitions of indicated, calibrated and true airspeed | X | X |
| | – instrument errors | X | X |
| | – airspeed indications, colour coding | X | X |
| | – pilot’s serviceability checks | X | X |
| 6.5.3 | Altimeter | X | X |
| | – principles of operation and construction | X | X |
| | – function of the subscale | X | X |
| | – effects of atmospheric density | X | X |
| | – pressure altitude | X | X |
| | – true altitude | X | X |
| | – international standard atmosphere | X | X |
| | – flight level | | |

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|---|---|---|---|
| | | X | X |
| | – presentation (three needle) | X | X |
| | – instrument errors | X | X |
| | – pilot's service ability checks | X | X |
| 6.5.4 | Vertical speed indicator | X | X |
| | – principles of operation and construction | X | X |
| | – function | X | X |
| | – inherent lag | X | X |
| | – instantaneous VSI | X | X |
| | – presentation | X | X |
| | – pilot's serviceability checks | X | X |
| 6.5.5 | Gyroscopes | X | X |
| | – principles | X | X |
| | – rigidity | X | X |
| | – precession | X | X |
| 6.5.6 | Turn indicator | X | X |
| | – rate gyro | X | X |
| | – purpose and function | X | X |
| | – effect of speed | X | X |
| | – presentation | X | X |
| | – turn co-ordinator | X | X |
| | – limited rate of turn indications | X | X |
| | – power source | X | X |
| | – balance indicator | X | X |
| | – principle | X | X |
| | – presentation | X | X |
| | – pilot's serviceability checks | X | X |
| 6.5.7 | Attitude indicator | X | X |
| | – earth gyro | X | X |
| | – purpose and function | X | X |
| | | | |

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|---|---|---|---|
| | – presentations | X | X |
| | – interpretation | X | X |
| | – operating limitations | X | X |
| | – power source | X | X |
| | – pilot's serviceability checks | X | X |
| 6.5.8 | Heading indicator | X | X |
| | – directional gyro | X | X |
| | – purpose and function | X | X |
| | – presentation | X | X |
| | – use with magnetic compass | X | X |
| | – setting mechanism | X | X |
| | – apparent drift | X | X |
| | – transport wander | X | X |
| | – operating limitations | X | X |
| | – power source | X | X |
| | – pilot's serviceability checks | X | X |
| 6.5.9 | Magnetic compass | X | X |
| | – construction and function | X | X |
| | – earth's magnetic field | X | X |
| | – variation and deviation | X | X |
| | – turning, acceleration errors | X | X |
| | – precautions when carrying magnetic items | X | X |
| | – pilot's serviceability checks | X | X |
| 6.5.10 | Engine instruments | X | X |
| | – principles, presentation and operational use of: | X | X |
| | – oil temperature gauge | X | X |
| | – oil pressure gauge | X | X |
| | – cylinder head temperature gauge | X | X |
| | – exhaust gas meter | X | X |
| | | | |

| | | | |
|---|---|---|---|
| | – manifold pressure gauge | X | X |
| | – fuel pressure gauge | X | X |
| | – fuel flow gauge | X | X |
| | – fuel quantity gauge(s) | X | X |
| | – tachometer | X | X |
| 6.5.11 | Other instruments | X | X |
| | – principles, presentation and operational use of: | X | X |
| | – vacuum gauge | X | X |
| | – voltmeter and ammeter | X | X |
| | – warning indicators | X | X |
| | – others relevant to aircraft type | X | X |
| 6.6 | Airworthiness and Emergency Procedures | X | X |
| 6.6.1 | Airworthiness | X | X |
| | – certificate to be in force | X | X |
| | – compliance with requirements | X | X |
| | – periodic maintenance inspections | X | X |
| | – compliance with flight manual (or equivalent), instructions | X | X |
| 6.6.2 | Limitations, placards | X | X |
| | – flight manual supplements | X | X |
| | – provision and maintenance of documents | X | X |
| | – aeroplane, engine and propeller log books | X | N/A |
| | – helicopter, engine and rotorblade logbooks | N/A | X |
| | – recording of defects | X | X |
| | – permitted maintenance by pilots | X | X |
| 6.6.3 | Emergency Procedures | X | X |
| | – emergency equipment and its use | X | X |
| | – fire extinguisher | X | X |
| | – engine/cabin fires | X | X |
| | – flammable goods/pressurised containers | X | X |
| 7.0 | FLIGHT PERFORMANCE AND PLANNING | X | X |
| 7.1 | Mass and balance | X | X |
| | | | |

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|---|---|---|---|
| 7.1.1 | Terminology: | X | X |
| | – Arm, moment, reference datum, flight station, centre of gravity | X | X |
| | – Forward and aft limitations of centre of gravity, normal and utility operation | X | X |
| | – Lateral limitations | N/A | X |
| | – Maximum ramp and taxi mass | X | N/A |
| | – Maximum take-off mass | X | X |
| | – Maximum zero fuel mass | X | X |
| | – Empty operating mass | X | X |
| | – Maximum floor load | X | X |
| | – Limitations on maximum mass | X | X |
| | – Forward and aft limitations of centre of gravity, normal and utility operation | X | X |
| | – Mass and centre of gravity calculations | X | X |
| | – Aircraft mass and balance sheet | X | X |
| 7.1.2 | Loadsheet | X | X |
| | – Calculation of CG | X | X |
| | – Movement of CG in flight/on ground | X | X |
| | – Maximum load at station | X | X |
| 7.2 | Abbreviations, definitions and symbols | X | X |
| | – IAS, RAS, TAS | X | X |
| | – Vx, Vy, Vfe, Vfo, Vle, Vlo, Va, Vne, Vno, Vs, Vso (as applicable) | X | X |
| | – OAT, IOAT | X | X |
| | – ISA temperature/deviation from ISA | X | X |
| | – pressure altitude, density altitude | X | X |
| | – QNH, QFE, QNE | X | X |
| 7.3 | Runways | X | X |
| | – runway length | X | X |
| | – take-off run available (TORA) | X | N/A |
| | – take-off run required (TORR) | X | N/A |

| | | | |
|---|---|---|---|
| | – take-off distance available (TODA) | X | N/A |
| | – take-off distance required (TODR) | X | N/A |
| | – landing distance available (LDA) | X | N/A |
| | – landing distance required (LDR) | X | N/A |
| | – displaced threshold, stopway, clearway | X | X |
| | – slope | X | N/A |
| | – surface | X | N/A |
| 7.4 | Aeroplane – use of performance graphs to determine: | X | N/A |
| | – take-off run (TORR) no flaps, effects of mass, wind, density altitude, ground surface and gradient | X | N/A |
| | – take-off run (TORR) with flaps, effects of mass, wind, density altitude, ground surface and gradient | X | N/A |
| | – take-off distance required (TODR), no flaps, effects of mass, wind, density altitude, ground surface and gradient | X | N/A |
| | – take-off distance required (TODR), with flaps, effects of mass, wind, density altitude, ground surface and gradient | X | N/A |
| | – climb performance | X | N/A |
| | – time, distance and fuel to climb | X | N/A |
| | – engine performance | X | N/A |
| | – speed – power performance cruise | X | N/A |
| | – speed – power economy cruise | X | N/A |
| | – range – performance cruise | X | N/A |
| | – range – economy cruise | X | N/A |
| | – endurance | X | N/A |
| | – time, distance and fuel to descend | X | N/A |
| | – glide range | X | N/A |
| | – landing performance, effect of flaps, mass, wind, density altitude, approach speed, ground surface and gradient | X | N/A |
| | – landing ground roll, effect of flaps, effects of mass, wind, density altitude, approach speed, ground surface and gradient | X | N/A |
| | – airspeed system calibration | X | N/A |
| | – stall speeds | | |

| | | | |
|---|---|---|---|
| | | X | N/A |
| 7.5 | Helicopter – use of performance graphs to determine: | N/A | X |
| | – Airspeed system calibration | N/A | X |
| | – Density altitude chart | N/A | X |
| | – Wind Component Graph | N/A | X |
| | – IGE Hover Ceiling vs Gross Weight | N/A | X |
| | – OGE Hover Ceiling vs Gross Weight | N/A | X |
| | – Airspeed Limitations (VNE/VNO) | N/A | X |
| | – Engine Limit of Manifold Pressure | N/A | X |
| | – Maximum Continuous Power | N/A | X |
| | – Autorotational Performance | N/A | X |
| | – Height/Velocity diagram | N/A | X |
| | – Longitudinal Weight and Balance | N/A | X |
| | – Lateral Weight and Balance | N/A | X |
| 7.6 | Fuel Weight and performance | X | X |
| | – specific weight | X | X |
| | – specific gravity | X | X |
| | – fuel consumption | X | X |
| | – fuel performance | X | X |
| | – calculation of fuel requirements | X | X |
| 7.7 | Aircraft Performance | X | X |
| | – icing, rain | X | X |
| | – condition of the airframe | X | X |
| | – wake turbulence | X | X |
| | – aqua-planing | X | N/A |
| | – windshear, take-off, approach and landing | X | X |
| 8.0 | HUMAN PERFORMANCE AND LIMITATIONS | X | X |
| 8.1 | Basic physiology | X | X |
| 8.1.1 | The atmosphere | X | X |
| | – composition of the atmosphere | X | X |
| | – the gas laws | X | X |
| | | | |

| | | | |
|---|---|---|---|
| | – oxygen requirement of tissues | X | X |
| 8.1.2 | The heart | X | X |
| | – basic physiology | X | X |
| | – blood pressure, pulse rate | X | X |
| | – composition of blood and circulation | X | X |
| | – ailments, recognition and treatment | X | X |
| 8.1.3 | The lungs | X | X |
| | – physiology | X | X |
| | – respiration | X | X |
| | – ailments and treatment | X | X |
| | – effects of partial pressure | X | X |
| | – effect of increasing altitude | X | X |
| | – gas transfer | X | X |
| | – hypoxia, symptoms, prevention | X | X |
| | – cabin pressurization | X | X |
| | – effects of rapid decompression | X | X |
| | – time of useful consciousness | X | X |
| | – the use of oxygen masks and rapid descent | X | X |
| | – hyperventilation, symptoms, avoidance | X | X |
| | – effects of accelerations | X | X |
| 8.1.4 | Vision | X | X |
| | – physiology of vision | X | X |
| | – limitations of the visual system | X | X |
| | – vision defects | X | X |
| | – optical illusions | X | X |
| | – night vision | X | X |
| | – spatial disorientation | X | X |
| | – avoidance of disorientation | X | X |
| | – ailments and treatment | X | X |
| | | | |

| | | | |
|---|---|---|---|
| 8.1.5 | Hearing | X | X |
| | – basic physiology | X | X |
| | – vestibular system | X | X |
| | – inner ear sensations | X | X |
| | – effects of altitude/pressure change | X | X |
| | – noise and hearing loss | X | X |
| | – protection of hearing | X | X |
| | – spatial disorientation | X | X |
| | – conflicts between ears and eyes | X | X |
| | – prevention of disorientation | X | X |
| | – motion sickness, causes, symptoms, prevention | X | X |
| 8.1.6 | Flying and health | X | X |
| | – medical requirements | X | X |
| | – effect of common ailments and cures | X | X |
| | – colds and flu | X | X |
| | – stomach upsets | X | X |
| | – hypotension, hypertension, coronary disease | X | X |
| | – obesity | X | X |
| | – nutrition hygiene | X | X |
| | – drugs, medicines, and side effects | X | X |
| | – alcohol | X | X |
| | – tobacco | X | X |
| | – self medication | X | X |
| | – personal fitness | X | X |
| | – passenger care | X | X |
| | – scuba diving – precautions before flying | X | X |
| | – decompression sickness | X | X |
| | – acceleration/deceleration and vibration | X | X |
| | – effects of pressure change | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – incapacitation | X | X |
| | – faints | X | X |
| | – toxic hazards | X | X |
| | dangerous goods | X | X |
| | carbon monoxide from heaters/exhausts | X | X |
| 8.2 | Basic psychology | X | X |
| 8.2.1 | Human information processing | X | X |
| | – attention, selective attention, divided attention | X | X |
| | – concepts of sensation | X | X |
| | – cognitive perception | X | X |
| | – expectancy and anticipation | X | X |
| | – habits | X | X |
| 8.2.2 | The central decision channel | X | X |
| | – mental workload, limitations | X | X |
| | – information sources | X | X |
| | – stimuli and attention | X | X |
| | – verbal communication | X | X |
| | – memory | X | X |
| | – sensory | X | X |
| | – working | X | X |
| | – long term | X | X |
| | – motor skills | X | X |
| | – limitations | X | X |
| | – causes of misinterpretation | X | X |
| 8.2.3 | Stress | X | X |
| | – causes and effects | X | X |
| | – concepts of arousal | X | X |
| | – effects on performance | X | X |
| | – identifying and reducing stress | X | X |
| | – fatigue | X | X |
| | | | |

| | | | |
|---|---|---|---|
| | – sleep | X | X |
| | – circadian rhythms | X | X |
| 8.2.4 | Judgement and decision-making | X | X |
| | – concepts of pilots' judgement | X | X |
| | – psychological attitudes | X | X |
| | – behavioural aspects | X | X |
| | – risk assessment | X | X |
| | – development of situational awareness | X | X |
| 9.0 | METEOROLOGY | X | X |
| 9.1 | The atmosphere | X | X |
| | – composition and structure | X | X |
| | – vertical divisions | X | X |
| | – ICAO standard atmosphere | X | X |
| 9.2 | Pressure, density and temperature | X | X |
| | – barometric pressure, isobars | X | X |
| | – changes of pressure and density with altitude | X | X |
| | – insolation and terrestrial energy radiation | X | X |
| | – diurnal variation of temperature | X | X |
| | – adiabatic process | X | X |
| | – temperature lapse rate | X | X |
| | – stability and instability | X | X |
| | – effects of advection and convection | X | X |
| 9.3 | Humidity and precipitation | X | X |
| | – water vapour in the atmosphere | X | X |
| | – dew point, relative humidity | X | X |
| | – condensation and vaporization | X | X |
| | – precipitation | X | X |
| 9.4 | Pressure and wind | X | X |
| | – high and low pressure areas | X | X |
| | – troughs, ridges, cols | X | X |
| | – pressure gradient, coriolis force | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – geostrophic and surface winds | X | X |
| | – vertical and horizontal motion, convergence, divergence | X | X |
| | – effect of wind gradient and windshear on take-off and landing | X | X |
| | – relationship between isobars and wind, Buys Ballot's law | X | X |
| | – turbulence and gustiness | X | X |
| | – local winds | X | X |
| | – föhn wind | X | X |
| | – land and sea breezes | X | X |
| | – anabatic and katabatic winds | X | X |
| 9.5 | Cloud formation | X | X |
| | – cooling by advection, radiation and adiabatic expansion | X | X |
| | – cloud types (high, medium, low and vertical development) | X | X |
| | – formation of cloud types | X | X |
| | – flying conditions associated with each cloud type | X | X |
| 9.6 | Fog, mist and haze | X | X |
| | – visibility | X | X |
| | – radiation fog | X | X |
| | – advection fog | X | X |
| | – frontal fog | X | X |
| | – freezing fog | X | X |
| | – steam fog | X | X |
| | – valley fog | X | X |
| | – formation and dispersal | X | X |
| | – assessment of probability of reduced visibility | X | X |
| | – hazards in flight due to low visibility, horizontal, vertical and slant angle | X | X |
| 9.7 | Air masses | X | X |
| | – characteristics and factors affecting the properties of air masses | X | X |
| | – classification of air masses, region of origin | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – modification of air masses during their movement | X | X |
| | – development of low and high pressure systems | X | X |
| | – weather associated with pressure systems | X | X |
| 9.8 | Frontology | X | X |
| | – cold fronts | X | X |
| | formation | X | X |
| | associated clouds and weather | X | X |
| | flying conditions | X | X |
| | changes with the passage of the front | X | X |
| | – warm fronts | X | X |
| | formation | X | X |
| | associated clouds and weather | X | X |
| | weather in the warm sector | X | X |
| | flying conditions | X | X |
| | changes with the passage of the front | X | X |
| | – occlusions | X | X |
| | formation | X | X |
| | associated clouds and weather | X | X |
| | – stationary fronts | X | X |
| 9.9 | Ice accretion | X | X |
| | – conditions conducive to ice formation | X | X |
| | – effects of hoar frost, rime ice, clear ice | X | X |
| | – effects of icing on aircraft performance | X | X |
| | – precautions and avoidance of icing conditions | X | X |
| | – powerplant icing | X | X |
| | – precautions, prevention and clearance of induction and carburettor icing | X | X |
| 9.10 | Thunderstorms | X | X |
| | – conditions required | X | X |
| | – formation, trigger action | X | X |
| | – air mass, frontal, orographic | X | X |
| | – development process | X | X |
| | – hazards for aircraft | X | X |
| | – effects of lightning and severe turbulence | X | X |
| | – avoidance of flight in the vicinity of thunderstorms | | |

| | | | |
|---|---|---|---|
| | | X | X |
| 9.11 | Flight over mountainous areas | X | X |
| | – hazards | X | X |
| | – influence of terrain on atmospheric processes | X | X |
| | – mountain waves, windshear, turbulence, vertical movement, rotor effects | X | X |
| | – valley winds | X | X |
| 9.12 | Climatology | X | X |
| | – general seasonal circulation in the troposphere over Southern Africa | X | X |
| | – local seasonal weather and winds | X | X |
| | – development of a coastal low (orographic depression) | X | X |
| | – South Westerly Buster | X | X |
| | – Cape Doctor | X | X |
| | – Black South Easter | X | X |
| | – Berg winds | X | X |
| 9.13 | Altimetry | X | X |
| | – operational aspects of pressure settings | X | X |
| | – pressure altitude, density altitude | X | X |
| | – height, altitude, flight level | X | X |
| | – QNH, QFE, standard setting | X | X |
| 9.14 | Weather analysis and forecasting | X | X |
| | – synoptic weather charts, symbols, signs | X | X |
| | – significant (prognostic) weather charts | X | X |
| | – upper wind and temperature charts | X | X |
| 9.15 | Weather information for flight planning | X | X |
| | – interpretation of coded information METAR, TAF, SPECI, SIGMET | X | X |
| | – Meteorological broadcasts for aviation | X | X |
| | – ATIS | X | X |
| 10.0 | NAVIGATION | X | X |
| 10.1 | Form of the earth | X | X |
| | – true north, axis, poles, direction and rate of rotation | X | X |
| | – cardinal and quadrantal points | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – meridians of longitude | X | X |
| | – prime (Greenwich) meridian | X | X |
| | – parallels of latitude | X | X |
| | – equator | X | X |
| | – great circles, small circles, rhumb lines | X | X |
| | – convergency between meridians | X | X |
| | – hemispheres, north/south, east/west | X | X |
| | – distances | X | X |
| | – units in use | X | X |
| | – derivation of nautical mile and kilometre | X | X |
| 10.2 | Time | X | X |
| | – Arc to time, relationship between universal co-ordinated (UTC) time, local mean time (LMT) and Standard time factor (STF) | X | X |
| | – definitions of sunrise and sunset times | X | X |
| | – official day and official night | X | X |
| 10.3 | Mapping – general | X | X |
| | – aeronautical maps and charts (topographical) | X | X |
| | – Lambert's conic conformal, (ICAO 1: 500,000 chart) | X | X |
| | orthomorphism | X | X |
| | – construction | X | X |
| | – convergence of meridians | X | X |
| | – presentation of meridians, parallels, great circles and rhumb lines | X | X |
| | – measurement of tracks | X | X |
| | – indication of magnetic variation | X | X |
| | – scale, standard parallels | X | X |
| | – measurement of distance in relation to map projection | X | X |
| | – conversion of units | X | X |
| | – map analysis | X | X |
| | depiction of height | X | X |

| | | | |
|---|---|---|---|
| | topography | X | X |
| | relief | X | X |
| | cultural features | X | X |
| | permanent features (e.g. line features, spot features, unique or | X | X |
| | special features) | X | X |
| | features subject to change (e.g. water) | X | X |
| | aeronautical symbols | X | X |
| | aeronautical information | X | X |
| 10.4 | Direction | X | X |
| | – true north | X | X |
| | – earth's magnetic field, variation – annual change | X | X |
| | – magnetic north | X | X |
| | – isogonals, agonic lines | X | X |
| 10.5 | Aircraft magnetism | X | X |
| | – magnetic influences within the aircraft | X | X |
| | – compass deviation | X | X |
| | – turning errors | X | X |
| | – acceleration/deceleration errors | X | X |
| | – avoiding magnetic interference with the compass | X | X |
| 10.6 | The navigation computer | X | X |
| 10.6.1 | Wind scale side | X | X |
| | – use of the computer to solve triangle of velocities | X | X |
| | – calculation of heading and groundspeed | X | X |
| | – drift, wind correction angle | X | X |
| | – finding wind velocity (W/V) | X | X |
| | – application of TAS and wind velocity to track | X | X |
| | – headwind and crosswind components relative to runway | X | X |
| 10.6.2 | Circular slide rule | X | X |
| | – IAS, CAS/RAS and TAS | X | X |
| | – groundspeed, distance and elapsed time | X | X |
| | – conversion of units (kg/lbs, USG/litres, nm/km, metres/feet) | X | X |
| | – fuel consumption and fuel required | X | X |
| | – pressure altitude true altitudes | X | X |
| | | | |

| | | | |
|---|---|---|---|
| | – density altitude | X | X |
| | – true altitude | X | X |
| | – time en route and ETA | X | X |
| | – one in sixty rule | X | X |
| 10.7 | Practical Navigation | X | X |
| | Use of South African Navigation Plotting Chart (1:5 000 000) | X | X |
| | – measurement of tracks and distances | X | X |
| | – dead reckoning, position, fix | X | X |
| | – procedure when uncertain of position | X | X |
| | – plotting positions | X | X |
| | – latitude and longitude | X | X |
| | – use of VOR/DME/ADF for position fixing | X | X |
| | – bearing and distance | X | X |
| | – use of navigation protractor | X | X |
| | – calculating headings (T), (M), (C) | X | X |
| | – EET and ETA | X | X |
| | – rate of descent and rate of climb | X | X |
| | – ETA for top of descent | X | X |
| | – fuel considerations | X | X |
| | – compass headings, use of deviation card | X | X |
| 10.8 | Radio navigation | X | X |
| 10.8.1 | Ground D/F | X | X |
| | – application | X | X |
| | – principles | X | X |
| | – presentation and interpretation | X | X |
| | – coverage | X | X |
| | – errors and accuracy | X | X |
| | – factors affecting range and accuracy | X | X |
| 10.8.2 | ADF, including associated beacons (NDBs) and use of the RMI | X | X |
| | – application | X | X |
| | | | |

| | | | |
|---|---|---|---|
| | – principles | X | X |
| | – presentation and interpretation | X | X |
| | – coverage | X | X |
| | – errors and accuracy | X | X |
| | – factors affecting range and accuracy | X | X |
| 10.8.3 | VOR/DME | X | X |
| | – application | X | X |
| | – principles | X | X |
| | – presentation and interpretation | X | X |
| | – coverage | X | X |
| | – errors and accuracy | X | X |
| | – factors affecting range and accuracy | X | X |
| 10.8.4 | GPS | X | X |
| | – application | X | X |
| | – principles | X | X |
| | – presentation and interpretation | X | X |
| | – coverage | X | X |
| | – errors and accuracy | X | X |
| | – factors affecting reliability and accuracy | X | X |
| 10.8.5 | Ground radar | X | X |
| | – application | X | X |
| | – principles | X | X |
| | – presentation and interpretation | X | X |
| | – coverage | X | X |
| | – errors and accuracy | X | X |
| | – factors affecting reliability and accuracy | X | X |
| 10.8.6 | Secondary surveillance radar | X | X |
| | – principles (transponders) | X | X |
| | – application | X | X |
| | – presentation and interpretation | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – modes and codes | X | X |
| 11.0 | PRINCIPLES OF FLIGHT | X | X |
| 11.1 | The atmosphere | X | X |
| | – composition and structure | X | X |
| | International standard atmosphere (ISA) | X | X |
| | atmospheric pressure | X | X |
| 11.2 | Lift | X | X |
| | – Newton's Laws of motion | X | X |
| | – Equation of continuity | X | X |
| | – IAS, CAS, TAS | X | X |
| | – Bernoulli's principle – venturi effect | X | X |
| | – airflow around a flat plate | X | X |
| | – airflow around a curved plate (aerofoil) | X | X |
| | – Description of aerofoil cross section | X | X |
| | Relative Airflow | X | X |
| | Chord line | X | X |
| | Mean camber line | X | X |
| | Camber | X | X |
| | Symmetrical aerofoils | X | X |
| | Surface area | X | X |
| | Shape | X | X |
| | Angle of Attack | X | X |
| | Centre of Pressure | X | X |
| | Lift Force | X | X |
| | Pressure distribution about an aerofoil | X | X |
| | – The lift formula – definitions | X | X |
| | Velocity | X | X |
| | Coefficient of Lift (CL) | X | X |
| | Density | X | X |
| | Surface area | X | X |
| | – Lift curve | X | X |
| 11.3 | Drag | X | X |
| | – Parasite (profile) drag | X | X |
| | form | X | X |
| | skin friction | X | X |
| | interference drag | X | X |
| | – Induced drag | X | X |
| | wingtip and trailing edge vortices | X | X |
| | downwash angle | X | X |
| | – Total Drag Curve | X | X |

| | | | |
|---|---|---|---|
| | – The Drag Formula | X | X |
| | – lift/drag ratio | X | X |
| | – aerofoil shapes and wing planforms | X | X |
| | – aspect ratio | X | X |
| 11.4 | Thrust | X | N/A |
| | – The propeller blade as an aerofoil | X | N/A |
| | – The thrust force | X | N/A |
| | – Thrust curve | X | N/A |
| | – Thrust Horse Power (THP) | X | N/A |
| 11.5 | Flying controls | X | X |
| | – the three planes | X | X |
| | – pitching about the lateral axis | X | X |
| | – rolling about the longitudinal axis | X | X |
| | – yawing about the normal axis | X | X |
| | – primary effects of the elevator (stabilators), ailerons and rudder | X | N/A |
| | – effect of speed, slipstream and location of centre of gravity | X | N/A |
| | – effects of cyclic, collective and rudder pedal inputs | N/A | X |
| | – further effects of the elevator (stabilators), ailerons and rudder | X | N/A |
| | – spiral dive recovery | X | N/A |
| | – Control in pitch, roll and yaw | X | X |
| | cross coupling, roll and yaw | X | X |
| | mass and aerodynamic balance of control surfaces | X | N/A |
| | effect of rotor configuration on control power | N/A | X |
| | adverse aileron yaw | X | N/A |
| 11.6 | Trimming controls | X | X |
| | – basic trim tab, balance tab and anti-balance tab | X | N/A |
| | – purpose and function | X | X |
| | – method of operation | X | X |
| 11.7 | Flaps and slats | X | N/A |
| | – simple, split, slotted and Fowler flaps | X | N/A |
| | – purpose and function | X | N/A |

| | | | |
|---|---|---|---|
| | – operational use | X | N/A |
| | – slats, leading edge | X | N/A |
| | – purpose and function | X | N/A |
| 11.8 | Flight mechanics | X | X |
| | – Forces acting on an aircraft | X | X |
| 11.8.1 | Straight and level flight | X | X |
| | – lift and mass | X | X |
| | – thrust and drag | X | X |
| | – methods of achieving balance (use of trim) | X | X |
| | – balance and couples (Lift/Weight and Thrust/Drag) | X | X |
| | – relationship between power required and power available | X | X |
| | – Understanding of power curves | X | X |
| | range and endurance | X | X |
| | effects of configuration, weight, temperature and altitude | X | X |
| 11.8.2 | Climbing | X | X |
| | – forces | X | X |
| | – maximum rate and maximum angle of climb | X | X |
| | – effects of configuration, weight, temperature and altitude, wind | X | X |
| | – use of power curves | X | X |
| 11.8.3 | Descending | X | X |
| | – descending without power | X | N/A |
| | – forces | X | X |
| | – effects of configuration, weight, temperature and altitude, wind | X | X |
| | – effect of power | X | X |
| 11.8.4 | Turning | X | X |
| | – forces | X | X |
| | – load factor | X | X |
| | – turn rate and turn radius | X | X |
| | – effects of weight, speed, angle of bank, wind, configuration | X | X |
| | – effect of torque | N/A | X |
| | – use of power curves | | |

| | | | |
|---|---|---|---|
| | | X | X |
| | – Advanced turning | X | X |
| | reduction of performance during climbing and descending turns | X | X |
| | steep turns | X | X |
| 11.9 | The stall | X | X |
| | – boundary layer | X | X |
| | – laminar and turbulent flow | X | X |
| | – stalling angle of attack | X | X |
| | – disruption of smooth airflow | X | X |
| | – reduction of lift, increase of drag | X | X |
| | – movement of centre of pressure | X | X |
| | – blade stall | N/A | X |
| | – symptoms of development | X | N/A |
| | – aircraft characteristics at the stall | X | N/A |
| | – factors affecting stall speed and aeroplane behaviour at the stall | X | N/A |
| | – stalling from level, climbing, descending and turning flight | X | N/A |
| | – inherent and artificial stall warnings | X | N/A |
| | – recovery from the stall | X | N/A |
| | – effect of weight and flaps | X | N/A |
| | – basic stalling speed | X | N/A |
| 11.10 | Avoidance of spins | X | N/A |
| | – wing tip stall | X | N/A |
| | – the development of roll and autorotation | X | N/A |
| | – recognition at the incipient stage | X | N/A |
| | – recovery technique | X | N/A |
| | – full spin recovery technique | X | N/A |
| 11.11 | Stability | X | X |
| | – definitions of static and dynamic stability | X | X |
| | – longitudinal, lateral and directional stability | X | X |
| | – effect of location of centre of gravity and speed | X | X |

| | | | |
|---|---|---|---|
| 11.12 | Load factor and manoeuvres | X | X |
| | – structural considerations | X | X |
| | – manoeuvring and gust envelope | X | X |
| | – limiting load factors, (aeroplane – with and without flaps) | X | X |
| | – changes in load factor in turns and pull-ups | X | X |
| | – vibrations, control feedback | N/A | X |
| | – manoeuvring speed limitations | X | X |
| | – in-flight precautions | X | X |
| | – H/V diagram, take-off and landing | N/A | X |
| 11.13 | Stress loads on the ground | X | X |
| | – side loads on the landing gear | X | X |
| | – landing | X | X |
| | – taxiing, precautions during turns | X | X |
| 12.0 | Helicopter Aerodynamics | N/A | X |
| 12.1 | Helicopter terms | N/A | X |
| | – Plane of rotation | N/A | X |
| | – Axes of rotation | N/A | X |
| | – Rotor shaft axis | N/A | X |
| | – Tip path plane | N/A | X |
| | – Rotor disc | N/A | X |
| | – Disc loading | N/A | X |
| | – Blade loading | N/A | X |
| 12.2 | The forces diagram and associated terminology | N/A | X |
| | – Pitch angle | N/A | X |
| | – Induced airflow | N/A | X |
| | – Relative airflow to the blade | N/A | X |
| | – Angle of attack | N/A | X |
| | – Drag-blade | N/A | X |
| | – Total reaction-blade | N/A | X |
| | – Rotor thrust | N/A | X |
| | | | |

| | | | |
|---|---|---|---|
| | – Rotor drag | N/A | X |
| | – Torque | N/A | X |
| | – Mass | N/A | X |
| | – Uniformity of rotor thrust along blade span | N/A | X |
| | – Blade twist | N/A | X |
| | – Blade taper | N/A | X |
| | – Coning angle | N/A | X |
| | – Centrifugal force | N/A | X |
| | – Limits of rotor RPM | N/A | X |
| | – Centrifugal turning moments | N/A | X |
| 12.3 | Helicopter Controls | N/A | X |
| 12.3.1 | Collective lever | N/A | X |
| | – collective pitch changes | N/A | X |
| | – relationship with rotor thrust and rotor drag | N/A | X |
| 12.3.2 | Cyclic stick | N/A | X |
| | – cyclic pitch changes | N/A | X |
| | – rotor disc attitude | N/A | X |
| | – rotor thrust tilt | N/A | X |
| 12.3.3 | Yaw pedals | N/A | X |
| | – fuselage torque | N/A | X |
| | – tailrotor drift | N/A | X |
| | – tailrotor roll | N/A | X |
| 12.4 | Rotor blade freedom of movement | N/A | X |
| 12.4.1 | Feathering | N/A | X |
| | – the feathering hinge | N/A | X |
| | – pitch angle | N/A | X |
| 12.4.2 | Flapping | N/A | X |
| | – the flapping hinge | N/A | X |
| | – alleviation of bending stresses | N/A | X |
| | – flapping to equality | N/A | X |
| 12.4.3 | Dragging | N/A | X |
| | – the drag hinge | | |

| | | | |
|---|---|---|---|
| | | N/A | X |
| | – drag dampers | N/A | X |
| | – leading/lagging | N/A | X |
| | – periodic drag changes | N/A | X |
| | – blade C of G (conservation of angular momentum) | N/A | X |
| 12.4.4 | Vertical flight | N/A | X |
| | – take-off | N/A | X |
| | – vertical climb | N/A | X |
| | – vertical descent | N/A | X |
| 12.5 | Hovering | N/A | X |
| 12.5.1 | Outside – Inside ground effect | N/A | X |
| | – factors affecting ground cushion | N/A | X |
| | – re-circulation | N/A | X |
| 12.5.2 | Forces in balance | N/A | X |
| | – in the hover | N/A | X |
| | – in forward flight | N/A | X |
| | – influence of centre of gravity | N/A | X |
| | – influence of rotor shaft tilt | N/A | X |
| 12.5.3 | Translational lift | N/A | X |
| | – effect of horizontal airflow on induced flow | N/A | X |
| | – variation of total flow through the disc with forward flight | N/A | X |
| 12.6 | The relationship between pitch angle and angle of attack | N/A | X |
| 12.6.1 | Power requirements | N/A | X |
| | – rotor profile power | N/A | X |
| | – power absorption – tail rotor and ancillary equipment | N/A | X |
| | – rotor profile power variation with forward speed | N/A | X |
| | – induced drag | N/A | X |
| | – parasite drag | N/A | X |
| | – rotor profile drag | N/A | X |
| | – total power required | N/A | X |
| | – power available | N/A | X |
| 12.7 | Transition from and to the hover | N/A | X |
| | | | |

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|---|---|---|---|
| | – symmetry and asymmetry of rotor thrust | N/A | X |
| | – main rotor flapback | N/A | X |
| | – tail rotor flapback and methods of removal | N/A | X |
| 12.8 | Factors affecting maximum forward speed | N/A | X |
| | – design limits of cyclic stick | N/A | X |
| | – airflow reversal | N/A | X |
| | – retreating blade stall | N/A | X |
| | – symptoms and recovery actions | N/A | X |
| | – flow separation | N/A | X |
| 12.9 | Factors affecting cyclic stick limits | N/A | X |
| | – All up mass (AUM) | N/A | X |
| | – Density altitude | N/A | X |
| | – Centre of gravity position | N/A | X |
| | – The flare – power flight | N/A | X |
| 12.10 | Helicopter specific hazards | N/A | X |
| 12.10.1 | Vortex Ring State (Settling with Power) | N/A | X |
| | – tip vortices | N/A | X |
| | – comparison between induced flow and rate of descent flow | N/A | X |
| | – development | N/A | X |
| | – change in relative airflow along blade span – root stall and turbulence | N/A | X |
| 12.10.2 | Blade sailing | N/A | X |
| | – rotor RPM and blade rigidity | N/A | X |
| | – effect of adverse wind | N/A | X |
| | – minimising the danger | N/A | X |
| 12.10.3 | Autorotation – vertical | N/A | X |
| | – rate of descent airflow | N/A | X |
| | – effective airflow | N/A | X |
| | – relative airflow | N/A | X |
| | – inflow and inflow angle | N/A | X |
| | – autorotative force | N/A | X |
| | | | |

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|---|---|---|---|
| 12.10.4 | Blade regions | N/A | X |
| | – stalled region | N/A | X |
| | – driven region | N/A | X |
| | – driving region | N/A | X |
| | – rotor drag | N/A | X |
| | – effect of mass and altitude | N/A | X |
| | – control of rotor RPM | N/A | X |
| 12.10.5 | Autorotation – forward flight | N/A | X |
| | – factors affecting inflow angle | N/A | X |
| | – effect of forward speed on rate of descent | N/A | X |
| | – effect of forward speed on the three regions | N/A | X |
| | – turning | N/A | X |
| | – the flare | N/A | X |
| | – rotor RPM increase from movement of autorotative section | N/A | X |
| | – increase in rotor thrust | N/A | X |
| | – reduction in rate of descent | N/A | X |
| | – autorotation for range and endurance | N/A | X |
| | – height/velocity avoidance graph | N/A | X |
| 12.10.6 | Rollover | N/A | X |
| | – dynamic roll-over and avoidance of | N/A | X |
| | – static rollover | N/A | X |
| | – effect of centre of gravity | N/A | X |
| 12.10.7 | Operating with limited power | N/A | X |
| 12.10.8 | Overpitch | N/A | X |
| 12.10.9 | Ground resonance | N/A | X |
| 12.10.10 | Mast bumping | N/A | X |

Study Material for the Private Pilot Licence Syllabus: Aeroplane and Helicopter

The following publications have been used as reference material for the PPL Syllabus.

Although some of these publications are aimed more for the Commercial Pilot, questions which are drawn from them will be at the PPL level in line with the syllabus, and therefore they may also be used as a source of information by ATO's or lecturers when preparing lectures for Private Pilots.

This list does not imply that ATO's must purchase the complete selection. Alternative reference sources, including existing study material, may also be used provided the content meets the requirements of the syllabus.

- South African AIP and AIC's (RSA)
- Aviation Legislation in South Africa – Cor Beek (RSA)
- South African Air Law for Private Pilots – Lilith A Seals (RSA)
- Southern Africa's Weather Patterns – J Van Heerden and L Hurry (RSA)
- Private Pilot Study Notes by Avex Air Training (RSA)
- The Private Pilot's Handbook – G D P Worthington (RSA)
- Commercial Pilot Study notes published by Aeronav Academy, Avex Air Training and Central Flying Academy (RSA)
- Air Pilots Manual – Volumes 2, 3 and 4 – P Godwin (UK)
- The Private Pilot's Licence Course – Jeremy M Pratt (UK) Volumes 3 and 4
- Ground Studies for Pilots, Volumes: Radio Aids, Meteorology, Navigation, Flight Instruments – (UK)
- Flying Training for The Private Pilot Licence – Instructor Manual – R D Campbell (UK)
- Mechanics of Flight – A C Kermode (USA)
- A Pilot's Guide to Aircraft and Their Systems – Dale Crane (USA)
- Aircraft Systems for Pilots – Dale De Remer (USA)
- Aircraft Instruments – E H J Pallett
- Principles of Helicopter Flight – W J Wagtendonk
- The Helicopter Pilot's Manual – N Bailey, Volume 1 – Principles of Flight (UK)
- The Helicopter Pilot's Manual – N Bailey, Volume 2 – Power plants, Instruments and Hydraulics (UK)
- Rotorcraft Flying Handbook – Federal Aviation Administration (USA)
- Rotary Wing Flight – Nicholas Ean (USA) available from ASA
- The Helicopter Pilot's Handbook – G D P Worthington/ K Piggott (RSA)
- Human Factors for Pilots – R Green/H Muir/M James/D Gradwwell/ R L Green (UK)
- Human Factors and Pilot Performance Vol 6 Air Pilots Manual – P Godwin (UK)
- Human Performance and Limitations in Aviation – R D Campbell/M Bagshaw (UK)
- Aircraft Performance Theory for Pilots, Chapter 12 Hydroplaning/Aquaplaning – P J Swatton (UK)