

We're Almost There

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Every good landing I have ever made began with a good approach.

My definition of a good landing is a landing where I am in control and able to stop the aircraft at a predetermined spot (i.e., achieve the SSF Goal Oriented Approach). Whether it's a big Boeing, a tactical jet on an aircraft carrier, or a glider, the fundamentals of a good approach are the same.

As we discussed last month, first you need to have the aircraft configured for the landing. Landing gear down, flaps set, airspeed close to your target airspeed, checklists complete, and radio calls made. And most importantly, the trim has to be set for the proper approach pitch attitude. If the trim is not set, you will be fighting the pitch attitude/airspeed all the way down. Use the trim to reduce your workload, allowing you to concentrate more on the other factors you need to consider.

In the Navy, we used to say "meatball, line-up, angle of attack". Translating this into something we can use, think "glidepath, ground track, pitch attitude".

It is essential that we use the proper flight control to control the glider's descent rate during the approach. Remember that the glidepath is a function of spoiler position, not stick position. If you can recognize yourself pushing or pulling on the stick, you are not trimmed properly and you are using pitch attitude for glidepath control. This is counter-productive to a good approach. Let the aircraft trim maintain the pitch attitude, it does a much better job of that than we do.

It is also important to note that not every landing will be made at your home airport, or at any airport for that matter. Therefore we don't want to use ground references to make decisions (e.g., deploy $\frac{1}{2}$ spoilers when crossing over Dale's Grocery). Instead we use a very scientific method called TLAR (That Looks About Right)¹. In TLAR we recognize that we have some basic limits on the glider's performance. For example, we can't assume a glide ratio greater than what the glider was designed for. We also can't assume the glider is capable of diving vertically towards the ground so some maximum glide ratio (approximately 7:1) is the best we can do.

For most of the gliders we fly, a descent rate in the 400 fpm to 500 fpm range provides the best performance. This translates into a glidepath of between 12:1 and 15:1 (i.e., a 60 kt airspeed and a 4 kt^2 descent rate is $60/4 = 15:1$). We'll use this visual glidepath throughout the approach with occasional glances at the vario and ASI to note any trends and apply the proper control to correct this change.

So how do we manage our glidepath?

1 Glider Flight Instructor Manual – T. Knauff
2 Recall that 1 kt equals 100 fpm

We'll use the basic rule of angles. They are sloped, so you get closer and lower at the same time. If you are descending along a constant glidepath, there will be one spot (your aim point – discussed last month) that will not move in your field of view. This concept is easy to see on final. If the aim point is moving (rising) up in the canopy, assuming a constant pitch attitude, you are falling below the glidepath and need less spoilers. If the aim point is moving down in the canopy you are moving above the desired glidepath and you need more spoilers or forward slip to increase the rate of descent. A variation of this concept, described below, can be used on downwind and base. A common error is to push or pull on the stick to keep the aim point from moving.

When flying the landing pattern in a dynamic atmosphere close to the ground, (i.e., strong winds or areas of strong lift and sink) you will learn to quickly recognize and react to those conditions to properly control the glidepath using the spoilers. The old school suggestion that we use half spoilers in the pattern and wait to see what happens is not going to work when thermic conditions exist. This also applies to gusts and wind shear or wind gradient near the surface on base and final.

You have probably noticed that when you are relatively relaxed, you can feel (the term is kinesthesia) the glider enter sink or lift while flying in the pattern. When you are tensed up, it is harder to sense these vertical changes.

Learn to feel these changes and relate them to what the variometer is saying. Learn how to react with the spoilers. When you feel the glider sink or settle, slightly close the spoilers. When you feel the glider float or balloon, slightly open the spoilers. Once the sink, settle, float, or balloon goes away, re-establish the prior spoiler position and start the glidepath evaluation process all over again. Continue as required until the glider is about to enter the flare. Do not chase the airspeed. If you allow the glider's trim to hold a constant pitch attitude, the airspeed will remain relatively stable and close to the desired parameters.

Now that we have the concepts in place, let's discuss how to put them into practice. As was discussed last month, you have established the glider on downwind at the proper pitch attitude and distance from the runway (our 30° lookdown angle). You now split your attention between your downwind ground track and the glider's relationship to your aim point on the runway. Note that the downwind leg has 2 parts, separated by the point when you are abeam of your aim point. From the entry point to the abeam point you are descending and getting closer to the aim point. If your glidepath is working, the aim point will track aft on the canopy in a horizontal manner. That is, it will not have any vertical movement.

Things change as you pass your aim point and continue on the downwind until you make the turn onto the base leg. At this time the glider is continuing to descend while it is also getting further away from the aim point. This means that the glider appears to be rapidly falling below the intended glidepath³. You should monitor the glider's sink rate

3 This is why the Navy eliminated the base leg for carrier landings and why the British have added a diagonal leg to their circuit (pattern).



and continue on making minor spoiler adjustments as necessary. Once you are established on base, the sight picture changes and from then on you will be getting closer and lower so you can use the aim point and glidepath angle to monitor and control the rest of the approach.

Once established on base leg you can re-establish the aim point at some spot on the canopy. The TLAR method determines what that spot will be, the task is to maintain that angle, or if you are too high/low, make a spoiler change to bring the aim point back to the proper spot on the canopy. As you continue flying the base leg the aim point will again move in a horizontal direction, back along the canopy. Any unintended vertical motion should be removed by opening/closing the spoilers as necessary. A common error is thinking you are too high and opening the spoilers to increase the descent rate, because pilots fail to recognize when they have re-intercepted the glidepath and wind up being low on final.

As you turn onto final, concentrate on making a coordinated turn. Once established on final continuing to keep the aim point fixed on the canopy with the spoilers is our task. Continue descending at a constant airspeed, being prepared to respond to any wind shear/gradient events as necessary. Next month we will discuss the final phase of landing (flare and roll-out).

The FAA has mandated that all aircraft, from the big Boeing's to our gliders, fly a "stabilized approach". Advisory Circular 61-98D defines a stabilized approach as having the aircraft fully configured, on airspeed, and on a glidepath appropriate to reach the intended point of landing. Additionally, the Glider Flying Handbook states that gliders need to achieve this "stabilized approach" by 100ft AGL. You will notice that we are suggesting that you meet this requirement as you enter the pattern.

Flying a good pattern may seem difficult at first, but with experience it will become second nature for you to deal with the challenging and dynamic environment that is never the same as the time before. It takes practice to fly a good pattern.

Self critique your approaches and landings so you can become a better pilot. Learn how to fly to your aim point so that the touchdown and stopping points are predictable. If you need help, find a CFG to evaluate your performance and offer suggestions to improve the approach and landing phase of your flight.