
J - USING GLIDING SIMULATORS FOR TRAINING

The use of gliding simulators has become widespread as clubs recognise their value for improving SPL and instructor training. There are many different configurations, using various types of software. Probably the most commonly used software is Condor (<https://www.condorsoaring.com/>) and this chapter has been written mostly with Condor in mind.

Some clubs have sophisticated setups involving a two-seater fuselage with working controls and multiple projectors showing realistic scenery. Much simpler and cheaper arrangements can also provide real value, perhaps just a PC with a screen and joystick. Clubs that have laid out on expensive hardware and software have often found that they can recoup the investment gradually by charging members for using the simulator. After all, it does provide real value and can save a trainee a lot of time and money by significantly reducing the airborne work needed.

This chapter is concerned with gliding training, by instructors, on the standard syllabus. Of course, simulators have other uses too, such as entertainment and 'taster' flying for visitors, wet day amusement (as well as serious training), races and competitions, exploration of new territory and preparation for visits to other sites, and probably many more ideas.

A range of members will enjoy using the facility, but users must be aware that training in the syllabus exercises should be carried out by qualified instructors.

If using a simulator, the plan should be to brief the exercise first, then 'fly' it on the simulator to allow repeated practice and to clear up any misunderstandings, and then fly the same exercise in a real glider. By this point the trainee should have a good grasp of it and for many exercises just one flight may be sufficient. This process has proved particularly valuable for instructor training, where a group of candidates can discuss the points of an exercise, using the 'pause' function, and subsequently a set of several exercises may sometimes be covered in a single real flight because they have been thoroughly explored first.

The BGA 'Instructor Resources' web page includes material on simulator use. There are several short example videos illustrating how a simulator can be used for exercises where it is especially valuable: ballooned landings, ultra-low launch failures, low aerotow failures and as an introduction to spins and spiral dives.

IDEAL SIMULATOR EXERCISES

These exercises are listed as 'ideal' not because they are more important than other exercises on the syllabus but because they are ones where using a simulator is particularly helpful. This may be because they are potentially dangerous to fly, putting pressure on both

instructor and trainee, or because most trainees require repeated practice. Whilst a gliding simulator is never the same as the real thing, it can be a very good approximation and experience shows that trainees find it valuable.

The details of these exercises are explained elsewhere in this manual so only an overview of how to perform them is given here.

In Condor, one can create flight plans with all the desired configuration for a particular exercise (starting airborne or doing a launch, wind speed and direction, choice of glider, position of airborne start, and so on) and save them as labelled exercises that can simply be loaded by the instructor wanting to train that exercise.

Ballooned Landings

Most people learning to land will do the odd balloon landing at some point; but the instructor will naturally take over, so they may not get an opportunity to practice recovering the situation themselves. It is important that they don't have to do this for the first time when flying solo. Yet setting up a deliberate balloon landing for a novice to recover from can be hazardous and both crew in the glider may be somewhat tense.

The Condor 3 simulator is particularly good for this exercise because it can be set up with an 'in air' start half-way down the approach, that can be repeated as many times as desired, without the need to reload or to fly around to that point. This saves a great deal of time and makes the exercise much more focused. The instructor must remember to set the trim and airbrakes each time before restarting.

As with any exercise, the instructor should brief, then demonstrate and then let the trainee practise. A range of different balloons can be executed, from very small ones where the pilot simply holds the attitude and allows the glider to sink onto the ground, continuing the round-out as appropriate, to high balloons where the airbrakes must be closed and the attitude adjusted to ensure no further loss of energy. One can experiment with situations where it is possible to regain airspeed and re-open the airbrakes and contrast these with ones where the pilot has enough airfield ahead (and a low airspeed) and patiently waits for the glider to touch down with no airbrake.

The instructor may choose to set up the balloon and handover control at that point, or to let the trainee experiment with creating the balloon themselves. It can be instructive to pause the simulator immediately after the balloon and switch to an external view of the glider. If one saw this view from the launch-point one would anticipate a crash, but then we return to the cockpit view, restart, and sort the situation out. This practice is especially useful in instructor training.

Ultra Low Winch Failures

Because of the risks involved, this exercise is a 'demonstration only' in the glider. However, it will increase a trainee's confidence if they are allowed to practice handling ultra-low launch failures themselves, on a simulator.

The setup is different from the ballooned landing: one starts a winch launch and pulls the release just after take-off (unlike in a real glider, where of course the winch must initiate the failure). The subsequent handling is very similar to the ballooned landing, however, without the extra complication of the airbrakes being deployed. The attitude must be adjusted to ensure no further energy loss, but without diving into the ground and, just as with the balloon exercise, the airspeed must be monitored and a decision made whether to patiently 'feel' one's way back onto the ground, or to very carefully open the airbrakes if there's sufficient airspeed but a shortage of room ahead.

The point of release can be varied from just after take-off, to, say, 50 feet up, and the recovery can be contrasted with that required for a higher failure.

For both this and the balloon exercise, the trainee may well have difficulty producing a good landing in the end, but to an extent this does not matter. The point of the exercises is to get the muscle memory and reinforced picture of how to adjust the attitude slightly and what to do with the airbrakes. To begin with, trainees probably won't be able to monitor the airspeed effectively, but that too is a matter of repeated practice.

Low Aerotow Failures

As is discussed in the Aerotow chapter, practising aerotow failures by pulling the release and (invariably) returning to the airfield, can be regarded as negative training. There have been a number of serious accidents where pilots attempted to return to the airfield from an aerotow failure when much too low to manoeuvre safely. It is better to practise these failures in a motor glider, and the simulator also provides a cheap and useful option.

These simulations are easy to set up: start on aerotow and pull the release at a suitable height. Multiple attempts can be made at different heights. These exercises could be combined with showing, for example, drone footage of flying over local landable fields.

A drawback with Condor is that one has no control over the flight path taken by the tug, and it may not correspond to local practice.

Spins and Spiral Dives

Many trainees are apprehensive about spinning and introducing the exercise on a simulator can boost their confidence and let them understand what to expect. The G sensations will not be present but the attitudes will look the same and the trainee gets invaluable practice in reading the instruments and moving the controls correctly. Indeed, unlike many training gliders, the simulator will not recover from a developed spin unless the full correct control inputs are given, so this is a chance

to establish for sure that the trainee knows how to do a full spin recovery. Achieving the same amount of practice in the air is very expensive in terms of height.

Of course, it is very important that the trainee flies these exercises in the air, especially the spin avoidance ones. The simulator is very useful, but it cannot provide the 'feel' of an approaching departure that the trainee needs to be able to recognise and recover from.

OTHER EXERCISES

Instructors with access to a simulator will find for themselves which exercises it can help with, but here are some ideas.

For beginners, the effects of controls can mostly be taught well. The effectiveness of the rudder may not correspond to the real glider the trainee will fly, but the basic movements and results can be shown. All of the early handling exercises up to and including turning can be usefully and cheaply practised. This can be a great way of using a bad weather day.

For landing, the advantage is that the trainee can have repeated practice; the disadvantage is that, at least in Condor's case, a fully held off landing is harder to achieve than in a real glider.

On the other hand, approach control exercises – managing airspeed and airbrakes and the reference point – can really help trainees, just because of the opportunity for repeated practice. Similarly to the ballooned landing exercise, one can set up a flight plan in Condor 3 starting at the top of an approach, from which the pilot should fly forward to intercept the $\frac{1}{2}$ to $\frac{2}{3}$ brake line, then open the airbrakes and continue down towards the round-out.

Circuit practice can be useful, and has the advantage that one can pause the flight at any time to point things out and discuss options. However, for this to work well one needs the kind of wide field of view that multiple projectors provide. Some clubs use a virtual reality headset as an alternative, which works well for the trainee wearing it but can induce nausea in the supervising instructor viewing a mirrored screen. It makes it difficult or impossible for the instructor to take over control for a demonstration, as they don't have control of the viewpoint.

In Condor the winch launch is not completely realistic and of course there is no sensation of acceleration. On the other hand, the simulator is excellent for introducing winch launch failures, assuming there is a sufficiently wide field of view, as just discussed. The recovery, airspeed monitoring and decision making can all be practised.

Aerotow practice will help trainees who are struggling with this. Be sure to adjust the rope length to be much longer than the default.

Variable amounts of wind can be programmed in different flight plans, plus cross winds during take-off or landing.

Surprisingly, given the lack of G sensation, simulators have been found to be useful in aerobatic training. They can let trainees practice the sequence of control movements, speed monitoring and sequence planning, before they lay out vast sums on high aerotows.

INSTRUCTOR TRAINING

Instructors trained recently will already know that simulators are becoming a routine part of BGA instructor training. Coaches doing local training should consider their use, if the facility is available.

As mentioned above, it can save a lot of time if exercises are briefed and flown on the simulator one after another, and then a single flight can usually cover several exercises. The opportunities for group discussion of exercises are very instructive. The candidates themselves become familiar with how to operate simulators so they should be able to carry back that expertise to their own clubs and benefit their future trainees.

Clubs wanting to increase their usage of a local simulator need to ensure that their own instructors are trained in its operation. A collection of labelled flight plans that can be loaded for specific exercises is convenient.

ENTERTAINMENT

It seems a pity not to mention what a huge amount of *fun* simulators can provide. One can fly in breathtaking scenery and push limits that only the bravest and most

skilful pilots attempt in real gliders. (Be sure *never* to do in real life some of the things that are enormous fun in Condor.)

Many clubs organise cross-country races on simulators and, as well as being terrific fun, these can hone some of the more basic cross-country skills. The pilot soon learns the importance of knowing the best speed to fly and when to stay in a thermal and when to press on. Understanding McCready settings for the final glide will separate the race winners from the runners up. Of course, this is very different from the real world, which is rather more unpredictable than Condor and the consequences of crashing before the finish are considerably more serious! However, beginners can learn the principles of McCready theory in a very engaging way. Incidentally, Condor contains, in its setup parameter screens, an excellent interactive graphical display of the relationship between speed and glide angle, at different MC settings and different head or tail winds.

More practically, it can be useful to 'fly' at another site that one is planning to visit on an expedition.

If one links a moving map programme – such as XCSoar, which makes this connection straightforward – one has a safe environment in which to get fully familiar with the software without the 'head in cockpit' dangers of learning the software in the air.

So, if you don't already have a simulator at your club, maybe you should be thinking about setting one up.