

General

Once stalling is completed it is normally time to start on the circuit - although no doubt the student will have flown parts of it during the earlier exercises. Initially, efforts will be concentrated on the powered approach. In addition at this stage, the student should consider taking the 'Aviation Law' examination and taking the 'CAA Medical Examination'. Both of these must be completed before your first solo.

The priorities of learning are that the student should start by getting the circuit pattern right, then the final approach and then to learn how to land. Too much concentration on all the aspects will slow the rate of learning. In other words, learn one aspect at a time.

Introduction to the Circuit

It will be helpful to have in front of you the diagram for exercises 12 & 13 from the school's PPL course notes. You may already have learned that exercise 12 is the take-off, including the climb-out and the downwind leg. Exercise 13 is the number allocated to the remainder of the circuit i.e. the approach and landing. As stated above the approach used initially will be the powered approach. Put together the two exercises and that gives us a complete circuit.

In these two exercises you will learn a lot of new skills. Fortunately, you will have many flights in which to learn them, so there is no need to worry if you find the workload hard to begin with. However, you will find yourself looking out of the cockpit and admiring the scenery during the third and fourth lessons.

The new skills that you will have to learn will include:

- 1) Speeding up all P-A-T and A-P-T procedures for the exercises already learned.
- 2) The ability to fly relative to the ground i.e. to fly in line with the runway, parallel to the runway and at right angles to the runway. This involves constant and instinctive appreciation of the wind direction.

- 3) Sharpening pilot lookout and appreciating other traffic - both on the ground and in the air.
- 4) The ability to carry out in the air cockpit checks from memory without hesitation and without causing the aircraft to deviate from the intended height or heading.
- 5) Development of judgement in assessing height above the ground without using the altimeter. This applies mainly during the landing stage.
- 6) Carrying out 'touch checks' when practising emergencies. This means carrying out emergency drills without actually moving the various controls and switches. The pilot just touches the controls and switches concerned, saying out loud the action(s) to be taken. Clearly it would be unwise to turn off the fuel and ignition switches whilst gliding at 500ft above ground level. In addition, in a real emergency, the pilot's hands would know where to go!
- 7) Finally, using the radio for the various circuit calls.

This is the stage where you really begin to change into an airman/woman because you have to learn to exercise judgement so that quick and accurate decisions can be made and implemented. To return to the briefing, the first thing you need to learn is the anatomy of the circuits as follows.

Terminology

After completing the pre-takeoff checks, the first thing we have to do is to announce over the radio that we are ready for departure (and not use the term 'take-off'). We then line-up at the runway threshold. In some circumstances we may have to line up and wait - a term which is self-explanatory. Then comes the take off followed by the climb out. At 500ft AGL we turn onto the crosswind leg. After levelling off at 800ft we turn onto the downwind leg. It is on this leg that we make our downwind radio call followed by the pre-landing or downwind checks. At a selected point we turn onto the base leg. After setting up the aircraft in the landing configuration we commence the descent. As the runway centre line is approached we turn at around 500ft onto the final approach. When the turn is complete and the aircraft is pointing towards the runway threshold a further radio call is made. This is called final. If we join direct onto the final approach without flying a circuit an earlier call can be made, normally whilst several miles out. This is called long final. For much of our circuit training we shall mostly use final.

In practise for the first few sessions, the instructor will operate the radio for you and will introduce you to the radio as and when you can handle it without detriment to your flying.

The Flight Experience

The pre-flight procedures will be much the same as those for the previous lessons although there will be some changes such as the use of QFE altimeter setting as opposed to QNH. The presence of other traffic is worth thinking about. For instance, is the circuit busy or too much fast traffic or is there slow moving traffic such as microlight aircraft? Is there good visibility or is the sun's position acceptable? There is nothing worse than a setting sun right on the end of the runway. Finally, you and your instructor will need to discuss the wind strength and direction because the wind velocity, which is the term, used to describe these two factors, will determine the runway in use and the crosswind component, if any.

You can always look at the operations board in the flying school or at the information in the signals square to establish the runway in use. Alternately, you could request the 'airfield information' (required if possible) over the radio after start up. However, it is part of your training to be able to decide the runway in use for yourself because later on when you have your pilot's licence you may fly from an airfield where you have to do just that.

On this lesson, then, the pre-flight checks including the pre-takeoff checks will be as previously. The instructor will, however, show you how to check the circuit for traffic before you line up. Two factors are worthy of mention.

Lining Up

The first concerns 'when' and 'how' to line up. On completion of the pre-takeoff checks, you should turn the aircraft out of the wind so that you can see the final approach, the base leg and where applicable the downwind leg to establish visual contact with any circuit traffic. Thus a decision can be made to either line up or hold position. Later, when you are more experienced, you will also be listening out on the radio - this will be of particular value when the visibility is poor.

In a busy circuit, it requires experience and good judgement to decide when to line up. Until you get that experience your instructor will help you. When the traffic is clear, the instructor will make the call for you. At Dunkeswell the call will be on the lines of: -

'Dunkeswell Traffic, Golf Romeo Yankee lining up runway 23'

This now takes us to the second aspect. The instructor will stress that on an active runway you do not loiter. By that doesn't mean that you have to taxi at high speeds but just do everything expeditiously. Having lined up on the runway centre line with the nose wheel straight, take just a few seconds to check the flying controls full and free, glance at the wind sock to confirm the wind hasn't changed direction, check the direction indicator to confirm correct runway, heels on the floor and off we go for the take off. What you must not do is sit there, repeating all your checks, so preventing anyone else from using the runway for taking off and landing.

The Take Off

The take off is quite straightforward. You will in all probability be following through on the controls and the instructor will demonstrate this first circuit. He/She will point out a reference feature at the far end of the runway, or he/she could use the white runway centre line, on which to keep the aircraft straight during the take off roll. He will open the throttle smoothly and fully, countering any tendency to yaw with rudder, the control column will be held neutral, as will the aileron controls unless there is a crosswind. As the aircraft gathers speed the instructor will point out that he is applying a light control column backpressure to take some of the weight off the nose wheel. This, incidentally, will prevent any nose wheel shimmy. Then the instructor will say the following checks: *'Power sufficient 2100rpm increasing to 2300rpm, temperature and pressure in the green, airspeed increasing'*. If any of these checks are unsatisfactory, there is any unusual vibration or noise, the pilot would close the throttle and abort the take off. However, this is a very rare event.

So normally, all we have to do is to look for an IAS of some 50 knots (C152) and at this point gently but firmly lift the aircraft clear of the ground, preventing yaw and holding the wings level. The pitch attitude required would not be the climbing attitude but one slightly lower that will allow the aircraft to accelerate to the safety speed. Then, we shall put the aircraft into the climb at the normal 65 knots (C152).

Remember; if the wings are level and the aircraft is free from yaw the aircraft will be in balance. So there is no need to stare at the ball indicator all the time. This applies throughout the climb and all straight flight.

If there happens to be a cross wind you will see the instructor turn the aircraft slightly into wind to cancel the drift. All that has to be done now is to climb the aircraft straight ahead to maintain the runway extended centre line in a normal climb. You have done this before.

The instructor will point out that it will soon be time at 300ft (QFE) to check temperature and pressures in the green and retract flap if any has been used for take off. In other words: *'Temperature and pressures green and retract flap'*. These are the 'after take off checks'. The aim is to teach these checks to assist you later in the course or if later you fly a more complex aircraft. At 400ft, it will be time to commence lookout and 500ft it will be time to turn. The lookout check is very important and must not be missed. In the Cessna 152 raising the wing a few degrees facilitates the lookout; in a low wing aircraft such as the PA28 lowering the wing serves the same purpose.

Whilst doing this, the instructor will show you how to select the next heading, indeed all the headings in the circuit. Since the aircraft needs to turn through some 90 degrees and the wings are attached to the fuselage at 90 degrees the wing tips can be used as pointers to select landmarks as reference points. This first turn is a climbing turn and must be strictly rate one. You will no doubt remember that an aircraft tends to over bank in a climbing turn, especially to the left. So keep strictly to between 12 and 15 degrees of bank. You can use the turn co-ordinator as a guide. Once you have started the turn, keep the bank constant and keep turning positively ensuring that recovery is made on the chosen landmark. The aircraft is now on the crosswind leg - and still in the climb.

The Crosswind leg

At this point, the instructor will show that it is advisable to look back and see that the runway is where it should be and that the wing is approximately parallel to the runway confirming the suitability of your heading. Climbing at the correct speed is paramount! If you haven't trimmed properly and your IAS is a bit on the high side the aircraft will not climb at the correct rate and this will lead to elongation of the circuit

and make the downwind leg too wide. In any event, at 800ft it will be time to level off using about 2150rpm (C152).

It is difficult to define a point at which to turn downwind but certainly if the aircraft has been climbed at the correct speed and on the correct heading, levelled and trimmed properly it will be time to turn, not forgetting the selection of the next landmark and lookout especially for aircraft joining on the downwind leg.

The Downwind Leg

Your instructor will point out that the heading on the downwind leg is, in fact the reciprocal of the runway in use i.e. opposite to the take off direction. The instructor will also point out that when you have turned, using a medium banked turn, you will need to check that the heading looks right and will enable the aircraft to maintain a consistent track parallel to the runway. To help keep straight use a sensible landmark in front of the aircraft, change it if necessary and there is no need to keep your head in the cockpit all the time. The downwind leg is just plain straight and level flight: constant height, constant heading and in balance. That is: aircraft trimmed, wings level and no yaw.

The next feature the instructor will demonstrate is a double event. The first is the downwind radio call and the second is the completion of the downwind or pre-landing checks. As soon as you have done the first get on with the second. Always complete these two actions in the order stated. Make a habit of it. The instructor will make the call to begin with, but you will be shown where to make the call, something on the lines of: *'Dunkeswell/Dunkeswell Traffic Golf Romeo Yankee downwind 23'* At this juncture you should look ahead, around the circuit pattern, along base leg and final to check if you are number one, number two, number three etc. to land. As soon as the traffic has checked downwind cockpit checks should be completed. This should be done from memory, and not from the checklist so that you don't have to bury your head in the cockpit and so wander off heading, or prejudice lookout. By the way, when the checks are complete, say so, i.e. *'checks complete'*.

It is good practice to make a point of 'flying with your feet'. This will help you to prevent yaw, that should keep the wings level and help you relax for a few moments. If you don't understand this, ask your instructor to demonstrate. You can even lift your hands off of the control column and get rid of those white knuckles.

All the while, you should be tracking absolutely parallel to the runway. You could if you wish note the heading on the direction indicator and use it as a guide when flying the next circuit - just as a datum - but still using your selected landmark reference. Your next task is to monitor your touchdown area i.e. the threshold adjacent to the runway number markings - and this applies to all types of circuits - so that you can decide when to turn onto the base leg. For a powered approach all you have to do is wait until the touchdown area is 45 degrees behind the aircraft. It will then be time to turn. Alternatively, if you cannot judge angles, your instructor may suggest another method using 'wing spans' as a guide. The procedure is as before: lookout for other traffic, select a reference point on the wing tip and turn.

A medium bank turn should be used and when you have turned, the wings should be approximately parallel to the runway. If anything, they should be angled in towards the runway slightly because of the wind direction. If you find that the wing is angled away from the runway there is something wrong.

The Base Leg

The instructor will show you how to set up the powered decent. You have done this before. This time, however, the point at which you set up the decent is important. Ideally, the chosen touch down area, should be at 45 degrees to the aircraft centre line or put it another way, halfway between the wingtip and the nose. With the aircraft travelling at something like just over a mile for every minute there is not time to spend a couple of minutes setting up the aircraft. However, if the following procedure is adopted you will soon be setting up the decent in no more than half a minute, which leaves time to lookout and concentrate on flying the aircraft.

- 1) Reduce power to approximately 1500rpm. Prevent yaw. Don't fiddle with the throttle; you can do that later.
- 2) Hold the straight and level attitude, wings level, speed will decay; don't allow the nose to drop.
- 3) Check the IAS. When the speed is in the white arc lower 20 degrees of flap.
- 4) As the flap is lowered apply forward control column pressure to counter the aircraft pitching up and to select a lower nose attitude that will give you 65 knots (C152) for the decent. Trim.

Try to remember this attitude. You will need to select it and maintain it for quite a few lessons to come.

You are now established in a powered, flapped decent for the approach and landing. On this leg you have to maintain lookout, especially out to the long final position to check for traffic joining direct and of course fly the aircraft: hand on throttle from hereon, power changes can thus be immediate and instinctive. The aim is to turn on to final at around 500ft and as the instructor will show you, this isn't difficult provided you watch two particular aspects: the first is height control i.e. the pilot must monitor the altimeter on this leg and make small power adjustments to regulate the height so as to commence the turn at around 550ft. The second aspect is knowing how to achieve the turn by phasing the angle of bank so that the pilot can recover from the turn spot on the runway extended centre line.

If you think about it, knowing when to turn is half the battle because of the wind effect. If you have a strong headwind component on base leg it is advisable to start the turn slightly later than you would with a lesser wind. It is also advisable to remember to relax the control column backpressure slightly in this medium bank descending turn so as to maintain the required 65 knots.

Final Approach

Once the aircraft is established on final, wings level, the instructor will make the appropriate radio call. The call is as follows: *'Dunkeswell Traffic/Dunkeswell Golf Romeo Yankee Final 23 touch and go'* This will tell other pilots, both in the air and on the ground that Golf Romeo Yankee is at about 500ft on final approach and after landing will roll, take off and start another circuit.

The instructor now has to show you how to fly the final approach. The landing is of secondary importance on this first demonstration circuit, and indeed on your first few circuits where the aim is first how to fly an accurate circuit pattern, secondly how to fly a competent and consistent approach and finally how to land.

Before proceeding further, the instructor will point out that we have in effect obtained landing clearance (because we have made our radio call), the runway ahead appears to be clear and that we are satisfied with the approach, so we can happily continue our approach to land. If any of these

aspects were unsatisfactory the instructor would initiate a go-around and make another circuit. That is the normal procedure to be learned.

Later in your training this will be the point where you will learn to lower the last stage of flap i.e. full flap that will be a feature of the more advanced circuits. But this will not take place until you have some solo flying hours in your logbook.

The instructor will next ask you to note the shape of the runway outline and to note the relative position of the touch down area in the windscreen. From hereon, we have to monitor the touch down area for movement. Ideally, the touch down area should remain stationary in the windscreen. The instructor will demonstrate that if the touch down area appears to move up the windscreen indicating that the aircraft is getting low so this will have to be corrected by adding power, say 100-200rpm, raising the nose slightly and re-trimming. Then re-assess to see if the selected area remains stationary in the windscreen, while still flying at 65 knots.

If the touch down area moves down the windscreen, indicating that the aircraft is getting high on the approach, this will have to be corrected by reducing the power slightly, say 100-200rpm, lowering the nose and re-trimming. Then re-assess. The secret is to fly relaxed but accurately, keeping the changes little and often, making it look like one continuous process. The instructor will sum up: we control our height with power, our speed with pitch control and the direction with ailerons and rudder.

The shape of the runway outline should stay the same throughout the descent, remaining in the same place in the windscreen, merely growing larger as the aircraft gets closer to the selected landing area. Incidentally, the ability to fly the aircraft down the final approach accurately and consistently is an essential part of learning to land. Usually, if a pilot has difficulty in learning to land it is invariably because the pilot is unable to fly an accurate and consistent approach. So if you can get this part right the remainder should be straightforward.

So, still flying the approach the instructor will prepare for the touch down and will point out the changing appearances of objects on the ground and how you can assess your height. After all, once you get near the ground it is impractical to refer to the instruments, you have to look outside especially as regards height - moreover the speed will be judged

by the nose attitude during the landing. One thing is certain: as you get nearer to the runway you will have to lift your eyes away from the selected touch down area that you have been concentrating on and look towards the end of the runway. The instructor will warn you that he will commence the flare, or round out at about 15-20ft above the ground and that is the height that you will have to remember when you come to fly the approach and landing. Some instructors liken it to the height of a double-decker bus.

Estimating Height

A quick aside on estimating height. When at altitude, normally the pilot looks down at all the features on the ground. On the other hand once below 100ft i.e. on the end of an approach to land the pilot will be able to look both up and down at the various objects on the ground. It is a fact that the height of an object that appears to touch the horizon is the same height as the observer's eye. To give an example, if during a descent to land the top of a 20ft wind sock which previously has been well below the horizon eventually rises and appears to touch the horizon, at that instant the aircraft is at 20ft above the ground. If still descending and half of the windsock appears to rise above the horizon then the aircraft is down to 10ft above the ground. The same principle applies to a 30ft tall hangar or a 50ft tall tree. However, it is suggested that you do not use the windsock during the landing procedure, but a general glance round the horizon in front of you when you come into land, associated with the known heights of trees and buildings will give the pilot an approximation of the aircraft height. If you get the opportunity during a flight in the vicinity of the airfield check your altimeter QNH reading when you see the top of the Stockland Hill TV mast just touching the horizon. You will see that it gives an approximation of the height of the top of the mast above sea level.

The Flare

Back to the approach and landing as regards the flare (or round out). The instructor will demonstrate the height at which the process is initiated. The height as mentioned above will be in the region of 15-20ft above the ground. You must try to remember what this looks like. At this height, the throttle should be gently closed and control column backpressure should be applied both to prevent the nose from dropping and to select a slightly higher nose attitude. Again, you should note and remember this new nose attitude. Furthermore, this new attitude should be held. This,

then, is the flare. The aim is not to fly parallel to the runway, but to start the transition from the descent to the landing attitude. In fact, the aircraft will begin to slow, and the overall effect is to give the pilot more 'thinking time'.

The flare is an essential first step in learning to land and it does take precise flying and practise. In fact, if the pilot has difficulty in learning this procedure, it is a simple matter to practise this 'upstairs' at circuit height. It will be appreciated that without this flare, the controls would be too lively and things would happen too quickly. Moreover, the aircraft would probably hit the wheels on the runway and bounce back into the air necessitating a go-around. So, learn to flare, as a first step and the remainder of the landing will be straightforward. Another feature is that if you always flare you can say to yourself 'I am happy with this, I'll land' - or you can say 'I am not happy with this, I'll go-around and have another try'.

After the flare, the aircraft will still be descending, but at a gentler rate and the instructor will hold the attitude with control column backpressure still keeping straight with the ailerons and rudder. At this stage it is advisable to move your sight closer to the aircraft - somewhere between the end of the runway and the area you would be looking at when driving your car at this same sort of speed - what you don't want to do is to try and look out of the side of the aircraft. In addition, your peripheral vision would be taking in the sides of the runway.

The Float

As the aircraft sinks to about 3 or 4ft above the runway the instructor will select and hold a slightly higher nose attitude, so that the aircraft will fly parallel to the ground. By this time the throttle should be fully closed. The aircraft will now have stopped descending and will be in the 'float'. Inevitably, the aircraft will eventually lose speed, and hence lose lift and sink. By looking ahead, the pilot will be able to sense what is happening to the aircraft by the way the perspective changes or doesn't change. The pilot will need to know if the aircraft is sinking, rising or just flying parallel to the surface. This is essential judgement the pilot needs to develop at this stage. So, there will be only small control column inputs - normally only backpressure being applied. What the instructor will not try to do is to land the aircraft. What the instructor will do is to prevent the aircraft from landing by increasing the control column backpressure every time he detects aircraft 'sink'. The student pilot can learn this

process by simply saying 'I must not let the aircraft land, I must not let the aircraft land' whilst continuously raising the nose every time 'sink' is detected - but holding the attitude whilst the aircraft is not sinking. The landing process sounds complicated - but the 'penny does eventually drop' and the student wonders why it appeared so difficult.

So, with only backpressure held, and no forward pressure applied, or possibly only the tiniest relaxation of the last control column backpressure input, the aircraft will eventually 'run out' of lift and the main wheels will contact the runway. The landing, of course, is not over until the aircraft slows to a normal taxi speed. At no time should the aircraft be landed on all three wheels. If that happens, the speed is excessive or the pilot has not flared adequately or 'held off' sufficiently.