

Basic Gliding - 103: Straight and Level Flight by Richard Carlson SSF Trustee

In our last 3 articles we discussed the pre-launch and launch phase of flight (aerotow from the glider/towplane pilot's point of view and from the self-launching glider pilot's point of view). Now that you are off-tow it's time to begin the gliding flight where we slowly descending back down to pattern altitude and our landing.

The first thing we want to determine is our location in relation to the airport. Were we towed up-wind or downwind? Are we in rising, descending, or still air? While we have been keeping track of these variables during the launch, it's best if we review them now that we are off tow so we can plan the next set of tasks. In-flight decision making skills are critically important if we are to safely fly every flight.

Let's look at some simple maneuvers and consider the in-flight decisions we also need to make.

Straight and level flight. This seems to be the simplest task we can do, and yet as every instructor knows it is extremely hard for a student to maintain straight and level for more than a few seconds. The task begins with the pilot picking a point off in the distance and flying towards that point. The problem is, that if the wings aren't perfectly level, the glider will start to turn in the direction of the lower wing. This is caused by the pilot keeping the stick slightly off to one side which starts the glider turning. From the pilot's point of view the gliders nose begins to move off to one side. Since the pilot isn't trying to turn he steps on the opposite rudder to stop the nose from moving. This causes the glider to begin slipping.

The basic problem is that the pilot has the flight controls set so that the glider is commanded to lower one wing. The solution is to move the stick, not the rudder¹, to return the wings to level. The glider will then start flying straight, but not towards the original spot. The pilot must make a coordinated turn in the other direction and then level out again once the glider has returned to the original heading. As for the decision making skills, the pilot also needs to determine which direction to fly. Should the flight be into the wind, downwind, or cross wind?

That all depends on the glider's height and position in relation to the airport.

If the winds are strong and the glider is upwind of and close to the field, then starting with nose pointed directly into the wind is a good option. As you know, the glider will travel farther over the ground with a tailwind than a headwind. Starting this task by flying into the wind means you can easily get back to the airport. Imagine that you are 2000 ft AGL and want to enter the pattern at 1000 ft AGL. If you start flying into the wind and continue straight until you lose 500 ft (half of your altitude) before you turn around you now have a tailwind and will easily glide back to the field. If you start by going downwind, you need to turn back at some higher altitude to give yourself enough altitude to safely make it home. The difficulty is in determining exactly how much altitude to lose before turning around.

We also want to control the glider's airspeed and fly at a constant speed. While it might seem like this is a job for the Airspeed Indicator (ASI) most instructors will give you a better method. That is to use the Heads Up Display (HUD) that comes with every glider. Remember, the glider is moving down and

1 Note that the pilot is already holding opposite rudder and moving the stick toward the high wing will result in a coordinated roll back to level flight.

forward and the nose must always be below the horizon for it to fly at a safe and efficient airspeed. The relationship between the nose and the horizon forms the HUD, also called the pitch attitude. If the nose remains in a constant position in relation to the horizon the glider will fly at a constant speed. If the nose is lowered, the speed will increase, and if the nose is raised the speed will decrease.

To use the HUD set the edge of the canopy frame, or some other mark, some distance (2-3 inches is a good starting point, but this depends on the glider, and pilots seating position) below the horizon. After several seconds the gliders speed will stabilize and you can glance at the ASI to get that number. If the speed is lower than expected, lower the nose further and establish a new pitch attitude with the HUD. If the speed is too high, raise the nose slightly and again hold this new pitch attitude with the HUD. After a couple of tries you will have the glider flying at the desired speed. At this point also reset the trim to remove any fore/aft stick pressure. Now continue to use the HUD and simply glance at the ASI to see what is happening. If the nose comes up, then the speed will begin to decrease. Don't wait for the ASI to show this, use your HUD and put the nose back where it used to be.

If you try to maintain speed by watching the ASI you will be doomed to failure as most ASIs will lag behind the change by as much as 5 seconds. In a normal situation things would go like this. Imagine you have a target speed of 55 kts and you are currently flying at 60 kts. To slow down you begin slowly pulling back on the stick and keep doing so until the ASI shows 55. Good, you've hit your target so you stop pulling. Unfortunately due to the glider mass and inertia, you have pulled too far back on the stick, so as you see the glider doesn't hold 55, it keeps slowing down. To correct this you start pushing forward again and stop when the ASI again shows 55. Again, you've over-corrected and pushed the stick too far forward so the airspeed keeps increasing. This will continue until you stop staring at the ASI and use your gliders HUD instead.

For the student pilot there are 3 basic pitch attitudes, 1) Minimum Sink/Slow Flight, 2) Best L/D/Cruise, and 3) Approach that they need to master. Almost all initial training can be accomplished using these 3 pitch attitudes and it simplifies what the student needs to learn. It also emphasizes pitch attitude concept (HUD) and reinforces the idea of using the ASI only as a reference instrument. Now the instructor can ask the student what phase of flight they're in (i.e. Approach) and what is the appropriate pitch attitude (HUD) for that phase of flight rather than telling the student what speed to fly during that phase of flight.

Keeping the pitch attitude constant with your HUD will allow you to fly at a constant speed and keeping the wings level will allow you to fly directly towards your intended spot.

Next month we'll cover the airmanship and decision making skills needed to intentionally make the glider turn. Until then, fly safe and keep your head out of the cockpit.