Introduction

The enclosed specific aircraft training notes form the basis of the flying training for the JAR-FCL Private Pilot's Licence. They have been set out to show the content of each flying lesson and will prove a useful aid throughout the course. For expanded information, reference should be made to one of the many informative Flying Manuals from the school shop.

Towards the end of the course the student pilot will be 'readied' for the final test for the issue of the licence.

Full details of this test, called a PPL Skill Test, are contained in FCL Standards Document 19 a copy of which will be available for student pilot's reference.

When applying for the licence the CAA syllabus states that a pilot should have flown:

A course minimum of 45 hours (of which5 hours may be in a Flight Navigation Procedure Trainer or Flight Simulator) including:

1) Minimum 25 hours dual
2) Minimum of 10 hours solo

The 25 hours dual must include:

1) At least 5 hours solo cross-country including at least one solo triangular cross–country of at least 150 nautical miles, with 2 landings away.

And of course, have completed all the relevant ground examinations including Radio Telephony.

National PPL

The syllabus for the NPPL is identical apart from Exercise 18C which is omitted.
The flight test is split into two flights. Your instructor will give you more details.

Note

For a list of abbreviations used in this document, please refer to the last page.

Aircraft Familiarisation – Exercises 1 & 1E

Aim:

To familiarise the student with the functions and operation of the aircraft systems so that by the time of the first solo flight the under mentioned items are fully understood. The emergency drills in particular must have been learned prior to the first instructional flight:

1) Airframe General
2) Engine General
3) Cockpit Layout
4) Flying Controls Including Flaps
5) Systems: Fuel, Oil, Ignition, Carb Heat, Electrical, Radio, Brakes, Mixture, Cabin Heating, Cabin Ventilation, Instruments Pressure/Vacuum, Stall Warner, Pitot/Static.
6) Fire Extinguisher
7) First Aid Kit
8) Control Locks and Tow Bar
9) Checklists and Check Procedures Including Emergencies

Sources of Information:

For information the student pilot is to read the associated pilots notes incorporated in the flight manual and the associated PA28 checklist.

Emergency Drills:

Action in the event of fire in the air and on the ground: Engine, Cabin and Electrical.

System failures applicable to type. e.g. Brakes, Radio, Alternator and Oil.

Escape drills, location & use of emergency equipment and exits.

Preparation For and Action After Flight – Exercise 2

Aim:

To teach the student how to prepare himself and the aircraft for flight and also how to check and leave the aircraft after flight. The many items will need to be learned over many flights.

Topics:

1) Student clothing suitability, especially footwear.
2) Flight authorisation, aircraft acceptance and serviceability documents.
3) External checks including local refuelling procedures and fire precautions.
4) Internal checks.
5) Student comfort. Harness and seat adjustment.
6) Special precautions. e.g. Door locking and unlocking.
7) Starting and warming up checks.
8) Power checks.
9) Running down and stopping the engine.
10) Leaving the aircraft, noting of defects, security and picketing.
11) Completion of authorisation and aircraft service documents, recording of any defects.

Important: If it is necessary to move the aircraft on the ground without power, the nosewheel tiller is to be used. Moving the aircraft by pressing down on the tailplane is strictly forbidden. If further information is required a flying instructor should be consulted.

Sources of Information:

Piper PA28 Pilot's Notes
Piper PA28 Checklist(s)

Air Experience – Exercise 3

Aim:
To familiarise a prospective pilot with flight in a light aircraft and to assess the possibilities of learning to fly.

Airmanship:
Seat, safety harness, headset adjustment, emergencies.

Air Exercise:

1) Familiarisation with the aircraft and the cockpit, including entry and exit.
2) Airfield layout and method of controlling the aircraft on the ground.
3) Airborne; new environment.
4) Familiarisation with aircraft controls, including use.
5) Rejoining and landing.

Note: Check before flight if this is to be the first flight in a light aircraft. If so, avoid prolonged turning etc. Watch out for signs of discomfort etc.

Effects of Controls – Exercise 4 (1)

Aim:

To teach the effects of the controls on an aircraft in flight.

Airmanship:

Lookout for aircraft. Handing over and taking over control.

Air Exercise:

Control	Movement	Primary Effect	Secondary Effect
Elevator	CC Fore & Aft	Pitch	IAS
Aileron	CC Side To Side	Roll	Yaw, More Roll, Spiral Descent
Rudder	Left Rudder Right Rudder	Yaw	Roll, More Yaw, Spiral Descent

1) All control movements to be smooth and progressive.
2) Aircraft continues to respond until the control is centralised.
3) Aircraft movements are in relation to the aircraft axes and not to external references. e.g. When level and when banked.
4) Rate of aircraft movement is proportional to amount of control deflection.
5) All control movements are natural and instinctive.

Effect of Airspeed	At Constant Low Power Setting
High Speed	Controls firm and effective
Low Speed	Controls sloppy and not very effective
Effect of Slipstream	**At Constant IAS**
High Power	Rudder and elevator effective. Ailerons not effected
Low Power	Rudder and elevator less effective

Effects of Controls – Exercise 4 (2)

Aim:
To teach the effects of the controls and supplementary control systems on the aircraft in flight.

Airmanship:
Lookout for other aircraft. Handing over and taking over control. Flap limiting speed. Orientation/Landmarks.

Air Exercise:

Power	
Open Throttle	
Increase Power	RPM Increase
Nose Pitches Up	Yaws To Left
Aircraft	Climbs
Close Throttle	
Decrease Power	RPM Decrease
Nose Pitches Down	Yaws To Right
Aircraft	Descends

Note: Smooth and progressive use of throttle.

Trim
A correctly trimmed aircraft will maintain its attitude at a constant IAS.

Elevator	
If Nose Rises	Forward Trim Needed
If Nose Drops	Backward Trim Needed

Note: The trimmer must not be used to change the attitude of the aircraft. That is, select the attitude using pitch control, then trim.

Flaps

With aircraft trimmed and IAS & Attitude noted:

Lowering flap by stages	At each stage, note attitude change and when corrected by elevator	1) Lower IAS 2) Trim Changes
Raising flap by stages	At each stage, note attitude change and when corrected by elevator	1) Higher IAS 2) Trim Changes

Mixture

Operation. Caution re-use.

Carb Heat

Operation and effects

Air Conditioning and Ventilation System

Operation and effects.

Taxying – Exercise 5 & 5E

Aim:
To teach how to manoeuvre the aircraft on the ground safely under its own power.

Airmanship:
Lookout. Liaison ATC. Speed. Engine and brake handling.

Ground Exercises:

1) Pre Taxy Checks
   Brakes on
   Friction nut slacked
   Trim neutral
   Note W/V
   ATC clearance/routing
   Instructor to check student's feet position

2) Initial Taxying
   Lookout
   Route to be followed and clear. Close throttle
   Brakes off
   Increase power sufficiently to move aircraft
   Close throttle for brake check
   Resume taxying
   Check rudder travel
   Check instruments when clear of obstructions

3) Control of Speed
   Lookout
   Speed control primarily with throttle and brakes
   Fast walking speed or as appropriate
   More power: uphill, into wind or soft ground
   Less power: downhill, downwind, hard surfaces
   Smooth and gentle throttle movements

Note: Do not use brakes in opposition to power. Keep hand on throttle.

4) Stopping
   Anticipate inertia

Close throttle
Rudder pedals central
Toe brakes, as applicable
When stopped, park brake, set 1200RPM

Note: For parking or power check turn into wind.

5) Control of Direction and Turning
Lookout
Anticipate
Rudder pedals for turning
Anticipate recovery

Note: Turning in confined space use differential brake, slow speed and slight increase in power. Watch wing tips and tail. Do not turn on locked wheels.

6) Routing
ATC instructions
Centreline on taxiway
Watch for surface and slope
Right of centreline on runways
Join taxiways from grass at 45° angles

Note: Use appropriate aileron control in crosswind conditions wherever the wind exceeds 10 knot. Pilot will do the right thing when wind is really strong.

7) Emergencies

Steering failure:

a. Stop
b. Inform ATC
c. If total failure, shut down aircraft. Remain with aircraft.

Brake failure:

d. Shut down aircraft
e. Steer away from obstructions
f. Inform ATC
g. Remain with aircraft

Note: Initially, student to control rudder, whilst instructor operated the throttle after initial demo. Later change over, then eventually student controls all systems.

Straight and Level Flight – Exercise 6 (1)

Aim:

To teach the student how to fly the aircraft at a constant height, in a constant direction and in balance.

Airmanship:

Lookout for other aircraft. In flight checks, FREDA.

Air Exercise:

1) Initial Demonstration

Straight and level flight, normal cruise.

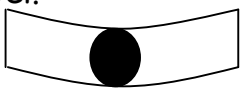
1) Note power setting.
2) Aircraft attitude.
3) Aircraft trimmed. Note inherent stability.
4) Flies 'Hands Off'. Only small control movements necessary.

2) Attain Straight and Level Flight

After Instructor disturbs aircraft.

P Power – Select RPM, prevent yaw.
A Attitude – Select and hold nose level. Crosscheck altitude.
T Trim – Trim the aircraft so no control column input is required. Check IAS.

3) Maintain Straight and Level Flight

Constant Height	Constant Direction	Balance
Hold selected attitude. Crosscheck altimeter. Correct small errors (+ or – 75ft) with elevator. For larger changes, correct with power	Maintain wings level (ailerons). Prevent yaw (rudder). Crosscheck external reference point or DI. To regain heading use co-ordinated aileron and rudder. Wings level, no yaw = balance	Demo. Unbalance. Check wings level. Ball in centre with wing level.  Marked unbalance is noticeable. Slight unbalance difficult to detect.

4) Student Practise Attaining and Maintaining Straight and Level Flight

(Instructor disturbs aircraft from straight and level flight condition. Student recovers aircraft from various attitudes).

5) Orientation and Return to Aerodrome

Straight and Level Flight – Exercise 6 (2)

Aim:

To teach how to fly straight and level at various power settings and selected airspeeds and with flap.

Airmanship:

Lookout. Orientation. Engine instruments. FREDA. Flap limiting speed. VFE.

Air Exercise:

Effect of Power on Straight and Level Flight

Note attitude at normal cruise then:

1) Select High Power (2600RPM)
   Maintain attitude, aircraft climbs. Select lower nose attitude to maintain level flight.
   Trim.
   Note the lower nose attitude at the higher IAS, also trim change and inertia.

2) Select Low Power (2000RPM)
   Maintain attitude- aircraft descends.
   Select higher nose attitude to maintain level flight.
   Trim.
   Note the higher nose attitude at the lower IAS, also trim change and inertia.

Straight and Level at 110 Knots From Normal Cruise

P Select **P**ower 2550RPM, prevent yaw
A Select lower nose **A**ttitude, hold
T **T**rim

Check instruments, readjust, re-trim aircraft

Straight and Level at 100 Knots From Normal Cruise

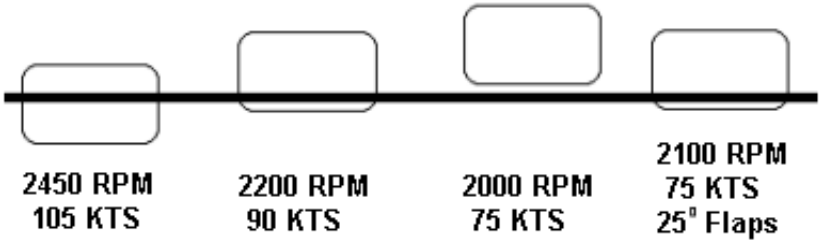
P Select **P**ower 2450RPM, prevent yaw
A Select lower nose **A**ttitude, hold
T **T**rim
Check instruments, readjust, re-trim aircraft.

Straight and Level With Flaps At 75 Knots

P Select **P**ower 2100RPM, prevent yaw
A Lower 25° flaps (VFE = 85kts). Select **A**ttitude, hold.
T **T**rim

Check instruments, readjust, re-trim aircraft.

Note: Flaps give lower nose attitude hence better forward vision. Extra RPM gives better control.



Straight and Level Flight – Exercise 6 (2)

Flight At Critically High Airspeeds

Instructor demo aircraft handling characteristics at the lower 'yellow arc' speeds pointing out the necessity for small control pressures if the aircraft inadvertently enters this speed range, plus the importance of VNE.

Important: For every speed there is only one correct attitude for level flight. In addition for any one power setting, level flight is possible at two speeds. This can be conveniently demonstrated on the return to the airfield.

Proof of Understanding:

Ask the student to fly as fast as possible to get back to the field to 'beat' a storm. Or ask the student to loiter!

Climbing – Exercise 7 (1)

Aim:
To learn how to put the aircraft in a climb at 75 knots and to level off at selected levels.

Airmanship:
Lookout ahead, above and behind. Engine checks.

Air Exercise:

1) **Best Rate of Climb (Vy)**

Entry
Lookout. Rich mixture. Select reference point. P – Apply full **P**ower (Check engine instruments). Prevent yaw. Check balance A – Select **A**ttitude for climb and hold wings level. T – **T**rim Check IAS 75 knots. Adjust attitude as necessary. Re-trim. Check balance
In Climb
Lookout. Note attitude and maintain. Check ASI to maintain 75 knots. Weave every 1000ft to lookout. Check engine temperatures and pressures. Note: Rate of climb decreases with altitude
Levelling Off
Lookout. Anticipate height. A – Select **A**ttitude for 100 knot cruise. Hold. P – Reduce to cruise **P**ower. (2450RPM). Prevent yaw. T - **T**rim

2) **Cruise Climb**
   As above, using 85 knots IAS. Lean mixture above 3000ft.

3) **Climb – Best Angle (Vx)**
   As above, using 63 knots, no flap once initial climb out is complete

Climbing – Exercise 7 (2)

Aim:
To learn how to climb with varying amounts of flap and how to raise flap during the climb.

Airmanship:
Lookout. Engine checks. Flap operating speeds. Application re 'Go Around'.

Air Exercise:
From normal climb, note the rate of climb.

Lowering Flap	Effect
At normal climb speed, lower 10° stage of flap. Maintain normal climb speed of 75 knots.	Note reduced climb rate plus lower nose and trim change.
Raise the nose and select recommended speed for go around, 70 knots.	Climb rate largely restored. Attitude and trim change.
Raise the nose and select recommended speed for best angle of climb, 63 knots.	Good climb rate with reduced speed, means better angle of climb. Attitude and trim change.
Select 25° flap.	Reduced rate of climb plus lower nose attitude and trim change.
Select 40° flap.	Further reduced rate of climb plus lower nose attitude and trim change

Raising Flap	Effect
Reduce flap by stages.	Attitude and trim change.
Climb at appropriate speed.	Rate of climb increases plus higher nose attitude as flap is retracted.
Resume normal climb of 75 knots.	

Caution: Raising flap from full to zero in one selection is to be avoided as it can cause aircraft 'sink' which is hazardous at low speeds or near the ground. The correct procedure is to reduce flap in stages applying control column back pressure to prevent 'sink' and to select the next higher attitude for the flap setting plus trimming.

Descending – Exercise 8 (1)

Aim:
To learn how to glide the aircraft at 75 knots and to level out at selected altitudes.

Airmanship:
Lookout (especially below). Use of carburettor heat. Engine checks. Altimeter settings

Air Exercise:
Gliding at 75 knots.

Entry
Lookout. Turn into cleared area. Mixture rich. Altimeter checked. Carb heat select. P – Close throttle to reduce **P**ower. Prevent yaw. Wings Level. Direction constant. A – **A**ttitude hold. The select for 75 knots. Maintain. T – **T**rim (Large back trim change).
In The Glide
Lookout. Note attitude and rate of descent. Maintain attitude and balance. Weave nose. Clear engine every 1000ft.
Levelling Out
Lookout. Carb heat cold. Anticipate recovery altitude. P – Apply cruising **P**ower. Wings level. Prevent yaw. A – Select cruising **A**ttitude for 100 knots. Hold. T – **T**rim (large forward).

Descending – Exercise 8 (2)

Aim:
To learn how to descend the aircraft at specific speeds and various rates of descent, in various configurations.

Airmanship:
Lookout (partially below). Engine considerations. Altimeter settings. VFE.

Air Exercise:
Revision of clean glide at 75 knots.

Descending With Flap
Enter clean glide at 75 knots. Note rate of descent. Lower 25° of flap. Maintain attitude. Airspeed decreases. Select lower attitude to regain 75 knots. Trim. Note: Lower nose attitude and increased rate of descent. Repeat for 40° flap. Note: Lower nose attitude and increased rate of descent although good forward visibility and the need for anticipation of recovery.
Descending With Power
Enter clean glide at 75 knots. Note rate of descent. Increase RPM to approx 1600. Maintain attitude. Airspeed increases. Select higher nose attitude to maintain 75 knots. Trim Note: Increased rate of descent.
Approach Configuration. Varying The Descent Path
Set up power/flapped descent. Use field for simulated approach, into wind. 1) If too high on descent: - Reduce power to lower nose. - Maintain 75 knots and trim. Note: Increased rate of descent. 2) If too low on descent: - Increase power. - Raise nose to maintain 75 knots and trim. Note: Decreased rate of descent.

Note: Cruise descent is covered in Exercise 18, navigation.

Descending – Exercise 8 (3)

Aim:
To teach how to descend at greater than normal rates of descent without increasing the airspeed. e.g. Sideslip.

Airmanship:
Lookout. Anticipate safe recovery by 200ft AGL. Application re flapless landings. Forced landings. Engine fires. See pilot's handbook re slipping with flap selected.

Air Exercise:

Sideslip

Entry
From straight glide at 75 knots, adopt a moderate bank to the left (15°) using opposite rudder to maintain heading. Simultaneously adjust nose attitude for 75 knots. Note the increased rate of descent and turn coordinator ball out of balance. Although greater bank angles give greater rate of descent care must be taken to maintain adequate rudder control especially with flap selected.
In The Slip
Maintain selected bank and sufficient opposite rudder to maintain direction. Hold attitude for correct speed, 75 knots. Caution: Ensure safe speed maintained since ASI can give erroneous indications during a slip.
Recovery To Glide
Anticipate safe recovery. e.g. Not below 200ft AGL. Level wings simultaneously centralising rudder. Readjust pitch attitude to maintain 75 knots.
Slipping Turn
From a gliding turn to the left at 75 knots. Apply opposite rudder to the turn maintaining the bank angle with ailerons. Adjust pitch attitude to maintain correct speed. Note increased rate of descent and turn coordinator ball out of balance. Maintain selected bank with sufficient opposite rudder. Maintain safe IAS. To recover apply rudder pressure in the direction of the turn to regain balanced flight whilst using aileron control to maintain bank. Adjust pitch attitude to maintain correct IAS.

Medium Turns – Exercise 9

Aim:
To learn how to turn the aircraft using bank up to 30° level, climbing and descending and to roll out on specific headings.

Airmanship:
Lookout and orientation. Synchronisation of DI and compass in the air.

Air Exercise:

Level Turn – Medium Bank

Entry
Lookout all round and above. Straight and level 100 knots. Roll on bank up to 30° using aileron and rudder in desired direction. Check with aileron to maintain. Increase control column back pressure to maintain height. Note that we do not trim in the turn.
In The Turn
Lookout. B – Maintain **B**ank 30° ailerons. A – **A**ttitude, constant height (elevator and altimeter). B – **B**alance (rudder and turn coordinator).
Rolling Out
Lookout. Anticipate required heading. Apply aileron and rudder opposite direction to rollout. When wings level centralise controls. Apply sufficient control column forward pressure to prevent gain in height.

Climbing Turns
Teach from straight climb at 75 knots. Rate one/15° bank. Note rate of climb less and need to control IAS accurately plus tendency to overbank especially to the left. Nose attitude slightly lower in turn. Show increased angle of bank reduces rate of climb.

Descending Turns
Teach from straight descent at 75 knots. Descend into cleared area/lookout. Bank up to 30°. Note turn increases rate of descent and lower nose attitude to maintain correct IAS. Show increase bank increases rate of descent and power must be added if original rate of descent required.

Important: All turns. Checking/correcting bank. Attitude. Balance in that order.

Slow Flight – Exercise 10A (1)

Aim:
To acquaint the pilot with the handling characteristics at speeds close to the stall and so allow the development of the necessary sensory and other perceptions to gauge the closeness of the stall. In addition, to give practise in controlling the aircraft at these slower speeds, especially as regards maintaining balance when manoeuvring.

Airmanship:
Lookout. HASELL. Engine handling/temperature and pressures. Safe height. Never fly at these slow speeds except take off and landing unless with instructor.

Air Exercises:

Level Flight
Introduce HASELL safety checks. Estimate/set power for flight at Vs1 + 5kts (55 knots). Select attitude and trim. Check and adjust.
Maintain altitude, heading and balance. Note sluggish controls, high nose attitude and hence poor forward lookout.
Also cannot maintain altitude with control column pressures. Must use control column and power.

Note: Keep hand on throttle.

Finally towards the end of this stage the flying instructor should begin to introduce student distractions as required. Flying time spent on this and other stall/spin awareness exercises is to be recorded separately in the student pilot's logbook.

Slow Flight – Exercise 10A (2)

Aim:

To acquaint the pilot with the handling characteristics in the range Vs1 + 5kts and Vso + 5kts down to minimum speed(s) at which the aircraft can be safely controlled, concluding with the symptoms of the approach to the stall and the recovery to safe flight.

Airmanship:

HASELL. Lookout. Engine handling/temperatures and pressures. Safe height. Never fly at these speeds unless with an instructor.

Air Exercises:

After the preceding part 1 exercises, the instructor should demonstrate, with subsequent student practise, the effects of applying full power in the landing configuration (to climb) and high power in the landing configuration as on a short field approach (descent) as described below.

Full Power In Landing Configuration

Instructor to demonstrate aircraft in full flap climb at 50 knots and necessity to maintain balance. Note poor rate of climb and if relax rudder pressure the ball moves off centre. Subsequent yaw can lead to roll. The loss of speed could lead to stall/spin.
Student practise Vso + 5kts (50 knots) flapped climbs whilst retracting flap to simulate go around action.

High Powered Flapped Descent

From low speed flight, instructor to demonstrate in full flap descent simulating low speed short field approach. Whilst descending allow the IAS to fall off sufficient to cause stall warner to operate. Note that the aircraft could stall albeit with the nose still relatively low. Student practise the descent at 50 knots then entering fully flapped climb, initially at 50 knots reverting to normal climb as flap is retracted.

Demonstration of Symptoms During Approach to Stall

Instructor conclude the exercise by demonstrating the symptoms approaching the stall. It is recommended that a lowish power setting, say 1950 RPM be used for this demonstration. The instructor should demonstrate the symptoms stressing that only a relatively small

movement of the control column is necessary to return the aircraft to safe controlled flight. Student to practise effecting recovery at the stall warner stage. This part of the flight is to be used to 'sow the seeds' of a recovery technique and so develop the student's competence in achieving safe recoveries to normal flight in the event of reaching a dangerous situation in the air. The instructor should stress that there is nothing dangerous about stall recovery provided action is taken soon enough and at the right altitude.

Stalling – Exercise 10B

Aim:
To examine the symptoms of an approaching stall, the characteristics of a stall and to teach the standard recovery with a minimum height loss, ensuring that the student knows when the aircraft has safely recovered.

Airmanship:
HASELL(HELL). Repeat as necessary during the exercise.

Air Exercise:
After student having been shown a stall.

Entry
HASELL. Lookout, clearing turn. Aircraft wings level and in balance. Close throttle (prevent yaw). Maintain height (pitch). Ailerons neutral. Note datum height. Note: Symptoms on entry: - Falling airspeed. - Sloppy controls. - High nose attitude. - Stall warner. - Slight buffet.
In The Stall
Hold control column fully back. Prevent yaw. Ailerons neutral. Note: Symptoms in the stall: - Low IAS, high rate of descent. - Heavy buffet. - Sink. - Nose pitches down. - Possible wing drop (Do not use aileron). - Note stall speed, control column fully back and cannot raise the nose. The aircraft is now no longer controllable in pitch.
Recovery
1) With Power: Holding ailerons neutral. Control column forward gently. Full power. Prevent yaw. Airspeed rises. Ease out of dive to 75 knots.

Approx height loss 150ft.

2) Without Power (Elevator Only):
Control column fully forward until buffet stops. Prevent yaw with rudder.
Airspeed increases. Ease out of dive to 75 knots.
Approx height loss 300ft.

Spin Avoidance – Exercise 11A

Aim:
To recognise the symptoms of an approach to a spin and to recover at the incipient stage from various flight attitudes.

Airmanship:
HASELL(HELL) safety checks. Essential recover by 3000ft AGL.
Constant lookout.

Air Exercise:

1. Recovery at the incipient stage from straight and level flight.

Entry
HASELL/HELL. Set up slow flight straight and level. Slowly apply control column back pressure without maintaining balance i.e. allow yaw to occur. The wing will normally drop as the aircraft stalls. Note: If reluctant to drop, use more rapid movement of control column, more power or rudder. Delay stall recovery until wing drops between 45° and 60°.
Recovery
Control column forward and rudder to prevent yaw. Power as required. Level the wings and regain balanced flight. Return to normal straight and level. Student practice.

2. Recovery at the incipient stage. Repeat from straight descent, climb, level turns, climbing and descending turns.

Important:

1. For the purpose of training, the incipient stage is that period when a wind drops at the stall to more than 45° but not more than 90°. Clean aircraft configuration to be used.
2. Prompt recovery is essential. If nose drops well below horizon power should not be applied until initial recovery is effected and nose is being raised towards the horizon. This is to avoid height loss.
3. Time spent on these exercises must be logged separately.

Take off and Landing – Circuits – Exercise 12 & 13 (1)

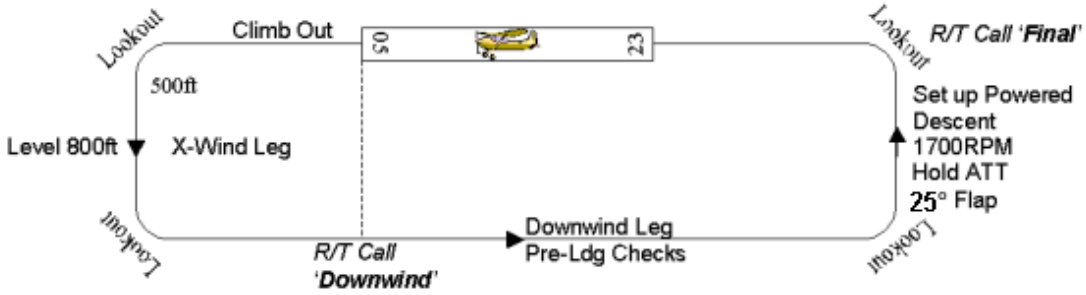
Aim:

To teach the technique of take off, climb to a downwind position, approach and landing.

Airmanship:

Vital action. Lookout at all times. Pre landing checks. Operation and judgement.

Air Exercise:



Before Take Off Checks
Taxy checks. Power checks. Take off checks. RT Call.
Take Off
Line up. Check wind sock. Align DI with compass (Correct runway?). Full power, compensate for yaw. Checks i.e. RPM, ASI, Engine Ts & Ps. Control column back pressure 55 kts. Rotate 65 kts. Safety speed, climb out 75 kts (Clean). Check drift.
Climb
Lookout. 300ft checks. 400ft Lookout. 500ft turn crosswind. Level at 800ft.
Downwind
Lookout. Constant heading, drift. Constant height. RT call. Pre landing checks. Check height.
Base Leg
On downwind, when threshold falls behind wingtip 45°, turn to base leg. Check drift.

Approach and Landing
Threshold at 45° to aircraft. Set up descent. 25° flap. Trim 70 kts. Check drift and height. Re-adjust power if necessary. Final turn at 500ft. RT call. Check 65 kts. Landing flap. Retrim. Over threshold at approx 65 kts.
Go Around
Carb heat cold. Full power. Climb attitude. Flap up in stages. Note: If full flap is applied, raise from 40° to 25° as soon as practical.

Engine Failure/Emergencies During & After Take Off – Exercise 12E

Aim:

To teach the procedures to be adopted in the event of emergencies occurring during or after the take off run.

Airmanship:

Normal considerations apply but care to be taken during practice to maintain safety and to avoid annoyance to people/livestock.

Air Exercise:

During Take Off

If any of the following occurs:

- Loss of power
- Abnormal oil pressure or temperature
- Low fuel pressure
- Vibration or rough running engine
- Nil ASI reading

Proceed as follows:

Close throttle fully, maintain directional control, apply brakes as required but take care to avoid skidding, report to ATC over radio, return to parking area.

Important: If the aircraft over runs the runway, complete the crash checks.

After Take Off

If an engine failure occurs shortly after take off:

- Lower nose and adopt 75 kts glide
- Trim
- Warn passengers
- Close the throttle
- Look ahead 30° either side of the nose and select best landing area.
- Maintain speed and set up glide approach to chosen area.
- If time, transmit Mayday call
- Flap as required

WARNING: Do not turn back!

Carry out crash checks:

- Throttle closed
- Magnetos off
- Fuel off
- Flap as required
- Hatches unlatched
- Harness tight
- Mayday call if time permits
- Master switch off (Once flaps set)

Touchdown with full flap, holding off, if possible, to achieve slow touchdown speed. After touchdown, evacuate aircraft promptly.

Note: During practice (dual only) check carb heat as required and recover in good time. Remember 500ft rule and avoid annoyance (people/livestock).

Caution: During practice, on the recovery, it is essential to avoid slam opening of the throttle: engine failure can occur if this advice is ignored.

Go Around – Exercise 13E

Aim:

To teach the student pilot how to discontinue an approach and climb back to the downwind position.

Airmanship:

Lookout. Normal aspects apply. Engine handling. VFE. ATC liaison.

Air Exercise:

1. Go around from final approach:
    - Lookout
    - Select carb heat cold
    - Full power, compensate for yaw, maintain balance
    - Select climb attitude (for flap setting)
    - Check positive climb, correct IAS achieved
    - Raise drag flap (last stage) as soon as practical
    - Trim
    - RT call
    - Clear the runway overhead to maintain visibility (keep in mind: Is there any parachuting in progress? Is there any areas I should avoid? Instructor will advice in this situation although all airfields may have different procedures)
    - Retract remainder of flap in stages and trim
    - Level out at circuit height
    - Turn crosswind
    - Lookout
2. Go around from mis landing:
    - Lookout
    - Full power and select safe climb attitude (for the flap setting)
    - Check carb heat cold
    - Climb straight ahead
    - With positive climb rate, correct IAS and retract drag flap at least 100ft AGL then 63 kts climb
    - RT call
    - At 300ft retract remainder of flap in stages
    - Retrim
    - Resume normal climb out and continue in circuit

Crosswind Approach and Landing – Exercise 12 & 13 (2)

Aim:

To teach the procedure and control technique to take off and land safely during cross wind conditions

Airmanship:

All normal considerations apply. Check aircraft manual for crosswind limitations. Your personal limitations?

Air Exercise:

1. Pre Take Off:
   Calculate crosswind component, line up with control column into wind.

2. Take Off:
   Progressively centralise control column as speed increases to maintain lateral level. Keep straight with rudder, beware of weathercock effect. Do not raise nose wheel until take off speed. Lift off cleanly at 65 to 70 kts, make immediate allowance for drift.

3. Climb and Circuit:
   Maintain extended runway centre line on climb out. Normal circuit pattern plus allowance for drift.

4. Approach and Landing:
   Approach as normal, flap as required. Allow for drift and round out as normal. Just before touchdown, make sure aircraft is facing down centre line with control column into wind. After touchdown, lower nose immediately, but gently to assist with directional control. Keep control column into wind during ground roll.

Note: The lift off speed should be a few knots higher than normal during cross wind conditions. Hence the different speed quoted above.

Flapless Approach and Landing – Exercise 13 (1)

Aim:

To teach the technique of approach and landing without flap.

Airmanship:

Normal considerations apply.

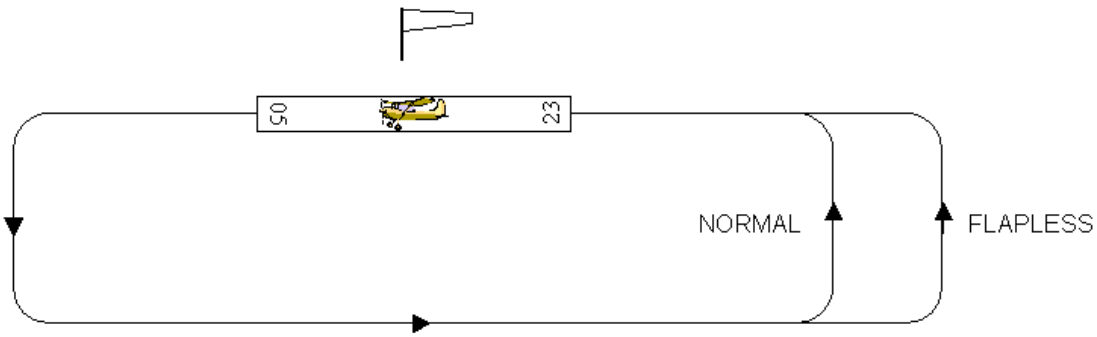
Air Exercise:

1. Downwind Leg:
   If surface wind is light it is permissible to fly further downwind due to flatter angle of approach.

2. Base Leg:
   Establish descent in good time using less power than normal. No flap. Trim 75 kts and turn 75 kts

3. Final Approach:
   Speed 75 kts. It is preferable to aim for a normal approach slope as a flatter approach path will result in a restricted forward view. Small power adjustments are to be used to maintain descent path. Cross the hedge at approx 70 kts.

4. Landing:
   A shallower round out will be required. The higher speed will involve a longer float and landing run. Touchdown approx 55 kts. Be prepared to use brakes.



Glide Approach and Landing – Exercise 13 (2)

Aim:

To teach how to complete a successful approach and landing from a predetermined position without the use of power. This exercise forms the basis for forced landing procedure.

Airmanship:

Normal airmanship considerations apply. Engine handling.

Air Exercise:

1. Downwind Leg
   As for normal circuit but earlier turn on to base leg. Select aiming point upwind of the intended point of touchdown.

2. Base Leg:
   Check drift, wind velocity and decide when to close the throttle. Select/check carb heat and close throttle when sure of reaching touchdown point. Trim for 75 kts glide. No flap. The wind will determine the position for establishing the glide. Better late than early. Maintain heading, look at selected aiming point and assess if too high or low. If very high, lower one stage of flap. If high or low turn away/towards runway.

3. Final Approach:
   Ensure maintain correct speed on final turn. Lower nose as necessary. Caution re wind gradient effect in strong winds. Lower further stages of flap as required to reach intended landing point.
   Caution: If undershooting on this exercise, do not stretch the glide. If high or if not on the ground in good time with insufficient runway left, initiate a go around.

4. Landing:
   Initiate round out in good time due to high rate of descent and large attitude change.

Student practice to achieve a high standard due to application re forced landing procedure.

Short Field/Soft Field Take Off and Landing – Exercise 12 & 13 (3)

Aim:
To teach take off and landing techniques where the field length is restricted or the surface is soft due to grass, mud, snow, slush etc.

Airmanship:
Normal considerations apply. Consult flight manual for performance.

Air Exercise:

1. **Short Field**

Take Off: Having determined best take off path re obstacles, surface slope, and wind etc. Take off checks complete; align aircraft with selected path using max run available. 25° flap to be used.
Open up to max power against the brakes. Check RPM and Ts & Ps. If satisfactory release the brakes for take off. Be prepared for swing and raise nose wheel at 55 kts. Climb away at 63 kts for the best angle of climb if obstructions exist; otherwise when clear of obstacles at a safe altitude raise flaps, climb at 75 kts. Trim.

Landing: Initial approach as for standard circuit but in light winds turn onto base slightly later. When established on final select full flap and make precision approach to selected touchdown point. Adjust attitude for 65 kts. Descent controlled with power and speed with elevator. As touchdown is approached, adjust aircraft attitude and apply power as required to reduce the speed to 60 kts.
Power should be maintained throughout the round out and the throttle closed just before or as the main wheels contact the ground. There should be no float. After landing, gently lower the nose wheel and apply brakes.

2. **Soft Field:**

Take Off: Having determined best take off path re obstacles, surface slope, and wind etc. Take off checks complete; align aircraft with selected path using max run available. 25° flap to be used. Apply full power. If the ground is very soft a rolling start may be desirable. The control column should be held back to permit the aircraft to leave the

ground at the lowest possible speed. As the aircraft does so, the control column backpressure should be relaxed and the aircraft flown parallel to the ground and allowed to accelerate to 63 kts prior to climb out which is as for short field.

Landing: The approach is as above and the touchdown is to be made with the nose wheel held clear of the ground as long as possible. If the landing distance permits, a trickle of power may be left on to improve elevator control and minimise weight on the nosewheel both during landing roll and taxiing.

Consolidation Flying – Exercise 14B
(First Solo – Exercise 14A)

Aim:
To prepare the student for local flights away from the base aerodrome following circuit consolidation

Airmanship:
Relevant documentation. Need to carry radio and navigation information. Local landmarks.

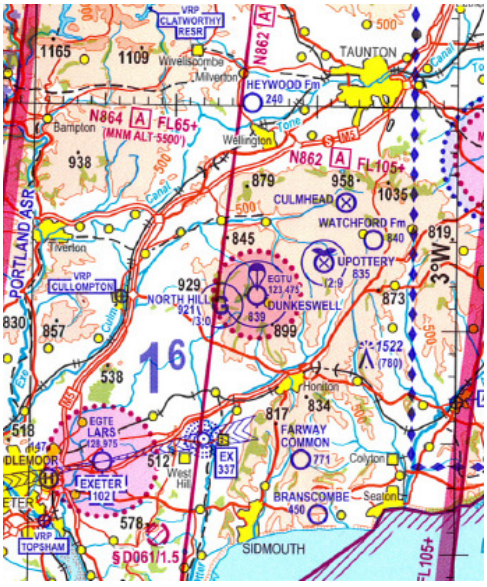
Air Exercise:

1. **Procedures For Joining and Leaving The Circuit**

Reference to the school pilot's order book, re circuit directions and procedures regarding effect of parachuting, glider and microlight aircraft activities. Signal area. Rejoin procedures. Radio and non radio. ATC liaison.

2. **Orientation In Local Training Area**

Awareness of training area boundaries and local features such as Wellington Monument, Upottery and Culmhead disused airfields, Stockland Hill TV Mast, Honiton town, M5 motorway, coastline, North Hill Gliding Site.



Ability to guesstimate compass heading to return to base plus knowledge of compass turning errors. If South of Honiton, call Exeter Radar on 128.975. Knowledge of SSR equipment for routine and emergency use. Need to equip with kneeboard, nav and radio data.

3. Obtaining QDM's, Radar Assistance and Pan Calls

Knowledge of lost or uncertain procedures i.e. how to obtain QDM's and radar assistance. Practise Pan call to be made.

Important: The above exercises will require several dual flights. Solo flying in the local area is to be carried out only after completion of exercises 15, 16, 17, 18A and 19.

Advanced Turning – Exercise 15 (1)

Aim:
To teach how to turn the aircraft at angles of bank between 30° and 60° in level flight and to improve the pilot's co-ordination and competency.

Airmanship:
Lookout. Cockpit safety checks and HASELL. Slow entries and recovery at early stages.

Air Exercise:

1. Steep Turn (45° Bank) From Level Flight At Cruise Speed)

Entry
Lookout turn complete. Cruise speed. Entry as for normal turn gradually increase power whilst increasing bank to 45°. Same time control column back pressure to maintain altitude. Rudder for balance.
In The Turn
Lookout. Maintain: - **B** Angle of bank – ailerons - **A** Attitude – elevator - **B** Balance – rudder - **S** Airspeed – power and control column Note: Nose moves round horizon at great rate.
Roll Out
Lookout. Anticipate, apply aileron and rudder opposite to turn whilst decreasing power to cruise RPM as bank decreases. Apply forward control column pressure to prevent altitude gain.

2. Faults In The Turn – Recovery From Spiral Dive

Entry
Check for clear area and height AGL. Set cruise power (or less). Enter steep turn, allow nose to drop.
In The Turn
Note rapid increase of speed and altitude loss. Control column back pressure ineffective in raising nose at large bank angle.
Recovery
Close the throttle. Roll wings level (firm pressure). Ease out of dive.

3. Stall Entry and Recovery In The Turn

Incipient Stage
Safety checks and lookout. Enter steep turn delaying power increase. Raise nose and when below Vs x 1.5 increase control column back pressure until stall symptoms occur. Note higher airspeed. Recovery: Release back pressure and continue turn.
Developed Stage
As for incipient stage but apply control column pressure until the developed stall occurs. Recovery: Positive forward movement of control column. Prevent further yaw with rudder. Adjust power as required. If nose is low reduce power, if nose is high or level increase power. Note: Rate of turn decreases markedly just before the stall also that Vs is increased by 100% at 75° of bank.

Advanced Turning – Exercise 15 (2)

Aim:
To teach how to make descending and climbing steep turns and how to recognise and recover from stalls and incipient spins in these turns.

Airmanship:
HASELL(HELL) checks. Orientation. Safe altitude.

Air Exercise:

1. **Descending Steep Turns**

With partial power in straight descent 90 kts, lookout complete, enter level steep turn 45°/50° bank. Monitor/maintain. Tendency to increasing airspeed to be controlled by bank reduction and increase in control column back pressure. For 60° banked descent turns use 105 kts. Repeat from the glide using idle power. Note the higher rate of descent. Repeat with stall and recovery at the incipient and developed stages. Entry and recovery as for level steep turn.

2. **Climbing Steep Turns**

For the climb at 85 kts, lookout complete, enter climbing steep turn using full power and bank angle of approx 40°. If necessary, reduce bank to give reasonable rate of climb.

Note: Such turns are not a recommended operational procedure but are useful co-ordination exercises. Repeat with stall and recovery at the incipient and developed stages. Entry and recovery as for level steep turn.

3. **Steep Turns And Incipient Spins**

Spin recoveries at the incipient stage are to be carried out from level and climbing steep turns.
After completing safety checks carry out steep turn entries, delaying power increase and raising the nose slightly to reduce speed below Vs x $1\frac{1}{2}$. Final look out.

Ensure positive yaw and unbalance (using rudder a/r), increase C.C. back pressure until stall with wing drop occurs. Recover before full spin develops.

Recovery: Standard recovery as for previous turns but greater control movements involved. If developed spin occurs use full recovery procedure as Flight Manual.

Advanced Turning – Exercise 15 (3)

Aim:
To teach how to recover from unusual flight attitudes

Airmanship:
Safety/HASELL. Engine handling. Safe altitudes.

Air Exercise:

1. **Recovery From Unusual Attitudes – Nose High**

Orientation/lookout complete.
Adopt steeply banked attitude, with nose high and low airspeed

Recovery: Ease gently forward on C.C. whilst simultaneously levelling wings and adding full power. Return to straight and level flight and cruise RPM

2. **Recovery From Unusual Attitudes – Nose Low**

Orientation/lookout complete
Adopt steeply banked attitude, with nose low and increasing airspeed

Recovery: Close throttle. Level wings (without raising nose). Ease gently out of the dive. Return to straight and level flight and cruise RPM as speed stabilises.

Forced Landing (Without Power) – Exercise 16

Aim:

To teach how to carry out a safe descent, approach and landing in the event of complete of partial engine failure in flight.

Airmanship:

Lookout. Engine considerations. Not fly below 500ft above ground level. In practise avoid annoying people and livestock.

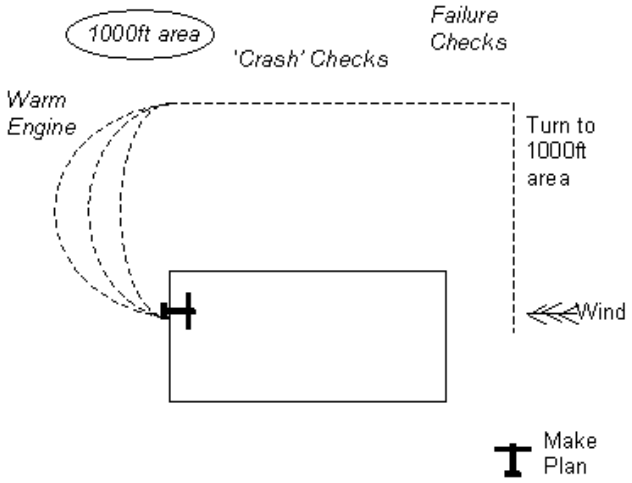
Air Exercise:

Simulated engine failure at 2500ft above ground level. En route remind student re selecting a forced landing area.

Carb Heat! Instructor to close throttle and say 'Simulated forced landing. You have control'.
Glide attitude and trim. Check w/v. Select landing area. Plan 1000ft area and circuit pattern. Turn aircraft as required.

Carry out failure checks:

Fuel Contents:	Sufficient
Fuel Selector:	Check ON
Mixture:	Rich
Carb Heat:	Change Mode
Magnetos:	Both
T & P's:	Check
Primer:	Locked



If committed – Mayday/Transponder 7700 and crash checks:

Throttle:	Closed
Ignition:	Off
Fuel:	Off and Mixture Cut-Off
Hatches:	Door Unlatched
Harness:	Tight
Master:	Leave ON

Check approach. Adjust pattern at 1000ft area to land mid-field (with no flap). Continue as for normal glide approach. On final when sure of

reaching landing area aim to land first third, using full flap. Check master switch off once flaps in position.
If high on finals, with flap selected, could increase glide speed. If too high, new field.
Note: All checks are touch checks during practice but carb heat hot and engine warmed every 500ft. Overshoot not lower than 500ft above ground level.

Instructor Notes:

1. Never turn so that the pilot's back is towards the landing area.
2. If very high at 1000ft area continue through extended centreline and make wide S-turn.
3. If engine failure at approx 2500ft: Plan as above.
4. If well above 2500ft: Could circle the area with chosen field near the aircraft.
5. If engine failure at 1500ft: Turn downwind or base leg heading.
6. If engine failure at 1000ft: Turn on to base leg heading.
7. Glide distance less with dead prop.
8. Ensure student and flight instructor both know which field and 1000ft area are to be used when demonstrating this exercise. Later, flight instructor to build realism safely.

Forced Landing (With Power) – Exercise 17

Aim:

To learn how to make an emergency/precautionary landing away from a normal aerodrome when power is available.

Airmanship:

All normal airmanship aspects apply but in addition emphasis is placed on avoiding annoyance to people and livestock during practice.

Air Exercise:

Selecting a suitable field and demonstrating forced landing procedure.

1. **Initial Procedure**

- Seek assistance by R/T if possible.
- Check fuel state/light/weather and decide time for search.
- Fly downwind for maximum coverage.
- Note w/v and select field if no aerodrome available.
- Considerations: -
    a. Size
    b. Surface
    c. Slope
    d. Obstructions
    e. Near Communications
- Overfly the area in slow safe cruise 75kts, flap 25°. Note heading and best landing run.

2. **Inspection Procedure**

- First circuit 500ft AGL or depending on cloud base. Note landmarks downwind and final.
- Pre-landing checks and set up approach for inspection run.
- Approach field and overshoot areas at 300ft
- Check any obstructions and drift
- If satisfactory: Second Circuit…
- Repeat, still slow cruise
- Pre-landing checks and set up approach for second inspection run approximately 100ft on right hand side of field to re-assess approach, landing area and overshoot area.

- Max take off flap
- If still satisfactory: complete third circuit for approach and landing

3. Approach and Landing

- Repeat approach with intention of making short field approach and landing if surface still satisfactory.
- Full flap 40°
- Aim to land one third way into field
- During practice overshoot at safe height and avoid annoyance to people and livestock

4. After Landing

- Only release harness when aircraft comes to rest
- Normal shut down
- Not taxi aircraft until ground inspected
- Move aircraft as necessary for shelter
- Tie down/protect from damage by people and livestock
- Inform base/police
- Not take off again. Report situation and obtain further instructions.

Pilot Navigation – Exercise 18A

Aim:
To teach all aspects of pilot navigation i.e. ground pre-flight preparation and in-flight procedures.

Airmanship:
Success depends on good flight planning. Weather appreciation. Good cockpit organisation in flight

1. Pre-Flight Action By The Pilot
Can the flight be safely made? Weather, route, altitudes, aircraft state, legal requirements, met, NOTAMS, AIP, selection of route and maps, maps marked up – timings 5° and 10° lines etc. Raise nav flight plan and log (to be checks by FI). Booking out procedure, navigation equipment to aircraft (several pencils or biros, accessible etc).

2. Nav Log, Departure Action and Setting Course Procedure
Entering departure time, inserting ETA 1st sector. Relevant altimeter setting. Decide method of setting course: on climb out or overhead the field (PARACHUTING IN PROGRESS?). RT.

3. En Route Pilot Navigation, Maintenance of Flight Log, Track Keeping, 1 in 60 Rule
Method of maintaining constant heading and altitude, constant monitoring of DI and compass, log keeping, lookout and track maintenance, corrections to track, updating ETA's. Remember at 90 kts 2/3 the n.m's = minutes.

4. Altimeter Settings
Altimeter setting regions.

5. R/T
If necessary, write message format on bottom of flight log. Remember Time/Turn/Talk

6. Action if Lost or Uncertain of Position
Essential learn this procedure. Know method re plotting circle of uncertainty. Awareness of facilities available on 121.5 mhz.

7. Weather Problems and Diversion to Alternate Airfield

Ability to estimate track (M) to an alternate airfield, plus mental dead reckoning (DR) re: ETA's. Awareness of need to divert etc.

8. Descent and Joining at Destination Airfield

Knowledge of cruise descent, calculation of Rate of Descent's etc. Must have all relative information re: destination airfield available (chart or copy on back of log). Altimeter settings, circuit directions, parking, security of aircraft. Refuelling and booking in.

9. Cross Country Routes

Please speak to your instructor to our latest cross country routes and the order in which they are flown.

Navigation at The Lower Levels – Exercise 18B

Aim:

To teach the correct flying techniques and engine handling when forced to fly low e.g. below 1000ft AGL due to bad weather or other operational reasons.

Airmanship:

Cockpit safety checks. Lookout for other aircraft and obstructions. ATC considerations. Weather appreciation. Avoid annoyance to people and livestock.

Air Exercise:

1. **Aircraft Safety Checks**
   - Fuel adequate
   - Radio: correct frequency, volume turned up
   - Engine temperatures and pressures, carb heat
   - DI synchronised
   - Altimeter: latest setting
   - Harness tight
   - Loose articles stowed
   - Location: know position
   - Low safe cruise configuration
   - Lights on. Implement course of action
   - Could use: FREDALLLL for checks
   - Descent using power is better than glide
   - Sharpen lookout
   - Keep hand on throttle

2. **Different Aspect of Features**
   - Oblique view gives changes aspect, need to estimate height AGL
   - Visually fly contours. Use extra power as required
   - Note apparent high speed
   - Possibly added turbulence
   - Observe 500ft rule. Keep 200ft below cloud.
   - Map reading
   - Lookout, hazardous obstructions

- Contour Flying: Ensure ground does not climb faster than aircraft. Watch for fixed bearing! Note that the altitude is not a lot of use except that it will give a good datum for straight and level and for minimum safe altitude. Pilot must judge height above ground.

3. **Need for Accurate Flying**
   - Demo! Across line feature
   - Upwind groundspeed slow
   - Crosswind drift
   - Turning slipping/skidding
   - Downwind groundspeed high
   - Do not correct for "apparent slip or skid"
   - Add power for turns and anticipate power when contour flying

4. **Simulate Bad Weather Return To Base With Bad Weather Circuit**
   - (3 typical cases)
   - 1. Heavy shower activity, possible hold off
   - 2. Low cloud good visibility
   - 3. Low cloud poor visibility

   - Simulate join plus bad weather circuit, hold off or divert

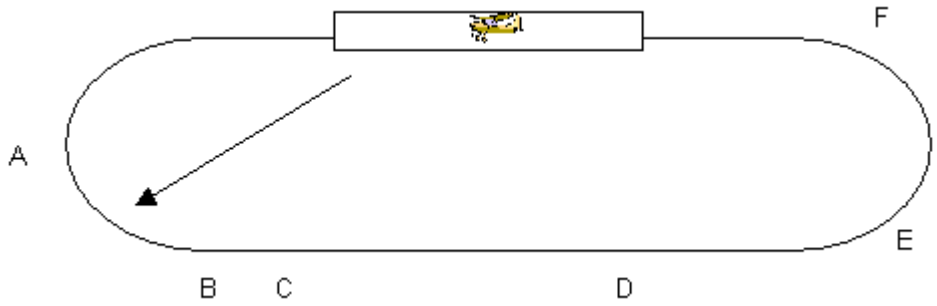
Operation At Low Level (Bad Weather Circuit) Exercise 18B(1)

Aim:
To teach how to manoeuvre the aircraft in the event of having to make a circuit at low level e.g. under a low cloud base and or in poor visibility.

Airmanship:
Normal aspects apply. 500ft rule etc, in training. Low speed cruise configuration. Avoid annoyance to people and livestock, in training.

Air Exercise:
(Either at an aerodrome or in the countryside in conjunction with Exercise 17)

Note: The under mentioned is the recommended training procedure to cover the worst case i.e. poor visibility and low cloud. In the cases of poor visibility and no low cloud, or good visibility and low cloud, the circuit pattern and height can be modified to suit. Where practicable for best lookout a left hand circuit is advisable.



A. In poor visibility, a 180° rate 1 turn is about right to position the aircraft on the downwind leg. This gives about the right radius for a poor visibility circuit. The angle of bank could be modified slightly in the case of a crosswind. The a/c should not normally be lower than, say, 400ft AGL and not closer to the cloud base than 200ft.

B. The distance out from the field or runway should be close enough to retain sight of the field in poor visibility but far enough out to make a safe base turn.

C. Downwind checks as normal include 25° flap for low safe cruise configuration. In training at an airfield, the R/T call would be "G-KR, Downwind, Low Level Left/Right Hand

Runway 23". Also, pilot should select a landmark ahead as in poor visibility.

D. Study ground track of base turn and final approach and fix landmark on final approach where pilot can aim to reach at say 300ft. Wings level ready for final lowering of flap, ready for landing.

E. Descending turn. Rate of descent less than for normal circuit due small height to be lost.

F. Set up for final approach. In training, at an airfield, aim for short field landing.

Radio Navigation – Exercise 18C

Aim:

To teach the use of Radio Navigation equipment in the aircraft. At least VHF/DF, SSR (Transponder), VOR and ADF to be taught. Other facilities such as DME, GPS can be taught as required

Airmanship:

Pre-flight AIP references and NOTAMS to be checked. Equipment to be set up/checked after start up and in the air. Application to Skill Test and subsequent PPL flying. ATC liaison.

Air Exercise:

1. VHF/DF

Refer to CAP413 (RT Procedures)

2. SSR (Transponder)

Refer to CAP413 (RT Procedures). AIP Application

3. VHF Omni Range (VOR)

Refer AIP, availability/frequencies

After start and in the air, select, identify, check display

- TO and FROM indications, orientation
- Intercepting and maintaining radial(s)
- VOR passage
- Obtaining a fix

4. Automatic Direction Finding Equipment (ADF)

Refer AIP, availability/frequencies

After start and in the air. Select, identify, and check display

Instructor demo:

- Orientation and method of obtaining QDM's
- Homing to a beacon
- Station passage
- Tracking from a beacon
- Obtaining fix if other aids available

5. DME/GPS

To be demonstrated/practised as required.

VOR Tracking – Exercise 18C (1)

Aim:
To teach how to track/intercept a track to and from a VOR

Airmanship:
Lookout. Safety altitude. FRIEDAL. AIP latest information.

General Notes:
The ground radio facility is known as the VOR (VHF omni-range) Station Each station transmits signals in all directions, hence the term omni-directional. The signals are arranged to produce an infinite number of courses or tracks, 360 of which can selected and identified by the VOR receiver in the aircraft. Each bearing from a station is called a radial. The audio signals from the station carry an identification feature and sometimes an ATIS transmission. As stated, VHF band is used (between 108MHz and 117.95MHz), the signals are line of sight and are relatively free from interference.

Basically, the aircraft equipment comprises antennae, receiver, frequency selector, and course deviation indicator (CDI). Warning 'flag' device is fitted to show when the equipment readings are likely to be unreliable. Likely range of the equipment is as follows:

Aircraft Altitude	**Approx Range**
1,000ft	40nm
2,000ft	55nm
4,000ft	78nm
8,000ft	110nm

It should be realised that each radial subtends an arc of approximately 1nm at 60 nm from the station, so intercepting a radial some distance from the station can require a larger closing angle than when close in.

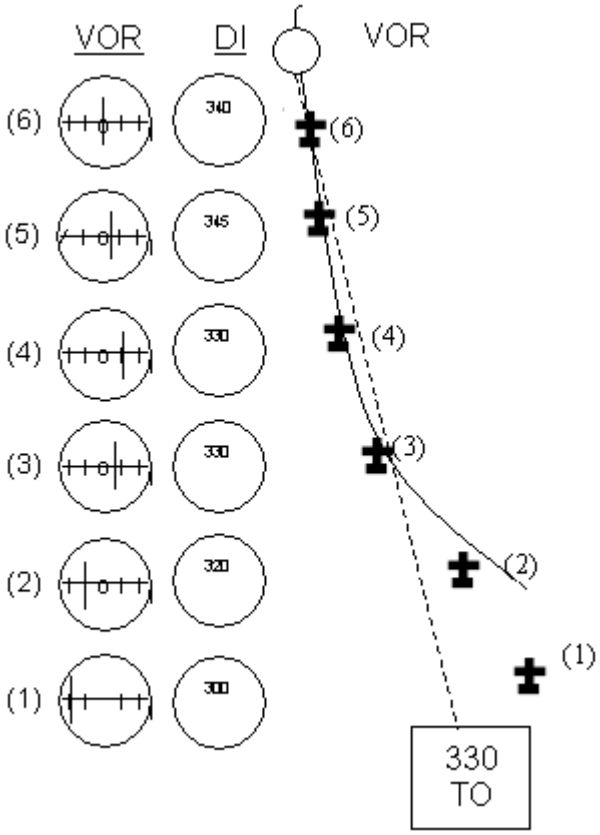
The VOR station's signals, one fixed and one rotating- are in phase when aligned with Magnetic north. Thus all bearings or radials are in degrees Magnetic.

To Track To A Station

Check before flight in the UK Air Pilot (AIP) and obtain 'frequency', ' ident', 'hours of operation', 'precise location', and 'designated operational coverage'. The user should having tuned and identified the station:

- Select required radial on the CDI
- Confirm no warning flag
- Ensure correct TO/FROM indication (i.e. Aircraft heading and CDI reading similar)
- While maintain heading, CDI needle L or R will indicate which way to turn
- The number of dots that the needle is off will show the amount of track error
- Assess track error, multiply by 3, plus drift allowance and select new heading
- A normal 'bite' would be 30 degrees
- As the needle moves to the centre, reduce the angle. Remember, full needle deflection is 10 degrees.
- As the aircraft nears the station, the radial width will reduce considerably.
- When very close in, it becomes impractical to fly using the CDI. Best option is to fly using your established heading.

See illustration below:



Example:
If CDI needle shows 2 dots to the left, this means deflection of 4 degrees.

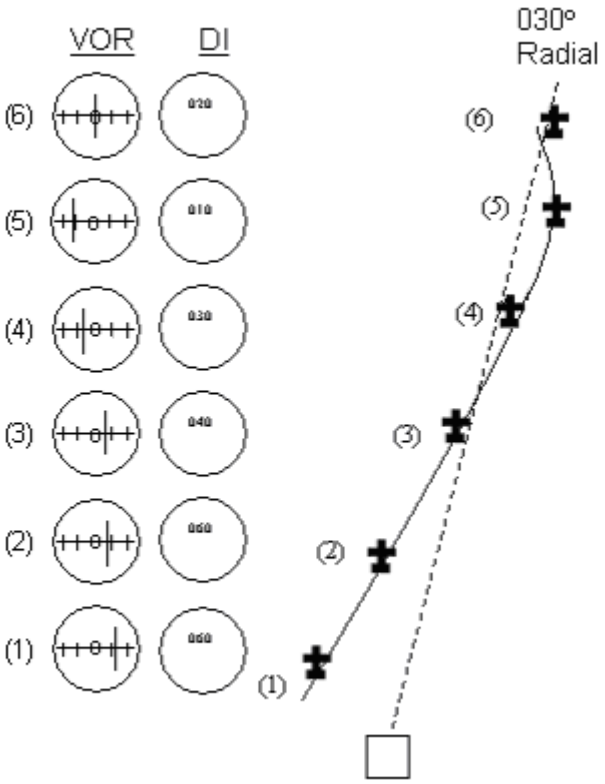
4 x 3 = 12 degrees, so change heading 12 degrees to left (+ or -) wind allowance.

To Track From A Station
As before and having tuned and identified the station

- Select the required radial on the CDI
- Confirm no warning flag
- Ensure a correct TO/FROM indication i.e. CDI says FROM and both the CDI reading and the aircraft heading are similar
- Maintain heading and CDI needle either left of right will indicate which way to turn
- The number of dots that the needle is off will show the track error

- Assess the error, multiply by 3, plus or minus a drift allowance and select a new heading. A normal 'bite' would be 30 degrees

Note: If the needle was deflected fully to one side, the safest way to assess the track error is to find the QDR by rotating the OBS knob in order to centralise the needle. The difference between the QDR and the required track will be the track error. Reassess, return the CDI to the required radial and fly the new heading. As the needle centres, reduce the 'bite'. Remember, as the aircraft flies away from the station the radial will widen and accuracy becomes important



To Assess Time To A Station

Tune and identify the station as before, assuming it is wished to establish the approximate time to the station, proceed as follows:

- Turn the aircraft so that it is flying at 90 degrees to the radial being tracked
- Centre the CDI and note the time
- As soon as the CDI starts to move, turn the OBS to set a new radial 10 degrees ahead

- When the needle centres again, note the elapsed time. Then apply the following formula:

$$\frac{\text{Time (Seconds)}}{\text{Degrees of Change}} = \text{Minutes From Station}$$

ADF Tracking and Position Finding – Exercise 18C (2)

Aim:
To teach how to track to and from a Non-Directional Beacon, also how to plot the aircraft position using NDB and VOR.

Airmanship:
Normal aspects apply. Lookout. Safety altitude. Must have instinctive idea of QDMs.

General Notes:
The student must understand the different type of beacon emissions and appreciate that if an a/c 'homes' on to a beacon without allowing for drift i.e. flies the a/c with the ADF needle centred the a/c will reach the station but not it's original track but pointing upwind!

Air Exercise:
(Initially practise in the clear, then under the IMC hood)

1. Flying a Pre-Selected Track To a Station

Normally the pilot would have verified before flight the frequency, ident, hours of operation, range, position, type of emission etc.

The ADF would have been tuned, idented and set to ADF. Needle operation would have been 'tested'. A fixed ADF card is assumed. A RMI would be easier. Two methods are given:

Method 'A'	**Method 'B'**
1. Check ADF needle and turn aircraft so needle reads zero. Ensure DI and compass synchronised. 2. The heading on DI is the QDM to station. 3. Maintain. Any deviation of ADF needle shows drift and the way to turn. 4. To regain original track, turn towards the wind (same side as needle) until the ADF needle is	1. Refer to ADF needle. 2. Ensuring DI and compass synchronised, mentally transpose ADF needle to DI face. The transposed position is the aircraft QDM. Decide if the QDM is as required or if aircraft required heading change to intercept required track. 3. If need to intercept, decide if to turn left or right and the

the same number of degrees on the other side of the nose.

5. Maintain until needle moves twice as far away from the nose. This confirms that the original track has been regained. Turn part way towards the station by a suitable amount to allow for drift.
6. Maintain new heading. If it is correct, the ADF needle will not move.
7. In practise, it will be necessary to correct further, as needle moves one way or the other. If needle does move then must correct. Pilot must decide if drift allowance is too much or too little. Repeat 4 to 6. Then make new drift allowance. Maintain.

Remember: The direction of needle swing will show which way to turn. Also, no need for too much arithmetic: to find actual QDM, either turn the aircraft to centre the ADF needle and read the heading or read the needle and add (if right of centre) or subtract (if left of centre) the aircraft heading. See diagram below.

8. If the QDM is not the one required, alter the heading as necessary i.e. decide direction and the 'bite', select a new heading until the needle reading + or – heading = QDM

amount of 'bite' e.g. Attack at 30°.

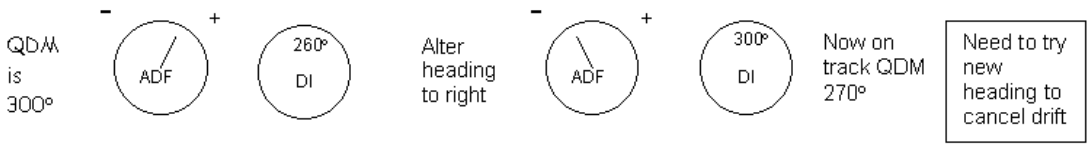
4. Turn the aircraft to the new heading.
5. Mentally transpose the needle and find the QDM. Initially it will be the same until the new heading has had time to 'work'.

Remember: The difference between the aircraft and the required track will be shown by the ADF needle when the aircraft is on the required track.

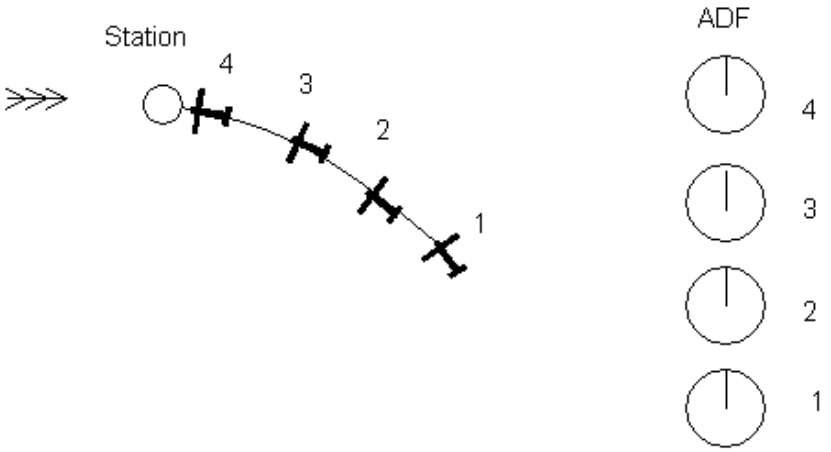
Example: Steering 300°, looking for 270°, will be on track when needle says 30°. (As the needle approaches 30° the 'bite' can be reduced).

6. By this method, the pilot constantly knows his QDM, without maths. As aircraft reaches required track a new heading can be estimated to take care of any drift.
7. When the aircraft is on the new heading the position of the ADF needle must be noted. This is essential.
8. If the needle remains fixed, the drift has been cancelled. If the needle moves (left or right) the aircraft heading must be corrected first to regain the required track, then again to try a new drift allowance.

Whichever of the two methods is used, the pilot must remain orientated at all times. The ADF needle is the key to where the station is and if the aircraft is drifting to or from its required track.



If no allowance is made for drift i.e. the pilot just flies to the station by constantly flying to keep the needle centred, the following shows what happens:



The aircraft starts with the best of intentions but will end up at the station headed into the wind and not on the required track, or from the intended direction. This last could be important if one was trying to avoid high ground! To achieve a required track the track must be intercepted, then maintained, by making a precise allowance for drift.

Overflying The Station/Beacon

If a careful track is maintained with the corrections 'sharpened' up as the aircraft approaches the station (but the heading alterations kept small) the aircraft should make a good station passage. The needle will oscillate/fluctuate as the station is approached but if a fairly accurate passage is made the needle will swing fairly quickly through 180° and point to the rear. If a transit is made just to one side, the needle will move fairly smartly through 180° without too many oscillations. If a transit is made well to one side, the needle will reverse much more slowly and finish up not quite pointing to the rear of the a/c. So the pilot will be able to infer a lot of useful information from the behaviour of the needle.

Measuring Time To The Station

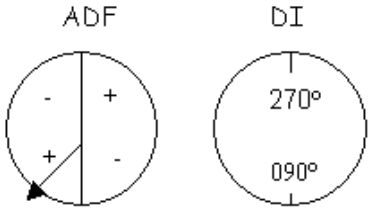
This can be done using the principle outlined in VOR TRACKING leaflet. This aid is, however, not quite so accurate. Remember: The time taken for a change of 1° of bearing measured in seconds = minutes to the station. In practice, of course, one would have to measure over 10° or more.

Obtaining a Fix Using 2 NDBs and a VOR

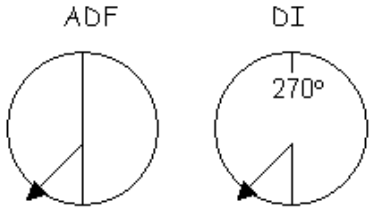
Tune and identify the 2 stations in turn, or if using 1 NDB & VOR simultaneously and obtain bearings from the station(s). In the case of NDB, this means obtaining QDM as outlined above in paragraph 1, then deducting the variation, and taking the reciprocal. Plot this figure as a QTE. In the case of VOR i.e. with variation, plot 'as is' from the VOR rose datum. In either case, the fix lies where the two bearings cross, assuming that the bearings were taken simultaneously or within, say, 30 seconds of each other. Anything more will give a measurable error.

Tracking From a Station

Either treat the ADF dial as a 'plus and minus indicator' to find the QDM (which is now opposite to the aircraft heading) or mentally transpose the ADF needle to find the QDM:



+10° Makes QDM=100°



Mentally Transpose QDM=100°

To intercept a given QDM turn the aircraft in the same direction that the needle is moving (assuming that it is moving and the aircraft is not on the required QDM). As for tracking to a station a definite 'bite' or attack angle must be used: the bite will to some extent depend upon the wind (direction & strength). Then wait for the new heading to 'work' and maintain until the aircraft is on the new QDM, or nearly so, adjust as required to maintain the new required QDM. Tracking from a station requires sharper thinking due to the QDM and heading being opposite. But the principles are the same. If using the ploy: the difference between the aircraft heading and required track will be on the ADF indicator when on the required track still works, but one has to use the reciprocal of the new heading selected.

Example: In the above sketch, if the ADF needle moved left by another 10° i.e. QDM110° this means that the a/c has drifted to the right, and needs a correction of heading to the left – say, steer 240°, take the reciprocal 060°. Then the ploy: 'the difference between 060° and the required track 100° = 40°. When steering hdg 240° the ADF needle will initially show +50° (at the bottom of the ADF indicator) and as the new heading 'bites' the ADF needle would move (if the wind is not too strong) towards +40°. Then the a/c is back on track. If the needle doesn't move, a bigger 'bite' is required.

Once on the track again, it would be necessary to fly another heading, say try 260°. In which case the ADF needle would move to +20°. If the new heading were exactly right, the ADF needle would not move, hopefully, indicating that the a/c remained on the required track.

Important: If the pilot is unsure, at any time, steer the heading of the required track and even though the aircraft may not be on the required track the ADF needle will show immediately which side of track the aircraft is, and also which way to turn. This works irrespective of whether the needle is pointing ahead or behind the aircraft.

Basic Instrument Flying Appreciation – Exercise 19

Aim:

First to demonstrate that the aircraft cannot be safely controlled without reference to the flight instruments when outside visual references are lost and secondly to ensure that it is fully appreciated that sustained instrument flight cannot be safely undertaken without a proper course of training.

Airmanship:

All normal aspects apply. Need to complete careful pre-flight check of aircraft antenna. Emphasise need for student pilot to avoid weather conditions necessitating instrument flight. Importance of taxying instrument check.

Air Exercise:

Physiological Sensations

Student to close eyes, head down and attempt to interpret aircraft movements through physical sensations. Instructor to fly aircraft. Conclusion: Sensations derived from motion and posture can become confused.

Basic Instrument Flying – Exercise 19 (1)

Aim:

To teach how to control the aircraft in straight and level flight by sole reference to instruments.

Airmanship:

All normal airmanship considerations apply but care must be taken re: controlled airspace and/or weather considerations if IMC flight involved. Introduction of FREDAL and suction gauge checks.

Air Exercise:

1. Achieving & Maintaining Straight & Level Flight, Normal Cruise
From a condition other than straight and level and using internal and external references:

Achieving	**Maintaining**	**Correcting**
Select approximate straight and level attitude using the Artificial Horizon (AH). Set cruise power. Initially scan AH, Altitude, DI then trim. Widen scan to include secondary supplementary instruments. Re-trim. If wings are level and heading is constant, the aircraft will be in balance. If wings are level and aircraft in balance but heading is changing, it could mean the AH is Unserviceable (U/S)	When straight and level achieved, the primary supporting instruments will be DI and VSI. If turbulent use DI and Alt. For small errors in Altitude use pitch changes. For larger errors re-adjust power. Scan to include the suction gauge.	Technique: Change, Check, Hold, Adjust, Trim. Pitch changes: Max ½ bar width. Heading changes: Max bank ½ of heading error in degrees. Max rate 1 turn. Alt in excess +/- 100ft: readjust power and pitch. Note: Accurate trimming essential. Better to prevent instrument deviations that to cure!

Basic Instrument Flying – Exercise 19 (2)

Aim:

To teach how to control the aircraft in climbing and descending flight by sole reference to instruments.

Airmanship:

All normal airmanship considerations apply but care must be taken re: controlled airspace and/or weather considerations if IMC flight is involved.

Air Exercise:

Achieving and Maintaining The Climb (75 kts) Levelling off At 95/100 kts)

From straight and level condition, using internal and external references:

Achieving	Maintaining	Correcting
Smoothly apply full power and prevent yaw. Then with wings level, place the index aircraft in the approximate climb attitude. Scan: AH, DI, RPM and trim. Then scan includes ASI. Readjust pitch attitude to achieve correct speed. Check balance.	Maintain correct pitch on AH. Scan plus DI and ASI. Monitor the Alt and anticipate levelling out by 10% of Rate of Climb and lower index aircraft so that straight and level is reached at the correct altitude. Hold. Reduce to cruise power and use scan as for straight and level plus ASI. Trim. Scan suction gauge.	Technique: Change, Check, Hold, Adjust, Trim. Heading changes. Max bank ½ of error in degrees. Max rate 1 turn.

Achieving and Maintaining Powered Descent 85 kts Levelling Off 95/100 kts

From straight and level condition, using internal and external references:

Achieving	Maintaining	Correcting
With correct altitude setting and having decided IAS and rate of descent. (400fpm) hold pitch attitude whilst reducing power as required. Include ASI in the scan and readjust index aircraft as IAS is achieved. Check wings level, balance and trim. Refer to VSI and adjust power and pitch as required. Check balance and re trim.	Having achieved correct rate of descent maintain correct pitch on AH. Scan to include DI, ASI and VSI. As approaching levelling off altitude scan Alt and anticipate 10% of rate of descent. Smoothly add cruise power and return to straight and level. The index aircraft should be raised so that straight and level is reached at correct Alt and trim	As above.

Basic Instrument Flying (Standard Rate Turns) – Exercise 19 (3)

Aim:
To teach how to turn in level, climbing and descending flight by sole reference to instruments.

Airmanship:
All normal instrument flying aspects apply.

Air Exercise:

Rate One Level Turns
Initially, using external and internal instrument references from straight and level flight at 95/100 kts:

Entry	In The Turn	Returning To S & L
Gradually bank the aircraft until 15° is shown on the AH. Maintain balance with rudder. Apply control column back pressure to slightly raise index aircraft to maintain altitude.	Rate of turn is shown on Turn Coordinator.	Anticipate recovery by ½ the bank angle. Adjust the rate of roll-out so that wings are level as recovery heading is reached.

Rate One Climbing Turns
Initially using external and internal instrument references from a straight climb at 75 kts.

Entry	In The Turn	Returning To Climb
Maintaining pitch attitude bank the aircraft until the AH pointer indicates 15°. Maintain balance with rudder. Lower index aircraft to maintain correct speed.	Check for tendency to over bank in climb. Turns especially to the left.	As for recovery from level turn.

Rate One Descending Turns

Initially, using external and internal instrument references from straight descent at 75 kts.

Entry	In The Turn	Returning To Descent
As for level turn above. But extra power may be required to maintain the original rate of descent and the VSI brought into the scan.	As for level turn.	As above.

Basic Instrument Flying (Recovery from Spiral Dive) – Exercise 19 (4)

Aim:
To teach how to recover from a descending spiral dive by sole reference to instruments.

Airmanship:
Normal instrument flying aspects apply. Observe adequate terrain clearance.

Air Exercise:

Entry	Recognition	Recovery
From straight and level apply steep bank and allow nose to drop. Power to be reduced to approximately 2200 RPM to avoid exceeding RPM limitations.	AH shows steep bank and low nose attitude. ASI shows increasing speed. Altimeter shows rapid height loss. Turn coordinator shows full deflection. Engine RPM increasing. Flight controls heavy.	Close throttle and roll wings level by firm use of ailerons (AH). Centralise aileron control. Raise the aircraft nose to a level attitude (AH) As the speed decreases to normal, restore cruise RPM.

Important: The student pilot must have demonstrated reasonable competence in Basic Instrument Flight before being authorised for first solo cross country flight.

Abbreviations

AGL	Above Ground Level
AH	Artificial Horizon
A/R	As Required
GS	Groundspeed
ASI	Airspeed Indicator
ATA	Actual Time (of) Arrival
ATC	Air Traffic Control
ATT	Attitude
BWC	Bad Weather Circuit
CAA	Civil Aviation Authority
CC	Control Column
DF	Direction Finding
DI	Direction Indicator
ETA	Estimated Time (of) Arrival
FCL	Flight Crew Licencing
FI	Flight Instructor
FREDA	(Checks) Fuel, Radio, Engine (Ts&Ps), DI, Alt
FWD	Forward
HASELL	(Checks) Height, Airframe, Security, Location, Lookout
Ht	Height
IAS	Indicated Airspeed
LSC	Low Safe Cruise
MAX	Maximum
MIN	Minimum
NOTAM	Notice To Airmen
PPL	Private Pilots Licence
QDM	(Q Code) Direction Magnetic (To Station)
ROC	Rate of Climb
ROD	Rate of Descent
RPM	Revolution Per Minute
SSR	Secondary Surveillance Radar
TC	Turn Coordinator
TO	Take Off
Ts & Ps	Temperature & Pressure (Engine)
UM	Under Mentioned
VFE	(V Code) Maximum Flaps Extended Speed
VHF	Very High Frequency
VNE	(V Code) Never Exceed Speed
VS	(V Code) Stall Speed (Full Flap)
VS_0	(V Code) Stall Speed (Landing Configuration)
VS_1	(V Code) Stall Speed (Clean Configuration)
V_X	(V Code) Best Angle of Climb
V_Y	(V Code) Best Rate of Climb