

Glider Landing – The Goal Oriented Approach by Richard Carlson

Whether this has been a soaring flight lasting several hours or training flight lasting just a few minutes, as you approach the last 2 minutes of it you need to mentally prepare for your landing. When you passed your flight test (practical test these days) you were able to land and stop within 200 ft (private) or 100 ft (commercial) of a predetermined spot on the ground. Ask yourself now, can you still do that?

If the answer is no, then follow this advice, work with your instructor, and you will soon be back in form.

There are 2 major tasks required to make a good spot landing. One is planning and the other is deviating from the plan as necessary to make your goal. Creating a rigid plan or following a rigid script is guaranteed to lead you to making a bad landing some day. This is why the Soaring Safety Foundation recommends flying a Goal Oriented approach. The Goal is to land safely and stop at the predetermined spot you chose. While you should strive to fly a normal pattern, as shown in figure 1 you can modify, pattern direction (left or right), the ground track (your position in relation to the aim point) and your descent rate (the amount of spoilers/dive brakes you deploy) throughout the approach. This flexibility allows you to deal with changes in height, speed, varying winds, lift/sink, and traffic both in the air and on the ground.

To achieve this Goal start out by picking a stopping spot on the runway, or the field you are going to land in. You can do this before you launch, and modify it when you come back or just confirm that your pre-launch decision is still reasonable.

Once you have picked your stopping point you need to determine where the glider should touch down. That is, how much ground roll will you use? Landing in a field and using maximum braking means a short ground roll to minimize the chance of striking an unseen rock or hole. Landing at your home field and using minimal braking action may mean a 1000 foot ground roll. The actual distance depends on the glider, wind, field condition (grass or asphalt), approach speed, field elevation/density altitude, the list goes on. If you don't know what to expect spend some time at your field and watch what others do. That can give you a pretty good idea how your landing will go.

Then evaluate your performance the next time you land. If you stopped short then think about how you can move your spot for the next landing. If you needed heavy braking to stop, then again move the landing spot to compensate. With practice you will get better and better at picking your spot.

Once you know where the glider will touch down, you need an aim point, also called a reference point by some. This point should be about 200 feet short of the touchdown point.

The aim point is now the primary spot that you will use to make your approach. Use it, not the end of the runway, as the point you fly the approach. We'll discuss the details of this next month.

Now that we know where we need to be, we need to figure out a path that will get us there in a safe manner. We'll start by planning a regular rectangle pattern that we are all familiar with. Then, as noted above, we make any necessary changes to ensure we are going to make our goal.

Start preparing for the approach several hundred feet or a minute or so before you enter the downwind leg. Now is the time to configure the glider for this landing. If you have a retractable gear, put it down and confirm it is in the down and locked position. Determine the approach speed you are going to use ($1.5 V_{so} + \frac{1}{2}$ the wind + a gust factor). You can establish this speed now, and retrim, or wait until you are on downwind. It just depends on how close you are to entering and how much altitude you have to spare. If you have flaps, know what flap setting you will use and when you will change settings. Verify the wind direction and understand which runway you are planning on using. Once the glider is configured, run through your landing checklist, before entering the pattern.

Now you are ready to enter downwind. If you haven't already done so, establish the pitch attitude that will give you your calculated approach speed and trim the glider to maintain it. The downwind leg should be about 1,500 ft to the side (right side for a left hand pattern) of the runway centerline. The runway should be about 30 degrees below the horizon (a 30° lookdown angle). Don't use a 45° lookdown angle, you will be too close to the runway or too high if you are a proper distance from the runway.

Once you have the lookdown angle set, look forward, not at the runway. Unless you are landing on an aircraft carrier, the runway isn't moving so you can glance at it, but your main focus should be on maintaining your downwind ground track parallel to the runway.

Do this by picking a spot a mile or 2 directly in front of you and fly towards that spot. If the spot is moving to the right you are drifting closer to the runway. Establish a crab angle, or increase the crab angle you already have. Spot moving to the left, change the crab angle in the other direction. While flying downwind monitor your ground track using this method and cross check it by glancing at the runway. Also monitor your pitch attitude in order to maintain the approach airspeed you calculated.

A good rule of thumb is to make your turn from downwind to base when the corner of this turn bisects a 45° angle back to your aim point. Note this is referenced to your aim point not the end of the runway! Also note that you need to start your turn before you get to this point as you can't make an abrupt 90° heading change, you need to make a coordinated turn. Focus your attention on making this a coordinated turn with a constant airspeed and the yaw string remaining centered.

Roll out on a heading that will make your ground track perpendicular to your downwind leg's ground track. This requires compensating for any crosswind. Now you again pick a point well in front of the glider and fly towards it, adjusting the crab angle as necessary to maintain your desired ground track. Use the same technique to make the turn from base to final. Concentrate on making a coordinated turn, and compensate for any crosswind so you roll out on the runway center line and track straight towards your aim point.

A common mistake is to stare at the aim point while making this turn resulting in a loss of both airspeed and coordination. As before, the runway isn't moving so there is no need to stare at it. If you time the turn correctly you will see the runway appear after about 45° of heading change even without staring at it.

Notice that I haven't said anything about spoilers or glide path control. We'll pick that side of the discussion up next month.

One final comment. The pattern is a tool we use to help us judge how the landing is going. Remember we don't use a hammer to drive in screws. If you have the wrong tool, put it aside and get the correct one. If the pattern you want to use wouldn't get you to your goal, put it aside and use a different one!