INFORMATION FOR STUDENT PILOTS
EASA FCL PPL (A)

The enclosed specific aircraft training notes form the basis of the flying training for the EASA-FCL Private Pilot's Licence. They have been set out to show the content of each flying lesson and will prove a useful 'aide memoire' 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 reference.

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

A course minimum of 45 hours (of which up to 5 hours may be in a Flight Navigation Procedure Trainer or Flight Simulator) comprising:
1) minimum of 10 hours solo
2) minimum of 25 hours dual

The 25 hrs dual must include:

a) at least 2 hrs stall/spin awareness
b) sufficient I.F. dual to enable a student pilot to maintain safe flight to regain VMC. This would be around 3½ hrs
c) at least 5 hrs solo cross-country inc. at least one solo triangular cross-country of at least 150 n.m., with 2 landings away

EASA LAPL

A course minimum of 30 hours (of which up to 3 hours may be in a Flight Navigation Procedure Trainer or Flight Simulator) including:
1) minimum of 6 hours solo
2) minimum of 24 hours dual

The 24 hrs dual must include:

a) at least 1 hrs stall/spin awareness
b) at least 3 hrs solo cross-country including at least one solo cross-country of at least 80 n.m., with 1 landing away

And of course, have completed all the relevant ground examinations including R/T for both courses.

AIRCRAFT FAMILIARIZATION – EXERCISE 1 & 1E & EMERGENCY DRILLS

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.

Airframe general

Engine general

Cockpit layout

Flying control including flaps

Systems: Fuel, Oil, Ignition, Carb Heat, Electrical, Radio, Brakes, Mixture, Cabin heating, Cabin Ventilation, Instruments pressure/vacuum, Stall warner, Pitot/static system.

Fire extinguisher

First aid kit

Control locks & Tow-bar

Checklists & 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 & Electrical.

Systems failure as applicable to type e.g. Brakes, Radio, Alternator and Oil system.

Escape drills, location and 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:
Student clothing suitability especially footwear
Flight authorisation, aircraft acceptance, and serviceability documents
External checks including local refuelling procedures and fire precautions
Internal checks
Student comfort, harness seat and adjustment
Special precautions e.g. - door locking and unlocking
Starting and warming up checks
Power checks
Running down and stopping the engine
Leaving the aircraft, noting of defects, security and picketing
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 Warrior PA28-151/161 Pilot's notes
Associated 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. Re-joining 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 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 - Handing over and taking over control – Orientation/
Aircraft Landmarks

AIR EXERCISE:

1.

CONTROL	MOVEMENT	PRIMARY EFFECT	FURTHER EFFECT
Elevator	C.C. Fore & Aft	Pitch	I.A.S.
Aileron	C.C. Side to Side	Roll	Yaw, more roll, Spiral descent
Rudder	Left Rudder Right Rudder	Yaw	Roll, more yaw, Spiral descent

a) All control movements to be smooth and progressive.

b) Aircraft continues to respond until the control is centralised.

c) Aircraft movements are in relation to the aircraft axes and not to external references i.e. when level and when banked.

d) Rate of aircraft movement is proportional to amount of control deflection.

e) All control movements are natural and instinctive.

2. EFFECT OF AIRSPEED (At a constant lowish power setting)

High Speed …. Controls firm and effective

Low Speed …. Controls sloppy and not very effective

3. EFFECT OF SLIPSTREAM (At a constant I.A.S.)

High Power Rudder/Elevator effective

Low Power Rudder/Elevator less effective } Ailerons unaffected by slipstream

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 (103 k)	Orientation / Landmarks

AIR EXERCISE:

POWER Open throttle Increase power Nose pitches up Aircraft RPM change Yaws to left climbs

Reduce throttle Decrease power Nose pitches down Aircraft RPM change Yaws to right descends

Note: Smooth and progressive use of throttle.

TRIM A correctly trimmed aircraft will maintain its attitude at a constant I.A.S

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.

Rudder Also natural sense

FLAPS With aircraft trimmed and I.A.S. and attitude noted:-

Lowering flap by stages At each stage note attitude change and when corrected by elevator 1) Lower I.A.S. 2) Trim changes

Raising flap by stages At each stage note attitude change and, when corrected by elevator 1) Higher I.A.S. 2) Trim changes

MIXTURE Operation : Caution re use

CARB HEAT Operation and effects

AIR CONDITIONING & 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 EXERCISE:

1. PRE-TAXY CHECKS
   Brakes on
   Friction nut slackened
   Trim neutral
   Note W/V
   ATC Clearance/Routeing
   F.I. 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
   and 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 up hill, or into wind, or soft ground
   Less power down hill, or downwind, or 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 1200 RPM
   Note: For parking or power check turn into wind.

5. CONTROL OF DIRECTION AND TURNING
   Lookout
   Anticipate
   Rudder pedals for turning
   Anticipate recovery
   Turning in confined space use differential brake, slow speed , slight increase in power
   Watch wing tips and tail
   Do not turn on locked wheel

6. ROUTEING
   ATC instructions
   Centreline on taxyway
   Watch for surface and slope
   Right of centreline on runways
   Join taxiways from grass 45°
   Caution wet grass – brakes
   Note: Use appropriate aileron control in crosswind conditions wherever the wind exceeds 12 k. Pilot will do the right thing when wind is really strong

7. EMERGENCIES

(a) Steering Failure
   Inform ATC
   If total failure shut down aircraft
   Remain with aircraft

(b) Brake Failure
   Shut down aircraft
   Steer away from obstructions
   Inform ATC
   Remain with aircraft

Note: Initially, student to control rudder, whilst F.I. operates the throttle after initial demo. Later change over, then eventually student does 'in toto'.

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 at 90 k.

AIRMANSHIP: Lookout – Other aircraft – Report clock code – In-flight checks (FREDAL)

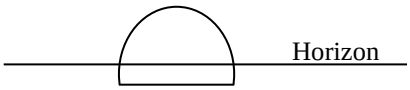
AIR EXERCISE:

1. INITIAL DEMONSTRATION of straight and level flight – Normal cruise

Note Power Setting 2300 RPM	Aircraft attitude IAS 90 kts Note wing tips	Aircraft trimmed Note inherent stability	Flies 'Hands Off' Only small control movements necessary

2. TO ATTAIN S & L FLIGHT (after F.I. disturb a/c)

P ower - Select 2300 RPM. Prevent yaw

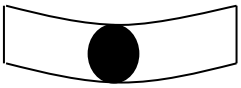


A ttitude - Select and hold nose level
Cross-check alt. Check lateral level and in balance

T rim -

Check I.A.S. P.A.T.

3. TO MAINTAIN S & L FLIGHT

Constant Height	Constant Direction	Balance
Hold selected attitude Cross check altimeter Correct small errors (+ or – 75') with elevator For larger changes correct with power	Maintain wings level (ailerons) Prevent yaw (rudder) Cross check 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 'tread on the ball'  Marked unbalance is noticeable. Slight unbalance difficult to detect. Use TC

4. STUDENT PRACTICE ATTAINING & MAINTAINING S & L FLIGHT
(Instructor disturbs aircraft from S & L condition. Student recovers aircraft from various attitudes).

5. ORIENTATION AND RETURN TO AERODROME

STRAIGHT & 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 FREDAL – Flap limiting speed VFE

AIR EXERCISE:

1. EFFECT OF POWER ON STRAIGHT & LEVEL FLIGHT

   Note attitude at normal cruise then:-

   Select High Power (2450 RPM)
   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 & inertia

   Select Low Power (2100 RPM)
   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 & inertia

2. STRAIGHT & LEVEL AT SELECTED AIRSPEEDS

   Straight & Level at 105 k (from normal cruise)
   P Select power 2450 RPM - prevent yaw
   A Select lower nose attitude – hold
   T Trim
   Check instruments, re-adjust, re-trim aircraft

   Straight & Level at 75 k (from normal cruise)
   P Select power 2100 RPM -prevent yaw
   A Select lower nose attitude – hold
   T Trim
   Check instruments, re-adjust, re-trim aircraft

   S & L (with Flap) at 75 k (LSC)

   P Select power 2150 RPM – prevent yaw
   A Lower 2 notch flap (VFE= 103k IAS)
   T Trim
   Check instruments, re-adjust, re-trim aircraft

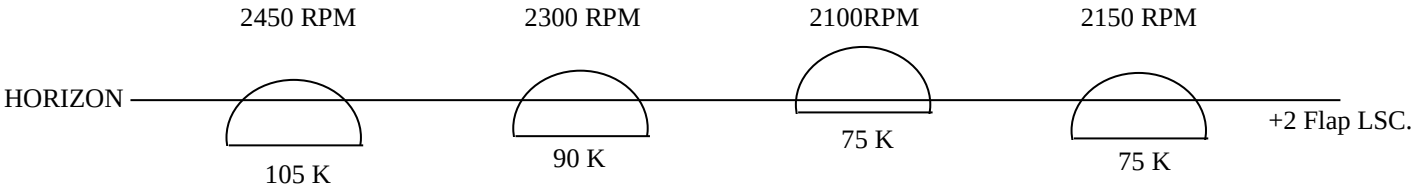
   Note: Flap gives lower nose attitude and hence better forward vision. Extra RPM gives better control.

STRAIGHT & LEVEL FLIGHT – EXERCISE 6 (2) continued

3. FLIGHT AT CRITICALLY HIGH AIRSPEEDS

F.I. 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)

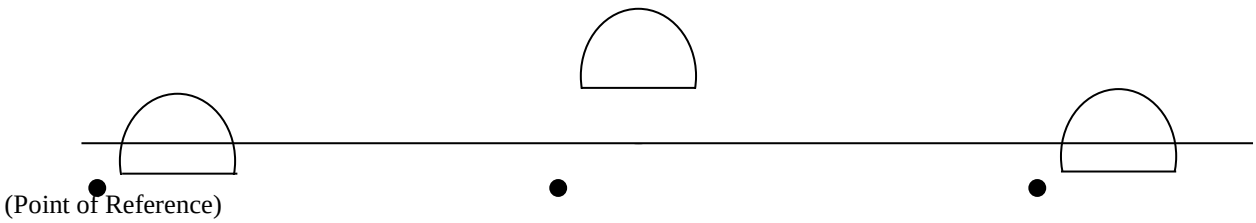
AIM: To learn how to put the aircraft in a climb at 75 k and to level off at selected levels.

AIRMANSHIP: Lookout ahead, above, and behind – Engine checks

AIR EXERCISE:

1. BEST RATE OF CLIMB (Vy)

ENTRY	IN THE CLIMB	LEVELLING OFF
Lookout. Rich Mixture Select reference point	Lookout	Lookout
P Apply full power (Check engine instruments) Prevent yaw Check balance	Note attitude and maintain	Anticipate height
A Select attitude for climb and hold Wings level check	Balance constant Cross reference ASI to maintain 75 k	**A** Select attitude for 90 k cruise. Hold
T Trim	Weave every 1000 ft for lookout purposes	**P** Reduce to cruise power (2300 RPM) Prevent yaw
Check I.A.S. 75 k Adjust attitude as necessary Re-trim Check balance/PAT	Check engine T & P's	**T** Trim
	Note: Rate of climb decreases with altitude	Check P A T Adjust as necessary Note aircraft inertia



2. CRUISE CLIMB
   As above, using 87 k IAS. Lean mixture a/r above 3000 ft.

3. CLIMB – BEST ANGLE (Vx)
   As above, using 63 k, 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.

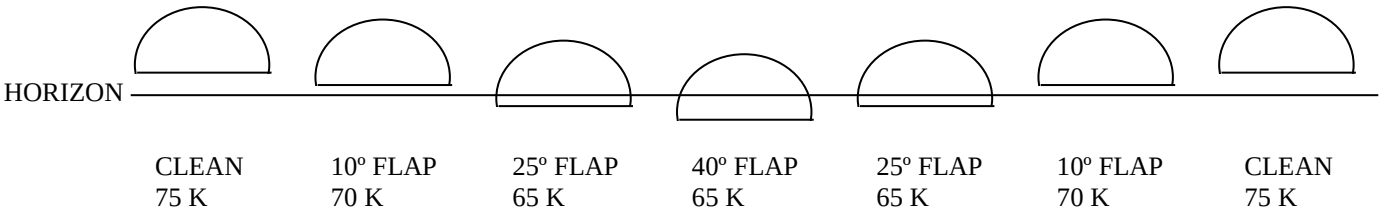
AIRMANSHIP: Lookout – Engine checks – Flap operating speeds – Application re 'go-around'

AIR EXERCISE:

1.	LOWERING FLAP	EFFECT
	At normal climb speed lower first stage Of flap. Maintain normal climb speed 75 k.	Attitude and trim change. Note reduced rate of climb.
	Lower second stage. Raise the nose and select the correct flap speed 65 k.	Note that climb rate is largely restored therefore <u>better climb angle.</u>
	Lower further stage of flap	Attitude and trim change. Note reduced rate of climb.
1.	RAISING FLAP	EFFECT
	Reduce flap by stages	Attitude and trim change. Re0trim.
	Climb at appropriate climbing speed	Note rate of climb increases as flap is taken in.
	Resume normal climb 75 k.	

<u>CAUTION:</u> 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 C.C back pressure to prevent 'sink' and to select the next higher attitude for the flap setting plus trimming.

2. STUDENT PRACTICE
Re application as for 'Go-around'



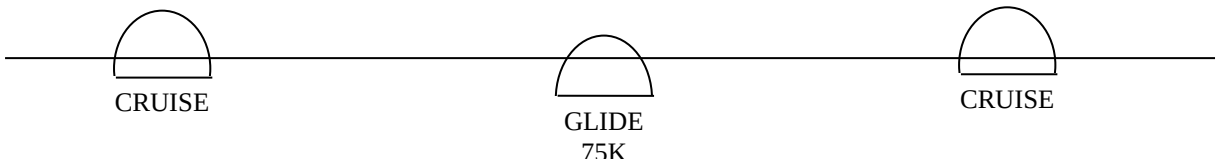
DESCENDING – EXERCISE 8 (1)

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

AIRMANSHIP: Lookout (especially below) – Use of carburettor heat - Engine checks
- Altimeter settings

AIR EXERCISE: Gliding at 75 k

ENTRY	IN THE GLIDE	LEVELLING OUT
Lookout	Lookout	Lookout
Turn into cleared area Mixture rich Altimeter checked Carb heat select	Note attitude and R.O.D. Maintain attitude and balance	Carb heat cold Anticipate recovery altitude
P Close throttle Prevent yaw Wings level Direction constant	Weave nose Clear engine every 1000 ft (N.B. Clear ears)	**P** Apply cruising power Wings level Prevent yaw
A Attitude <u>hold</u> Then select for 75 k Maintain	<u>Note</u>: The controls, especially the tail surfaces, are less effective	**A** Select cruising attitude for 90 k <u>Hold</u>
T Trim (large back trim change)		**T** Trim (large fwd.) Check PAT Re-adjust
Check correct IAS Re-adjust. PAT		



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 (particularly below) – Engine considerations – Alt. Settings – VFE

AIR EXERCISE: Revision of clean glide 75 k

1. DESCENDING WITH FLAP

   Enter clean glide 75 k
   Note rate of descent

   Lower 20° flap
   Maintain attitude
   Airspeed decreases
   Select lower attitude to regain 75 k
   Trim
   Note: Lower nose attitude and increased R.O.D.

   Repeat for other settings

   Note: Lower nose attitude and increased R.O.D. although good forward visibility there is need for anticipating recovery

   Recover to straight and level, later to climb
   Do not exceed VFE

   i.e. Missed approach action (Going round again)

   STUDENT REPEAT

2. DESCENDING WITH POWER

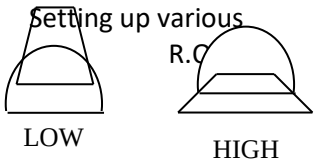
   Enter clean glide 75 k
   Note rate of descent

   Increase RPM approx. 1800
   Maintain attitude
   Airspeed increases
   Select higher nose attitude to regain 75 k
   Trim
   Note: Higher nose attitude and reduced R.O.D.

   Reduce RPM approx. 1300
   Maintain attitude
   Airspeed decreases
   Select lower nose attitude to regain 65 k
   Trim
   Note: Increased R.O.D.

   Rate of descent is varied with power

   STUDENT REPEAT
   Setting up various R.O



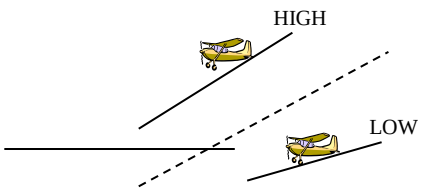
3. APP. CONFIG'N VARYING THE DESCENT PATH
   Set up power/flapped descent
   Use field for simulated approach, into wind

   If too high on descent
   Reduce power
   Lower nose to maintain 75k and trim
   Note: Increased R.O.D.

   If too low on descent
   Increase power
   Raise nose to maintain 75 k and trim
   Note: Decreased R.O.D

   i.e. Power ctrl's R.O.D
   Elevator controls SPEED (attitude)
   Aileron & Rudder control DIRECTION

   STUDENT REPEAT



Note: Cruise descent is covered in Ex.18 Navigation. Normal cruise speed 90 k to be used to maintain E.T.A. When to setup depends upon cruise altitude and time to run to the ATZ.

DESCENDING – EXERCISE 8 (3)

AIM: To teach how to descend at greater than normal rates of descent without increasing the airspeed i.e. Side-slip.

AIRMANSHIP: Lookout - Anticipate safe recovery by 200 ft AGL. - Application re flapless landings, forced landings, and engine fires – See Pilot's Handbook re slipping with flap selected.

AIR EXERCISE:

1. SIDESLIP

ENTRY	IN THE SLIP	RECOVERY TO GLIDE
From straight glide 75 k adopt a moderate bank to the left (15°) using opposite rudder to maintain heading. Simultaneously adjust nose attitude for 75 k Note the increased R.O.D. and T.C. ball out of balance. Although greater bank angles give greater R.O.D. care must be taken to maintain adequate rudder control especially with flap selected.	Maintain selected bank and sufficient opposite rudder to maintain direction. Hold attitude for correct speed 75 k . Caution: Ensure safe speed maintained since A.S.I. can give erroneous indications during a slip.	Anticipate safe recovery i.e. not below 200 ft AGL. Level wings simultaneously centralising rudder, re-adjust pitch attitude to maintain 75 k.

Student practice. Left slips and Right slips.

3. SLIPPING TURN:

From a gliding turn to the left 75 k apply opposite rudder to the turn maintaining the bank angle with ailerons. Adjust pitch attitude to maintain correct speed. Note increased R.O.D. and T.C. ball out of balance.	Maintain selected bank with sufficient opposite rudder. Maintain safe I.A.S.	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 I.A.S.

Student Practice. Left slipping turns then to the Right.

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 D.I. and Compass in the air.

AIR EXERCISE:

1. LEVEL TURN – MEDIUM BANK (After demo. To show Lookout, Attitude in turn, & C.C back press., speed loss etc.)

ENTRY	IN THE TURN	ROLLING OUT
Lookout all round and above. Straight and level 90 k Roll on bank up to 30° using aileron and rudder in desired direction Check with ailerons to maintain Increase C.C. back pressure to maintain height Note that we do not trim in the turn	Lookout **B** Maintain Bank 30° (ailerons) **A** Attitude, constant Ht. (Elevator & Alt.) **B** Balance (Rudder & B.I.) Co-ordination most important, if adjust one control need re-adjust the other two! Note: Slight loss of IAS Check: Bank, Att., Bal.	Lookout Anticipate required heading Apply aileron and rudder opposite direction to rollout When wings level centralise controls Apply sufficient C.C. fwd. press to prevent gain in height Note: IAS restored

Student practice eventually both directions. Note offset seat effect. Stress instrument scan – Bank A/H etc but not to detriment of lookout. Recoveries on features, or 'roll out now', then later on DI headings.

2. FAULTS IN THE TURN
   Faults in the turn can easily be demonstrated in the sequence Bank – Attitude – Balance plus corrections.

3. CLIMBING TURNS
   Teach from straight climb 75 k. Rate one/15° bank
   Note R.O.C. less and need to control IAS accurately plus tendency to overbank especially to left
   Nose attitude slightly lower in turn
   Show increased angle of bank reduces R.O.C.

4. DESCENDING TURNS
   Teach from straight descent 75 k. Descend into cleared area/lookout. Bank up to 30°
   Note turn increases R.O.D. and lower nose attitude to maintain correct IAS
   Show increased bank increases R.O.D. and power must be added if original R.O.D. required

   IMPORTANT: All turns – Checking/Correcting Bank – Attitude – Balance in that order

5. SLIPPING TURNS
   These are covered in Ex. 8 (3)

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 practice in controlling the aircraft at these slower speeds, especially as regards maintaining balance when manoeuvring.

AIRMANSHIP: Lookout – Hasell – Engine Handling/T&P's – Safe Height – Never fly at these low speeds except T.O. and Landing,, unless with F.I.

AIR EXERCISES

1. LEVEL FLIGHT
   Introduce HASELL safety checks
   Estimate/set power for flight at Vs1 +5 k (55 k), select attitude and trim.
   Check/adjust PAT a/r.
   Maintain alt., hdg., and balance
   Note sluggish controls, high nose att., and hence poor fwd lookout.
   Also cannot maintain alt. with CC pressures.
   MUST USE CC & POWER.
   Essential keep hand on throttle.

   Student Practice

3. TURNING FLIGHT
   Lookout
   From slow flight Vs1 +5k enter medium turn without adding power.
   Note lower airspeed i.e. cannot maintain alt. & airspeed. Recover.
   Lookout
   Repeat turn but adding power to maintain airspeed and altitude.
   Note: for turns, must use extra power, and preferably keep bank gentle, hence must keep hand on throttle.

   Student practice turns in both directions, including S-turns.
   F.I. stress necessity to maintain balance.

2. CLIMBING
   Lookout
   Nominate R.O.C. say 500'/min. for Vs1 +5k (55 k)
   Gradually increase power whilst maintaining airspeed, hdg., and balance. Stabilise power when ROC achieved. Trim.
   Note: danger of too much aft trim and care needed to maintain balance.
   Return to S & L at 55 k

   Student practice

4. DESCENDING
   Lookout
   Nominate R.O.D. say 500'/min. for Vs1 +5k (55 k)
   Gradually reduce power whilst maintaining airspeed, heading and balance. Stabilise power when R.O.D. is achieved. Trim.

   Return to straight and level 55k

   Student Practice then repeat above, including climbing and descending turns at Vso + 5k (50 k) with full flap.

   Again, F.I. stress balance.

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 log book.

SLOW FLIGHT – EXERCISE 10A (2)

AIM: To acquaint the pilot with the handling characteristics in the range Vs1 +5k and Vso +5k down to the 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/T&P's – Safe Height – Never fly at these speeds unless with F.I.

AIR EXERCISES

After the preceding Part 1 exercises, the instructor should demonstrate, with subsequent student practice, 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. Please see also the 'Note to instructors'.

1. FULL POWER IN LANDING CONFIGURATION

   F.I. demo a/c in full-flap climb at 50 k and necessity to maintain balance
   Note poor ROC 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 practice Vso +5 (50 k) flapped climbs, whilst retracting flap to simulate 'go-around' action.

2. HIGH POWER, FLAPPED DESCENT

   From low speed flight F.I. demo a/c 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 a/c could stall albeit with the nose still relatively low. Student practice the descent 50 k then entering fully flapped climb, initially at 50 k reverting to normal climb as flap is retracted.

Note to Instructors: A convincing demonstration of the above is to demo a go-around without compensating control or trim changes. That is, set up a/c in the approach configuration, 1500 rpm 70 k. Simulate go-around, apply full power, allow nose up and yaw to go unchecked.. The IAS will decrease, and yaw will cause roll.
Wait until stall warner sounds, then correct with C.C. and rudder. Re-trim and revert to best angle climb speed.

3. DEMONSTRATION OF SYMPTOMS DURING APPROACH TO STALL
   F.I. conclude the exercise by demonstrating the symptoms approaching the stall. It is recommended that a lowish power setting, say, 2100 rpm be used for this demonstration. The F.I. should demo the symptoms stressing that only a relatively small movement of the C.C. is necessary to return the aircraft to safe controlled flight. Student to practice, 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 he air. The F.I. should stress that there is nothing dangerous about stall recovery provided action is taken soon enough and at the right altitude.

STALLING – EXERCISE 10 (B) 1

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	IN THE STALL	RECOVERY
HASELL Lookout: clearing turn Aircraft wings level and in balance Close throttle (prevent yaw) Maintain height (pitch) Ailerons neutral Note datum ht.	Hold C.C. fully back Prevent yaw, ailerons neutral	<u>WITHOUT POWER</u> – (i.e. elevators only) C.C. forward until buffet stops Prevent yaw with rudder Airspeed rises Ease out of dive 75 k <u>Note</u>: Height loss approx. 300 ft Student practice
SYMPTOMS ON ENTRY Falling airspeed Sloppy controls High nose attitude Stall warner Slight buffet (last symptom)	SYMPTOMS IN THE STALL Low IAS, High R.O.D. Heavy buffet Sink 'We are stalled' Nose pitches down Possible wing drop (Not use aileron) Note stall speed C.C. fully back, cannot raise the nose. The a/c is now no longer controllable in pitch	<u>WITH POWER</u> STANDARD STALL RECOVERY Holding ailerons neutral C.C. forward Full power Prevent yaw Airspeed rises Ease out of dive 75 k <u>Note</u>: Height loss reduced 150 ft This is the basis of the Standard Stall Recovery (S.S.R.) Student practice

2. DEMO RE WING DROP
   <u>Important</u>: If wing drops – Incipient spin. <u>Must Not</u> use ailerons to lift wing.
   <u>Recovery</u>: Apply sufficient opposite rudder to prevent further yaw.
   C.C. forward and full power. As speed rises roll wings level and climb away.
   See also Exercise 11A.

3. RECOVERIES AT THE INCIPIENT STAGE
   Student practice

STALLING – EXERCISE 10 B (2)

AIM: To examine the behaviour of the aircraft stalling in various configurations of power and flap and to practise the recoveries with minimum height loss.

AIRMANSHIP: HASELL (HELL) – Flap limiting speed – Lookout/checks each exercise

AIR EXERCISE N.B. Initially revise 'clean' stall and note 'clean' stalling speed

CONFIG'N	ENTRY	AT THE STALL	RECOVERY
1500 RPM No flap	Select power Maintain height Speed reduces more slowly Longer warning More chance of wing drop	Normal symptoms Reduced stall speed Higher stall attitude Rudder effective, also elevators Wing may drop	S.S.R. to climb Smaller Ht. Loss due to power.
25° Flap Power off	Select flap Carb heat check Power off, maintain height Speed reduces more rapidly Shorter warning	Normal symptoms Sink. Lower nose attitude More chance of wing drop Reduced stall speed As above with lower stall speed.	S.S.R. to climb Avoid exceeding VFE Requires coarser use of controls
Full flap Power off	As above	Rel. large C.C. movement req'd for recovery As above with lower stall speed Wing may drop rapidly	S.S.R. to climb Take in flap by stages
1700 RPM Full flap	Set power & flap. Landing config'n.	Ditto re wing drop	S.S.R. to climb Take in flap by stages
1700 RPM Full flap	Repeat in the turn	F.I. allow yaw to develop	Note larger control movements req'd
Full power No flap	From straight climb and a climbing turn to demo unbalance at stall can cause marked wing drop. Demonstration only		S.S.R. to climb

Student practice various stalls and recoveries from straight and level, climbing and descending flight, including turns. Also to repeat at the incipient stage i.e. when the stall warner operates and before the stall is reached e.g. during Slow Flight.

SPIN AVOIDANCE – EXERCISE 11 A

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 3000 ft AGL – Constant lookout

AIR EXERCISE:

1. RECOVERY AT THE INCIPIENT STAGE – FROM S & L FLIGHT

ENTRY	RECOVERY
HASELL/HELL	C.C. centrally forward & rudder to prevent yaw
Set up/slow flight S & L	Power as required
Slowly apply C.C. back pressure without maintaining balance i.e. allow yaw to occur. The wing will normally drop as the aircraft stalls.	Level the wings and regain balanced flight
<u>Note</u>: If reluctant to drop, use more rapid movement of C.C., or more power or rudder.	Return to normal S & L Student practice
Delay stall recovery until wing drops between 45° & 60°	

2. RECOVERY AT THE INCIPIENT STAGE – REPEAT FROM:
STRAIGHT DESCENT, CLIMB, LEVEL TURNS, CLIMBING & DESCENDING TURNS

Further FI demos., including dangers of crossed controls in descending turns. Student practice

<u>Important</u>:

1) For the purpose of training, the incipient stage is that period when a wing 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 to avoid height loss.
3) Time spent on these exercises must be logged separately.
4) At the end of the lesson, if student agrees, suggest F.I. demo a fully developed spin & recovery. Student participation as necessary.

SPINNING – EXERCISE 11 (B) (OPTIONAL EXERCISE)

AIM: To teach the method of spin entry, to appreciate the sensations of spinning, and teach the correct recovery procedure from a developed spin.

AIRMANSHIP: HASELL safety checks – Orientation – HELL checks
Essential to maintain safe altitude and recovery by 3000 ft AGL
Re-synchronise D.I. after exercise

AIR EXERCISE: Note: This exercise will normally be done in a Cessna 152.

1. FROM STRAIGHT AND LEVEL

ENTRY	MAINTAINING THE SPIN	SPIN RECOVERY
Safety checks Reduce power/yaw C.C. back press. to maintain height, allow speed to reduce to figure for a/c type. Apply full rudder and then move C.C. fully back, smoothly Aircraft will now enter the spin	Full rudder C.C. fully back Ailerons neutral Throttle closed Confirm dir'n of spin Note: Nose moves around horizon in dir'n of spin Instruments I.A.S. : Low reading Turn ind. : Direction of Spin V.S.I. : High R.O.D.	Confirm direction of spin Ailerons neutral Throttle closed Flaps raised 1) Apply full opposite rudder (slight pause) 2) Move C.C. forward progressively until rotation stops 3) Centralise rudder 4) Level wings with aileron 5) Recover from the dive 6) Regain Height lost

Note: Aircraft manual to be checked for correct recovery procedure and to ensure if spin entries with 'power on' are permitted.

2. FROM OTHER ATTITUDES OF FLIGHT

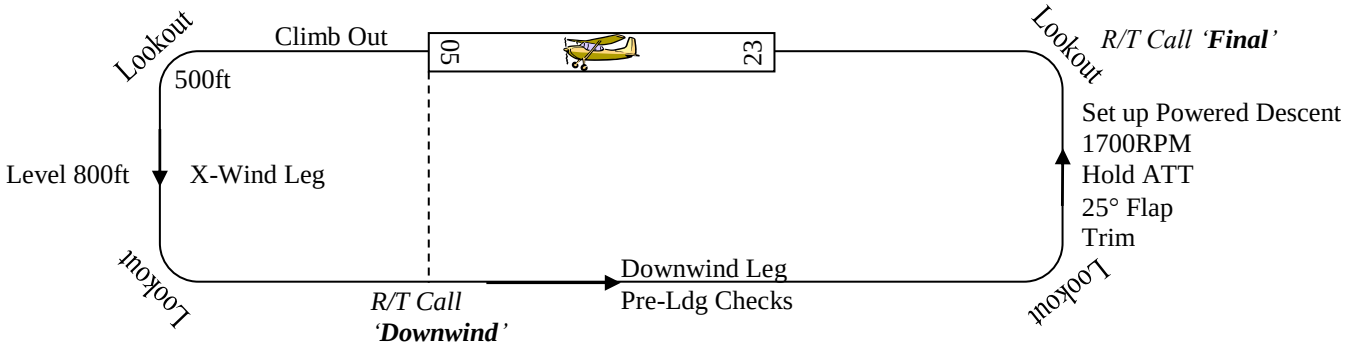
Instructor to demonstrate as required especially 'accidental' spins. For example, making a 'final' turn with crossed controls, using clean configuration.

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 actions – Lookout at all times – Pre-landing checks – orientation and Judgement

AIR EXERCISE:



1. BEFORE TAKE-OFF CHECKS
   Taxy checks
   Power checks
   T.O. checks
   R/T call

2. TAKE-OFF
   Line up/check W/V
   DI with runway
   Full power/yaw
   Checks
   C.C. back pressure
   40 - 45 k
   Rotate 64 k
   Safety speed 64 k
   Climb 75 k (clean)
   Check drift

3. CLIMB
   Lookout
   300 ft checks
   400 ft lookout
   500 ft turn
   Cl. turn rate 1
   on to x-wind leg
   Drift allowance
   Level at 800 ft

4. DOWNWIND
   Lookout
   Constant hdg./drift
   Constant Height
   R/T call
   Pre-landing checks
   Check height

5. FOR BASE LEG
   When threshold falls behind wing tip 45° – turn
   Check drift

6. APP. & LANDING
   Threshold at 45° to a/c
   Set up descent
   2 notches of flap
   Trim 75 k
   Check drift/height
   Re-adjust power a/r
   Final turn 500 ft
   Radio call
   Check 75 k
   Landing flap
   Re-trim 70 k
   Decision height 200 ft
   Threshold approx. 65 k

7. GO-AROUND
   Decision ht 200 ft
   Overshoot action:
   Full power
   Cold air
   Cl. attitude
   Flap in by stages
   Trim

Note: This is a brief for powered approach. It can be modified to suit other approaches.
The long briefing to include relevant noise abatement procedures.

ENGINE FAILURE/EMERGENCIES DURING
& AFTER TAKE-OFF - EX. 12 E

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:

1. DURING TAKE-OFF

If any of the following occurs:-
Loss of power
Abnormal oil pressure or temperature
Low fuel pressure
Vibration or rough engine running
Nil ASI reading
Door problem
Any doubt of aircraft integrity

Proceed as follows:-

Close throttle fully
Maintain directional control
Apply brakes a/r but take care to avoid skidding etc.
Report to ATC over radio
Return to parking area

IMPORTANT: If the aircraft over-runs the runway complete the Crash Checks

2. AFTER TAKE-OFF

If an engine failure occurs shortly after take-off :-

Lower nose and adopt glide 75 k
Trim
Warn pax. Close throttle
Look ahead either side of the nose say $\pm 30°$, and select best landing area.
Maintain speed and set up glide approach to chosen area.
If time, transmit Mayday call
Flap a/r

WARNING: DO NOT TURN BACK !

Carry out 'crash checks' :-

Throttle closed
Ignition off
Fuel – all off (3)
Flap a/r
Hatches – unlatched
Harness tight
Mayday a/r
Master switch off

Touchdown with full flap, holding off, if possible, to achieve slow touchdown speed
After touchdown evacuate a/c promptly

Note: During practice (dual only) check carb heat a/r and recover in good time. Remember 500 ft rule and avoid annoyance re people and 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 13 E

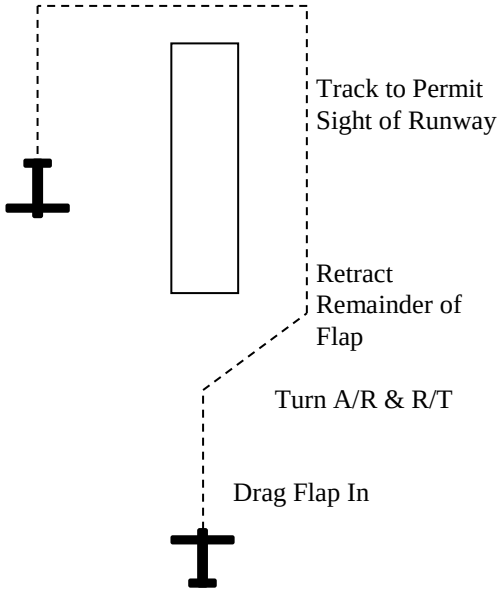
AIM: To teach the student pilot how to discontinue an approach and climb back to the downwind position.

AIRMANSHIP: Lookout – normal aspects apply – engine handling – VFE – ATC liaison

AIR EXERCISE

1. GO-AROUND FROM FINAL APPROACH

Lookout
Select Cold air a/r
Full power, prevent yaw, maintain balance
Select climb attitude (for the flap setting)
Check positive climb, correct IAS achieved, raise first stage flap i.e. drag flap. Trim.
Once drag flap is retracted, R/T call, clear the runway overhead to maintain visibility
Select next flap stage, next IAS, and trim
Retract remainder of flap, select req'd attitude, and trim
Climb away
Level out at circuit height, turn cross-wind. Lookout

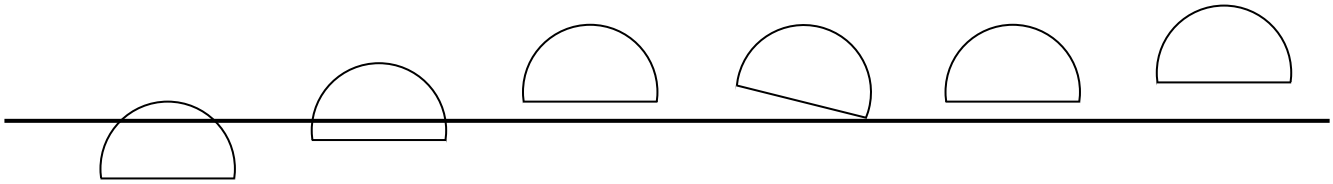


Go-Around From Final

2. GO-AROUND FROM MIS-LANDING

Lookout
Full power and select safe climb attitude (for the flap setting)
Check Cold air
Climb straight ahead
With positive climb rate, correct IAS, and above approx. 100 ft retract drag flap.
R/T call if appropriate
Climb away
At 300 ft retract remainder of flap, re-trim
Resume normal climb-out and continue in circuit

FROM FINAL APPROACH



On APP	Go-Around	Drag Flap In	Turn A/R	Remainder Flap Coming In	
75-70k	Climb 65k	Climb 65k		70k	75k
Full Flap	Full Flap	25° Flap		10° Flap	Clean

Note: Pitch attitudes are approximate.

CROSSWIND APPROACH & 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 (17 kts)
Solo student limitations – 10 kts

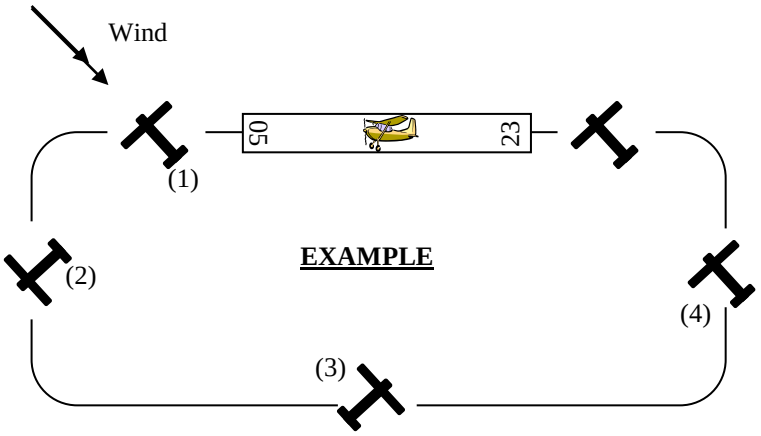
AIR EXERCISE

1. PRE-TAKE-OFF Calculate crosswind component, line-up, stick into wind
2. TAKE-OFF Progressively centralise stick 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 67 k, 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, round out as normal, just before touchdown yaw aircraft into centre line direction, stick into wind to counteract any roll. After touchdown lower nose immediately – but gently – to assist with directional control. Keep stick 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

Student Practice

Note: Instructor to follow-up with demonstration of combined 'CRAB' and 'WING DOWN' method.



1) Follow extended centre line by turning into wind to allow for drift.
2) Note increased ground speed.
3) Allow for drift by turning towards the wind.
4) Note reduced ground speed necessitating a higher power setting and a later turn.

TAKE-OFF 30° out of wind…crosswind component 50% wind strength
TAKE-OFF 45° out of wind…crosswind component 75% wind strength
TAKE-OFF 60° out of wind…crosswind component 90% wind strength
TAKE-OFF 90° out of wind…crosswind component 100% wind strength

FLAPLESS APPROACH & 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, but see 3. Below.

2. BASE LEG

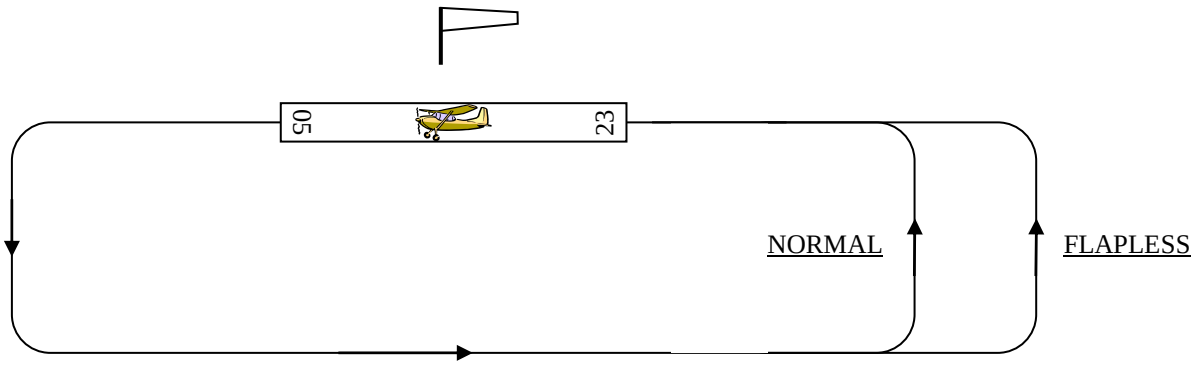
   Establish descent in good time using less power than normal. No flap. Trim 80 k Turn 80 k

3. FINAL APPROACH

   Speed 80 k. 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 - 65 k.

4. LANDING

   A shallower roundout will be required. The higher speed will involve a longer 'float' and landing run. Touchdown approx. 60 k. Be prepared to use brakes

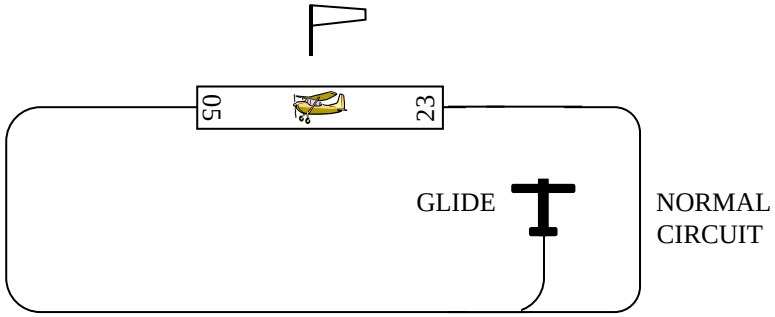


GLIDE APPROACH AND LANDING – EXERCISE 13 (2)

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

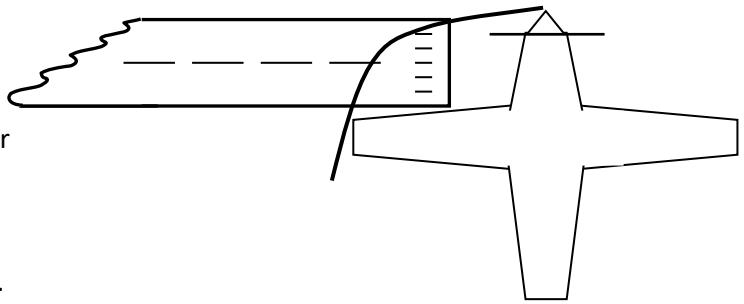
AIRMANSHIP: Normal airmanship considerations apply – Engine handling

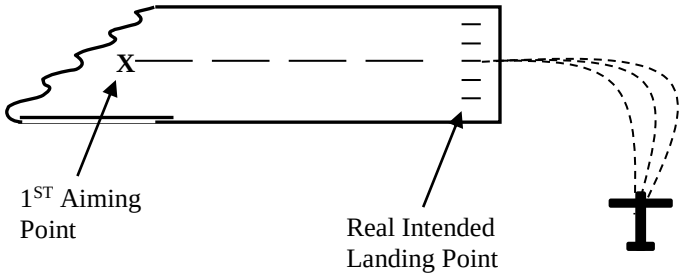
AIR EXERCISE



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/ w/v and decide when to close throttle.
   Select/check carb heat and close throttle, when sure of reaching touchdown point.
   Trim for glide 75 k. No flap.
   The w/v will determine the position for establishing the glide.
   Better late than early.
   Maintain heading, look at selected aiming point and assess if High or Low.
   <u>If very high</u> – Lower one stage flap.
   <u>If high</u> – Turn away 10° approx.
   <u>If low</u> – Turn towards runway 10° approx.
   <u>If unsure.</u> - Hold heading, then re-assess
   That is, the flight path is adjusted by turning towards or away from the field.





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.
   <u>Caution</u>: If undershooting on this exercise do not 'Stretch The Glide'.
   Add power, full if necessary, to re-establish on the correct glide path.
   If high, or if not on the ground by the first main intersection, 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 & LANDING – EX. 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, wind etc. Take-off checks complete, align a/c with selected path using max. run available 25° flap to be used.

Open up to max. power, against the brakes, check RPM, T & P's. If satisfactory release the brakes for take-off. Be prepared for swing and raise nose wheel at 50/55kts. Climb away at 65kts for the best angle of climb if obstructions exist, otherwise when clear of obstacles at a safe altitude raise flaps, and climb at 75kts. Trim.

Landing

Initial approach as for standard circuit but in light winds turn on to base slightly later. When established on final select full flap and make precision approach to selected touch down point. Adjust attitude for 65kts. Descent controlled with power and speed with elevator. As touch down is approached, adjust a/c attitude, apply pwr. as req. to reduce the speed to 60kts. 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 the best take-off path etc., take-off checks complete and the flaps selected as above, align the a/c and select full power. If the ground is very soft a rolling start may be desirable. The C.C., should be held back to permit the a/c to leave the ground at the lowest possible speed. As the a/c does so, the C.C. back pressure should be relaxed and the a/c flown parallel to the ground and the a/c allowed to accelerate to 65kts 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 nose wheel both during landing roll and taxying.

Note: Student practice for these exercises will normally be with the instructor.

CONSOLIDATION FLYING – EXERCISE 14 B
(FIRST SOLO FLIGHT 14 A)

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

AIRMANSHIP: Relevant documentation – need to carry radio and nav. information.
Local landmarks

AIR EXERCISE:

1. PROCEDURES FOR LEAVING AND JOINING THE CIRCUIT:

Reference to school pilot's order book re – circuit directions and procedures regarding effect of parachuting, glider and microlight a/c activities.
Signals area.
Re-join 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 etc.
Ability to 'guesstimate' compass headings to return to base, plus knowledge of compass turning errors.
If south of Honiton call Exeter 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 of position procedures i.e. how to obtain QDM's and Radar assistance.
Practice 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 early stages

AIR EXERCISE: (AFTER DEMO. TO SHOW ANGLE OF BANK, PITCH, EXTRA POWER, G-LOADING

1. STEEP TURN (45° bank) FROM LEVEL FLIGHT AT CRUISE SPEED)

ENTRY	IN THE TURN	ROLL OUT
Lookout turn complete Cruise speed Entry as for normal turn gradually increase power whilst inc. bank to 45° Same time C.C. back pressure to maintain alt. Rudder for balance	Lookout Maintain **B** Angle bank – ailerons **A** Attitude – elevators **B** Balance – rudder **S** Airspeed – power & CC Note: Nose moves round horizon at great rate.	Lookout/anticipate Apply aileron & rudder opposite to turn whilst decreasing power to cruise RPM as bank decreases. Apply forward C.C. pressure to prevent altitude gain.

Student practice L & R initially using slow rate of entry and recovery.
Then repeat for 60° bank/max. rate turn using full power i.e. full power, up to the buffet.

2. FAULTS IN THE TURN – RECOVERY FROM SPIRAL DIVE

ENTRY	IN THE TURN	RECOVERY
Check for clear area and height AGL Set cruise power (or less) Enter steep turn, allow nose to drop Student Practice	Note rapid increase of speed and alt. loss C.C. back pressure ineffective in raising nose at large bank angle	Close 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 ½ increase C.C. back pressure until stall symptoms occur.
Note higher airspeed.

Recovery: Release back pressure and continue turn.

Student Practice

As for incipient stage but apply C.C. pressure until the developed stall occurs.

Recovery: Positive fwd. movement of C.C.
Prevent further yaw with rudder.
Adjust power as required
If nose is low reduce power
If nose is high or level increase power.

Repeat to show the higher stalling speeds.

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 checks – Orientation – Safe altitude

AIR EXERCISE: (After revising level steep turns)

1. DESCENDING STEEP TURNS

With partial power in straight descent 85 k, lookout complete, enter level steep turn 45°/50° bank. Monitor/maintain. Tendency to increasing airspeed to be controlled by bank reduction and increase in C.C. back pressure. For 60° banked descent turns use 90 k.
Student Practice

Repeat from the glide using idle power. Note the higher R.O.D.
Student Practice

Repeat with stall and recovery at the incipient and developed stages.
Entry and recovery as for level steep turn.

Student Practice

2. CLIMBING STEEP TURNS

From the climb at 85 k, lookout complete, enter climbing steep turn using full power, bank angle 40° approx. If necessary, reduce bank to give reasonable R.O.C.

Student Practice

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.

Student Practice

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 1½. 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.

Student Practice

ADVANCE 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

   Student Practice

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

   Student Practice

FORCED LANDINGS – WITHOUT POWER – EXERCISE 16

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

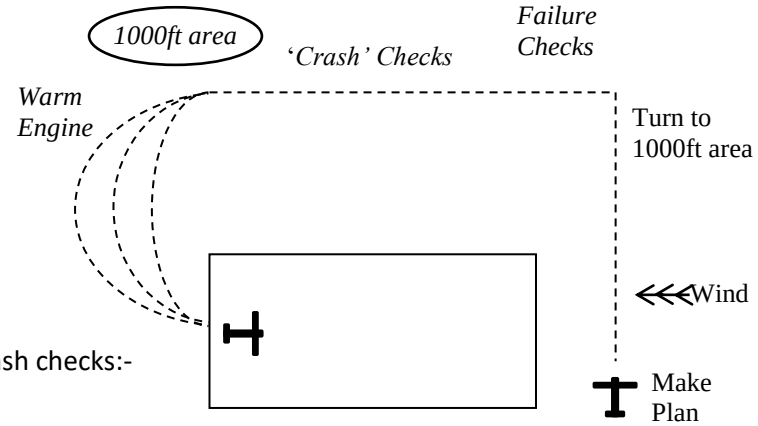
AIRMANSHIP: Lookout – Engine considerations – not fly below 500 ft above ground level.
In practice avoid annoying people and livestock.

AIR EXERCISE: Simulated engine failure at 2500 ft 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 1000 ft area and circuit pattern. Turn a/c 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 & mixture cut-off
Hatches	:	Door unlatched
Harness	:	Tight
Master	:	Leave ON

Check approach. Adjust pattern at 1000 ft 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
If high on Finals, with flap selected, could inc. glide speed. If too high, new field.
Note: All checks are touch checks during practice but carb heat hot and warm engine every 500 ft.
Overshoot not lower than 500 ft above ground level.

Student practice : Same field, then different field(s), then from various heights.

Instructors Notes:
1. Never turn so that the pilot's back is towards the landing area
2. If very high at 1000 ft area continue through extended centreline and make wide S-turn
3. If engine failure at approx 2500 ft : Plan as above
4. If well above 2500 ft say 4000 ft : Could circle the area with chosen field near the aircraft
5. If engine failure at 1500 ft : Turn downwind or base leg heading
6. If engine failure at 1000 ft : Turn on to base leg heading
7. Glide distance less with dead prop
8. Ensure student and F.I. both know which field and 1000 ft area are to be used when demonstrating this exercise. Later, F.I. to build in realism SAFELY!
9. Later, practice plus sim. engine fire drill

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. FREDALLLL
Fly down wind for max. coverage a/r
Note w/v and select field if no aerodrome available

Considerations: Size
Surface
Slope
Obstructions
Near communications

Overfly the area in slow safe cruise
75 k, flap 25°
Note hdg (M) and best landing run

2. INSPECTION PROCEDURE

First Circuit 500 ft AGL or depending on cloud base
Note landmarks down wind and final
Pre-landing checks and set up approach for inspection run
Approach field and overshoot areas at 300 ft
Check any obstructions and drift

If satisfactory:-
Second Circuit
Repeat, still slow cruise, pre-landing checks and set up app. for second inspection run approx 100 ft on R.H. side of field to re-assess approach, ldg area, and overshoot area. Max. T.O. flap

If still satisfactory:-
Complete third circuit for approach and landing.

3. APPROACH & 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 a/c comes to rest
Normal shut down
Not taxi a/c until ground inspected

Move a/c 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

Student Practice

PILOT NAVIGATION – EXERCISE 18 A

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.

Note:	There is no fixed format, but attention to the u/m points plus reference to the Solo Navigation Briefing Certificate should suffice.

1. Pre-flight action by the pilot
   Can the flight be safely made? Weather, route, altitudes, aircraft state, legal requirements, met., Notams, A.I.P., selection of route and maps, maps marked up – timings 5° and 10° lines etc. Raise nav flight plan and log (to be checked by F.I.). Booking out procedure, Nav. 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. R/T a/r.

3. En route pilot nav. – 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 k nominal 2/3 the n.m.'s = minutes.

4. Altimeter settings
   Altimeter Setting Regions

5. Flying for Range

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

7. 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.

8. Weather problems and diversion to alternate airfield
   Ability to estimate Tr (M) to an alternate airfield, plus mental D.R. re ETA's. Awareness of need to divert etc..

9. Descent and joining at destination airfield
   Knowledge of cruise descent, calc. of ROD's etc. Must have all relative information re destination airfield available (chart or copy on back of log). Alt. settings, Circuit directions etc., Parking. Security of aircraft. Refuelling. Booking in.

10. Cross-Country Routes
    A typical sequence would be as follows:-
    'Round the Blackdowns' – Dual,
    'MATZ/Control Zone, plus landing away' – Dual
    'Cardiff landing away' – Dual
    Then assuming completion Ex's 14B, 15, 16, 17, 18A, 18B, and 19, plus completion of the solo x-country certificate the student pilot can be authorised to fly solo the above routes already flown dual. The 150 nm triangular/landing away routes would then be flown dual & solo. A final navigation flight test will be flown as part of the Skill Test for the PPL.

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 1000 ft AGL due to bad weather or other operational reasons.

AIRMANSHIP: Cockpit safety checks – Lookout for other a/c and obstructions – ATC considerations – Weather appreciation – Avoid annoyance to people and livestock.

AIR EXERCISE:

1. AIRCRAFT SAFETY CHECKS
(After airmanship decision and prior to descent).
Fuel adequate
Radio – correct frq. vol. turned up
Engine T & P's, carb heat etc..
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: F R E D A L L L L for checks
Descent using power is better than glide
Sharpen lookout
Keep hand on throttle

2. DIFFERENT ASPECT OF FEATURES
Oblique view gives change aspect, need to 'guesstimate' Ht. Agl
Visually fly contours – use extra power a/r.
Note apparent high speed
Possibly added turbulence
Observe 500' rule. Keep 200' below cloud.
Map reading
Lookout, hazardous obstructions
Contour Flying: Ensure ground does not climb faster than a/c – watch for fixed bearing! Note that the alt. is not a lot of use except that it will give a good datum for S & L and for Min. Safe Alt.
Pilot must judge height above ground.

3. NEED FOR ACCURATE FLYING
Demo! Across line feature.
Upwind G/S slow.
Crosswind drift
Turning slipping/skidding
Downwind G/S 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 B.W. CIRCUIT
(3 typical cases)
1) Heavy shower activity possible hold off
2) Low cloud good visibility
3) Low cloud poor visibility

Simulate join plus BWC, hold off or divert.

STUDENT PRACTICE
'S' turns along a road/line feature
360° turns around a fixed object.
Useful for para. 4(1)
Maintaining track (s) on dual Nav. Flts.

CONSIDERATIONS
ATC
Good decision-making
Good lookout
Avoidance of noise-sensitive areas in training

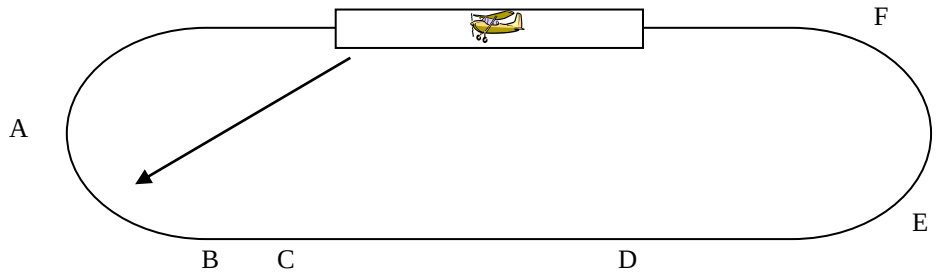
OPERATION AT LOW LEVEL– EXERCISE 18 B(1)
BAD WEATHER CIRCUIT

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 – 500 ft rule etc in training – LSC 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 u/m 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.



Downwind Turn

(The letters in the text, apply to the letters shown in the diagram)

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, 400 ft AGL and not closer to the cloud base than 200 ft.

Downwind Leg

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 (PA28) for low safe cruise configuration. In training at an airfield, the R/T call would be 'Downwind low level' or similar. 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 300 ft., wings level, ready for final lowering of flap, ready for landing.
E. Descending turn – R.O.D. 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 18 C

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

AIRMANSHIP: Pre-flight AIP references & 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 CAP 413 – R/T Procedures — Student Practice
   AIP – frequencies — Obtaining bearings, orientation

2. SSR (TRANSPONDER)
   Refer CAP 413 — Student Practice
   AIP – application — Every flight

3. VHF Omni Range – VOR
   Refer AIP – availability/frequencies
   After start and in the air – Select, Identify
   Check display
   F.I. demo: TO & FROM indications
   Orientation
   Intercepting & Maintaining Radial(s)
   VOR passage — Student Practice
   Obtaining a fix — To repeat F.I. demos

   Note
   For detailed information, reference should be made to attached Sheet 18C(1) VOR tracking.

4. AUTOMATIC DIRECTION FINDING EQUIPMENT – ADF (optional)
   Refer AIP – availability/frequencies
   After start and in the air – Select, Identify, Check display
   F.I. demo: Orientation and method of obtaining QDM's
   Homing to a beacon
   Station Passage
   Tracking from beacon — Student Practice
   Obtaining fix if other aids available — To repeat F.I. demos

   Note: For detailed information reference should be made to attached Sheet 18C(2) ADF Tracking and Position Finding.

5. DME/GPS
   To be demonstrated/practise as required.

VOR TRACKING – EXERCISE 18C(1)

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

Airmanship: A/c Lookout – Safety altitude- FRIEDAL- AIP latest info.

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-

A/c Altitude	Approx. Range
1,000	40 nm's
2,000	55 nm's
4,000	78 nm
8,000	110 nm

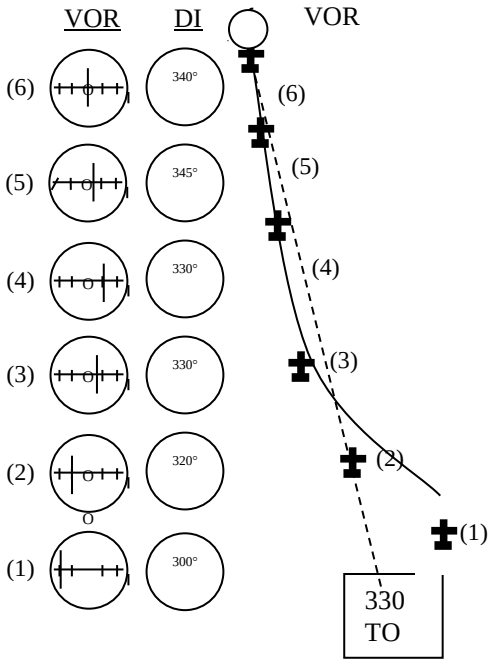
It should be realised that each radial subtends an arc of approx. 1nm at 60 nm from the station, so intercepting a radial some distance from the station can require a larger closing angle than when close in.

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

Having checked before flight in the UK Air Pilot (AIP) and obtained 'frequency', ' ident.', 'hours of operation', 'precise location', and 'designated operational coverage', the user should, having tuned and identified the station, continue:-

Select reqd. radial on the CDI.
Confirm no warning flag.
Ensure correct TO/FROM indication (i.e. A/C hdg and CDI reading similar).
Maintain hdg and CDI needle L or R will indicate which 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 allce. And select new hdg.
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 A/c nears the station the radial width will reduce considerably.
When very close in, it becomes impractical to fly CDI.
Best to fly hdg established.



Example
If CDI needle shows 2 dots to the left this means deflection of 4 degrees; times 3 = 12 degrees.
So change hdg 12 degrees to left (+ or -) wind allowance.

VOR TRACKING – EXERCISE 18C(1)

<u>To track from a station</u>

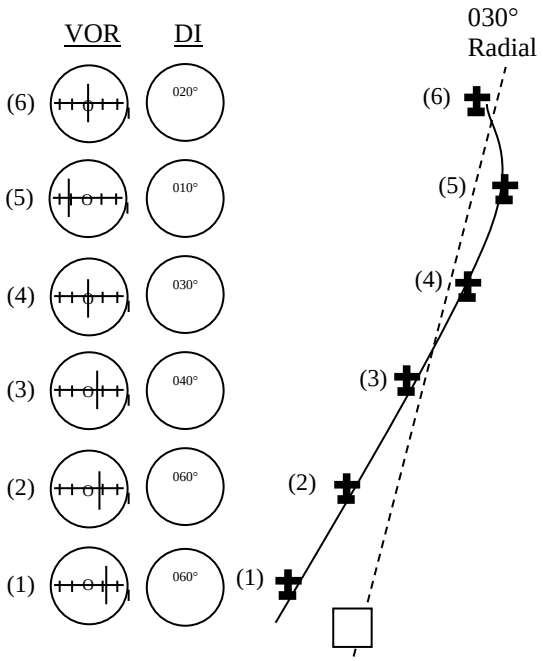
As, before and having tuned and identified the station, continue-

Select the require 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 a/c hdg. are similar.

Maintain hdg. and CDI needle either left or right will indicate which way to turn.



The number of dots that the needle is off will show the track error.

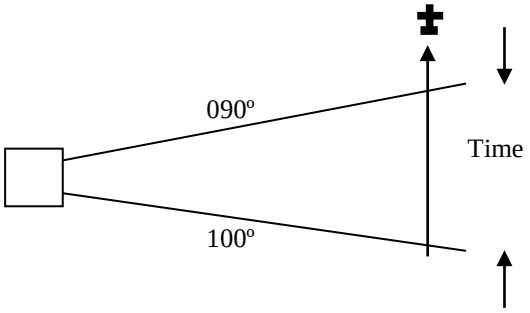
Assess the error, multiply by 3, plus or minus a drift allce. and select a new hdg. a normal 'bite' would be 30 degrees.

<u>Note:</u> 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 reqd. track will be the track error. Reassess, return the CDI to the reqd. radial, and fly the new reading. As the needle centres, reduce the 'bite'.

Remember, as the a/c flies away from the station the radial will widen, and accuracy becomes important.

<u>To assess time to a station</u>

After tuning and identifying the station as before, assuming it is wished to establish the approx. time to the station proceed as follows:-



Turn the a/c 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 formula:-

$$\frac{\text{Time (secs)}}{\text{Degs. Of change (10 in this case)}} = \text{Minutes from station}$$

ADF TRACKING AND POSITION FINDING – EXERCISE 18C(2)

Aim: To teach how to track to & from a N.D Beacon, also how to plot the aircraft position using NDB & VOR.

Airmanship: Normal aspects apply - Lookout – Safety altitude – Must have instinctive idea of QDM's.

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, practice in the clear, then under the 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 R.M.I would be easier. Two methods are given:-

Method 'A'

1. Check ADF needle and turn a/c so needle reads zero. Ensure DI and compass synchronised.
2. The hdg on DI is the QDM to Stn.
3. Maintain. Any deviation of ADF needle shows drift and the way to turn.
4. To regain original track, turn twds the wind (same side as needle) until the ADF needle is the same no. of Degs 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 hdg. If it is right, the ADF needle will not move.
7. In pxtice, 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 dr. allce. is too much or too little. Repeat 4) to 6). Then make new dr. allce. Maintain.

Remember: The dir. of needle swing will show which way to turn. Also, no need for too much arithmetic: to find actual QDM – either turn the a/c to centre the ADF needle and read the hdg. or read the needle and add (if R of centre) or subtract (if L) re the a/c hdg. See diagram.

8. If the QDM is not the one required, alter hdg. as necessary: i.e. decide dir. and the 'bite', select new hdg until the needle reading + or – hdg = QDM. See example.

Method 'B'

1. Refer to ADF needle
2. Ensuring DI/compass synchronised, mentally transpose ADF needle to DI face. The transposed position is the a/c QDM. Decide if the QDM is as reqd or if a/c requires hdg change to intercept reqd track.
3. If need to intercept, decide if to turn L or R, and the amount of 'bite' e.g. attack at 30^0 or whatever.
4. Turn the a/c to the new hdg.
5. Mentally transpose the needle and find the QDM. Initially, it will be the same until the new hdg has had time to 'work'.

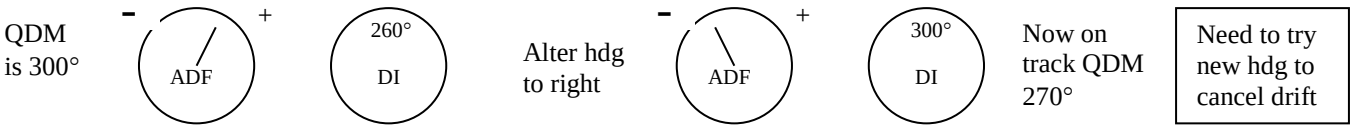
Remember: The difference between the a/c and the reqd track will be shown by the ADF needle when the a/c is on the reqd track.

Example: (say) Steering 300^0, looking for 270^0, will be on track when needle says 30^0. (As the needle approaches 30^0 the 'bite' can be reduced.)

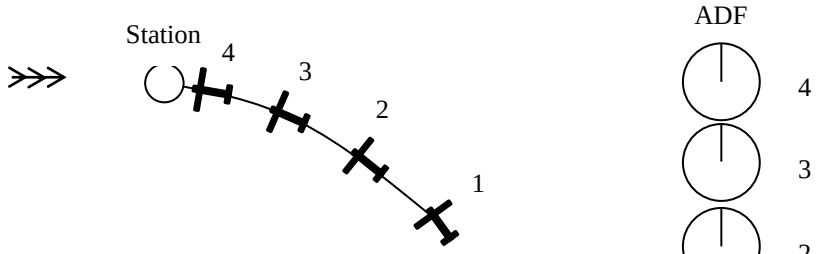
6. By this method, the Pilot constantly knows his QDM, without maths. As a/c reaches req'd track a new hdg can be 'guesstimated' to take care of any drift.
7. When the a/c is on the new hdg. the position of the ADF needle must be noted. This is essential. Note as … Degs (minus) if L of zero, or … Degs (plus) if R.
8. If the needle remains fixed, the drift has been cancelled. If the needle moves (L or R) the a/c hdg must be corrected first to regain the reqd track, then again to try a new drift allowance.

Remember: The needle will show which way to turn, and say again the saying at 5) above.

1. Tracking to a station (cont'd)
   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 a/c is drifting to or from its required track..



2. What happens if you don't allow for drift
   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 a/c 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.

3. Overflying the Station/Beacon
   If a careful track is maintained with the corrections 'sharpened' up as the a/c approaches the station (but the heading alterations kept small) the a/c 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.

4. 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.

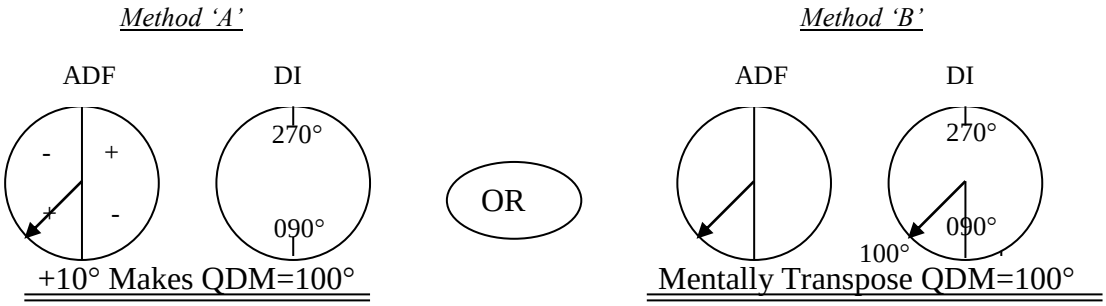
6. Tracking from a station
   The methods outlined in para 1 can be used. Either treat the ADF dial as a 'plus and minus indicator' to find the QDM (which is now opposite to the aircraft heading) or mentally transpose the ADF needle to find the QDM: -

5. Obtaining a fix using 2NDB's 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 para. 1, then deducting he 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, 30seconds of each other. Any thing more will give a measurable error.



To intercept a given QDM turn the a/c in the same direction that the needle is moving (assuming that it is moving and the a/c 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 a/c is on the new QDM, or nearly so, adjust as reqd 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 a/c heading and reqd track will be on the ADF indicator when on the reqd 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. QDM 110° 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 reqd 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. I not, 'per ardua ad astra'.

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 – I.F. 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-flightcheck of aircraft antenna etc – emphasise need for student pilot to avoid weather conditions necessitating I.F. – importance of taxying instrument check.

AIR EXERCISE:

1. PHYSIOLOGICAL SENSATIONS
   Student to close eyes, head down, and attempt to interpret a/c movements through physical sensations. Instructor to fly a/c. Conclusion: Sensations derived from motion and posture can become confused.

2. INSTRUMENT INDICATIONS

Instruments	Demonstration	Conclusion
AH (AI) Alt. VSI ASI	Pitch: AH index aircraft one bar width up and one bar width down. Note large change of speed & altitude.	AH shows direct and instant ind's of pitch. Small movements of index a/c in pitch will result in large changes of a/c att. Hence need to make small control movements. The 3 press. insts. give indirect ind's of pitch.
AH Alt.	Bank: (Revise markings a/r) Then bank AH index a/c until 10° is reached. Hold. Adjust pitch att. to maintain constant alt. Return to S & L. Re-adjust pitch as required. Repeat for 15° and 20° both L & R return to S & L Re-adjust pitch as required.	AH shows immediate and accurate indication of bank or lateral level. This inst. is only inst. to show direct indics. of both pitch & bank and is called the Master Instrument.
AH DI (HI) TC/Bal. Ind.	Heading & Balance: Fly the a/c S & L. The insts. show lat. level hdg. & balance. Demo if small bank (faulty AH) but hdg maintained – out of balance. Or if slight yaw but lateral level maintained – out of balance.	It is essential to fly a/c laterally level and with no yaw i.e. in bal. The DI gives direct & instant indic. of hdg.; and TC/Bal. Ind. gives direct & instant indic. of balance.

Student practice, then with hood: maintaining aircraft attitude by reference to the AH only: laterally level and constant pitch attitude. F.I. to mention attitude flying, also control Instruments and Performance Instruments.

3. Attitude Instrument Flight

(The student can be reminded that the establishment of given pitch and bank attitudes accompanied by a specific power setting gives a predictable aircraft performance and that when these are established by reference to the flight instruments then the result is Attitude Instrument Flying).

Effect of power changes whilst maintaining level flight

Instruments	Demonstration	Conclusion
AH RPM Gauge DI (HI) ASI VSI Alt.	Effects of changing power: Increase power whilst maintaining level attitude. Apply control pressure to hold constant altitude. As speed increases, note increased CC pressure needed. Also changes in hdg. & balance.	Initially, changes in alt. & speed, but esp. early VSI response. Hdg. & balance affected plus a/c inertia.

Student practice using external and instrument references to maintain altitude, heading and balance, whilst changing power and speed.

Introduction of selective radial scan

Selective radial scan, using hood. AH Alt.	Student practice Selective Radial Scan whilst maintaining constant alt.	To scan from AH to Alt. and back to AH. Maintain alt. by adjusting pitch att. of index a/c. Adjustment: max ½ bar width.
AH DI	As above whilst maintaining constant hdg.	To scan from AH to DI and back to AH. Maintain by control adjustments to hold wings level and constant hdg.
AH DI Alt.	As above whilst maintaining constant altitude & heading	Develop scan technique radiating from AH to DI and back to AH. Then to Alt. and to AH. Hence termed 'Sel. Rad. Scan'

As proficiency is gained the scan can be widened to bring in the secondary supporting instruments.

IMPORTANT This I.F. appreciation exercise must be preceded by a briefing on the under-mentioned topics:-

Reasons for I.F. Training: Statistics re accidents, responsibility in law, weather minima etc..

The Instrument Panel: Instruments and their basic operation, Master, primary, and secondary

Flying Techniques: Attitude flying, trimming, small control movements, selective radial scan, standard rate turns.

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 S & L FLIGHT, NORMAL CRUISE (85/90 K)
From a condition other than S & L and using internal and external references:-

Achieving	Maintaining	Correcting
Select approx S & L att. using AH. Set cruise power. Initially scan AH, Alt., DI then trim. Widen scan to include sec. supp. instruments. Re-trim. If wings are level and Hdg is constant a/c will be in balance. If wings level, a/c in balance, but hdg is changing, could be u/s AH.	When S & L achieved the primary supporting insts. will be DI and VSI. If turbulent use DI and Alt. For small errors in Alt. use pitch changes. For larger errors re-adjust power using alt. as supp. inst. Scan to include the Suction Gauge.	Technique: change-check-hold-adjust-trim. Pitch changes: max ½ bar width. Hdg changes: max bank ½ of hdg error in degrees. Max rate one. Alt. in excess +/- 100 ft: re-adjust power and pitch.

Student repeat, then with hood.

Note: Accurate trimming essential. Better to prevent instrument deviations than to 'cure' !

2. ACHIEVING AND MAINTAINING Ss & L FLIGHT AT VARIOUS AIRSPEEDS AND IN VARIOUS CONFIGURATIONS
Repeat the previous exercise in level flight for fast cruise, slow cruise, slow safe cruise i.e. with flap. Scan will be as before but glances at RPM gauge will be involved. Remember that pitch changes of one bar width equals a change of IAS of some 10 - 12 k and vertical speed of some 500'/min.

Student practice, then with hood

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. Introduction of FREDAL and suction gauge checks.

AIR EXERCISE

1. ACHIEVING & MAINTAINING THE CLIMB (80 K) LEVELLING OFF AT 90 K
From S & L condition, using internal and external references:-

Achieving	Maintaining	Correcting
Smoothly apply full power and prevent yaw. Then with wings level place the index a/c in approx climb attitude. Scan: AH, DI, RPM and trim. Then scan includes ASI. Re-adjust pitch attitude to achieve correct speed. Max pitch change ¼ - ½ bar width. Re-trim. Check balance.	Maintain correct pitch on AH. Scan plus DI and ASI. Monitor the Alt. and anticipate levelling out by 10% of R.O.C. and lower index a/c so that S & L is reached at the correct alt. Hold. Reduce to cruise power and use scan as for S & L plus ASI. Trim. <u>Remember tendency for a/c to climb during levelling out.</u> Scan Suction Gauge.	Technique: change-check-hold-adjust-trim. Hdg changes: max bank ½ of error in degrees. Max Rate one. Pitch changes: max ¼ - ½ bar width.

Student repeat, then with hood

2. ACHIEVING & MAINTAINING PWRD DESCENT 70 K, LEVELLING OFF 85/90 K
From S & L condition, using internal and external references:-

Achieving	Maintaining	Correcting
With correct Alt setting and having decided IAS and R.O.D. (400 fpm) hold pitch attitude whilst reducing power as required. Include ASI in the scan and re-adjust index a/c as IAS is achieved. Check wings level, balance, & trim. Refer to VSI and adjust power and pitch a/r. Check balance and re-trim.	Having achieved correct R.O.D. maintain correct pitch on AH. Scan to include DI, ASI & VSI. As approaching levelling off Alt scan Alt and anticipate by 10% of R.O.D. smoothly add cruise power and return to S & L. The index a/c should be raised so that S & L is reached at correct Alt and trim. Scan as for S & L using ASI as primary support inst. until IAS is obtained. Check balance and re-trim a/r. Scan Suction Gauge	As for climb above.

Student Repeat,

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

1. RATE ONE LEVEL TURNS
Initially, using external and internal instrument references from S & L flight at 85/90 k:-

Entry	In The Turn	Returning to S & L
Grad. bank a/c until 15° is shown on the AH. Maintain balance with rudder. Apply C.C. back press. to slightly raise index a/c to maintain altitude. Primary Supp. Insts:- VSI and TC If turbulent use Alt.	The primary Supp. Insts. are VSI and TC. Rate of turn is shown on the TC. DI will be sec. supp. then primary as hdg is reached.	Anticipate recovery by ½ the bank angle. Adjust the rate of roll-out so that wings are level as recovery heading is reached. Prime Supporting Insts. are DI, VSI and TC (Balance)

Student practice, then with hood, both left and right turns, especially 180° turns to simulate return to VMC after inadvertent entry into cloud.

2. RATE ONE CLIMBING TURNS
Initially, using external and internal instrument references from a straight climb at 70 k:-

Entry	In the Turn	Returning to Climb
Maintaining pitch att. bank the a/c until the AH pointer indicates 15°. Maintain balance with rudder. During the entry, primary supp. insts. ASI and TC (Bal). Lower index a/c to maintain correct speed.	Primary supp. insts. are VSI and TC. The DI will be a Sec. Supp. inst. then primary as hdg is approached. Check for tendency to over-bank in cl. turns especially to the left.	As for recovery from level turn. Primary supp. insts. are DI, ASI and TC (Balance).

Student practice, then with hood, both left and right turns.

3. RATE ONE DESCENDING TURNS
Initially, using external and internal instrument references from a straight descent at 70k

Entry	In the Turn	Returning to Descent
As for level turn above. But extra power may be required to maintain the original ROD and the VSI brought in to the scan.	As for level turn.	As above.

Student practice, then with hood, both for left and right turns, including 180° turns 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 S & L apply steep bank and allow nose to drop. Power to be reduced to say 2000 RPM at commencement to avoid exceeding RPM limitations.	AH shows steep bank and low nose att. ASI shows increasing speed. Alt. shows rapid ht. loss. TC shows full deflection. Engine RPM increasing. Flying controls heavy.	Close throttle and roll wings level by firm use of ailerons. (AH). Centralise aileron control. Raise the a/c nose to a level attitude (AH). As the speed decreases to normal restore cruise RPM. During the recovery the primary supp. instruments will be the ASI and the TC. Then the DI.

Student practice, initially with external and internal instrument references, then with hood, both left and right spiral dives. Excessive C.C. back pressures must be avoided during the recoveries which might cause possible aircraft structural damage and/or spatial disorientation.

IMPORTANT

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