# SECTION 3 – AERONAUTICAL KNOWLEDGE TRAINING

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## SUBSECTION 1 – INTRODUCTION

**1.1.** To integrate theory training with flight training, the Aeronautical Knowledge syllabus has been divided into two ground training blocks as indicated below

**Block 1:**

Contains the knowledge requirements to be taught prior to the General Flying Progress Test and nominates specific objectives to be met prior to undertaking the following flights:

- 1st Solo
- 1st Area Solo
- General Flying Progress Test (GFPT).

**Block 2:**

specifies the knowledge requirements prior to the completion of the:

- PPL training phase
- CPL training phase.

**1.2.** The Performance Standards used to define the relative importance of each syllabus objective are:

| STANDARD | LEVEL | DESCRIPTION |
|---|---|---|
| A | Essential | Must be known completely relates directly to the safety of the aeroplane and occupants. |
| B | Important | Must be known in considerable depth relates to the efficient and practical operation of an aeroplane. |
| C | Additional | Pre-PPL background knowledge only<br>PPL basic principles should be known<br>CPL should be known in considerable depth. |

***Note:*** *Where a sequence is left blank the preceding standard is to apply*

### 1.3. Interpreting the syllabus

**1.3.1.** This syllabus is designed to integrate flight and ground training, and provide guidance on the relative importance of particular topics.

**1.3.2.** The following example illustrates how to obtain maximum value from the ground training syllabus:

| Topic No. | Objective | 1st Solo | 1st Area Solo |
|---|---|---|---|
| 6.7.3 | State the effect (increase/decrease) of bank angle on: | | |
| | (a) stall IAS | A | |
| | (b) the aircraft's structure (load factor) | | A |

**Explanation:**

Topic 6.7.3 (a) is an ESSENTIAL item of knowledge which must be learnt prior to the first solo flight and is required knowledge for ALL SUBSEQUENT PHASES of training.

Topic 6.7.3 (b) is also deemed to be ESSENTIAL knowledge which:

- May be taught prior to first solo, but
- Must be taught prior to the first area solo, and is required knowledge for all SUBSEQUENT PHASES of training.

## 1.4. Industry Examinations

**1.4.1.** To maintain a measure of ground/flight integration, a student must pass the following examinations, set and marked by the industry, prior to progressing to the next training phase:

- Prior to first solo:
  An oral or written examination.
- Prior to first area solo:
  A written examination
- Prior to the general flying progress test (GFPT):
  A written Basic Aeronautical Knowledge (BAK) examination.

**1.4.2.** Results of the above examinations are to be recorded in a student's flying training record.

**1.4.3. Industry examination – guidance**

**1.4.3.1.** It is suggested that examinations should sample approximately 60% to 70% of "A" topics. The pass mark may be nominated by the training organisation but should not be less than 70%.

**1.4.3.2.** Though these examinations should, in the main, sample topics appropriate to the phase of training, it is advisable to include some ESSENTIAL knowledge topics from earlier phases, particularly if there has been a prolonged break in training.

**1.4.3.3.** The three examinations mentioned in paragraph 1.4.1 may be compiled by training organisations other than the flying training organisation using them.

## 1.5. CASA Examinations

**1.5.1.** Prior to the PPL or CPL flight test, a person must pass the following CASA examinations:

(a) For PPL, a single multiple-choice examination which will sample any topic of the syllabus from "1st solo" up to and including topics listed under the "PPL flight test" column

(b) For CPL, a single multiple-choice examination consisting of a number of subject-part examination, each of which is to be sat separately. The subject-part examination will in general sample any of the respective subject topics of the syllabus.

**1.5.2.** The pass standards for these examinations are:

(a) PPL – **70%**

(b) CPL – **80%** for Flight Rules and Air Law subject-part examination and **70%** for each of the other subject-parts, unless amended by changes to regulations.

# GROUND TRAINING BLOCK 1

**RELATES TO FLIGHT PHASES 1 TO 3 (1ST SOLO, 1ST AREA SOLO, GFPT)**

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| | | Standard prior to: | | |
|---|---|---|---|---|
| | | 1st Solo | 1st Area Solo | GFPT |
| **2 – AIRCRAFT GENERAL KNOWLEDGE** | | | | |
| **2.1** | **Terminology** | | | |
| | With respect to the items listed below recall the standards abbreviations used and meet the objectives stated: | | | |
| 2.1.1 | **Direction:** | | | |
| | (a) recall the following methods of expressing direction: | B | | |
| | (i) as a three figure group | | | |
| | (ii) as a two figure group for runways | | | |
| | (iii) in the clock code | | | |
| | (b) define heading (HDG) | B | | |
| | (c) define True (T), Magnetic (M), and Compass (C) North | | B | |
| | Distance, Speed and Velocity | | B | |
| | (d) state the units used for distance: | | B | |
| | (i) navigation - nautical miles (NM) | | | |
| | (ii) visibility - metres (m), kilometres (km) | | | |
| | (e) define a knot (kt) | | B | |
| | (f) define wind velocity (W/V) | | B | |
| 2.1.2 | **Time:** | | | |
| | (g) express time as a 4, 6, and 8 figure group | B | | |
| | (h) mentally convert local time (EST, CST, WST) to UTC and vice versa | | B | |
| 2.1.3 | **Vertical measurement** | | B | |
| | (i) state the unit used (ft) for vertical measurement and differentiate between: | | | |
| | (i) height | | | |
| | (ii) altitude | | | |
| | (iii) elevation | | | |
| 2.1.4 | **Other units** | | B | |
| | (j) state the units used for: | | | |
| | (i) runaway dimensions | | | |
| | (ii) temperature - degrees Celsius (C) | | | |
| | (iii) pressure - hectopascals (hPa), psi, Hg | | | |
| | (iv) weight - kilograms (kg), pounds (lb) | | | |
| | (v) volume - litres (l), US and Imp. Gallons (gal) | | | |
| | (k) given W/V and runway directions determine the appropriate runway for take-off/landing: | | | |
| | (i) the direction (left/right) of any cross wind component | | | |
| | (ii) the value of crosswind component. | | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **2.2** | **Power plants and systems – basics** | | | |
| | ***Notes:*** *Because "type" knowledge of power plants, systems and engine handling is more appropriate during initial training, the majority of the generic items below need only be taught after the "area-solo" phase.* | | | |
| | *"Type" knowledge requirements are specified in subsection 5.* | | | |
| 2.2.1 | Demonstrate a basic understanding of the principle of operation of a four stroke cycle internal combustion engine and state the purpose of the following components:<br>• cylinders pistons piston rings inlet/exhaust valves crank shaft cam shaft spark plugs. | | | B |
| 2.2.2 | State the purpose of the following components/features:<br>(a) carburettor<br>(b) throttle<br>(c) magneto, dual ignition<br>(d) alternator<br>(e) battery, battery compartment vent<br>(f) propeller<br>(g) circuit breaker, fuse, bus bar<br>(h) impulse start<br>(i) oil cooler<br>(j) fuel tank vents. | | | B |
| 2.2.3 | State the purpose of the following gauges:<br>(a) RPM (Tachometer), MAP<br>(b) CHT, EGT<br>(c) voltmeter, ammeter, loadmeter<br>(d) fuel pressure<br>(e) oil temperature and pressure.<br>***Note:*** *"Purpose" means the importance in relation to monitoring the powerplant and systems.* | B | | |
| 2.2.4 | State how the following affect the power output of an engine:<br>(a) throttle lever position<br>(b) RPM<br>(c) air density. | | | B |
| 2.2.5 | State the purpose of engine lubrication.<br>***Note:*** *"Purpose" means the reduction of friction and engine cooling.* | | | B |
| 2.2.6 | State the purpose of mixture control and describe the effect of excessively rich and lean mixture strengths on engine operation.<br>***Note:*** *Also see 5. 'Aircraft Type Knowledge'* | | B | |
| 2.2.7 | Compare the advantages and disadvantages of a simple carburettor and a direct injection system. | | B | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **2.2.8** | **Fuels and oils** | | | |
| | (a) list sources of fuel contamination | | A | |
| | (b) state the advantage of filling tanks prior to overnight parking | | B | |
| | (c) explain the terms: | | | |
| | (i) viscosity, oil sump, multi-grade oils | | | |
| | (ii) octane rating | | | |
| | (iii) Avgas, Avtur | | | |
| | and indicate how to identify Avtur and Avgas | | | |
| | (d) list the potential dangers/problems of: | | | B |
| | (i) mixing hydraulic fluids | | | |
| | (ii) using automobile fuel or fuel of a grade other than specified | | | |
| | (e) list factors conducive to fuel vapourisation and identify statements to minimise this phenomenon. | | | |
| 2.2.9 | List typical services provided by a light aeroplane's: | | | B |
| | (a) hydraulic system | | | |
| | (b) electrical system | | | |
| | (c) ignition system | | | |
| | (d) vacuum system. | | | |
| **2.3** | **Engine handling** | | | |
| 2.3.1 | List the causes and effect of detonation. | | A | |
| | ***Note:*** *Limited to improper use of mixture control, MP/RPM, & use of incorrect fuel octane.* | | | |
| 2.3.2 | On aircraft fitted with a fixed pitch propeller, describe the method of using a manual mixture control if the aircraft: | | | B |
| | (a) does not have an EGT gauge | | | |
| | (b) has an EGT gauge. | | | |
| | ***Note:*** *For initial training this topic is covered in 5.4.2, Aircraft Type Knowledge.* | | | |
| 2.3.3 | State the effect on engine operation of: | | | B |
| | (a) prolonged idling | | | |
| | (b) using a mixture that is too rich or too lean. | | | |
| 2.3.4 | Give reasons for the following limitations/actions: | | | B |
| | (a) minimum oil pressure | | | |
| | (b) minimum/maximum oil temperature | | | |
| | (c) minimum/maximum CHT | | | |
| | (d) maximum RPM | | | |
| | (e) ignition checks: pre-takeoff and shutdown | | | |
| | (f) prolonged use of starter motor, and use of pilot heat on the ground | | | |
| | (g) engine warm up on prolonged descents. | | | |
| 2.3.5 | Explain the significance of blue or black exhaust smoke. | | B | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **2.4** | **Malfunctions** | | | |
| 2.4.1 | With respect to a malfunction or a failure of the components listed in (a) to (h) below:<br>• identify cockpit indications which may suggest a malfunction<br>• state pilot actions (if any) to rectify the problem<br>• describe the consequences if the malfunction cannot be rectified.<br>Components:<br>(a) alternator<br>(b) magneto<br>(c) battery<br>(d) ignition switch<br>(e) fuel vent (blockage), fuel/booster pump<br>(f) oil cooler, cowl flaps<br>(g) vacuum pump<br>(h) hydraulic brakes. | | | B |
| 2.4.2 | With respect to the following engine gauges:<br>• identify reasons for an abnormality<br>• state pilot actions (if any) to rectify a problem<br>• state the consequences if the problem cannot be rectified by the pilot<br>(a) oil temperature and pressure<br>(b) CHT<br>(c) fuel pressure<br>(d) tachometer<br>(e) ammeter/loadmeter<br>(f) voltmeter. | | | B |
| **2.5** | **Engine icing**<br>***Note:*** *Students should be advised that the following material is general in nature and that the operational application of engine ice prevention/control varies between individual aircraft and engines. Pilots should therefore follow procedures recommended in the pilots' operating handbook.* | | | |
| 2.5.1 | Describe the method for checking the operation of carburettor heat prior to take-off. | A | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| 2.5.2 | State the atmospheric conditions and engine control settings conducive to the formation of:<br>(a) throttle ice<br>(b) fuel evaporation ice<br>(c) impact ice in a carburettor.<br>*The student should be aware of the probability and severity of icing under different OAT, relative humidity and power conditions.* | | A | |
| 2.5.3 | For aircraft fitted with a fixed pitch propeller, identify cockpit indications which would signify the presence of engine ice.<br>***Note:*** *For initial training, this topic is covered in '5.4.2, Aircraft Type Knowledge'.* | | | A |
| 2.5.4 | State the danger of progressive throttle increments if engine icing is not diagnosed. | | A | |
| 2.5.5 | Discuss the use of carburettor heat for:<br>(a) anti-icing<br>(b) de-icing<br>(c) ground operation. | | | B |
| 2.5.6 | Differentiate between the use of "alternate air" and "carburettor heat" controls. | | | B |
| 2.5.7 | State the effect of the application of carburettor heat on engine performance and engine instrument indications. | | | B |
| **2.6** | **Flight instruments** | | | |
| 2.6.1 | Interpret colour codes on an ASI. | B | | |
| 2.6.2 | From a list, identify pressure and gyroscopic (suction and electrical) instruments used in a typical light trainer.<br>***Note:*** *Pressure instruments are the:*<br>• *ASI, altimeter, VSI.*<br>*Gyroscopic instruments are the:*<br>• *DI, rate of turn, turn coordinator, flight attitude indicator (artificial horizon)* | | B | |
| 2.6.3 | State the effect of a blockage of the pitot or static source on the indications displayed by each pressure instrument listed in 2.6.6 above. | | B | |
| 2.6.4 | (a) state the effect of an incorrect sub-scale setting on the reading of an altimeter | A | | |
| | (b) calculate height error resulting from incorrect sub-scale settings. | | | A |
| 2.6.5 | State the effect of using an alternate static source located inside the cockpit, on the reliability of pressure instrument indications.<br>***Note:*** *In 2.6.3 to 2.6.5 above, "effect" means "over-reading" "under-reading" or "nil effect".* | | B | |
| 2.6.6 | State the effect of low suction & loss of electrical power on the reliability of the gyroscopic flight instruments. | | | B |
| 2.6.7 | List conditions/situations which may result in toppling of gyroscopic instruments and identify conditions under which they would re-erect. | | | B |
| 2.6.8 | State how, when and why a DI should be synchronised with the magnetic compass. | | B | |
| 2.6.9 | Describe checks which would ensure the serviceability of a magnetic compass and the flight instruments mentioned in 2.6.2 above. | | | A |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | 1st Solo | 1st Area Solo | GFPT |
| **3 – FLIGHT RULES AND AIR LAW** | | | | |
| **3.1** | **Documentation** | | | |
| 3.1.1 | Introduce student to the method of maintaining a pilots' log book and the purpose of flight progress records. | B | | |
| 3.1.2 | Know the reasons for and general contents of:<br>• CARs, CAOs, AIP, CAAP<br>• ERS(A), NOTAMS, AIC. | | | B |
| **3.2** | **Pilot licences, privileges and limitations** | | | |
| 3.2.1 | State the flight area limitations which apply to the holder of a Student Pilot Licence. | | A | |
| 3.2.2 | State the recency requirements which apply to solo flight by a student pilot. | | A | |
| 3.2.3 | State the privileges granted and the limitations imposed on the holder of a Student Pilot licence with passenger carrying privileges. | | | A |
| **3.3** | **Flight rules and conditions of flight** | | | |
| 3.3.1 | Recall/apply the following rules/requirements: | | | |
| | (a) rules of the air | A | | |
| | (b) the requirements relating to the operation of aircraft on & in the vicinity of an aerodrome & the conditions relating to turns after take-off | A | | |
| | (c) separation minima between a/c for take-off & landing at a non-controlled aerodrome | A | | |
| | (d) rules relating to restrictions on smoking in aircraft during take-off, landing and refuelling | A | | |
| | (e) visual flight rules and visual meteorology conditions (aeroplanes) for operations below 10,000ft | | A | |
| | (f) altimetry procedures for flight below 10,000ft. | | A | |
| 3.3.2 | State the rules relating to: | | | |
| | (a) the use of drugs & alcohol, and recall the minimum period between alcohol consumption and flight departure | A | | |
| | (b) temporary medical unfitness. | | A | |
| 3.3.3 | Recall the meaning of the following light signals directed at an aircraft: | | A | |
| | (a) steady "Green" and steady "Red" | | | |
| | (b) "Green" "Red"' and "White" flashes. | | | |
| 3.3.4 | Recall regulations relating to the minimum heights for flights over: | | A | |
| | (a) populated areas | | | |
| | (b) other areas. | | | |
| 3.3.5 | State the limitations imposed on: | | A | |
| | (a) acrobatic flight | | | |
| | (b) flights over public gatherings. | | | |
| 3.3.6 | Recall the requirements for landing prior to the end of daylight. | | A | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **3.4** | **Air service operations** | | | |
| 3.4.1 | Extract the restrictions pertaining to the carriage of passengers on certain flights. | | | A |
| 3.4.2 | Extract/apply the following regulations/rules/orders relating to the responsibilities of a pilot in command: | | | A |
| | (a) before flight: | | | |
| | (i) requirements regarding: | | | |
| | • fuels and oils | | | |
| | • fuelling of aircraft | | | |
| | • starting and ground operation of engines | | | |
| | (ii) appropriate passenger briefing | | | |
| | (b) during flight: | | | |
| | (i) regulations regarding the operation ad safety of the aircraft and the authority of the pilot in command. | | | |
| | (ii) dropping of articles from an aircraft in flight. | | | |
| 3.4.3 | Recall the following requirements: | | | |
| | (a) before flight: | | A | |
| | (i) the orders regarding the: | | | |
| | • removal of locking devices | | | |
| | • security of doors, hatches, tank caps | | | |
| | • testing of flight controls | | | |
| | • removal of frost and ice | | | |
| | • instrument checks | | | |
| | • security of safety harness prior to solo flight in a dual control aircraft | | | |
| | (ii) fuel system inspection: | | A | |
| | • when and how | | | |
| | (iii) carriage of passengers in a control seat | | | A |
| | (iv) carriage of infants and children: | | | A |
| | (b) during flight: | | | |
| | (i) the orders regarding: | | | A |
| | • occupation of seats | | | |
| | • wearing of seat belts | | | |
| | • adjustment of seats | | | |
| | (ii) regulations regarding manipulation of aircraft controls: | | | A |
| | • by pilots | | | |
| | • not permitted by unauthorised persons | | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | 1st Solo | 1st Area Solo | GFPT |
| **3.5** | **Aerodromes** | | | |
| 3.5.1 | With reference to a diagram of the aerodrome(s) used for training:<br>(a) identify movement areas<br>(b) explain the significance of taxiway, runway, and/or helipad markings. | A | | |
| 3.5.2 | Identify the following positions in a circuit:<br>(a) downwind leg<br>(b) base leg<br>(c) crosswind leg<br>(d) upwind leg<br>(e) dead side of the circuit. | A | | |
| 3.5.3 | Explain the significance of a white cross on the movement area. | A | | |
| 3.5.4 | Identify and explain the purpose of the following aerodrome markings:<br>(a) runway markings<br>(b) runway threshold markings<br>(c) runway end markings<br>(d) cone and gable markers<br>(e) taxiway markings<br>(f) holding points/bays<br>(g) a double white cross adjacent to a primary wind indicator<br>(h) a horizontal white dumbbell. | | A | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **3.6** | **Airspace (Local)** | | | |
| 3.6.1 | See Flying Training Syllabus. | | A | |
| **3.7** | **Emergencies and SAR** | | | |
| 3.7.1 | Recall the intermittent use of navigation and landing lights by an aircraft to indicate. | A | | |
| 3.7.2 | Differentiate between an accident and an incident. | | | B |
| 3.7.3 | Extract the requirements applicable to the notification of accidents and incidents. | | | B |
| 3.7.4 | Explain the terms:<br>(a) SARTIME<br>(b) INCERFA ALERFA DETRESFA. | | | <br>C<br>C |
| 3.7.5 | Extract emergency procedures from ERS(A). | | A | |
| | **4 – RADIO TELEPHONY** | | | |
| **4.1** | **Radio Telephony** | | | |
| 4.1.1 | Recall the phonetic alphabet and the method of transmitting numerals. | A | | |
| 4.1.2 | Recall pertinent (local) procedures and radio phraseology for:<br>(a) circuit flying<br>(b) flights to/from the training area. | A | | |
| 4.1.3 | State the purpose of the following radio controls:<br>(a) on/off switches<br>(b) frequency selector and squelch control<br>(c) transmit button and mute switch. | A | | |
| 4.1.4 | Differentiate between a distress & urgency message<br>(a) give examples when each should be used<br>(b) recall each prefix and extract the elements of each message from ERS(A). | A | | |
| 4.1.5 | Extract radio failure procedures from ERS(A). | A | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | 1st Solo | 1st Area Solo | GFPT |
| | **5 – AEROPLANE TYPE KNOWLEDGE** | | | |
| | ***Note:*** *The following topics relate primarily to a basic nose-wheel training aeroplane.*<br>*A person who wishes to gain a licence on a different class/type eg, multi-engine, must meet the appropriate endorsement requirements specified.* | | | |
| **5.1** | **Identification of aircraft components** | B | | |
| | The student should be introduced to the training aeroplane to be used and identify the following components (as applicable to type): | | | |
| 5.1.1 | Fuselage: | | | |
| | (a) entry and emergency exits | | | |
| | (c) aerials, static vents, rotating beacon | | | |
| | (d) inspection hatches. | | | |
| 5.1.2 | Wings: | | | |
| | (a) leading and trailing edges, nav lights | | | |
| | (b) ailerons, flaps, trim tabs, and associated hinges/attachments | | | |
| | (c) pitot head, tie down points, stall warning | | | |
| | (d) fuel caps, tanks, drains, vents, hatches. | | | |
| 5.1.3 | Tail: | | | |
| | (a) elevator/stabiliser | | | |
| | (b) fin, rudder, trim tabs and associated hinges. | | | |
| 5.1.4 | Undercarriage: | | | |
| | struts, wheels, brakes steering and ground handling points. | | | |
| 5.1.5 | Engine: | | | |
| | location | | | |
| | type, number of cylinders | | | |
| | induction system. | | | |
| 5.1.6 | General cockpit layout: | | | |
| | engine and flight controls | | | |
| | engine and flight instruments | | | |
| | heating and ventilation controls | | | |
| | main switches. | | | |
| **5.2** | **Emergency actions** | | | |
| | Recall the: | | | |
| 5.2.1 | Emergency actions listed in the pilot's operating handbook. | A | | |
| 5.2.2 | Power plant and airspeed limitations given in the flight manual. | A | | |
| 5.2.3 | The following operating speeds: | | | |
| | lift off | A | | |
| | climb: normal best rate | A | | |
| | short take-off and landing. | | B | |
| 5.2.4 | Stall recognition and recovery relevant to type | A | | |
| 5.2.5 | Pilot actions in the event of: | A | | |
| | an aircraft fire in the air and on the ground | | | |
| | engine failure: | | | |
| | after take-off | | | |
| | in the training area | | | |
| | propeller overspeed. | | | |
| 5.2.6 | Engine oil specifications and quantity. | | A | |
| 5.2.7 | following fuel requirements/data: | | A | |
| | grade used and method of identification | | | |
| | total usable fuel. | | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **5.3** | **Systems** | | | |
| 5.3.1 | With reference to a pilot's operating handbook, demonstrate a basic understanding of the following systems:<br>(a) fuel, engine lubrication, hydraulic<br>(b) electrical, ignition<br>(c) undercarriage, brakes. | | B | |
| 5.3.2 | List the services provided by the:<br>(a) battery alternator magneto<br>(b) hydraulic system<br>(c) lubrication system<br>(d) vacuum system. | | B | |
| 5.3.3 | With reference to the systems (or components) listed in 5.3.1 and 5.3.2:<br>(a) identify malfunctions<br>(b) list pilot actions (if any)<br>(c) state consequences if the malfunction cannot be rectified. | | B | |
| **5.4** | **Engine ice and handling:** | | | |
| 5.4.1 | State the cockpit indications that signify the presence of engine ice and state the recommended procedure to clear engine ice. | | A | |
| 5.4.2 | State the methods used to:<br>(a) control engine temperature<br>(b) lean fuel/air mixture<br>(c) control power and<br>(d) recall the allied cockpit gauges which provide information on the above parameters. | B | | |
| **5.5** | **Take-off and landing performance**<br>***Note:*** *Background knowledge in subsections 8.2 and 8.3 of this phase should be taught prior to commencing this section. As operations during this phase are "local" it may be assumed that take-off weight equals landing weight.* | | | |
| 5.5.1 | Given appropriate data use the flight manual to: | | | |
| | (a) extract take-off and landing distances required | | | B |
| | (b) determine maximum take-off/landing weight | | | A |
| | (c) adjust take-off weight to ensure that structural weight limits are not exceeded. | | | A |
| **5.6** | **Loading** | | | |
| 5.6.1 | use the aeroplane's loading system to distribute load and ensure that the aeroplane will not exceed CG limits. | | | A |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | 1st Solo | 1st Area Solo | GFPT |
| **6 – AERODYNAMICS** | | | | |
| **6.1** | **Basic theory** | | | |
| 6.1.1 | Identify the following:<br>(a) aerofoil, angle of attack, relative airflow<br>(b) centre of pressure, centre of gravity<br>(c) lift, weight, thrust, drag. | B | | |
| 6.1.2 | Differentiate between:<br>(a) IAS and GS<br>(b) IAS, CAS, TAS and GS. | B | | B |
| **6.2** | **Lift and drag** | | | |
| 6.2.1 | State whether lift and drag of an aerofoil will increase or decrease with changes in:<br>(a) airspeed<br>(b) angle of attack<br>(c) flap setting. | B | | |
| 6.2.2 | List the types of drag, which affect a subsonic aircraft in flight.<br>***Note:*** *Types are:*<br>*(a) Parasite (zero lift):*<br>*form, interference, skin friction*<br>*(b) Induced (lift dependent).* | | | B |
| 6.2.3 | State how Total Drag varies with airspeed. | | | B |
| 6.2.4 | Recall typical angles of attack at which a basic low speed aerofoil:<br>(a) generates maximum lift (16 degrees)<br>(b) is most efficient (best L/D : 4 degrees)<br>and relate these angles to:<br>(i) stall speed<br>(ii) best glide speed.<br>***Note:*** *Students should be aware that these values are representative only.* | | B | |
| **6.3** | **Flight controls** | | | |
| 6.3.1 | Describe the primary and further effects of the elevator, rudder and aileron on an aeroplane's movement about the longitudinal, lateral and normal (vertical) axes. | B | | |
| 6.3.2 | Describe the effect of changes in power and airspeed on pitch trim and on the effectiveness of the elevator, rudder and ailerons. | B | | |
| 6.3.3 | Describe the purpose of trim control. | B | | |
| 6.3.4 | State the effect of lowering or raising flap on lift, drag and attitude. | B | | |
| **6.4** | **Straight and level flight** | | | |
| 6.4.1 | State the relationship between attitude, angle of attack and airspeed in level flight.<br>***Note:*** *Students should appreciate that this relationship is only true in level flight.* | B | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **6.5** | **Climbing** | | | |
| 6.5.1 | Differentiate between rate and angle of climb. | B | | |
| 6.5.2 | State the effect (increase/decrease) on climb rate and angle resulting from changes in:<br>(a) weight<br>(b) power<br>(c) airspeed (changed from recommended)<br>(d) flap deflection<br>(e) head/tailwind component, windshear<br>(f) bank angle<br>(g) altitude and density altitude. | | B | |
| **6.6** | **Descents:** | | | |
| 6.6.1 | State the effect on rate, angle of descent and attitude resulting from changes in:<br>(a) power - constant IAS<br>(b) flap - constant IAS. | B | | |
| 6.6.2 | State the effect of head/tail wind on the glide path and glide distance (relevant to the earth's surface). | B | | |
| 6.6.3 | Explain why a pilot should maintain the recommended glide speed, if undershooting an approach to land. | B | | |
| **6.7** | **Turning** | | | |
| 6.7.1 | Describe what is meant by a balanced turn. | B | | |
| 6.7.2 | Describe the terms "g" wing loading load factor. | | | B |
| 6.7.3 | During a level turn, state the effect (increase/decrease) of bank angle on:<br>(a) stall IAS<br>(b) the aircraft's structure (load factor).<br>***Note:*** *An appreciation of the rate of increase of stall speed with bank, and possible airframe damage if limits are exceeded is also required.* | A | A | |
| 6.7.4 | List reasons for avoiding steep turns:<br>(a) shortly after take-off<br>(b) during a glide - particularly on approach. | A | | |
| 6.7.5 | Explain why an aeroplane executing balanced level turns at low level may appear to slip or skid when turning downwind or into wind. | | A | |
| 6.7.6 | Given level flight stall speed, determine the stall speed and load factor during turns at 45 and 60 degrees bank. | | B | |
| 6.8 | Stalling, spinning & spiral dives. | | | |
| 6.8.1 | Define stalling angle and describe:<br>(a) the symptoms when approaching the stall<br>(b) the characteristics of a stall. | A | | |
| 6.8.2 | Explain:<br>(a) the effect of using ailerons when approaching and during the stall<br>(b) why an aeroplane may stall at different speeds. | A<br>A | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| 6.8.3 | List the effect (increase/decrease/nil) of the following variables on the level flight stall IAS: | | | |
| | (a) power | A | | |
| | (b) flap | A | | |
| | (c) wind shear vertical gusts | A | | |
| | (d) manoeuvres | A | | |
| | (e) weight | | A | |
| | (f) frost and ice | | A | |
| | (g) altitude. | | A | |
| 6.8.4 | Cite manoeuvres during which an aeroplane may stall at an angle which appears to be different to the true stalling angle. | | B | |
| 6.8.5 | Differentiate between a spin and a spiral dive in a light aeroplane and describe the standard recovery technique for each manoeuvre (Refer CAA Flight Instructors Manual). | | A | |
| | ***Note:*** *Student should be advised to follow the techniques recommended in the pilot's operating handbook.* | | | |
| **6.9** | **Taxi, take-off, landing** | | | |
| 6.9.1 | Cite situations which may cause an aeroplane to "wheel barrow" and state the recommended pilot action in the event of such an occurrence. | B | | |
| 6.9.2 | Describe the effect of a cross-wind on high and low wing aeroplanes during taxi, take-off and landing. | B | | |
| | ***Note:*** *"Effect of a cross-wind" means the effect on "yaw" & "roll" and includes the tendency to nose over during taxi.* | | | |
| 6.9.3 | List the advantages of taking-off and landing into wind. | | B | |
| 6.9.4 | Compare a flapless approach to an approach with flap in terms of: | | B | |
| | (a) attitude during descent | | | |
| | (b) approach path angle | | | |
| | (c) threshold and touch-down speeds | | | |
| | (d) landing roll. | | | |
| 6.9.5 | Describe the effect of wind shear (wind gradient) and ground effect on aerodynamic and flight characteristics and identify. | | | B |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **6.10** | **Wake turbulence** | | | |
| | ***Note:*** *If a student is operating from an aerodrome where helicopters or heavy aircraft also operate, all 'A' items must be taught prior to pre-solo.* | | | |
| 6.10.1 | List factors affecting the strength of vortex flow viz:<br>• aircraft weight, speed, wing shape | | | B |
| 6.10.2 | State the primary control hazard that may result from a vortex encounter. | | A | |
| 6.10.3 | Identify from diagrams the:<br>(a) approximate flow direction around each vortex<br>(b) approximate location of vortices (in still air) generated by a preceding aeroplane during:<br>(i) cruise flight<br>(ii) take-off and landing<br>(c) approximate take-off/touch-down points and flight profiles which<br>Caution: Students should be advised that heavy/med. aeroplanes are capable of steep climb gradients after take-off when operating at low take-off weights. | | | B |
| 6.10.4 | State/identify the effect of wind and atmospheric turbulence on the:<br>(a) strength of vortices<br>(b) longevity of vortices<br>(c) location of vortices. | | | B |
| 6.10.5 | Recall that rotor downwash can be a hazard to a radius of approximately thrice the rotor diameter, and that this area should be avoided by light aircraft.<br>***Note:*** *Students should be aware of wake turbulence sep. standards in order to make value judgements to waive these standards at a controlled aerodrome or provide their own separation at non-controlled aerodromes.* | | A | |
| **6.11** | **Thrust stream turbulence (jet blast)** | | | |
| 6.11.1 | Recall that this form of turbulence varies with engine power and distance from the source.<br>***Note:*** *The following information may be of value to illustrate the need for caution:*<br>(a) approximate speeds of the jet at 30 metres are:<br>• idling power: 25 kt<br>• full power: 125 kt<br>(b) at high power settings stream turbulence can extend to approximately:<br>• 500/600 mtrs behind a DC 10 and 180 mtrs behind a 727 | | | B |
| **6.12** | **Structural damage** | | | |
| 6.12.1 | Describe the effect of structural damage, including bird strikes, with emphasis on:<br>(a) stall characteristics and<br>(b) controllability. | | | |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| | **7 – NAVIGATION** | | | |
| | ***Note:*** *Reference to AIP "visual" charts means the present ERC, VTC, and AUS PCA and embraces any subsequent changes to charts required for flight under VFR.* | | | |
| **7.1** | **Basics – Extract Information from documents** | | | |
| 7.1.1 | On a WAC and AIP "visual" charts (if applicable) which cover the local area of operation:<br>(a) identify, without reference to the chart legend:<br>(i) major features to assist in map reading eg, roads, rivers, lakes<br>(ii) obstacles and spot heights, including elevation or height above terrain<br>(iii) CTA, PRDs, and aerodrome data on VTC/ERC (if applicable)<br>(b) decode other symbols with reference to the chart legend<br>(c) assess the general height of the terrain from hypsometric tints and contours<br>(d) estimate track and distance<br>(e) demonstrate and explain the reason for chart orientation in flight. | | B | |
| 7.1.2 | On visual AIP charts identify airspace boundaries and symbols with reference to the chart legend. | | | B |
| 7.1.3 | Use ERS(A) to extract:<br>(a) runway data<br>(b) data pertaining to Prohibited, Restricted and Danger Areas. | | | B |
| **7.2** | **Computation techniques** | | | |
| 7.2.1 | Use mental rules of thumb to estimate:<br>(a) time interval using estimated GS and distance eg, 120 kt = 2 NM/min<br>(b) endurance given fuel flow and fuel available (excluding reserve fuel).<br>***Note:*** *Students should be given examples to indicate that over short distances and periods of time, such approximations are reasonably accurate.* | | B | |
| 7.2.2 | Apply magnetic variation to obtain magnetic direction. | | B | |
| 7.2.3 | Carry out conversions between:<br>(a) feet/metres<br>(b) nm/km<br>(c) lbs/kg<br>(d) US gal/litres/kg of avgas. | | | B |
| 7.2.4 | Determine head/tail, and x-wind components given W/V and HDG.<br>***Note:*** *Students should also practice using the conversion and wind component tables in ERS(A).* | | | B |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **8 – OPERATION, PERFORMANCE & FLIGHT PLANNING** | | | | |
| **8.1** | **Airworthiness & aircraft equipment** | | | |
| 8.1.1 | With reference to a maintenance release decide whether an aircraft is serviceable for a specific flight. | | | A |
| 8.1.2 | Recall the limitations imposed on a student pilot permit holder with regard to:<br>(a) conducting daily inspections<br>(b) signing a maintenance release<br>(c) reporting of defects. | | | B |
| **8.2** | **Take-off and landing performance** | | | |
| | ***Note:*** *Use of take-off and landing charts is included in "Type" training.* | | | |
| 8.2.1 | State the effect (increase/decrease) of the following factors on take-off, landing, & take-off climb performance:<br>(a) strength of head/tail wind component<br>(b) air temperature<br>(c) QNH<br>(d) density height (non-standard conditions)<br>(e) airfield elevation<br>(f) runway slope & surface including wet & slushy runways<br>(g) ground effect and windshear<br>(h) frost on an aircraft. | | B | |
| 8.2.2 | Differentiate between pressure height & density height. | | B | |
| 8.2.3 | Describe how to use an altimeter to obtain:<br>(a) local QNH at an aerodrome<br>(b) pressure height of an aerodrome<br>(c) elevation of an aerodrome. | | B | |
| 8.2.4 | Explain the terms:<br>(a) maximum structural take-off and landing weight<br>(b) climb weight limit. | | | B |
| 8.2.5 | State the likely results of exceeding aircraft weight limits. | | | B |
| **8.3** | **Loading** | | | |
| | ***Note:*** *Practical use of a loading system is included in "Type" training.* | | | |
| 8.3.1 | At this phase of training, a student should have a basic understanding of the terms listed below, to enable him/her to apply this knowledge when using the applicable loading system in type training:<br>(a) arm, moment, datum, station, index unit<br>(b) centre of gravity (CG) and CG limits<br>(c) empty weight, zero fuel weight (ZFW), ramp weight<br>(d) maximum take-off and maximum landing weights<br>(e) floor loading limits. | | | B |

| | | Standard prior to: | | |
|---|---|---|---|---|
| | | **1st Solo** | **1st Area Solo** | **GFPT** |
| **8.4** | **Speed limitations** | | | |
| 8.4.1 | Explain the following terms/abbreviations:<br>(a) normal operating speed ($V_{no}$)<br>(b) never exceed speed ($V_{NE}$)<br>(c) maximum manoeuvre speed ($V_A$)<br>(d) turbulence penetration speed ($V_B$)<br>(e) limit and design load factors<br>(f) flap operating speed ($V_{FO}$) and flap extended speed ($V_{FE}$). | | A | |
| 8.4.2 | Cite situations which may result in an aircraft exceeding speed limits and load factor limits. | | A | |
| | **9 – METEOROLOGY** | | | |
| **9.1** | **Knowledge of local weather** | | | |
| 9.1.1 | Demonstrate a basic knowledge of local weather, in particular the likely occurrence of :<br>(a) thunderstorms<br>(b) low cloud<br>(c) poor visibility<br>(d) turbulence<br>and describe how these phenomena may affect the safe operation of an aircraft. | | | B |
| **9.2** | **Knowledge of forecasts and reports** | | | |
| 9.2.1 | Demonstrate an understanding of weather forecasts, reports and broadcasts that are pertinent to the area of operation. | | | B |
| **9.3** | **Understand significance of observations** | | | |
| 9.3.1 | Recognise signs which may indicate the presence of :<br>(a) turbulence, thermals, dust devils<br>(b) wind gradient, wind shear,<br>and describe the effect of these phenomena on flight characteristics.<br>***Note:*** *"Signs" means forecast conditions and pilot observations.* | | | B |

# GROUND TRAINING BLOCK 2

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**FLIGHT PHASES 4/5**

**Notes:**

- *Where topics are common but completion standards differ for PPL and CPL students, separate standards are specified for each licence level.*
- *Objectives which apply to PPL also apply to CPL students*.

| | | Standard prior to: PPL Flt Test | CPL Flt Test |
|---|---|---|---|
| | **2 – AIRCRAFT GENERAL KNOWLEDGE** | | |
| **2.1** | **Engines** | | |
| 2.1.1 | Carburetion | | |
| | (a) describe the principle of operation of a simple carburettor in terms of : | | C |
| | (i) fuel vaporisation and distribution | | |
| | (ii) control of the fuel/air charged: | | |
| | • throttle butterfly | | |
| | (iii) idling, main and acceleration jets: | | |
| | • purpose of these jets | | |
| | (iv) mixture control. | | |
| 2.1.2 | Supercharging | | |
| | (a) state the purpose of supercharging | | C |
| | (b) list the types of superchargers: | | C |
| | (i) geared (mechanically driven) | | |
| | (ii) turbo (exhaust driven). | | |
| | (c) state the purpose/function of the following components: | | B |
| | (i) geared superchargers | | |
| | • impeller, diffuser | | |
| | (ii) turbo chargers: | | |
| | • compressor, waste gate (fixed, manual, automatic) | | |
| | (d) state the precautions to be observed to avoid detonation when operating a supercharged engine. | | A |
| **2.2** | **Propellers** | | |
| | *Notes: Depending on design, a variable pitch propeller will, when the propeller oil pressure is lost, adopt either full fine or full coarse pitch.*<br>*With this in mind, the following generalities will be used when examining topics relating to variable pitch propellers. The use of springs is omitted as their function varies depending on propeller design.*<br>• *centrifugal twisting moment (CTM) tends to reduce (fine) pitch*<br>• *counter weights, when used, increase (coarsen) pitch*<br>• *oil pressure is used to decrease pitch if counterweights are fitted*<br>• *oil pressure is used to increase pitch if counterweights are not fitted*<br>*Students should be advised to check pilots' operating handbook to ascertain the constant speed mechanism used when operating different types.* | | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| 2.2.1 | Describe the following terms:<br>• blade angle, helix angle/pitch<br>• propeller thrust and torque<br>• thrust horsepower (THP)<br>• brake horsepower (BHP)<br>• asymmetric blade effect . | | C |
| 2.2.2 | Describe how a propeller converts engine power into thrust and explain what is meant by fine and course pitch stops. | | C |
| 2.2.3 | Describe the effect of using carburettor heat on aeroplanes fitted with a CSU. | | B |
| 2.2.4 | Describe how power output is controlled when operating aeroplanes fitted with a variable pitch propeller and know how to monitor power using engine instruments. | | B |
| 2.2.5 | List the precautions necessary if operating a variable pitch propeller when:<br>(a) conducting ground checks<br>(b) changing power i.e. use of throttle/RPM levers. | | B |
| 2.2.6 | List reasons for propeller overspeed in aeroplanes fitted with:<br>(a) fixed pitched propellers<br>(b) variable pitch propellers<br>and state the associated remedial pilot action. | A | A |
| 2.2.7 | Describe:<br>(a) the effect of CSU malfunction on engine operation<br>(b) the effect of using engine controls in the event of malfunction. | | B |
| 2.2.8 | In aeroplanes fitted with a CSU, identify cockpit indications which could signify:<br>(a) the presence of engine ice<br>(b) that engine ice has been cleared after application of "carb heat". | | A |
| **2.3** | **Power plants** | | |
| 2.3.1 | Explain the term "full throttle height". | B | |
| 2.3.2 | Describe the effect of the following factors on engine performance:<br>(a) fuel/air mixture strength<br>(b) density height<br>(c) altitude, on:<br>(i) normally aspirated engines<br>(ii) turbocharged/supercharged engines. | <br>B<br>B<br><br>B | <br><br><br><br>B |
| 2.3.3. | Compare the performance characteristics of :<br>(a) aeroplanes with fixed pitch propellers and those fitted with a CSU<br>(b) engine operation (within limits) at high MP/low RPM and low MP/high RPM<br>(c) normally aspirated and turbocharged/supercharged engines. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **2.4** | **Aeroplane systems** | | |
| 2.4.1 | Describe or state the function of the following typical components mentioned in pilot operating handbooks: | | |
| | (a) **Fuel system components**: | | B |
| | (i) auxiliary/booster pump | | |
| | (ii) fuel drain | | |
| | (iii) fuel pressure gauge | | |
| | (iv) fuel flow gauge | | |
| | (v) check valves. | | |
| | (b) **Lubrication system**: | | B |
| | (i) by-pass valves | | |
| | (ii) oil cooler | | |
| | (iii) wet sump system | | |
| | (iv) dip stick. | | |
| | (c) **Stall warning devices** | A | |
| | (d) **Electrical & Ignition systems**: | | B |
| | (i) alternator generator | | |
| | (ii) voltage regulator over voltage relay | | |
| | (iii) ammeter voltmeter | | |
| | (iv) circuit breaker fuse | | |
| | (v) battery ampere hours | | |
| | (vi) bus bar battery master switch | | |
| | (vii) starter motor starter relay | | |
| | (viii) dual ignition distributor ignition switch | | |
| | (ix) external power receptacle, ground/flight switch. | | |
| | **(e) Undercarriage system:** | | B |
| | (i) oleos/shock struts | | |
| | (ii) shimmy dampers | | |
| | (iii) nose wheel steering/castering | | |
| | (iv) retractable undercarriage | | |
| | • uplocks/downlocks | | |
| | • anti-retraction devices | | |
| | • aural/visual warning devices | | |
| | • emergency systems | | |
| | • free fall | | |
| | • electric, hydraulic, pneumatic | | |
| | **(f) Hydraulic system:** | | B |
| | (i) accumulator | | |
| | (ii) actuators | | |
| | (iii) brake master cylinder | | |
| | (iv) check valve restrictors. | | |
| | **(g) Auto-pilot:** | | B |
| | (i) roll attitude heading pitch controls | | |
| | (ii) trim indicator | | |
| | (iii) cut-out mechanisms. | | |
| | ***Note:*** *Includes the possibility of "overpowering" the system and associated precautions.* | | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| | **(h) Fire protection:** | | |
| | (i) typical detectors: | | B |
| | • overheat - thermal switches | | |
| | • rate of temperature rise - thermocouple | | |
| | • flame | | |
| | (ii) typical warning devices: | A | |
| | • lights | | |
| | • audio | | |
| | (iii) types of fire extinguisher and usage | A | |
| | (iv) engine cooling: | | B |
| | • fins | | |
| | • baffles | | |
| | • cowl flaps. | | |
| **2.5** | **Flight instruments** | | |
| 2.5.1 | General: | | |
| | (a) explain the following terms: | B | |
| | (i) pitot-static system | | |
| | (ii) pitot pressure static pressure | | |
| | (iii) alternate static source | | |
| | (iv) pressure error | | |
| | (b) explain the relationship between: | B | |
| | (i) IAS CAS EAS TAS. | | |
| | ***Note:*** *The item listed in 2.5.2 below include some aspects learnt in Training Block 1.* | | |
| | (c) have a basic knowledge of the principle of operation and construction of the: | | C |
| | (i) ASI, VSI, altimeter | | |
| | (ii) artificial horizon, direction indicator, rate of turn indicator, turn co-ordinator. | | |
| 2.5.2 | State the effect of the following factors on the accuracy of pressure instrument indications: | B | |
| | (a) ASI: | | |
| | (i) blockage/leaks (pitot or static) | | |
| | (ii) manoeuvre induced errors (eg sharp pull out from a dive). | | |
| | (b) VSI: | | |
| | (i) blockage of the static source | | |
| | (ii) lag. | | |
| | ***Note:*** *Student should be aware that an IVSI compensates for lag errors.* | | |
| | (c) Altimeter: | | |
| | (i) blockage of the static source | | |
| | (ii) lag | | |
| | (iii) incorrect sub-scale settings | | |
| | (iv) errors due to changes in atmospheric temperature and pressure. | | |
| 2.5.3 | Gyroscopic principles: | | C |
| | (a) describe the gyroscopic properties of rigidity and precession | | |
| | (b) compare the advantages and disadvantages of air driven and electrically driven gyroscopes | | |
| | (c) state the effect on a Directional Indicator of: | | |
| | • apparent wander/drift | | |
| | • maximum at the poles, zero at the equator | | |
| | • transport wander. | | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| 2.5.4 | Direct reading magnetic compass<br>Background knowledge<br>Principle of construction:<br>• magnetic needles point to magnetic north<br>• fluid decreases oscillations and friction<br>- should not contain bubbles<br>• pendulosity of magnet systems causes errors. | | C |
| 2.5.5. | State the effect of the following errors on compass indications in the southern hemisphere:<br>(a) turning errors<br>(b) acceleration errors. | B | |
| 2.5.6 | State the purpose of and use a compass correction card to determine magnetic heading. | B | |
| | **3 – FLIGHT RULES & AIR LAW** | | |
| **3.1** | **Documentation** | | |
| 3.1.1 | Describe the method of obtaining publications and know why it is important to update these documents. | B | |
| 3.1.2 | Given an item of operational significance:<br>(a) select from the list below the appropriate reference document:<br>CAR CAO AIP (Book) CAAP<br>(b) extract relevant and current information from these documents. | B | |
| 3.1.3 | Extract/decode information contained in ERS(A), NOTAMS and AIP supplements. | B | |
| 3.1.4 | Understand the terms and abbreviations in AIP GEN which are relevant to flight in accordance with VFR. | A | |
| **3.2** | **Pilot licences, privileges and limitations** | | |
| 3.2.1 | Know:<br>(a) privileges and limitations of the licence<br>(b) recent experience requirements<br>(c) classification of operations. | A | |
| 3.2.2 | Extract/apply the rules pertaining to flight and duty time limitations for:<br>(a) PPL holders<br>(b) CPL holders. | A | A |
| **3.3** | **Flight rules and conditions of flight** | | |
| 3.3.1 | Select documents that must be carried on board an aircraft during flight in Australian airspace. | B | |
| 3.3.2 | Extract/apply the rules relating to:<br>(a) carriage and discharge of firearms<br>(b) aerodromes where operations are note restricted to runways<br>(c) the conditions relating to flight in PRD areas. | A<br>A<br>B | |
| 3.3.3 | Give examples of situations which would require a "security" prefix prior to a radio call. | B | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **3.4** | **Air service operations** | | |
| 3.4.1 | Extract/apply the rules relating to: | | |
| | (a) a pilot's responsibilities before flight | A | |
| | (b) aerodrome meteorological minima | A | |
| | (c) flights over water and in designated remote areas | A | |
| | (d) carriage of: | B | |
| | (i) cargo | | |
| | (ii) sick and handicapped persons | | |
| | (iii) parachutists | | |
| | (iv) flotation and survival equipment | | |
| | (v) animals | | |
| | (vi) dangerous goods | | |
| | (e) requirement for passenger lists. | | B |
| 3.4.2 | State the requirements to test radio equipment prior to taxi and maintain a listening watch. | A | |
| **3.5** | **Aerodromes** | | |
| 3.5.1 | State a pilot's responsibilities with regard to the use of aerodromes. | C | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **3.6** | **Airspace** | | |
| 3.6.1 | Differentiate between the various classifications of airspace. | B | |
| 3.6.2 | With respect to the terms listed in (a) to (g): | B | |
| | • explain each term and, if applicable.<br>- identify airspace boundaries on appropriate charts<br>- extract vertical limits of designated airspace from charts or ERS(A) | | |
| | (a) flight information service FIR FIA OCTA | | |
| | (b) air traffic control service CTA CTR controlled airspace | | |
| | (c) radio "reports" and "broadcasts" | | |
| | (d) VFR route and lanes of entry | | |
| | (e) PRD areas | | |
| | (f) CTAF(R) areas | | |
| | (g) controlled aerodromes GAAP aerodromes. | | |
| 3.6.3 | Extract/apply permitted tracking tolerances for VFR aircraft to avoid controlled airspace. | B | |
| 3.6.4 | Know the requirements and procedures to be adopted when operating: | | B |
| | (a) in any class of airspace | | |
| | (b) from or into: | | |
| | (i) any licensed aerodrome | | |
| | (ii) a CTAF(R). | | |
| | *Notes: 1. "Requirements" means the need for clearances, reports and broadcasts. 2. "Procedures" means when to request a clearance, make a report/broadcast and pilot action on receipt of an instruction from ATC. 3. THIS TOPIC DOES NOT INCLUDE RADIO PHRASEOLOGY.* | | |
| 3.6.5 | Altimetry: | | |
| | (a) recall the datum from which an altimeter indicates height when the following are set on the sub-scale:<br>• Area QNH<br>• Local QNH<br>• QFE<br>• Standard Pressure Setting | A | |
| | (b) recall the meaning of the following:<br>• transition altitude<br>• transition level<br>• transition layer | | C |
| | (c) recall the procedures that are carried out with the altimeter at the Transition Altitude and the Transition Level on climb & descent | | B |
| | (d) derive the Transition Level for any given area QNH. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **3.7** | **Emergencies, accidents, incidents** | | |
| 3.7.1 | State the conditions under which a pilot may declare a mercy flight and select occasions when a mercy flight must not be undertaken. | B | |
| 3.7.2 | Extract from AIP the responsibilities of a pilot regarding the notification of accidents and incidents. | B | |
| 3.7.3 | (*AIRFLASH PRIORITY* deleted) | A | |
| 3.7.4 | Cite examples of "hazards to navigation" that must be reported by pilots. | B | |
| **3.8** | **Security** | | |
| 3.8.1 | Explain the term ADIZ and extract:<br>(a) the general requirements for operations in this zone<br>(b) the action by the pilot of the intercepted aircraft. | A | |
| 3.8.2 | State the powers vested in a pilot in command. | A | |
| | **4 – RADIO TELEPHONY** | | |
| **4.1** | **Radio** | | |
| 4.1.1 | Know the basic principles of radio wave propagation and recall the appropriate frequency bands for VHF, MF and HF. | | C |
| 4.1.2 | Know the limitations of VHF and HF in terms of quality of reception and range. | B | |
| 4.1.3 | List factors which may affect VHF and HF reception. | B | |
| 4.1.4 | Use appropriate charts/documents to:<br>(a) extract VHF and HF frequencies<br>(b) determine communication coverage. | A | |
| **4.2** | **Transponder** | | |
| 4.2.1 | State the precautions to be observed when selecting codes and extract transponder codes for:<br>(a) radio failure<br>(b) an emergency. | A | |
| 4.2.2 | Given an area of operation decide whether it is necessary to use a transponder. | A | |
| 4.2.3 | State the meaning of the terms SQUAWK, IDENT and CODE. | B | |
| 4.2.4 | Describe the information (if any) that is transmitted when a pilot selects:<br>(a) STBY, ON<br>(b) ALT, IDENT. | B | |
| 4.2.5 | Identify indications of normal and abnormal transponder operation and list factors that affect transponder reception. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **5 – AEROPLANE TYPE KNOWLEDGE** | | | |
| **5.1** | **Aeroplane knowledge** | | |
| 5.1.1 | Prior to cross-country flight training, a student should:<br>(a) list aircraft equipment necessary for the flight<br>(b) demonstrate a knowledge of :<br>(i) tie down procedures<br>(ii) stowage of equipment/cargo<br>(iii) knowledge of location and use of an ELB<br>(iv) an awareness of survival procedures given in ERS(A). | B | |

| | | Standard prior to: PPL Flt Test | Standard prior to: CPL Flt Test |
|---|---|---|---|
| | **6 – AERODYNAMICS** | | |
| **6.1** | **Terminology** | | |
| 6.1.1 | Identify descriptions/drawings of the following terms:<br>• aerofoil span chord camber thickness/chord ratio<br>• relative airflow angle of attack<br>• total reaction lift drag<br>• laminar and turbulent boundary layers. | B | |
| **6.2** | **Design features** | | |
| 6.2.1 | State the purpose of the following design features/controls:<br>• anhedral dihedral aspect ratio sweepback wash-out<br>• wing spoilers flaps vortex generators<br>• trim tabs. | | C |
| **6.3** | **Bernoulli's theorem** | | |
| 6.3.1 | Apply Bernoulli's theorem of constant energy flow to describe how an aerofoil produces lift.<br>***Note:*** *Limited to the variation of kinetic energy (dynamic pressure) and potential energy (static pressure) as air flows through a venturi or over a wing.*<br>*Student should also be aware that the upper surface of a wing generates the majority of lift.* | | C |
| **6.4** | **Changes in angle of attack** | | |
| 6.4.1 | State/identify the effect of changes in angle of attack up to the stalling angle on:<br>(a) pressure changes above and below the wing<br>(b) changes in airflow characteristics streamlined to turbulent<br>(c) lift and drag<br>(d) the boundary layer. | | C |
| **6.5** | **Lift and drag** | | |
| 6.5.1 | State the meaning of the following terms used in the lift and drag formulae viz:<br>(a) $C_L$ and $C_D$ - depend on shape & angle of attack of an aerofoil<br>(b) ½ P $V^2$ - defines dynamic pressure (IAS)<br>(c) S - defines surface area. | | C |
| 6.5.2 | With reference to $C_L$, $C_D$, $C_L/C_D$ graphs identify angles of attack associated with:<br>(a) minimum drag - max level flight speed<br>(b) max lift - stalling angle<br>(c) best $C_L/C_D$ - best glide range and still air range. | | B |
| 6.5.3 | Revise types of drag and state the effect on total drag resulting from changes in IAS, aircraft weight and height. | | B |
| **6.6** | **Manoeuvres** | | |
| 6.6.1 | Draw/identify the forces of lift, weight, thrust and drag acting on an aeroplane in:<br>(a) "steady" level flight<br>(b) a "steady" climb<br>(c) a "steady" descent<br>(d) a balanced level turn. | | C |
| 6.6.2 | State the relationship between speed, bank angle, radius and rate of turn during a balanced level turn. | B | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| 6.6.3 | For a given IAS use the rule of thumb to determine the approximate bank angle for a rate one turn. | B | |
| 6.6.4 | State why: | | B |
| | (a) power must be applied to maintain speed in a level turn | | |
| | (b) an aeroplane tends to overbank in level and climbing turns and not in descending turns. | | |
| 6.6.5 | State: | | |
| | (a) the effect of aileron drag on turn performance at low airspeed | B | |
| | (b) how the following design features offset this drag: | | C |
| | (i) frise ailerons | | |
| | (ii) differential ailerons. | | |
| 6.6.6 | Stalling and spinning: | A | |
| | Review stall topics learnt in Block 1 (item 6.8). | | |
| **6.7** | **Performance considerations** | | |
| 6.7.1 | Give reasons for flying for maximum still air range and endurance. | B | |
| 6.7.2 | List/identify aerodynamic and engine considerations which are required to achieve maximum still air range and endurance when operating an aeroplane with a: | | |
| | (a) normally aspirated engine | B | |
| | (b) turbocharged/supercharged engine. | | B |
| 6.7.3 | From (theoretical) power required and power available graphs identify: | | C |
| | (a) stall speed (power on) | | |
| | (b) best still air range speed | | |
| | (c) best endurance speed | | |
| | (d) maximum level flight speed | | |
| | (e) the region of reverse command. | | |
| | ***Note:*** *The region of reverse command is (sometimes) colloquially described as the "back of the power curve".* | | |
| 6.7.4 | Revise the terms "load factor", "g" and "wing loading" and cite situations that may result in an aeroplane exceeding load factor and wing loading limits. | A | |
| 6.7.5 | Given that certain flight conditions remain constant, state the effect of: | B | |
| | (a) changes in weight and altitude (height) on: | | |
| | (i) angle of attack and IAS in level flight | | |
| | (ii) level flight range and endurance | | |
| | (iii) turn rate and radius | | |
| | (iv) glide range and endurance | | |
| | (b) changes in head/tail wind component on: | | |
| | (i) level flight range and endurance | | |
| | (ii) glide range and endurance | | |
| | (c) changes in power on turn rate and radius. | | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **6.8** | **Stability and control** | | |
| 6.8.1 | State the effect of the factors listed below on the stability and control of an aeroplane in each of the three planes of movement: | | |
| | (a) longitudinal stability: | B | |
| | (i) position of CG | | |
| | (ii) movement of centre of pressure | | |
| | (iii) changes in thrust | | |
| | (iv) tailplane moment. | | |
| | (b) lateral stability: | | B |
| | (i) high versus low set wings | | |
| | (ii) dihedral versus anhedral | | |
| | (iii) sweepback. | | |
| | (c) directional stability: | | B |
| | (i) large fore/aft displacement of the CG | | |
| | (ii) large versus small fin and rudder moment. | | |
| 6.8.2 | Understand the relationship between directional and lateral stability (spiral instability) and state the effect of spiral instability on the control of an aeroplane. | B | |
| 6.8.3 | Recognise statements/diagrams which describe static and dynamic stability. | | C |
| 6.8.4 | Describe the controllability problems associated with flight in the region of reverse command. | B | |
| 6.8.5 | Explain the purpose of: | B | |
| | (a) trim tabs (fixed and cockpit controlled) | | |
| | (b) balance tabs | | |
| | (c) anti-balance tabs | | |
| | (d) aerodynamic balance | | |
| | (e) mass balance. | | |
| 6.8.6 | Explain the function of the items mentioned in 6.8.5 in relation to the movement of a main control surface. | | C |
| **6.9** | **Taxi, take-off and landing** | | |
| 6.9.1 | Describe the stability and control characteristics of nose wheel aeroplanes during ground operation. | | B |
| 6.9.2 | Describe the result of the following factors on the controllability of an aeroplane: | B | |
| | (a) propeller torque and slipstream effect | | |
| | (b) gyroscopic effect | | |
| | (c) asymmetric blade effect. | | |
| 6.9.3 | Describe the term "ground effect" and its effect on aeroplane performance. | B | |

| | | Standard prior to: PPL Flt Test | Standard prior to: CPL Flt Test |
|---|---|---|---|
| | **7 – NAVIGATION** | | |
| **7.1** | **Form of the earth** | | |
| 7.1.1. | In order to apply this knowledge a student should have an understanding of the items listed in (a) to (h) and, if applicable, their effect on:<br>• position on the earth<br>• time differences<br>• distance and direction<br>(a) the shape and rotation of the earth<br>(b) latitude, longitude<br>(c) meridians of longitude, parallels of latitude<br>(d) equator, Greenwich meridian<br>(e) great circles, small circles, rhumb lines<br>(f) difference between true and magnetic north<br>(g) terrestrial magnetism, magnetic variation and the change in variation with time<br>(h) distance on the earth i.e. relationship between a minute of latitude and a nautical mile. | B | |
| **7.2** | **Time** | | |
| 7.2.1 | Explain the terms UTC, Local Mean Time, Local (Standard) Time, Local summer time. | B | |
| 7.2.2 | Extract (within +/- 5 min) the beginning and end of civil twilight from AIP daylight and darkness graphs. | B | |
| 7.2.3 | Carry out conversions between:<br>• LMT, UTC, Local (Standard) times including local summer time | B | |
| 7.2.4 | List factors which may cause daylight to end earlier than the time extracted from AIP darkness graphs. | B | |
| 7.2.5 | Describe the effect of the earth's rotation and revolution around the sun on the:<br>(a) beginning and end of daylight<br>(b) period of daylight. | | C |
| 7.2.6 | Describe the effect of changes in longitude on local mean time. | | C |
| **7.3** | **Charts and publications**<br>***Note:*** *AIP "Visual Charts" refers to the present ERC, VTC and AUS PCA and embraces any subsequent changes to charts required for flight under VFR.* | | |
| 7.3.1 | From AIP "Visual Charts" and ERS(A), select the chart(s) document(s) which contain information about a given item of operational significance. | B | |
| 7.3.2 | Extract/decode symbols and apply information displayed on AIP "visual charts". | B | |
| 7.3.3 | Interpret topographic detail and decode symbols displayed on a WAC and VTC. | B | |
| 7.3.4 | On a WAC and AIP "visual charts":<br>(a) measure rhumb line track<br>(b) measure distance:<br>(i) using chart and latitude scale<br>(c) plot a position given:<br>(i) latitude and longitude<br>(ii) bearing and distance.<br>***Note:*** *Students should also practice techniques to estimate track and distance.* | B | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| 7.3.5 | A CPL student is expected to have a basic knowledge of the theory of map projections and:<br>(a) identify the following properties of a Lamberts Conformal:<br>(i) appearance of rhumb lines, great circles, meridians and the graticule<br>(ii) distortion of shapes & areas<br>(iii) scale variation.<br>(b) describe the methods of representing scale. | | C |
| **7.4** | **Computations:** | | |
| 7.4.1 | Review computations and conversions and:<br>(a) solve GS, distance, fuel used, fuel required, fuel remaining and fuel consumption problems, given appropriate combinations of these factors<br>(b) solve CAS/TAS problems given air temp & pressure height<br>(c) determine HDG, GS and drift given TAS, W/V, TR<br>(d) determine TR given HDG, TAS, W/V<br>(e) solve problems relating to rates/gradients of climb and descent<br>(f) determine TOPC and TOPD position using average airspeed, W/V, and rates of climb/descent. | B | |
| **7.5** | **Pilot Navigation** | | |
| 7.5.1 | Principles of map reading:<br>(a) describe the method of chart orientation<br>(b) list situations when a pilot should read:<br>(i) from map to ground<br>(ii) from ground to map.<br>(c) select appropriate position lines to establish:<br>(i) ground speed<br>(ii) track error<br>(iii) a fix.<br>(d) select appropriate ground features to establish position when flying:<br>(i) at low level (500 ft AGL) | B | |
| | (ii) between (approximately) 2000 and 10,000 ft<br>(iii) over mountainous terrain, coastal areas, densely populated and sparsely populated areas. | | |
| 7.5.2 | Chart preparation and selection (practice):<br>(a) draw tracks, track error lines, time/distance markings<br>(b) given a route:<br>• select WAC(s) and appropriate AIP "visual charts". | B | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| 7.5.3 | With reference to a planned or given track and given appropriate data:<br>(a) determine track made good (TMG)<br>(b) calculate drift<br>(c) determine alteration of heading or HDG(M) to:<br>(i) parallel track<br>(ii) intercept track at a nominated point<br>(iii) maintain track once track is intercepted.<br>(d) revise/confirm estimates or ETA using latest ground speed or time/distance proportion<br>(e) establish a DR position using latest TR & GS.<br>*Notes:*<br>*PPL - Whilst the use of a map plotter is acceptable, students should be taught to employ mental dead reckoning and proportional techniques to solve in-flight navigational problems.*<br>*CPL - A CPL student is also required to:*<br>• *mentally apply the one in sixty rule*<br>• *mentally revise estimates/ETA's*<br>• *estimate TR & ETI to a selected diversion point.* | B | |
| 7.5.4 | Monitor flight progress by maintaining an in-flight navigation log. | B | |
| 7.5.5 | Monitor fuel consumption and revise fuel reserves. | A | |
| 7.5.6 | Plan in-flight diversions:<br>(a) around adverse weather<br>(b) to a suitable aerodrome.<br>***Note:*** *Diversions must address all appropriate items listed in AIP with respect to flight plan amendments.* | A | |
| **7.6** | **Radio Navigation Aids** | | |
| 7.6.1 | Describe how to identify an aid and state the frequency of a nominated NDB or VOR. | B | |
| 7.6.2 | Extract NDB and VOR information from ERS(A) or ERC and state the rated coverage of a VOR up to 10,000 ft. | B | |
| 7.6.3 | State the effect (in Australia) of the following errors on the reliability of ADF cockpit indications:<br>(a) co-channel interference<br>(b) mountain effect<br>(c) effect of thunderstorms<br>(d) coastal refraction. | B | |
| 7.6.4 | Explain why information pertaining to broadcasting stations is included in ERS(A). | | C |
| 7.6.5 | Recall the "aggregate" error of a VOR and explain what is meant by "scalloping". | | C |
| 7.6.6 | Establish a position line given:<br>(a) HDG & ADF data<br>(b) VOR indications. | B | |
| 7.6.7 | Describe how to use the VOR to determine TR to or from a station. | B | |
| 7.6.8 | Describe how to use an ADF or VOR to home to a station, and recognise instrument indications that signify station passage.<br>***Note:*** *CPL students are expected to apply drift when tracking inbound to an NDB.* | B | |
| 7.6.9 | Establish fixes using a DME distance and:<br>(a) HDG & ADF data or<br>(b) VOR indications<br>and use these fixes to make off track corrections. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **8 – AIRCRAFT OPERATION, PERFORMANCE AND PLANNING** | | | |
| **8.1** | **ERS(A)** | | |
| 8.1.1 | Extract/apply all items of information contained in ERS(A) which are relevant to VFR (day) operations. | B | |
| **8.2** | **Aerodromes and Aeroplane Landing Areas (ALAs)** | | |
| | ***Note:*** *ALAs are included as a topic in this syllabus pursuant to a pilot's responsibilities in accordance with CAR 92.* | | |
| 8.2.1 | Explain/apply the following terms used in CASA publications & documents:<br>(a) take-off safety speed<br>(b) take-off distance available (TODA)<br>(c) take-off distance required (TODR)<br>(d) landing distance available (LDA)<br>(e) landing distance required (LDR). | B | |
| 8.2.2 | Determine whether a given is suitable for an aeroplane to take-off and land safety in accordance with guidelines contained in CAAP 92.1. | B | |
| **8.3** | **Density Height:** | | |
| 8.3.1 | Determine density height:<br>(a) given OAT & pressure height<br>(b) using cockpit temp. & an altimeter setting of 1013.2 hPa<br>(c) density altitude charts.<br>**Notes:** The following methods should be taught for (a) and (b):<br>a manual computer flight manual charts or mathematics. | B | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **8.4** | **Take Off & Landing Performance** | | |
| | ***Note:*** *"Completion Standards" and associated "Knowledge Standards" for PPL and CPL students are specified at the end of this topic.* | | |
| 8.4.1 | Use the flight manual to extract maximum structural take-off and landing weights. | A | |
| 8.4.2 | Given a typical flight scenario, use performance charts to extract: | | |
| | (a) maximum take-off weight | A | |
| | (b) maximum landing weight | A | |
| | (c) take-off distance required (TODR) | B | |
| | (d) landing distance required (LDR) | B | |
| | (e) climb weight limit | A | |
| | (f) take-off parameters: | B | |
| | • power, flap setting, take-off safety speed | | |
| | (g) landing parameters: | B | |
| | • flap, threshold speed | | |
| | and state the conditions on which the parameters listed in (f) & (g) are based. | B | |
| | ***Note:*** *The objective in 8.4.2 will require the ability to perform one or more of the following tasks:* | | |
| | *(a) apply information extracted from ERS(A)* | | |
| | *(b) determine TODA and LDA at a ground ALA* | | |
| | *(c) apply the CASA regulatory requirements/orders as applicable to single engine aeroplanes* | | |
| | *(d) extract/derive entry parameters for take-off & landing charts viz:* | | |
| | *(i) temperature and pressure* | | |
| | *(ii) take-off and landing weights* | | |
| | *(e) extract structural weight limits from a flight manual.* | | |
| | **Completion standards for Topic 8.4** | | |
| | **PPL** | A | |
| | The primary requirement is to ensure that safety limits are not exceeded. | | |
| | **CPL** | | A |
| | In addition to the requirement to conform to safety criteria, a student is also required to: | | |
| | (a) demonstrate speed and accuracy | | B |
| | (b) give reasons for imposing climb weight and structural weight limits | | B |
| | (c) calculate: | | B |
| | (i) climb gradient | | |
| | (ii) rate of climb. | | |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **8.5** | **Climb, Cruise and Descent Performance** | | |
| 8.5.1 | From typical charts or tables extract/determine the following data for climb, cruise and descent:<br>(a) time, speed, distance, fuel flow/quantity<br>(b) appropriate engine settings<br>(c) rates of climb/descent<br>(d) the conditions under which an aeroplane will achieve maximum range and endurance. | B | |
| 8.5.2 | Determine the:<br>(a) best air and ground NM/unit of fuel. (eg: 2.5 NM/kg)<br>(b) least fuel/air or ground NM (eg: 0.4 kg/NM).<br>***Note:*** *Fuel units are US gal, kg, litres.* | | B |
| 8.5.3 | Estimate:<br>(a) mid zone weight<br>(b) landing weight<br>(c) take off weight at an intermediate landing point. | | B |
| **8.6** | **Loading** | | |
| 8.6.1 | Explain the following terms:<br>(a) arm, moment, datum, station, index unit<br>(b) centre of gravity (CG) and CG limits<br>(c) mean aerodynamic chord (MAC)<br>(d) empty weight, zero fuel weight (ZFW), ramp weight<br>(e) maximum takeoff and maximum landing weights<br>(f) floor loading limits.<br>***Note:*** *The only requirement for PPL is the application of the information in 8.6.1.* | | B |
| 8.6.2 | Demonstrate the ability to:<br>(a) express CG as a % of MAC<br>(b) determine CG position relative to the datum<br>(c) determine movement of CG with changes in load distribution and mass. | | B |
| 8.6.3 | Given appropriate data use a typical loading system or a load sheet to distribute load to maintain CG within limits throughout a flight<br>***Note:*** *This objective requires the ability to perform one or more of the following tasks:*<br>*(a) extract the following weight limits from a flight manual:*<br>• *empty weight ZFW*<br>• *maximum structural take-off and landing weight*<br>*(b) determine:*<br>• *maximum payload*<br>• *maximum load per station*<br>• *maximum floor loading capacities*<br>• *fore and aft CG limits for a given/derived weight*<br>• *weight of fuel/ballast to be carried.* | | A |

| | | Standard prior to: PPL Flt Test | Standard prior to: CPL Flt Test |
|---|---|---|---|
| | **Completion standards for 8.6.1 to 8.6.3** | | |
| | **PPL** | | |
| | The primary requirement is to ensure that: | A | |
| | (a) the CG is within limits throughout the flight | | |
| | (b) structural and performance limits are not exceeded | | |
| | (c) compartment and floor load limits are not exceeded. | | |
| | **CPL** | | |
| | In addition to the safety standards specified for a PPL, a CPL student is required to: | | A |
| | (a) demonstrate speed and accuracy as defined in knowledge tests/examinations | | |
| | (b) determine: | | |
| | (i) the maximum payload/fuel that may be carried | | B |
| | (ii) ballast requirements if any | | B |
| | (iii) the position of the CG under different load configurations. | | B |
| **8.7** | **Flight Plan Preparation** | | |
| 8.7.1 | Extract/apply the responsibilities of a pilot in command with regard to weather and operational briefing prior to planning a VFR flight. | A | |
| 8.7.2 | Given a route applicable to:<br>• the level of licence<br>• type of operation viz: OCTA/CTA: | | |
| | (a) select appropriate visual charts for the flight | A | |
| | (b) list the operations for which it is mandatory to obtain meteorological and operational briefing | A | |
| | (c) list the weather services available, and nominate the sources and methods of obtaining this information | B | |
| | (d) extract/apply CASA requirements/instructions for flight notification of VFR flights and state the preferred methods of submitting this notification. | B | |
| 8.7.3 | Given an aerodrome forecast determine whether holding or alternate requirements apply and if so:<br>(a) nominate an appropriate alternate aerodrome<br>(b) determine the quantity of additional fuel required for holding or flight to the alternate. | A | |
| **8.8** | **Flight Planning**<br>***Notes:***<br>*1: In the interests of standardisation the domestic flight plan form should be used.*<br>*2. Fuel policy for exam purposes will be as discussed in CAAP 234-1(0). It forms part of the syllabus pursuant to a pilot's responsibility in accordance with CASA regulations.* | | |

| | | Standard prior to: PPL Flt Test | Standard prior to: CPL Flt Test |
|---|---|---|---|
| **8.8.1** | **Completion standard prior to 1st solo nav-ex.** | | |
| | Given: | | |
| | • a typical training navigation route (OCTA/CTA) as applicable) | | |
| | • appropriate weather and operational briefing | | |
| | • aircraft (type) planning data and fuel at start up: | | |
| | (a) select correct (safe) cruise levels | A | |
| | (b) enter information correctly in the flight plan form | B | |
| | (c) submit appropriate flight notification details | B | |
| | (d) determine minimum (safe) fuel and endurance | A | |
| | (e) demonstrate accuracy in computations: | B | |
| | • HDG +/- $5^0$, ETI +/- 2 mins Fuel/Endurance +5% | | |
| | (f) meet the standards specified in Nav topics 7.5.2 to 7.5.6. | | |
| **8.8.2** | **PPL - Completion Standard** | A | |
| | Given: | | |
| | • a departure place and two landing points | | |
| | • weather and operational briefing | | |
| | • passenger and/or baggage requirements | | |
| | • appropriate performance data | | |
| | Complete a Flight Plan form after considering the following aspects: | | |
| | (a) selection of safe route(s) and cruise levels to comply with VFR | | |
| | (b) selection of cruise levels in accordance with the table of cruising levels | | |
| | (c) fuel for the flight, holding fuel, fuel to an alternate aerodrome, and specified reserves | | |
| | (d) weight limitation and aeroplane balance requirements | | |
| | (e) latest departure time. | | |
| | *Notes:* | | |
| | *1. A PPL with OCTA (only) privileges is required to operate OCTA.* | | |
| | *2. A PPL with CTA privileges is required to plan at least one segment to/from a GAAP or primary airport.* | | |
| **8.8.3** | **CPL - Completion Standard** | | |
| | Given a typical commercial task including: | | |
| | • departure and landing points within and/or outside controlled airspace | | |
| | • weather and operational briefing | | |
| | • appropriate performance data: | | |
| | (a) select safe routes to comply to VFR | | A |
| | (b) select cruise levels: | | |
| | (i) to comply with VFR and the table of cruising levels and | | A |
| | (ii) which meet passenger and fuel economy requirements | | B |
| | (c) determine: | | |
| | (i) the minimum (safe) fuel required | | A |
| | (ii) the maximum payload (passengers/cargo and fuel) that may be carried | | A |
| | (iii) whether intermediate refuelling is necessary | | B |
| | (iv) ETD/ETA after considering Day VFR requirements, flight/duty time limitations and commercial considerations | | A |
| | (d) complete a Flight Plan form and a loading system. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **8.9** | **Equi-time Point (ETP), Point of no return (PNR), Diversions** | | |
| 8.9.1 | Cite/recognise situations that may require the calculations of an ETP or PNR. | B | |
| 8.9.2 | Assuming a constant cruise altitude and TAS, indicate the position of an ETP between two points in still air. | B | |
| 8.9.3 | Calculate time and distance to an ETP or PNR between two points, using planned or given data. | | B |
| 8.9.4 | Given fuel on board, use planned/given ground speed to decide which of the following courses of action would require the least fuel (including reserves):<br>(a) proceed to destination<br>(b) return to the departure aerodrome<br>(c) proceed to a suitable alternate.<br>***Note:*** Also refer to Topic 7.5.6 relating to diversions. | B | |
| **8.10** | **Airworthiness and Equipment** | | |
| 8.10.1 | State the purpose of certificates of airworthiness and registration. | B | |
| 8.10.2 | Given a typical scenario, extract from CASA regulations/orders/instructions the communication and normal and emergency equipment required to be on board an aircraft. | A | |
| 8.10.3 | State the responsibilities of a pilot in command with regard to:<br>(a) daily inspections<br>(b) recording/reporting aircraft defects. | A | |
| 8.10.4 | As applicable, determine the types of maintenance that may be carried out by a PPL or CPL holder. | B | |
| 8.10.5 | Given a copy of a maintenance release:<br>(a) determine its validity<br>(b) list the class(es) of operation applicable to the aircraft<br>(c) list outstanding defects/endorsements and decide whether these affect the airworthiness of the aircraft. | A | |

| | | Standard prior to: PPL Flt Test | CPL Flt Test |
|---|---|---|---|
| | **9 – METEOROLOGY** | | |
| | ***Note:*** *Reference documents:*<br>• *AIP, Manuals of Meteorology, ERS(A)* | | |
| **9.1** | **Composition of the atmosphere** | | |
| 9.1.1. | Student should know the following vertical divisions in the atmosphere:<br>(i) troposphere, tropopause, stratosphere<br>(ii) that most weather effects occur below the stratosphere. | B | |
| 9.1.2 | In the standard atmosphere, recall:<br>(a) sea level temperature and pressure<br>(b) temperature and pressure lapse rates in the troposphere. | B | |
| **9.2** | **Heat, temperature, pressure and humidity** | | |
| 9.2.1. | A student should:<br>(a) describe the method of measuring surface air temperature, and know that actual temperatures may be much higher eg, above a runway | A | |
| | (b) know the meaning of the following terms:<br>(i) isotherm, temperature inversion<br>(ii) radiation, advection, convection, conduction<br>(iii) isobar, horizontal pressure gradient<br>(iv) saturated air, relative humidity, dew point<br>(v) evaporation, condensation, freezing. | B | |
| 9.2.2 | List the effect of changes in temperature, pressure and humidity on air density. | A | |
| 9.2.3 | List factors that influence the diurnal variation of surface air temp & explain the temp gradient between land and sea surfaces. | | C |
| **9.3** | **Atmospheric Stability** | | |
| 9.3.1 | Differentiate between stable, unstable and conditionally atmospheric conditions.<br>*Notes: PPL - a basic understanding may be necessary to meet the requirements of Item 9.8.1(j).*<br>*CPL - A basic understanding of adiabatic process and the parcel method of assessing stability is required.* | | C |
| **9.4** | **Clouds and Precipitation** | | |
| 9.4.1 | Identify and "classify" cloud "types".<br>Classifications required are:<br>• high, medium, low<br>• cumuliform, stratiform<br>Examples of "type" are Cu, Ci etc. | B | |
| 9.4.2 | State the standard abbreviation for each cloud type, and the method used to report cloud amount. | B | |
| 9.4.3 | Describe the weather associated with each cloud type. | B | |
| 9.4.4 | Differentiate between drizzle, rain, showers and virga.<br>***Note:*** *A general description will suffice ie, actual droplet size is NOT required.* | B | |
| 9.4.5 | Select statements that describe the conditions necessary for the formation/dispersal of various types of cloud. | | B |

| | | Standard prior to: | |
|---|---|---|---|
| | | **PPL Flt Test** | **CPL Flt Test** |
| **9.5** | **Visibility** | | |
| 9.5.1 | Know the method used in meteorological forecasts and reports to determine visibility. | B | |
| 9.5.2 | Describe the term "runway visual range". | B | |
| 9.5.3 | Give reasons for differences between "in-flight" and "reported" visibility. | B | |
| 9.5.4 | List meteorological factors that will reduce in-flight visibility. | B | |
| **9.6** | **Winds – General** | | |
| 9.6.1 | Describe the relationship between pressure and wind and apply Buys Ballot's law to assess the approximate location of high and low pressure systems. | B | |
| 9.6.2 | Differentiate between:<br>(a) squalls and gusts<br>(b) backing and veering. | B | |
| 9.6.3 | Compare surface and gradient winds in terms of direction and strength. | B | |
| 9.6.4 | List the "factors" that effect the diurnal variation of wind and describe typical "variations" in surface wind strength during a 24-hour period. | B | |
| **9.7** | **Air Masses and fronts** | | |
| 9.7.1 | Describe typical "flying weather" associated with:<br>(a) cold fronts<br>(b) warm fronts<br>(c) wave depressions<br>(d) occluded fronts<br>(e) tropical cyclones<br>(f) the equatorial trough.<br>***Note:*** *In 9.7.1 above, "flying weather" embraces:*<br>• *temperature (warmer/colder)*<br>• *wind changes (back/veer, stronger/weaker)*<br>• *stability and turbulence*<br>• *cloud type and approximate amount, precipitation.* | B | |
| **9.8** | **Flight Considerations** | | |
| 9.8.1 | With respect to the phenomena listed below:<br>• state the conditions favourable to their development and where applicable, their dispersal<br>• recognise signs which may indicate their presence<br>• describe their effect on flight characteristics<br>• where applicable, state the pilot actions required to minimise their effect on an aircraft in flight:<br>(a) thermals, turbulence<br>(b) dust devils and dust storms<br>(c) wind gradient, wind shear and low level jetstreams<br>(d) anabatic and katabatic winds<br>(e) mountain waves and fohn winds<br>(f) land and sea breezes<br>(g) inversions and fog<br>(h) thunderstorms and microbursts<br>(i) downdrafts associated with terrain/cloud<br>(j) atmospheric stability and instability<br>(k) hoar frost, rime, and clear airframe ice<br>(l) tropical cyclones, tornadoes. | B | |

| | | Standard prior to: PPL Flt Test | Standard prior to: CPL Flt Test |
|---|---|---|---|
| **9.9** | **Synoptic Meteorology** | | |
| 9.9.1 | Given a Mean Sea Level analysis chart, identify:<br>(a) high and low pressure systems<br>(b) a trough, a ridge, a col<br>(c) warm, cold and occluded fronts<br>(d) a tropical cyclone<br>(e) approximate wind direction. | B | |
| 9.9.2 | Describe typical weather characteristics associated with the items listed in 9.9.1 (a) & (b) above.<br>*Notes: Items (c) & (d) are covered in 9.7.1*<br>*"Weather characteristics" means:*<br>• *approx wind direction*<br>• *moisture content (dry/humid)*<br>• *cloud: stratiform and cumuliform*<br>• *clear skies*<br>• *turbulent or smooth air*<br>• *good or poor visibility.* | B | |
| **9.10** | **Weather Services** | | |
| 9.10.1 | For given locations, determine from CASA documents the availability of aviation forecasts, meteorological reports and weather briefing and state the method of obtaining this information.<br>***Note:*** *Also included in Flight Planning* | B | |
| 9.10.2 | State/select the conditions under which it is mandatory to obtain a forecast. | A | |
| 9.10.3 | With reference to CASA documents, extract, decode and apply information contained in an ARFOR, TAF, TTF, METAR, SPECI, AIRMET, SIGMET.<br>***Note:*** *Decode means the ability to:*<br>• *decide whether a particular forecast is valid for a flight*<br>• *interpret any coded information into plain language.* | A | |
| 9.10.4 | Given typical weather briefing, evaluate weather information applicable to a flight, and:<br>(a) assess likely changes in weather during the flight<br>(b) list phenomena which may adversely affect the flight.<br>***Note:*** *"weather" is defined in 9.9.2 and includes "fine weather".* | B | |
| 9.10.5 | List the conditions that require a pilot to submit a short AIREP. | B | |
| 9.10.6 | State the purpose of VOLMET and ATIS broadcasts indicate how this information is obtained and apply this information to practical scenarios. | B | |
| 9.10.7 | State what is meant by a Hazard Alert service. *(This is an updated description of the previous TAT or TAST).* | B | |
| **9.11** | **Climatology** | | |
| 9.11.1 | Describe typical seasonal weather conditions in different regions of Australia with reference to:<br>(a) visibility (good/poor)<br>(b) prevailing winds<br>(c) typical cloud patterns and precipitation<br>(d) seasonal pressure and frontal systems including the ITCZ and equatorial trough<br>(e) tropical cyclones. | B | |

## 10 – RECOMMENDED PRE-STUDY

10.1 A knowledge of mathematics and physics is necessary to meet the aeronautical knowledge objectives in this syllabus. The subjects are not examined independently, but applicants below standard in mathematics and physics are advised to seek tuition until they are able to meet the laid down objectives. Failure to do so may make the aeronautical knowledge objectives difficult to achieve.

10.1.1 For MATHEMATICS the requirement is to solve problems requiring the use of:

(a) basic arithmetic:
- (i) vulgar fractions
- (ii) decimal fractions
- (iii) percentages
- (iv) averages
- (v) squares.

(b) ratio and proportion:
- (i) direct and inverse proportion
- (ii) representative fractions.

(c) circular slide rule:
- (i) multiplication and division
- (ii) conversion problems between the following units: nautical miles, statute miles and kilometres degrees Fahrenheit and degrees Celsius pounds and kilograms litres, imperial gallons and US gallons
- (iii) squares and square roots.

(d) basic trigonometry:
- (i) sine, cosine and tangent
- (ii) simple problems involving solution of right-angled triangles.

10.1.2 For PHYSICS the requirements are:

(a) solve problems relating to time, speed (velocity) and distance

(b) define velocity, acceleration, weight, mass, force, momentum, work, energy, power, static equilibrium, density, specific gravity and pressure

(c) solve graphically the wind triangle

(d) solve problems relating to the principle of moments and centre of gravity

(e) given the specific gravity and fuel quantity calculate fuel weight

(f) basic electrical principles as applicable to aircraft systems:
- (i) units of measurement for:
  current, voltage, resistance, capacity, power
- (ii) typical methods of electrical generation
- (iii) difference between AC and DC:
  typical aircraft components

(g) basic principles of hydraulics.

# AMENDMENTS TO DAY VFR SYLLABUS

## (HUMAN PERFORMANCE AND LIMITATIONS)

**Effective from:**

01 March 1996

**Relevant Section of the Syllabus:**

- (AEROPLANES), Section 3, Block 2*, Subsection 11
- (HELICOPTERS)**, Section 3, Subsection 11

**Notes:**

*The HPL subject, though grouped under Block 2 of the Aeroplane syllabus, must **NOT** be considered as peculiar only to this Block/stage of training. **Instructors and candidates shall refer to the performance standard required for each topic item at the respective phase of flight training.**

** The Helicopter syllabus has only four stages of flight training denoted, as opposed to five for that of the Aeroplane. The stages listed in this amendment follow the Aeroplane syllabus, and where "Ist Solo" and "Ist Area Solo" are denoted, these shall be considered as equivalent to the Helicopter's "Student Pilot Licence Solo Only (S)".

**CASA Examinations:**

HPL will be examined in CASA examinations at both the PPL and CPL level.

**Performance Standard:**

Definition of the level of knowledge required:

| STANDARD | LEVEL | DESCRIPTION |
|---|---|---|
| A | Essential | Must be known completely relates directly to the safety of the aeroplane and occupants. |
| B | Important | Must be known in considerable depth relates to the efficient and practical operation of an aeroplane. |
| C | Additional | Pre-PPL background knowledge only<br>PPL basic principles should be known<br>CPL should be known in considerable depth. |

***Notes:***

- *Where a sequence is left blank, the preceding standard (to the left) is to apply*
- *Where the standard is notated against the topic item heading, this standard applies to the whole paragraph, except where different standards are applied to a sub-item*

**Study Reference:**

PPL: "Air Craft - Human Performance & Limitations" by Tony Wilson***

CPL: "Air Craft - Human Performance & Limitations" by Tony Wilson***, and
"Human Factors for Pilots" by Roger C Green et al.

***Note:***

*** *The "contents page" of Tony Wilson's book give the INCORRECT impression that certain topics need not be studied and therefore will not be examined, for certain licence level. For example, one could draw the erroneous conclusion that the topic of "alcohol and other drugs" is only pertinent at the PPL level, and not at the more basic stages of flight training or that the topics of the "Ear and Eye" will only be learnt and examined at the CPL level.* ***Instructors and candidates must refer to the performance standards denoted.***

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
|---|---|---|---|---|---|---|
| **11.1** | **Basic health** | | | B | | A |
| 11.1.1 | Know the effect and importance on pilot performance of the following factors:<br>(a) diet, exercise<br>(b) coronary risk factors - smoking, cholesterol, obesity, hereditary factors<br>(c) upper respiratory tract infection eg. colds, hay fever, congestion of air passages and sinuses<br>(d) food poisoning and other digestive problems<br>(e) headaches and migraines<br>(f) pregnancy:<br>• when to stop flying<br>• impact on cockpit ergonomics<br>(g) injuries<br>(h) ageing<br>(i) alcohol and smoking<br>(j) blood donations<br>(k) dehydration<br>(l) emotional<br>• anxiety, depression, fear. | B<br><br><br><br><br><br><br><br><br><br><br><br><br><br>A | | | A | |
| 11.1.2 | Know that a pilot is not to fly when on any medication unless a medical clearance from a DME has been obtained. | A | | | | |
| 11.1.3 | Know the responsibilities of pilots with regard to being medically fit for flight. | | | B | A | |
| **11.2** | **Reserved** | | | | | |
| **11.3** | **Health and fitness** | | | | | |
| 11.3.1 | Know the:<br>(a) reasons for and frequency of physical examinations and that a CASA network of Designated Aviation Medical Examiners (DAMEs) exists<br>(b) process of obtaining a medical examination<br>(c) role of the CASA with regard to medical fitness and that only those conditions which present a flight safety hazard are disqualifying. | | | C | B | A |
| 11.3.2 | **Alcohol:**<br>(a) Explain how alcohol is absorbed and excreted<br>(b) state **and** explain what a 'hangover' is<br>(c) explain the effect a 'hangover' may have on flying performance<br>(d) explain the relationship between a 'hangover' and level of blood alcohol in a person<br>(e) explain the relationship between the level of blood alcohol and the recovery period from a 'hangover'<br>(f) state the factors that affect the elimination of alcohol from the body and describe the effects of illicit drugs and alcohol on proficiency eg:<br>• judgement, comprehension, attention to detail<br>• the senses, co-ordination and reaction times. | C | | B | | A |
| 11.3.3. | **Drugs:**<br>Explain that:<br>Drug abuse is a behavioural problem and is independent of<br>• dependence (addiction)<br>• frequent use.<br>Define illicit or non-illicit psychoactive substances. | C | | B | | A |

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
|---|---|---|---|---|---|---|
| | Explain the adverse effects of illicit or non-illicit psychoactive substances.<br>Explain the effects and duration of such effects on human performance related to perception, speed of processing information, and reaction time of such drugs as:<br>• cannabis-based substances eg, marijuana, ganja<br>• amphetamine-based substances eg, Ecstasy<br>• opium-based substances eg, codeine, heroin.<br>Have a broad knowledge of the undesirable effects of over-the-counter and prescription drugs. In particular, the side effects of:<br>• aspirin, antihistamines, nasal decongestants<br>• amphetamines, tranquillisers, sedatives, antibiotics. | | | | | |
| 11.3.4 | **Blood donations:**<br>(a) state the effect on flying after giving a blood donation<br>(b) state the recommended period between giving blood and the next flight and know that this period can vary between individuals. | C | | B | | A |
| **11.4** | **Hyperventilation** | C | B | | | A |
| 11.4.1 | Know how to recognise and combat hyperventilation. | | | | | |
| 11.4.2 | Know what hyperventilation is and its causes. | | | | | |
| **11.5** | **Atmospheric pressure changes** | C | B | | | A |
| 11.5.1 | Trapped gases:<br>(a) know the effect of changes in pressure on gases trapped in the body cavities<br>(b) describe the effect on normal bodily function<br>(c) state/list measures for prevention/treatment. | | | | | |
| 11.5.2 | Know the effects of flying after a period of underwater diving and state the precautions to be taken if intending to fly after underwater diving. | | | | | |
| **11.6** | **Basic knowledge of the anatomy of the ear** | | | | | |
| | (a) Know its function in receiving sound transmissions | | | | B | |
| | (b) explain the purpose of the Eustachian tube and effects of atmospheric/cabin pressure changes | C | | B | | A |
| | (c) state the effects of noise exposure on:<br>• hearing loss: long/short term<br>• speech intelligibility<br>• fatigue | C | | | B | |
| | (d) describe recommended methods of hearing protection. | C | | B | | |
| **11.7** | **Vision, spatial disorientation, illusions** | | | | | |
| 11.7.1 | Have a basic knowledge of the anatomy of the eye and its function during the day and at night. | | | C | B | |
| 11.7.2 | Know the factors that affect night vision and identify methods of "dark adaptation". | | | C | B | A |
| 11.7.3 | Describe the limitations of the eye in discerning objects at night and the "off-centre" method of identifying objects at night. | | | C | B | A |
| 11.7.4 | Know the limitations of the eye with respect to:<br>(a) the ability to discern objects during flight eg.<br>• other aircraft, transmission lines etc<br>(b) empty field myopia<br>(c) glare<br>(d) colour vision in aviation | C | B | | | A |

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
|---|---|---|---|---|---|---|
| | (e) common visual problems, viz: | | | | | |
| | • myopia, hyperopia, astigmatism, presbyopia | | | | | |
| | (f) rotor flicker and its effects (helicopters only). | | | | | |
| 11.7.5 | Be aware of the importance of: | | | C | C | |
| | (a) seeking experienced professional advice for spectacles prescriptions | | | | | |
| | (b) selecting suitable sunglasses. | | | | | |
| 11.7.6 | Know of the factors which are conducive to mid-air collisions and describe/practice techniques for visual "scanning". | C | B | | A | |
| 11.7.7 | Understand and define the term "disorientation". | | C | B | | A |
| 11.7.8 | Know the sensory systems involved in maintaining body equilibrium ie. that: | | | | | |
| | • equilibrium is normally maintained by use of the eyes, inner ear and proprioceptive system ("seat of pants"). | C | | B | A | |
| 11.7.9 | Understand that these mechanisms were developed for use by land based mammals and do not provide reliable information under all conditions of flight. | C | | | B | A |
| 11.7.10 | Describe illusion(s) that may be associated with the factors listed below: | | | C | B | A |
| | (a) "leans" | | | | | |
| | (b) linear and angular accelerations | | | | | |
| | (c) unperceived changes in the pitch roll yaw | | | | | |
| | (d) autokinetic illusions | | | | | |
| | (e) "graveyard spin" illusion. | | | | | |
| | (f) somatogravic illusion. | | | | | |
| 11.7.11 | Know: | | | | | |
| | (a) that sensory illusions usually occur when external visual clues are poor or ambiguous and that they are predictable | | | C | B | |
| | (b) the importance of an artificial visual reference system and a pilot's ability to use the system | | | C | B | A |
| | (c) the factors that may make a person more susceptible to disorientation | | C | | B | |
| | (d) how to overcome sensory illusions. | | C | B | A | |
| 11.7.12 | Know what illusions may result from the following flight factors: | C | | B | | A |
| | (a) false horizontal clues eg: | | | | | |
| | • sloping cloud formations and sloping terrain | | | | | |
| | (b) depth perception eg: | | | | | |
| | • flying over water, snow, desert and other featureless terrain | | | | | |
| | • effect of fog haze dust | | | | | |
| | (c) optical characteristics of windscreens | | | | | |
| | (d) landing illusions: | | | | | |
| | • approach angles: steep shallow | | | | | |
| | • width and slope of runway | | | | | |
| | • slope of (approach) | | | | | |
| | • terrain approaches over water | | | | | |
| | (e) relative motion between objects. | | | | | |
| **11.8** | **Motion sickness** | | C | B | | |
| 11.8.1 | State the basic cause of motion sickness | | | | | |
| 11.8.2 | List factors which may aggravate motion sickness. | | | | | |
| 11.8.3 | List methods of combating motion sickness in flight. | | | | | |

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
|---|---|---|---|---|---|---|
| **11.9** | **Acceleration "g" effects**<br>Know the effects of positive & negative accelerations on the human body include:<br>(a) on the cardiovascular systems<br>(b) vision and<br>(c) consciousness. | | C | B | | |
| **11.10** | **Toxic hazards** | C | B | | A | |
| 11.10.1 | Know the sources, symptoms, effects and treatment of carbon monoxide poisoning. | | | | | |
| 11.10.2 | Know the effect of breathing air contaminated by fuel and other noxious or toxic aviation products. | | | | | |
| **11.11** | **The atmosphere and associated problems** | | C | | B | A |
| 11.11.1 | State the chemical composition of the atmosphere and recall the variation of temperature and pressure with altitude. | | | | | |
| 11.11.2 | Have a basic concept of the circulatory and respiratory systems in terms of the distribution of oxygen and the excretion of carbon dioxide. | | | | | |
| 11.11.3 | Describe what is meant by the partial pressure of oxygen. | | | | | |
| **11.12** | **Hypoxia** | | C | B | | A |
| 11.12.1 | (a) List the causes of hypoxia and recognise the symptoms of hypoxia particularly:<br>• its effect on night vision<br>• the dangers of behavioural changes eg. lack of self criticism, over-confidence & a false sense of security<br>(b) know that symptoms are difficult to detect in healthy individuals and can develop much faster at higher altitudes – eg. 14,000 ft.<br>(c) list factors which may increase a person's susceptibility to hypoxia<br>(d) state the approximate time of useful consciousness (Effective Performance Time: EPT) at 20,000, 25,000 and 30,000 feet and list factors which affect EPT<br>(e) list methods of combating various forms of hypoxia. | | | | | |
| **11.13** | **Human factors considerations:** | | | | | |
| 11.13.1 | Know the basic concepts of information processing and decision making including:<br>(a) how sensory information is used to form mental images<br>(b) the influence of the following factors on the decision making process:<br>• personality traits eg. introvert/extrovert<br>• pride, peer pressure, employer pressure<br>• the desire to get the task done<br>• anxiety, over-confidence, boredom, complacency<br>• types of memory - long/short term<br>• memory limitations<br>• aides memoire, rules of thumb<br>• work load/overload<br>• skill, experience, currency. | | C | | | B |
| 11.13.2 | Discuss the general concepts behind decision-making and the methods of enhancing decision-making skills. | | C | | | B |
| 11.13.3 | Concepts of Stress:<br>(a) know the interaction between stress and arousal and the effects of short and long term stress on pilot performance and health | | | C | B | |

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
|---|---|---|---|---|---|---|
| | (b) know the symptoms, causes and effects of environmental stress<br>• working in an excessively hot, cold, vibrating or noisy environment<br>(c) know the symptoms and effects of domestic and work related stress<br>(d) know the effects of stress on performance<br>(e) know the principles of stress management eg.<br>• cognitive/behavioural techniques<br>• relaxation<br>• time management | | | | | |
| 11.13.4 | Concepts of Fatigue<br>(a) identify causes of fatigue and describe its effects on pilot performance<br>(b) differentiate between acute and chronic fatigue<br>(c) discuss coping strategies eg<br>• sleep management<br>• relaxation<br>• fitness and diet | | | C | B | |
| 11.13.5 | Basic Ergonomics<br>(a) discuss principles of control design and the design features of conventional and modern displays<br>(b) discuss problems associated with:<br>• poorly designed controls/positioning of controls<br>• interpreting instrument presentations<br>(c) know the following information regarding safety harnesses:<br>• types, how to assess their maintenance<br>• inertia reels, how to assess their maintenance | | | | C | |
| 11.13.6 | Basic Principles of Crew Co-ordination<br>(a) discuss factors which:<br>• influence verbal and non-verbal communication between flight deck crew viz:<br>o barriers to communication<br>o listening skills<br>o assertion skills<br>• affect the decision making process viz:<br>o communication - attitude<br>o personality<br>o judgement<br>o leadership style<br>(b) discuss ideal leadership qualities<br>(c) review aircraft accidents which resulted from poor crew co-ordination. | | | | C | |
| **11.14** | **Principles of first aid and survival**<br>The student should be aware of the first aid and survival information contained in ERS(A) and preferably be exposed to practical instruction in the terms of first aid given in this document. | | | C | B | |

| | 11 – HUMAN PERFORMANCE AND LIMITATIONS | 1st Solo | 1st Area Solo | GFPT BAK | PPL | CPL |
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| **11.15** | **Threat and Error Management** | | | | | |
| | Basic principles of TEM | | | | | |
| | (a) Explain the principles of TEM and detail a process to identify and manage threats and errors during single pilot operations. | | C | A | | |
| | (b) Define 'threat' and give examples of threats. | | | A | | |
| | (c) Give an example of a committed error and how action could be taken to ensure safe flight. | | C | B | A | |
| | (d) Explain how the use of checklists and standard operating procedures can prevent errors. | | B | A | | |
| | (e) Give examples of how an undesired aircraft state can develop from an unmanaged threat or error. | | | B | | |
| | (f) Explain what resources a pilot could identify and use to avoid or manage an undesired aircraft , state such as being lost or entering adverse weather. | | C | A | | |
| | (g) Explain the importance of ensuring that tasks are prioritised to manage an undesired aircraft state. | | C | A | | |
| | (h) Give examples of how establishing and maintaining interpersonal relationships can promote safe flight | | | B | | |

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