

# The Honourable Company of Air Pilots



## SEP Rating Training Programme

*AltMoC1.FCL.210;215 and AMC1 FCL.725(a)*

Validated by the UK CAA



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## *EU SEP Flight Training Programme*

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## **Introduction**

This document provides Training Organisations with a basic programme to complete a syllabus of training for the issue of a SEP (Land) rating. The Lesson Plans produced by the Honourable Company of Air Pilots provide expanded guidance for those instructors using this programme.

The programme forms a coherent series of ground and airborne lessons which not only teach or revise the SEP Skill Test components in Part-FCL Annex 9, but also revise or update previous training.

Local procedures and individual training needs will affect the time and number of flights required to complete individual exercises. The variables of aircraft class and type, student ability, local airspace considerations and weather will ultimately dictate the teaching methods, the construction of each flight lesson, the time taken and the exact order of events.

This training programme is based on the following assumptions:

- I. The student has good aptitude and natural ability and will be conducting the training on a regular basis.
- II. The aircraft is a simple single engine aeroplane, with a fixed pitch propeller, carburetted engine with manual mixture control, fixed undercarriage and basic avionics.
- III. The training aerodrome is outside controlled airspace with an Air Traffic Service available.
- IV. Controlled airspace and other suitable airfields with and without ATC/RADAR are located nearby for training purposes.

If the facilities of the training organisation differ from the above, adjustments to the lessons should be incorporated to provide effective training for the student.

### **Programme Structure**

The programme includes aircraft familiarisation, navigation and the other more advanced handling and safety exercises required before Skill Test.

### **Progress Checks**

There are no formal progress checks included in this training programme.

### **Pre-Entry Requirements:**

The student must already hold at least a PPL (A) before commencing training on the SEP rating course, but it is anticipated that he or she will hold a Commercial licence. The following points should be noted and applied where applicable:

A student pilot shall not fly solo unless specifically authorised and supervised by a flight instructor. (Part FCL.020 refers).

### **Credits for Previous Experience**

The needs of students with previous experience in aeroplanes of the Single Engine Piston or Single Engine Turbine classes should be assessed by a senior member of the instructional staff and any credit applied and/or lessons already completed should be annotated accordingly on their progress sheets.

## Theoretical Knowledge

During the Skill Test for rating issue, Part-FCL.725(b)(3) requires the examiner to conduct an oral examination. The course for the licence already held by the student should have taught all theoretical knowledge subjects to at least the PPL level. However, not all the syllabus may have seemed relevant at the time, and some items may have been forgotten. The course begins with ground lessons on aircraft general knowledge, and revision on visual navigation techniques and other relevant subjects taken from Alt MoC1.FCL.725. Briefings and debriefings should refresh or confirm the remainder of the syllabus at FCL.725(a) as the course progresses.

## Threat & Error Management

The philosophy of Threat & Error Management should be applied and taught throughout the course in conjunction with the DTO's basic Safety Management System (SMS). At the beginning of the training programme a list of potential relevant Threats, Errors and Mitigations/Undesired Aircraft States is given. Within each lesson plan, specific Threats and/or Errors particular to that lesson are specified for consideration & discussion.

The array below summarises the threats and human errors that are always present, note that this list should not to be taken as exhaustive. These threats & errors are assessed using the tables listed after the array; the Risk Severity table (3.5.1.2) and the Risk Likelihood table (3.5.2.2) and are summarised by reference to the Risk Tolerability Table (3.5.4). The scale used is ranged 1–5. The number entered into the 'Risk' column of the array below is the result following mitigation not the original value that may have been given to the threat or error. This methodology shows how TEM can effectively reduce the risk to an acceptable level by appropriate mitigation techniques and procedures. The "Lesson Input" column of the array suggests appropriate lessons where teaching of the particular TEM element from the array may be considered.

After each lesson TEM teaching & learning can be enhanced if both instructor and student take a few minutes to reconsider what threats, errors and/or undesired aircraft states were encountered during the lesson. Discussion may be useful to consider how well they were managed and what could have been done differently to improve the management of those threats and errors.

Where appropriate a safety report, as part of the SMS may be a useful method of sharing the experiences with others within the organisation.

In addition, instructors should, whenever possible during the course, use unplanned threats or errors (simulated if necessary), to allow the student to develop decision making skills.

Threat	Consequence	Mitigation	Error	Consequence	Mitigation	Risk: 1 -5	Lesson input
<b>Uncontrolled flight and operations.</b>	Taxiing collision. Deviation from flight profile: CAS bust & CFIT	Determine PIC: who has control and when.	Failure to establish the Pilot in Command; failure to recognise: control input confusion / no one has control	Conflicting control inputs leading to loss of controlled flight/taxi.	Ensure who is PIC and when: Control handover procedures: Verbalise: "I have control", "you have control"	5 reduced <b>1</b>	All
<b>Other aircraft</b>	Collision / loss of control while avoiding	<b>LOOKOUT:</b> Correct scanning techniques. Left/right and above/below. Weaving and clearing turns. <b>CLOCK CODE</b>	Rushed & incomplete scan. Eye blind spots/visual field limits. Failure to recognise closing flight paths & speeds. Poor communications	Conflict aircraft unseen. Avoiding action too late.	Training to understand the limitations of sight & training in collision avoidance procedures & techniques. Skills in clear articulate communications.	5 reduced <b>2</b>	All
<b>Un-forecast winds, Weather/low cloud and poor visibility.</b>	CFIT, breach of CAS, Becoming lost. Fuel exhaustion.	<b>MAP READING</b> skills. Flight planning; <b>Safe altitude.</b> <b>Heading &amp; Time,</b> Positive fixes. Magnetic compass checks. Lost procedures. Radio aids and GPS skills. Minimum safe Operating Altitude	Poor flight planning. Incorrect reading of the map; Misidentification of features, Compass alignment & reading errors. Incorrect use of radio aids/GPS. Work rate overload	Entry into cloud. Disorientation; spatial/situational awareness lost - unsure of position. Degradation of confidence. Natural senses unreliable. Overload. CFIT	Continuous Lookout; situation/spatial awareness skills. Use of ATS. Priority of actions: aviate, navigate – communicate. Trust instruments.	5 reduced <b>2</b>	EX 6 -10, EX 18
<b>Airframe Structure and component Overstress</b>	Airframe/ Component failure.	Aircraft maintenance schedule. Flight time limits: Inspection, servicing and replacement. Vne, Vno Va & Vfe	No/ poor pre-flight inspection. Unrecognised flight Limits. Exceeding VNE. Operation of flap/gear outside limits.	Miss-diagnosis. Incorrect response causing further alarm & confusion..	Understand PIC responsibilities. Check A. Documentation & checklist. Knowledge of aircraft limitations.	5 reduced <b>1</b>	All
<b>Exceed engine limits</b>	Engine failure. Engine malfunction	FREDA, Engine management; Monitor; Power/Prop limits, mixture, Oil Ts & Ps	Failure to undertake, understand & monitor instruments & gauges. No routine checks.	Forced landing or unplanned diversion	FREDA, Climb/descent pre-entry checks	4 reduced <b>2</b>	All

Continued..

<b>Carburettor icing.</b>	Engine failure/loss of power	FREDA checks. Identify ice/no ice.	Complacency: failure to ensure ice not present or eradicated. Icing undetected. No routine check.	Engine failure/loss of power. Work overload.	Applying Carb. Ht: from indications check to identify ice present. Allow Sufficient time for heat to purge ice.	4 reduced <b>2</b>	All
<b>Engine malfunction/failure</b>	Reduced/total loss of power	Pre-flight and power checks. FREDA checks. Engine instruments monitored, mixture settings and temperatures managed. Forced landing drills.	Rushed or skimmed pre-flight check. Oil dipstick unsecured. Power checks rushed or not completed. Failure to complete FREDA. Miss-management of mixture or temperatures. Forced landing procedures not followed.	Unable to maintain height. Forced landing: Loss of control, poor landing site selection. Severe damage, personal injury/fatal	Know and follow checks. Actually check – not just a routine. Refer to engineer ANY faults found prior to flight. Report post flight. In-flight malfunction; more likely to be action / inaction by the pilot – double check.	5 reduced <b>3</b>	EX16/17
<b>The intended/unintentional Stall/spin</b>	Potential for loss of control. Impact with the surface.	HASELL checks. Recovery techniques. Weight & balance Calculations.	Loose items in cockpit: incapacitate crew / restriction of controls. Insufficient height to recover from stall.	Jammed controls. Loss of control. Loss of Spatial & situational awareness. Serious injury/fatal	HASELL, Pre-stall/stall recognition signs. Identification. Terrain clearance. Power and speed maintenance. Stall avoidance /recovery	5 reduced <b>3</b>	Ex 10/11
<b>Propellers</b>	Serious injury/fatal	Propeller handling. Stationary & rotating. Magnetos earthed (off). Mixture fully lean. Electric master off. Brakes and chocks.	Failure to follow propeller pre-handling procedures and poor/ no passenger safety brief given. Failure to ensure area clear of personnel and obstructions.	Serious injury/fatal. Propeller damage. Engine shock loaded.	Ensure area clear around aircraft pre-flight. Brief passengers regarding dangers and apron conduct. Ensure taxi path clear.	5 reduced <b>2</b>	EX 1-5
<b>Surface obstructions / taxiing/parked aircraft</b>	Collision with other aircraft and surface obstructions.	Ensure area clear to taxi. Brakes checked immediately on taxiing. Controlled taxi speed. Maintain centre line markings.	Failure to check brakes. Taxiing too fast. Not maintaining centre lines. “Squeezing” between aircraft. Poor communications	Collision. Departure from taxiways. Ground loop/tip onto propeller following heavy braking.	Ensure taxi path clear. Brakes checked immediately after commencement of taxi. Weaving turns. Good communications.	4 reduced <b>1</b>	Ex 1- 5

**3.5.1.2 Risk severity should be defined in accordance with the following table.**

SEVERITY OF CONSEQUENCES		
Definition	Meaning	Value
Catastrophic	Results in an accident, death or equipment destroyed	5
Hazardous	Serious injury or major equipment damage	4
Major	Serious incident or injury	3
Minor	Results in a minor incident	2
Negligible	Nuisance of little consequence	1

**3.5.2.2 Risk likelihood should be defined in accordance with the following table:**

LIKELIHOOD OF OCCURRENCE		
Definition	Meaning	Value
Frequent	Likely to occur many times	5
Occasional	Likely to occur sometimes	4
Remote	Unlikely to occur but possible	3
Improbable	Very unlikely to occur	2
Extremely Improbable	Almost inconceivable that the event will occur	1

### 3.5.4 Risk Tolerability Matrix

The tolerability of an individual risk is determined by use of the following Risk Matrix:

Risk Likelihood	Risk Severity				
	Catastrophic 5	Hazardous 4	Major 3	Minor 2	Negligible 1
<b>Frequent 5</b>	Unacceptable	Unacceptable	Unacceptable	Review	Review
<b>Occasional 4</b>	Unacceptable	Unacceptable	Review	Review	Review
<b>Remote 3</b>	Unacceptable	Review	Review	Review	Acceptable
<b>Improbable 2</b>	Review	Review	Review	Acceptable	Acceptable
<b>Extremely Improbable 1</b>	Review	Acceptable	Acceptable	Acceptable	Acceptable







## **The SEP (Land) Course**

During the course, exercises 12e, 13e, 16 and 17 should be completed and other exercises revised.

### **Theoretical Knowledge**

The course begins with ground lessons on aircraft general knowledge, and revision on visual navigation techniques and other relevant subjects taken from Alt MoC1.FCL.725. Briefings and debriefings should refresh or confirm the remainder of the syllabus at FCL.725(a) as the course progresses.

### **Threat and Error Management**

In addition to those suggested in individual lessons, the threats and errors below may affect flight during the course. Suitable mitigations should be considered and applied.

#### **THREATS**

Cockpit blind spots  
Unfamiliar surroundings  
System/Engine problems  
Weather conditions  
Controlled Airspace in the vicinity  
Carburettor ice  
Loss of bearings  
Engine failure  
Blind spots  
Confined airspace due weather  
Poor landing area  
Other aircraft including in the circuit and military low flying  
Unfamiliar runway shape/ size/surface at landaway bases  
Illusion of speed/sideslip at low altitude  
Physiological sensations in cloud/poor visibility

#### **ERRORS**

Breach of low flying regulations  
Errors in measuring / calculating navigation data  
Feature misidentification  
Inadequate terrain clearance  
Poor lookout whilst using radio aids  
Flap misuse  
Exceeding engine limits  
Descending too low  
Insufficient height to recover from practise stall/spin exercises

#### **UNDESIRE AIRCRAFT STATES**

Engine overheating  
Loose items in cockpit during practise stalling

### UPGRADE AIR SYLLABUS CHECK LIST – Ref: Alt MoC1.FCL.210 (extracts)

AMC Alt MoC1 Ref.	Exercise
Ex 1a Aircraft Familiarisation	<ul style="list-style-type: none"> <li>(a) Aircraft construction and characteristics</li> <li>(b) Normal exits</li> <li>(c) Cockpit layout</li> <li>(d) Aircraft systems</li> <li>(e) Use of the checklist and Pilot Operating Handbook/ Aircraft Flight Manual</li> </ul>
Ex 1e Emergency and Abnormal Procedures	<ul style="list-style-type: none"> <li>(a) Fire on the ground</li> <li>(b) Cockpit fire in the air</li> <li>(c) Engine fire in the air</li> <li>(d) Systems failures</li> <li>(e) Emergency equipment and drills, emergency exits</li> </ul>
Ex 2 Preparations for flight and action after flight	<ul style="list-style-type: none"> <li>(a) Personal preparation</li> <li>(b) Flying equipment required</li> <li>(c) Weather forecasts and actual reports</li> <li>(d) NOTAMs and AIS information</li> <li>(e) Flight authorisation, aircraft serviceability and acceptance</li> <li>(f) Booking-out procedures</li> <li>(g) Airfield sense</li> <li>(h) Refuelling procedures</li> <li>(i) External checks</li> <li>(j) Internal checks</li> <li>(k) Seat, harness and rudder adjustment</li> <li>(l) Starting</li> <li>(m) Power and pre take off checks</li> <li>(n) Local procedures</li> <li>(o) Closing down checks</li> <li>(p) Parking, moving, security and tie down</li> </ul>
Ex 4 Effects of Controls	<ul style="list-style-type: none"> <li>(e) Effect of propeller slipstream</li> <li>(f) Effect of power</li> <li>(g) Effect of trimming controls</li> <li>(h) Effect of flaps</li> <li>(i) Effect of other controls (as applicable)</li> <li>(j) Operation of the carburettor heat control (as applicable)</li> <li>(k) Operation of the mixture control (as applicable)</li> <li>(l) Operation of the cockpit heating and ventilation controls (as applicable)</li> <li>(m) Operation of other controls (as applicable)</li> </ul>
Ex 5a Taxiing	<ul style="list-style-type: none"> <li>(c) Engine handling</li> <li>(d) Control of direction</li> <li>(f) Effect of wind and use of the flying controls</li> </ul>
Ex 5e Taxiing Emergency & Abnormal procedures	<ul style="list-style-type: none"> <li>(a) Steering failure</li> <li>(b) Brake failure</li> <li>(c) Emergency stop</li> </ul>
Ex 8 Descending	<ul style="list-style-type: none"> <li>(h) Sideslipping</li> <li>(i) Entering a climb from the descent (go-around)</li> </ul>
Ex 10a Slow flight	<ul style="list-style-type: none"> <li>(c) Controlled flight slowing to critically slow airspeed</li> <li>(d) Coordinated use of controls at critically slow airspeed</li> <li>(e) Recovery from a critically slow airspeed</li> </ul>

Ex 10b Stalling	<ul style="list-style-type: none"> <li>(f) The approach to stall and recovery in the approach configuration</li> <li>(g) The approach to stall and recovery in the landing configuration</li> <li>(h) The approach to stall and recovery in the take-off configuration</li> <li>(i) Stall and incipient stall and recovery in different configurations and various manoeuvres</li> </ul>
Ex 12a Take-off and Climb	<ul style="list-style-type: none"> <li>(c) Standard take off and initial climb</li> <li>(d) Crosswind take-off</li> <li>(e) Short field and soft field take off</li> </ul>
Ex 12e Emergency and Abnormal procedures	<ul style="list-style-type: none"> <li>(a) Abandoned take off</li> <li>(b) Engine failure after take-off</li> </ul>
Ex 13a Circuit, approach and landing	<ul style="list-style-type: none"> <li>(a) Joining the circuit</li> <li>(b) Circuit pattern and procedures</li> <li>(c) Pre landing checks</li> <li>(d) Initial approach to land</li> <li>(e) Normal (performance) landing</li> <li>(f) Touch and go</li> <li>(g) Effect of surface wind</li> <li>(h) Crosswind circuit, approach and landing</li> <li>(i) Glide approach and landing</li> <li>(j) Flapless approach and landing</li> <li>(k) Short field and soft field approach and landing</li> <li>(l) Missed approach and go around</li> <li>(m) Bad weather circuit and landing</li> <li>(n) Noise abatement</li> <li>(o) ATC procedures</li> </ul>
Ex 13e Emergency and Abnormal procedures	<ul style="list-style-type: none"> <li>(a) Engine failure in the circuit</li> <li>(b) Systems failures</li> <li>(c) Misjudged landing</li> </ul>
Ex 11 Spin avoidance	<ul style="list-style-type: none"> <li>(a) Safety checks</li> <li>(b) Recognition of the incipient spin</li> <li>(c) Recovery from the incipient spin</li> </ul>
Ex 15 Advanced turning	<ul style="list-style-type: none"> <li>(f) Recognition of and recovery from the spiral dive</li> <li>(g) Recovery from other unusual attitudes</li> </ul>
Ex 16 Forced Landing without power	<ul style="list-style-type: none"> <li>(a) Forced landing procedure</li> <li>(b) Assessing the surface wind</li> <li>(c) Assessing the gliding range</li> <li>(d) Selecting a suitable landing area</li> <li>(e) Planning the approach path, provision for change of plan</li> <li>(f) Cause of engine failure checks</li> <li>(g) Use of the radio</li> <li>(h) Committal / pre landing checks and actions</li> <li>(i) Final approach and landing</li> <li>(j) Actions after landing</li> <li>(k) In-flight engine stopping procedure [TMG]</li> <li>(l) In-flight engine restarting procedure [TMG]</li> </ul>
Ex 17 Precautionary Landing	<ul style="list-style-type: none"> <li>(a) Precautionary landing procedure</li> <li>(b) Selection of landing area</li> <li>(c) Surrounding area and landing site inspection</li> <li>(d) Approach and landing</li> <li>(e) Actions after landing</li> </ul>

Ex 18a VFR Navigation – Departure and En Route procedure	<ul style="list-style-type: none"> <li>(c) Departing non controlled aerodromes (as applicable)</li> <li>(e) Altimeter setting procedures</li> <li>(f) Principles of map reading</li> <li>(i) Assessing weather en route, weather minima</li> <li>(j) Revision of ETA and heading</li> <li>(n) Organising cockpit workload</li> </ul>
Ex 18a VFR Navigation – arrival procedures	<ul style="list-style-type: none"> <li>(a) ATC and radio procedures</li> <li>(b) Arriving at non controlled aerodromes (as applicable)</li> <li>(d) Altimeter setting procedures</li> <li>(e) Circuit joining procedures</li> <li>(g) Refuelling</li> </ul>
Ex 18b Navigation problems at lower levels and in reduced visibility	<ul style="list-style-type: none"> <li>(a) Actions before descending or entering DVE</li> <li>(b) Appropriate aeroplane configuration</li> <li>(c) Hazards, obstacles and terrain</li> <li>(d) Map reading at lower level and in DVE</li> <li>(e) Visual impressions of flight at minimum level</li> <li>(f) Visual impressions of flight in DVE</li> <li>(g) Effect of wind, turbulence and windshear</li> <li>(h) Vertical situational awareness</li> <li>(i) Weather considerations and assessing weather</li> <li>(j) Noise sensitive areas</li> </ul>
Exercise 18e Emergency and Abnormal Procedures	<ul style="list-style-type: none"> <li>(a) Diversion procedure</li> <li>(b) Uncertain of position and lost procedures</li> <li>(c) Loss of sight of the surface</li> <li>(d) Electrical failure</li> <li>(e) Radio failure</li> <li>(f) Instrument failure</li> <li>(g) Systems failure</li> </ul>

## **AMC1 FCL.725(a) Theoretical Knowledge Syllabus for Class/ Type Rating**

### **(a) Aeroplane structure & equipment, normal operation of systems & malfunctions:**

- (1) dimensions: minimum required runway width for 180 ° turn.
- (2) engine including auxiliary power unit:
  - (i) type of engine or engines;
  - (ii) in general, function of the following systems or components:
    - (A) engine;
    - (B) auxiliary power unit;
    - (C) oil system;
    - (D) fuel system;
    - (E) ignition system;
    - (F) starting system;
    - (G) fire warning and extinguishing system;
    - (H) generators and generator drives;
    - (I) power indication;
  - (iii) on piston or turbine-propeller engines additionally:
    - (A) propeller system;
    - (B) feathering system.
  - (iv) engine controls (including starter), engine instruments and indications in the cockpit, their function, interrelation and interpretation;
  - (v) engine operation, including APU, during engine start, start and engine malfunctions, procedures for normal operation in the correct sequence.
- (3) fuel system:
  - (i) location of the fuel tanks, fuel pumps, fuel lines to the engines, tank capacities, valves and measuring;
  - (iii) in the cockpit:
    - (A) the monitors and indicators of the fuel system;
    - (B) quantity and flow indication, interpretation.
- (6) hydraulic system:
  - (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
  - (ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.
- (7) landing gear:
  - (i) main components of the:
    - (A) main landing gear;
    - (B) nose gear;
    - (C) gear steering;
    - (D) wheel brake system, including anti-skid.
  - (iii) required tyre pressure, or location of the relevant placard;
- (8) flight controls and high lift devices:
  - (i) (A) aileron system;
  - (B) elevator system;
  - (C) rudder system;
  - (D) trim system;
  - (E) spoiler system;
  - (F) lift devices;
  - (G) stall warning system;
- (9) electrical power supply:
  - (i) number, power, voltage, frequency and location of the main power system (AC or DC), auxiliary power system location and external power system;
  - (ii) location of the controls, monitors and indicators in the cockpit;
  - (iii) flight instruments, communication and navigation systems, main and back-up power sources;
  - (iv) location of vital circuit breakers;
  - (v) generator operation and monitoring procedures of the electrical power supply.

- (10) flight instruments, communication, navigation equipment:
  - (i) visible antennae;
  - (ii) controls and instruments of the following equipment in the cockpit during normal operation:
    - (A) flight instruments;
    - (B) flight management systems;
    - (D) communication and navigation systems;
    - (E) autopilot;
    - (H) collision avoidance system;
    - (I) warning systems.
- (11) cockpit, cabin and cargo compartment:
  - (i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;
  - (ii) operation of the cabin and cargo doors, windows and emergency exits;
- (12) emergency equipment operation and correct application of the following emergency equipment in the aeroplane:
  - (i) portable fire extinguisher;
  - (ii) first-aid kits;
  - (vii) emergency transmitters;
  - (viii) crash axes;
- (b) Limitations:**
  - (1) general limitations:
    - (i) certification of the aeroplane, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems:
      - (A) maximum tail and crosswind-components at take-off and landing;
      - (B) maximum speeds for flap extension  $v_{fo}$ ;
      - (C) at various flap settings  $v_{fe}$ ;
    - (ii) (C) stall speed under various conditions  $v_{so}$ ,  $v_{s1}$ ;
    - (D) maximum speed  $v_{ne}$ ,
    - (E) maximum speed for normal operation  $v_{mo}$ ,
    - (F) altitude and temperature limitations;
  - (iii)
    - (C) maximum take-off mass;
    - (E) maximum landing mass;
    - (F) zero fuel mass;
    - (H) maximum load factor during operation;
    - (I) certificated range of centre of gravity.
  - (2) engine limitations:
    - (i) operating data of the engines:
      - (A) time limits and maximum temperatures;
      - (B) minimum RPMs and temperatures;
      - (E) piston engines: certified range of mixture;
      - (F) minimum and maximum oil temperature and pressure;
      - (G) maximum starter time and required cooling;
      - (H) time between two start attempts for engines and auxiliary power unit;
      - (I) for propeller: maximum RPM of propeller triggering of automatic feathering device.
    - (ii) certified oil grades.
  - (3) systems limitations:
    - (i) operating data of the following systems:
      - (B) electrical power supply, maximum load of main power system (AC or DC);
      - (C) maximum time of power supply by battery in case of emergency;
      - (E) autopilot limitations of various modes;
    - (ii) fuel system: certified fuel specifications.
  - (4) minimum equipment list.

**(c) Performance, flight planning and monitoring:**

(1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing according to the documentation available on the following factors:

- (i) accelerate or stop distance;
- (ii) take-off run and distance available (TORA, TODA);
- (iii) ground temperature, pressure altitude, slope, wind;
- (iv) maximum load and maximum mass (for example ZFM);
- (vi) influence of snow, slush, moisture and standing water on the runway;
- (xi) safe approach speed  $v_{ref}$ , and turbulent conditions;
- (xii) effects of excessive approach speed and abnormal glideslope on the landing distance;
- (xv) maximum allowable landing mass and the landing distance for the destination and alternate aerodrome on the following factors:

- (A) available landing distance;
  - (B) ground temperature, pressure altitude, runway slope and wind;
  - (C) fuel consumption to destination or alternate aerodrome;
  - (D) influence of moisture on the runway, snow, slush and standing water;
- (2) flight planning for normal and abnormal conditions:
- (iv) power setting of the engines during climb, cruise and holding under various circumstances, as well as the most economic cruising flight level;
- (3) flight monitoring.

**(d) Load and balance and servicing:**

- (1) load and balance:
- (i) load and trim sheet on the maximum masses for take-off and landing;
  - (ii) centre of gravity limits;
  - (iii) influence of fuel consumption on the centre of gravity;
- (2) servicing on ground, servicing connections for:
- (i) fuel;
  - (ii) oil;
  - (iii) water;
  - (viii) electric power;

**(e) Emergency procedures:**

(1) recognition of the situation as well as immediate memory actions in correct sequence and for those conditions recognised as emergencies by the manufacturer and competent authority for certification:

- (i) engine failure during take-off, as well as in-flight;
- (ii) malfunctions of the propeller system;
- (iii) engine overheat, engine fire on ground and in-flight;
- (v) electrical smoke or fire;
- (viii) fuel pump failure;
- (x) electric power failure;
- (xii) flight instrument failure;
- (xiv) failures at the lift devices
- (xv) cargo compartment smoke or fire.

(2) actions according to the approved abnormal and emergency checklist:

- (i) engine restart in-flight;

**(g) Special requirements for 'glass cockpit' aeroplanes with EFIS**

Additional learning objectives:

- (1) general rules of aeroplanes computer hardware and software design;
- (2) logic of all crew information and alerting systems and their limitations;
- (3) interaction of the different aeroplane computer systems, their limitations, the possibilities of computer fault recognition and the actions to be performed on computer failures;
- (4) normal procedures;
- (5) aeroplane operation with different computer degradations (basic flying).

**(h) Flight management systems.**

## **LESSON G1 – AIRCRAFT GENERAL KNOWLEDGE 1**

**(2.00)**

### **Piston Engines**

- (1) Principles of operation
- (2) Piston engine design and components
- (3) Serviceability checks

### **Piston Engine Systems**

- (1) Fuel system
- (2) Induction system
- (3) Ignition system
- (4) Oil system
- (5) Cooling system
- (6) Other engine systems

### **Instruments and Systems**

- (1) The suction system
- (2) Attitude indicator and Heading indicator

## **LESSON G2 – AIRCRAFT GENERAL KNOWLEDGE 2**

**(2.00)**

### **The Propeller**

- (1) Principles of operation
- (2) Propeller design and components
- (3) Propeller handling and serviceability checks

### **Engine Handling**

- (1) Engine limitations and handling

### **Meteorology**

- (1) Piston engine icing

### **Human performance and Limitations**

- (1) Toxic hazards

### **Principles of Flight**

- (1) Spin avoidance and spinning characteristics

## **LESSON G3 – LAW REVISION**

**(1.00)**

### **Air Law**

- (1) Visual Meteorological Conditions (VMC) minima
- (2) Visual Flight Rules (VFR)
- (3) Minimum heights

## **LESSON G4 – FLIGHT PLANNING AND NAVIGATION**

**(2.00)**

### **In-flight VFR Navigation**

- (1) Principles of dead reckoning
- (2) Off track correction
- (3) ETA revision
- (4) Diversion
- (5) Integrating radio navigation with VFR navigation
- (6) GNSS – operation and interpretation, limitations and accuracy

### **VFR Flight Planning**

- (1) Route selection



## **LESSON A1 – AIRCRAFT FAMILIARISATION**

**(DURATION 1:00)**

*Ref: Alt MoC1 Ex 1b (e), 3*

**Aim:** To introduce the student to single engine piston flying.

### **Likely Threats, Errors and Undesired Aircraft States:**

Brake/steering failure, Engine overheating and excessive engine cooling

### **PRE FLIGHT:**

- Emergency and evacuation brief

### **AIR EXERCISE:**

- Aircraft familiarisation
- Start, stop, steering and controlling speed during taxiing
- Normal take-off and climb
- Effect of speed on the primary controls
- Effect of power, speed and flap/spoiler/airbrake on the trimmed state
- Use of mixture and carb heat
- Straight & level at different power settings and speeds
- Slow safe cruise
- Entry to the glide
- Approach & landing configurations – control of descent
- Go around
- **Recovery from the stall at the incipient stage:**
  - Recovery at the incipient stage in landing configuration (simulated final approach)
  - Recovery at the incipient stage in the turn with approach configuration (simulated base to final turn)
  - Recovery at the incipient stage in the departure turn (simulated turn after take-off)
- **Advanced Turning;**
  - Level 45° AOB Turns
  - Use of magnetic compass (simulated DI Failure)
  - Steep descending turns 45 ° AOB
  - Recoveries from undesired aircraft states, including spiral dives
- Recovery to base for a standard (Overhead?) join and normal circuit to land

### **STANDARD:**

The student demonstrates the correct use of the requisite techniques to:

- ☐ Operate the ancillary controls
- ☐ Adopt slow safe cruise & return to normal cruise
- ☐ Enter the glide
- ☐ Perform a go round
- ☐ Recover to a safe climb at the incipient stage of a stall in simulated final approach
- ☐ Recover to a safe climb at the incipient stage of a stall in simulated base to final turn
- ☐ Recover to a safe climb at the incipient stage of a stall in a simulated climbing turn after take off
- ☐ Fly level and descending turns at cruise speed using 45°- 50° AOB
- ☐ Recover the aircraft safely from Unintended Attitudes including Spiral Dives

## **LESSON A2 - CIRCUITS & EMERGENCIES**

**(1.00)**

*Ref: Alt MoC1 Ex 12, 13, 12e, 13e*

**Aims:**

1. To practise the circuit.
2. To introduce circuit emergencies
3. To introduce glide approaches
4. To introduce approach without flap/spoiler/airbrake

### **Likely Threats, Errors and Undesired Aircraft States:**

Flap failure, Engine malfunctions, Malfunction during T/O, Crosswind

### **PRE FLIGHT:**

- Pre-flight brief on circuit procedures (Ex12 and 13)
- Pre flight brief on emergency procedures (Ex 12e & 13e)
- Weather and NOTAM brief

### **AIR EXERCISE:**

#### **Revise general circuit procedures**

#### **Engine failure after takeoff;**

- Speed achievement and maintenance
- Field selection
- Crash drill

#### **Approach without flap/spoiler/airbrake;**

- Effect on Landing Distance Performance.

#### **Academic glide approach;**

- Judgement of touchdown point (point of constant reference)
- Undershoot/overshoot corrections – flap/spoiler/airbrake/turns/sideslip
- Speed control
- Pitch control
- Landing flare
- Circuit emergency(s) from overview (Ex 12e & 13e)

### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- ☐ A flapless circuit & approach
- ☐ A glide circuit & approach
- ☐ Dealing with emergencies in the circuit
- ☐ Going around from an unstabilised approach

The student demonstrates the correct use of the requisite techniques to:

- ☐ Fly the standard circuit
- ☐ Fly a safe glide approach
- ☐ Make a safe landing
- ☐ Use standard RT

## **LESSON A3 –SOLO (CHECK POINT)**

**(0.45)**

*Ref: Alt MoC1 Ex 12, 13, 14*

### **Pre-requisites:**

- Valid medical certificate
- Satisfactory handling of circuit emergencies

**Aim:** To safely fly circuits in an SEP aeroplane for the first time unaccompanied.

### **Likely Threats, Errors and Undesired Aircraft States:**

Student bounce/balloon,

### **PRE FLIGHT:**

- Briefing on: Flight requirements  
Action in the event of an unsatisfactory approach or baulked landing

### **AIR EXERCISE:**

- Student fly normal circuits and landings
- Student fly glide circuits and landings

### **STANDARD:**

The student demonstrates the correct use of the requisite techniques to:

- ☐ Fly the circuit
- ☐ Make a safe normal landing
- ☐ Make a safe glide landing
- ☐ Use standard RT

## **LESSON A4 - CROSSWIND TAKE-OFF & LANDING**

*Carried out when conditions dictate*

**(0.30)**

*Ref: Alt MoC1 Ex 12,13*

Aim: To safely handle the aircraft during take-off and landing in crosswind conditions.

### **Likely Threats, Errors and Undesired Aircraft States:**

Excessive gust, Balloon during Flare, Bounced Landing.

#### **PRE FLIGHT:**

- Pre-flight brief on Crosswind Take-off and Landing
- Weather and NOTAM brief

#### **AIR EXERCISE:**

- Use of elevator/aileron to counter wind effects taxiing
- Anticipation and prevention of weathercocking and wing lifting on takeoff
- Wing down or crab technique on landing to offset for drift

#### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- Crosswind operations and personal limits

The student demonstrates the correct use of the requisite techniques to:

- ☐ Make a safe takeoff in a crosswind
- ☐ Make a safe landing in a crosswind

## LESSON A5 – SPIN AVOIDANCE

(0.45)

Ref: Alt MoC1 Ex 11

Aims: 1. To take off and land in minimum distance.  
2. To recognise and recover the aircraft safely from the spin at the incipient stage with minimum height loss

### **Likely Threats, Errors and Undesired Aircraft States:**

Performance miscalculation

Controls mishandled, Other aircraft, Incorrect configuration, Harness insecure, Loose objects, Engine fails, Diving towards excessive airspeed

### **PRE FLIGHT:**

- Pre-flight brief on Spin avoidance (Ex11)
- Pre-flight brief on Short Field Take-off and Landing (Ex12 &13)
- Weather and NOTAM brief
- Note control central position

### **AIREX:**

- Short field take-off
  - Aircraft configuration
  - Control of lift off
  - Best angle climb out to clear obstacle – convert to best rate

#### **Incipient spin recognition and recoveries:**

- From stall in a climbing turn with full power
- From stall in a steep, level turn.
- Instructor induced distractions during the stall
- Recovery from extreme undesired aircraft states
- Demonstration of full spin and recovery
- Short field landing
  - Aircraft configuration
  - Speed control
  - Landing flare
  - Control after landing/maximum effective braking

### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- ☐ Using the Flight Manual or POH to identify correct spin recovery technique

The student recognises:

- ☐ The incipient stage of the spin

The student demonstrates the correct use of the requisite techniques to:

- ☐ Recover the aircraft safely from the Incipient Spin Stage
- ☐ Recover the aircraft safely from extreme undesired aircraft states
- ☐ Carry out a short field take-off
- ☐ Carry out a soft field take-off
- ☐ Achieve and maintain best angle of climb and recover to best rate
- ☐ Make a safe short field landing

## **LESSON A6 - FORCED LANDINGS WITHOUT POWER**

**(1.00)**

*Ref: Alt MoC1 Ex 16*

**Aim:** To plan, fly an approach and to land safely in the event of a complete engine failure.

### **Likely Threats, Errors and Undesired Aircraft States:**

Engine failure, Too high in pattern, Low flying military aircraft

### **PRE FLIGHT:**

- Pre-flight brief with Forced Landings Without Power (Ex16) as main exercise
- Weather and NOTAM brief

### **AIREX:**

- Short field take-off over 50ft obstacle
- Field selection
- Ideal FLWOP procedure
- Revise climbing at best angle
- Practise emergency
- Further practise of full procedure.
- Recovery to base for PFL pattern or glide approach

### **STANDARD:**

The student demonstrates the correct use of the requisite techniques to:

- ☐ Execute a planned approach
- ☐ Perform relevant checklist drills

## **LESSON A7 - FORCED LANDINGS WITHOUT POWER PART 2**

**(1.00)**

*Ref: Alt MoC1 Ex 16*

Aims: 1. To take off from soft ground

2. To plan, fly an approach and to land safely in the event of a complete or partial engine failure.

### **Likely Threats, Errors and Undesired Aircraft States:**

Recent rain

Carburettor icing, Real engine failure, Low flying military aircraft

### **PRE FLIGHT:**

- Pre-flight brief on Forced Landing Without Power and partial engine failure (Ex16)
- Pre-flight brief on Soft Field Take-off and Landing (Ex12 &13)
- Weather and NOTAM brief

### **AIREX:**

Soft field take-off

Aircraft configuration

Avoid stopping on soft ground

### **FLWOP:**

- Practise procedure from altitude .
- Adjusted procedure for failure at lower altitude
- Adjusted procedure for failure at 1000' AGL
- Practise from different starting altitudes and locations.
- Actions in the event of partial engine failure.

### **Recovery to base:**

Overhead join and PFL from overhead if traffic permits or glide approach & landing

### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- ☐ Maximising use of available power
- ☐ Maintaining a safe airspeed

The student demonstrates the correct use of the requisite techniques to:

- ☐ Carry out a soft field take-off
- ☐ Execute a planned forced landing approach
- ☐ Perform relevant checklist drills
- ☐ Make a Distress R/T call
- ☐ Brief passengers in the event of an emergency

## LESSON A8 – DUAL NAVIGATION

(2.00)

Ref: Alt MoC1 Ex 18a, 18e

- Aims:
1. To consolidate basic VFR nav technique.
  2. To land at an unfamiliar aerodrome.
  3. To practise en-route hazard avoidance and diversion techniques.
  4. To execute a safe approach to a selected precautionary landing area.

### **Likely Threats, Errors and Undesired Aircraft States:**

Lowering cloudbase, Hazard ahead on track

Unfamiliar airfield procedure, Unfamiliar runway shape/size/surface

Deteriorating weather, Poor visibility, Surrounding weather, Dusk, Poor landing area

### **PRE FLIGHT:**

- **Pre-flight brief on:**
  - En-route diversion (Ex18e)
  - Precautionary Landing (Ex17)
  - Pre-flight planning including destination information and performance planning

### **AIREX:**

- En-route hazard avoidance
- Joining, circuit & administrative procedures at unfamiliar airfield
- In-flight diversion
- Revise poor visibility configuration.
- Selecting suitable field
- Precautionary circuit procedure

### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- ☐ Acceptable minimum weather conditions to continue VFR
- ☐ Sound in-flight decision making

The student demonstrates the correct use of the requisite techniques to:

- ☐ Make performance calculations using the Flight Manual
- ☐ Use the correct R/T procedures
- ☐ Complete a navigation route after planning
- ☐ Liaise with ATS and join the circuit & follow ground procedures at destination
- ☐ Plan & execute a diversion



## **LESSON A9 – SOLO NAVIGATION**

(1.15)

*Ref: Alt MoC1 Ex 18a*

Aim: To consolidate VFR navigation techniques on a solo cross-country flight.

### **Likely Threats, Errors and Undesired Aircraft States:**

Over-map-reading HSI/DI failure, Poor weather en-route

### **PRE FLIGHT:**

- Student plan a triangular route under supervision
- Revise procedures to transit complex airspace
- Revise use of ATC radar service
- Completion of Solo Navigation Briefing Certificate.
- Weather and NOTAM brief.

### **AIREX:**

Student completes the flight solo completing a log en-route

### **STANDARD:**

The student demonstrates the correct use of the requisite techniques to:

- ☐ Obtain weather information and extract data relevant to nav planning
- ☐ Obtain and interpret NOTAMS
- ☐ Prepare the map for the route
- ☐ Make navigation planning calculations and complete a plog

## **LESSON A10 – LOW VISIBILITY NAVIGATION & GNSS INTEGRATION**

**(1.00)**

*Ref: Alt MoC1 Ex 18b*

Aims: 1. To navigate under VFR in low visibility VMC [Degraded Visual Environment (DVE)]  
2. To practise navigating using GNSS in addition to visual navigation.

### **Likely Threats, Errors and Undesired Aircraft States:**

High ground/obstructions, Loss of control

GNSS power failure, GNSS signal failure, Poor lookout whilst using GNSS

### **PRE FLIGHT:**

- Route planning
- Preflight brief on GNSS use and limitations [Ex 18c(A)]
- Brief on area surface elevations, & obstructions and airspace
- Weather (real and simulated) and NOTAM brief
- Load & activate route in GNSS unit pre-flight

### **AIREX:**

- GNSS integration
  - Use of pre-programmed GNSS route to cross-check track
  - GNSS tracking to a waypoint
  - Use of “Direct” or “GO-TO” Function
- Medium level poor vis simulation
  - Practise integrated scan
  - Revise recovery from spiral dive (using instrument indications)
  - Revise safe slow flight on instruments
- Low level
  - Effects of gradient wind on drift at 1000ft AGL
  - Simulate reduced visibility - slow safe cruise - wind effect
  - Situation (obstruction) awareness;
  - Map reading
  - Radio aids & communication limitations at low level.
  - Early decision making to turn back/divert/land
  - Integrated scan at low level
- Low level bad weather join and circuit for short field landing

### **STANDARD:**

The student demonstrates a clear understanding of the principles of:

- ☐ Spatial Orientation
- ☐ Gradient wind effects
- ☐ Radio Aids limitations
- ☐ Obstruction profiles
- ☐ Situation awareness
- ☐ Minimum Safe Altitude

The student demonstrates the correct use of the techniques to:

- ☐ Check the validity of the GPS database.
- ☐ Programme a route into the GPS Unit
- ☐ Track the route using headings to achieve desired track & cross refer to the visual navigation plan.
- ☐ Use the “Direct” or “Go-To” Function.
- ☐ Recognise GPS failures/error messages and revert to visual navigation
- ☐ Fly using an integrated visual/instrument scan
- ☐ Achieve and maintain safe slow flight

## **LESSON A11 – INTRODUCTION TO SKILL TEST**

**(2.00)**

Aim: To experience the content and conduct of the EU PPL(A) Licensing Skill Test (Single Engined Piston) and revise to the required standards.

