16 - Out-Landings

SPL syllabus: Exercise 16 Out-Landings			
(i)	**Gliding range**	**(vi)**	**Circuit and approach procedures**
(ii)	**Restart procedures (only for self-launching and self-sustaining sailplanes)**	**(vii)**	**Actions after landing**
(iii)	**Decision process to not start the engine and to outland**	**(viii)**	**Determination of wind direction**
(iv)	**Selection of landing area**	**(ix)**	**Selection of landing direction**
(v)	**Circuit judgement and key positions**	**(x)**	**Considerations for landing at high slope landing sites**

INTRODUCTION

The most important message is that a good field landing is something that starts long before it is necessary. The whole flight needs to be conducted so that a good field landing can be made – and doing so, helps makes a cross-country flight much less stressful.

THEORY

Flying cross country safely

Flying a glider means that there is no guarantee of staying airborne. Even if the glider has an engine, it may not start. So, it is important to need to have at least one safe landing option available. At the right time of year, in the flatlands, there are plenty of landable fields in range in the direction of travel. In areas of inhospitable terrain, such as the mountains, (or even the flatlands when the crops are well developed) it might mean planning the route to stay in safe glide range of known landable places.

What does safe glide range mean? It means that even if we fly through reasonably foreseeable sink, we will get to our landing area with enough height to do a safe landing. A reasonable estimate might be half the best glide angle of the glider to the required arrival height – so 20:1 for a 40:1 glider – ***plus*** an allowance for wind. The circuit height needed will depend on experience and where you intend to land. More height may be required to fit in with traffic at an airfield, or to inspect an unknown field. Beware the 'arrival height' given by nav computers – they assume the full performance of the glider at the appropriate speed for the McReady setting in use.

In inhospitable areas, once you have got down to the minimum height for a safe glide (so, for example, when your glide angle to the circuit height above the field reduces to your previously chosen 20:1), you need to make a decision to fly towards the landing option and land if you can't find lift.

In more hospitable areas, with good landing options, tactics will vary with height.

- Above, say, 2500' AGL, it is enough to have landable fields ahead.
- Between, say, 1500' and 2500' AGL, you must be able to identify specific landable areas in safe gliding range.
- Below, say 1500' AGL choose a specific field, and local soar that or land. Do not give up that field unless another has been selected.
- At, say, 1000' AGL make a decision to land and stick to it.

The actual heights chosen will vary with conditions and the glider being flown.

Field Selection

Teach Wind + the six S's as a mnemonic for use in the air: Size, slope, surface, surroundings (or sticks) and stock. Inexperienced cross-country pilots should study the BGA's field selection videos before going cross-country. It is also useful as a revision for more experienced pilots at the start of the season.

Wind: It is essential to know what the wind direction is locally. The pilot should have a good idea of what the surface wind is from the forecast, and what it was at the point of take-off. However, in some areas, particularly the mountains, local effects may be significant. The nav computer may give the wind at soaring height, and movement of the cloud shadows will also indicate the local wind. Typically, the surface wind is backed by up to 30 degrees and is approximately half the strength of the boundary layer winds. Landing into wind has a significant effect on the size of the field that is required. It is easy to become disoriented with respect to wind direction, so it may help to teach the trainee to know where it is in relation to the position of the sun, for example.

Size: A big field is good and gives more margin for error. You cannot land in a field that is not big enough, no matter how good it looks from any other point of view. Even a field full of crop is preferable to one that is too small, especially if it has obstructions on the approach. Beware thinking that it is a large field simply because it is the biggest field in the area. Particularly in hilly areas the field may be smaller than in the flatlands.

Slope: Slope can be quite difficult to see from the air and requires inspection from the side of the field (another reason to get there with a reasonable amount of height). If you can see the slope from higher up it may be so steep that it is difficult to land in. A flat field is very helpful. With any significant slope landing uphill is essential (and requires extra speed).

Fields that run parallel to rivers or railway lines are likely to be flatter.

Surface: Attention needs to be paid to any crop and its height. If there is no crop, there is a significant difference between a recently ploughed field and one that has been tilled. If there are tramlines in the field (from a tractor) landing across them you will probably lose the undercarriage doors, at least. In addition, look for things on the surface of the field, such as drains, fences and wires.

There's a very good video of how crops develop during the year which should be studied (fieldselection.co.uk). More can be learned by looking at the crops in fields on the way to the airfield.

Ensure your trainee is aware that a cropped field can be a good landing option at the right time of year, but a bad one at other times – it is all dependent on the height and density of the crop. If you can see the soil through the crop, then the crop is probably short enough to land in.

Shape: A square field can give more landing options that a long thin one. Landing across the diagonal also increases the landing run but beware ruts/tramlines etc.

Surroundings (or 'Sticks'): Obstacles on the approach significantly affect the landing distance available. Worse, many obstacles are difficult to see – often fields have telephone or power wires along their edge, and these can be hard to see until the last minute. Likewise, pilots have been known not to notice smaller trees within their wingspan. Brief your trainee that they should assume there will be obstacles, and land well into the field.

Stock: Fields with stock in should be avoided if possible – they are moving targets which might get in your way when landing and could be a problem when you are on the ground.

These are all factors that are used in choosing a field, but what if they can't all be met? It is worth discussing with your trainee the priorities amongst them, and what trade-offs can be made.

Estimating height

Few people can judge heights with any accuracy, and even then, it is very dependent on known features. The advice should be to use all the methods that are available for estimating height.

The recommendation is to fly cross country with the altimeter set to QNH. Discourage pilots from leaving their altimeter set to the departure airfield QFE – it is not very helpful 100km away. The QNH is needed as a reference for airspace and in talking to Air Traffic (or the standard pressure setting if high enough). From map study prior to the flight, pilots should also have an idea of the height of the ground in the area they are flying in, so the altimeter will give a reasonably good idea of height AGL, by subtracting the height of the ground from the altimeter reading.

Most modern navigation computers have a digital model of the terrain and so can display height AGL. This is very useful and usually reasonably accurate.

Lastly, those can be checked against how low the glider appears to be visually.

Landing / engine start decision height

Encourage pilots to have a decision height below which they commit to land, or in the case of a Self-Sustaining Sailplane (Turbo'), attempt an engine start. This is to mitigate three potential problems:

- the first is that by continuing to search for lift in the vain hope that it will be found, you end up too low to fly a safe circuit.
- even if lift is subsequently found, if that lift does not turn out to be reliable, the glider can be drifted away from the safe landing. Thermalling very low, has its own dangers as well.
- Lastly, in the case of a glider with a turbo, the glider engine may take time to start and generate thrust or not start at all. The minimum height for an engine start needs to be such that if the start fails, a safe landing can still be made.

There is often a time when a pilot is trying to find lift or circling in weak lift with a specific field chosen. At this point, if the pilot has capacity, they can evaluate other fields to see if there are better choices or look for fields downwind which can be alternatives. This is good but emphasise that they should not give their chosen field up unless confident that the alternative is appropriate.

Flying a glider with a turbo can reduce the need for field landings. However, it can increase the workload and risk if things do not go to plan. The details vary with the engine type.

Gliders with a two-stroke engine need to accelerate to start and will lose height in the process. The picture to the field is going to look different after the dive if it does not start. Additionally, if the engine does not start and is left erected, the glide performance will have decreased significantly. Jets and FES gliders are better in this regard – not needing much height to start and not giving extra drag if the start is unsuccessful. The distraction caused by a failed start could easily lead to the typical stall/spin accident that is too common in field landings. Further height will be expended for a second start attempt, if the first one fails.

A partially failed engine i.e. not running at full power, can be dangerous, and pilots are best advised to shut down the engine and land in their chosen field if that happens. The risk being that partial power merely moves them to somewhere without a good landing option.

Accordingly, the decision height for a turbo can or should be higher than for a pure glider. If the pilot of a glider with a turbo finds themselves below their decision height, it may be better to land rather than attempt an engine start.

Having a turbo makes little to no difference as to how the flight should be conducted – the reliability of turbos is such

that the pilot should assume that the engine will not start and be pleased when it does!

Flying the field landing

Prior to the decision to land, an initial set of pre-circuit checks can be made. The BGA recommend WULF which is at least a partial set of things to think about. Water should be jettisoned in plenty of time – there is a better chance of climbing without it and landing with water on uses a longer landing run. The cockpit can be tidied, and straps tightened. Consider the altimeter setting that is in use and decide on an approach speed and flap setting for the conditions and field.

Whilst searching for lift in the vicinity of the field, there should have been an opportunity to inspect it, and perhaps rethink the field choice if there is a better option. If not, then the inspection needs to be done during the circuit, but that is really leaving it too late.

In the event of arriving in the vicinity of the field lower than is desirable, then the circuit should be intercepted at the appropriate height, rather than trying to fly a complete but low circuit.

Once the decision to land has been made, the wheel should be lowered. Using the landing decision as a trigger for the wheel can be effective, especially if backed up by a check downwind and on final. That is particularly true if the circuit has been intercepted, so the normal trigger for lowering the wheel has not happened.

Ideally a full circuit should be flown. This needs to start in the high key area, the normal distance upwind and to one side of the field. That area is likely to be two or three fields upwind of the intended landing area – a common mistake is to start at the upwind end of the chosen field, not realising that the field is much shorter than one's home airfield. But the circuit should look very much like the circuit that is flown at the home airfield in terms of size and shape.

The landing area chosen should, by preference, be well into the field. If the field is too small for this to be practical, then extra attention should be paid to the possibility of obstacles on the approach. Remember that once on the ground, the stopping distance in a soft field is likely to be less than on a smooth, hard, airfield. Also, that given a choice between hitting an obstacle at the near hedge whilst in the air, and running into the far hedge on the ground, the latter is better. If necessary, a deliberate ground loop can be an emergency solution to avoid running into the far hedge or other obstacle.

Aids can be used to help start the circuit at the appropriate height AGL, but once started the primary means of guidance is the distance and angle to the landing area. Avoid cramping the circuit (a common mistake) and do not get fixated on the landing area – pay particular attention to speed control, and attitude during turns. A normal half to two-thirds airbrake approach leads to a shorter landing than a shallow approach.

Once on the ground, stop as quickly as is practical – that reduces the risk of finding an unseen ditch, hole or post in the field.

After landing

This should include:

- After landing on an airfield or strip, move the glider off the runway.
- Find the owner of the field and tell them (with apologies, not arrogance).
- Contact the home club and crew.
- If you land in a field, you can contact (Distress and Diversion) D&D by phone in case the landing is reported as a crash. They are happy to be made aware. 01489 612691.
- Put a notice to put in the canopy stating the pilot is uninjured, a give a mobile phone number to contact them (whilst out looking for the owner).

TEM

Threats:	**Mitigation:**
Few good fields (terrain – crop)	Make routing decisions based on landing options early
Unseen obstacle or poor surface	Make as good as an inspection as you can make. Pick a big field and land well in.
Errors:	
Trying too hard to stay airborne – not making field choice early enough	Choose field earlier & do not lose sigh/track of it
Excessively focussed on the field leading to loss of speed control	Fly a proper circuit and look back over the nose in the final turn.

The Flying

OUTLANDING AIR EXERCISE

Practical teaching of field selection and field landings is best done in a Motor Glider, by an appropriately qualified instructor. Ideally, it should be done when there are a reasonable number of fields with crops in, rather than every field being landable.

Whilst it can be done on the same sortie as the navigation exercises, in practice this means that both exercises are compromised due to lack of time. Better split the task up into two or even three sorties.

Remember safety is the key priority. That means:

- When making an approach you, as instructor need to be confident that you have good options should the engine not respond when you open the throttle for the go-around. That means that you might reject fields chosen by the student that would otherwise be acceptable.
- BGA guidance is that you do not descend below 500' AGL. That is primarily because the risk caused by an engine issue lower than that goes up significantly, but it also helps you comply with the low flying rules. However, the downside to this is that you can only say that the trainee has got the aircraft to a reasonable final approach position.

It is better for the trainee if they do their circuit with the field on the side that they are sitting, if they are in a side-by-side motorglider. However, this might compromise the desire to do the circuit on the downwind side of the field.

AIR-EXERCISE BRIEFING

Explain the plan for the flight e.g. familiarisation with handling the motorglider first, followed by a demonstration and then trainee field selection. Before you launch, agree how you will both identify the fields that you are looking at. You need to be very specific – '*the green one*' rarely works. So, it's '*the field at 1 o'clock, about 2 km away, oblong running left to right with a triangular shaped wood in the top right corner*', for example.

AIR EXERCISE

The process might be as follows:

- At a reasonable height after take-off, let the trainee fly to get used to the handling of the motorglider. Explain the differences with a normal glider, and the controls that they will use. For some motorgliders, the airbrakes may be less effective than they are used to, for example.
- Climb to around 2000' AGL and set the power for a glider-like descent (~150 fpm) at a nominated speed. Teach the process of looking for landable areas, then specific fields, and the decision heights associated with them. Demonstrate a field selection then fly a well-spaced circuit around that field (with the field on the student's side of the aircraft), resulting in what would have been a final turn at greater than 300' AGL.
- Then climb back above 2000' AGL and let the trainee have a go. Look for sensible field choices, decision making at the right heights, and a good circuit.

COMMON DIFFICULTIES

Losing orientation and getting the wind wrong.

Starting the circuit at the upwind end of the field chosen, not the normal distance upwind.

Cramping the circuit, particularly by turning towards the field from a slight close high key area, whilst heading upwind.

Leaving the landing decision late and being too low.

Being fixated on the landing area and not looking over the nose during turns and consequently losing speed control.

