Lesson 4: The Traffic Pattern

Fly This Lesson Now

—by Rod Machado

Airplanes are like homing pigeons: they all have a particular place to go. In the case of airplanes, it's the airport. For homing pigeons, they head… home. With all those airplanes heading for airports (in some cases, the same airport), it's amazing that they don't bump into one another more often.

In the spirit of the homing pigeon, I guess you could say that pilots pull off quite a "coo" in how they manage to do this safely. The fact is, pilots are highly organized when they operate at airports. They don't fly around in a chaotic manner like moths around search lights. They fly a rectangular pattern relative to the runway, and they do it at a specific altitude. This pattern is formally called a traffic pattern, and it allows pilots to know where to look for and expect other aviators that are operating at the airport. It's also the pattern you'll fly when you want to practice your takeoffs and landings. Let's have a closer look at how to fly the traffic pattern.

Flying around an airport is done in precise, careful ways so we don't run into each other and so we set ourselves up for good landings, aligned with the runway. This approach and alignment with the runway is called a traffic pattern—a rectangular pattern as shown in Figure 4-1.

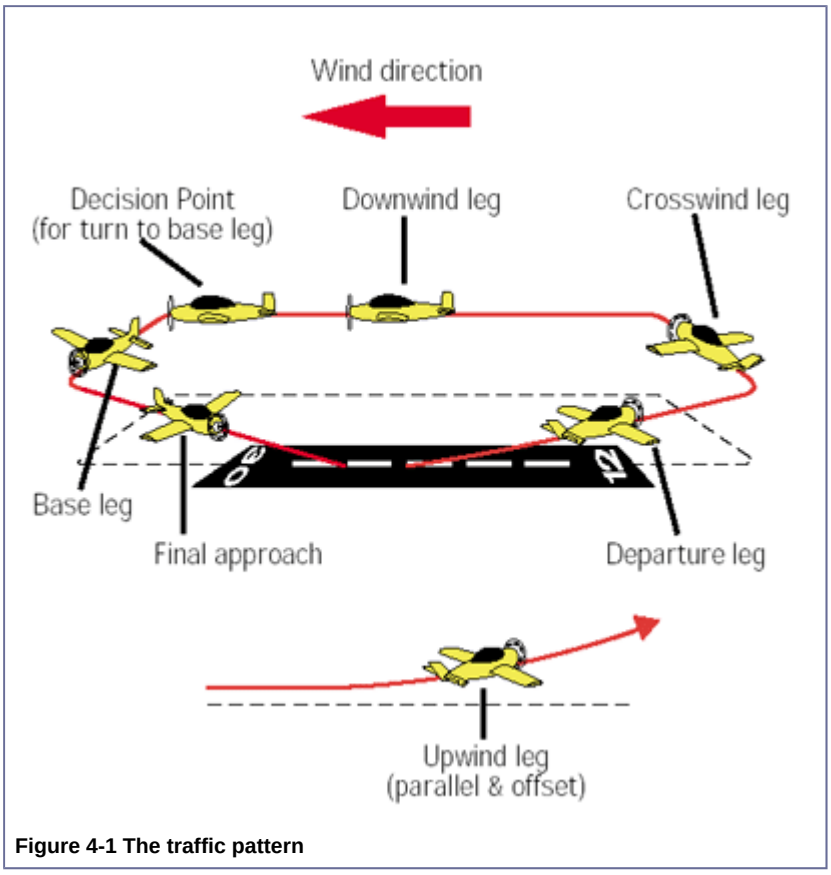

Figure 4-1 The traffic pattern

The traffic pattern has five major legs, or segments:

1. The departure leg
2. The crosswind leg
3. The downwind leg
4. The base leg
5. The final approach

Let's review each segment and discuss its purpose. And since we can imagine this any place we want, why not imagine ourselves at the beautiful Honolulu airport?

The Departure Leg

The departure leg is the takeoff, which we've already covered. I guess you could say that we're off to a good start since we already have a leg to stand on.

The Crosswind Leg

Since you'll remain in the traffic pattern for training, you'll make a 90-degree left turn (most traffic patterns use left turns) to the crosswind leg. This portion of the pattern is called the crosswind leg because the flight path is perpendicular to the runway and generally crosswise to the wind direction. Make this turn when the airplane is beyond the departure end of the runway and within 300 feet of traffic pattern altitude (TPA). (TPA is the maximum altitude at which you'll fly the pattern.) For this ground school class, let's set the pattern at 1,000 feet MSL which puts you approximately 1,000 feet above the ground (and the water, too, so watch out for flying fish.)

Throughout the departure and crosswind legs (and sometimes part of the downwind leg, too), the airplane may continue to climb until reaching traffic pattern altitude. This depends on how close you fly the pattern, as well as airplane performance, runway length, and the number of hula dancers you have in the airplane with you. If you reach TPA while you're still on the crosswind leg, then level the airplane at 1,000 feet, accelerate to 90 to 95 knots, reduce the rpm to 2000, and trim. It's also best to limit your turns to no more than 30 degrees of bank while operating in the pattern. This is no time to practice your combat turn techniques; save 'em for Microsoft® Combat Flight Simulator.

The Downwind Leg

As the airplane continues on the crosswind leg, another 90-degree turn is made. This places the airplane parallel to the runway, going opposite the direction in which it will land. This is called the downwind leg (Figure 4-1) because you're now going with the wind instead of into it.

Fly the downwind leg at between half a mile and one mile out from the landing runway. There are several reasons for this. First, this position allows you to remain comfortably close to the runway. That way, in the event of an engine problem, you can glide to a safe landing on the runway instead of ending up in someone's lobster trap. Second, it keeps you close enough to the runway so you can see it easily. It makes no sense to fly so far from the side of the runway that it looks like the end of a tiny matchbox. Being closer means you can more easily estimate wind drift and make the necessary wind corrections.

The problem is, how do you know when to begin the downwind turn? There are several ways to do this. In an actual airplane, you can look out the left window and estimate the distance. You can also do the same in Flight Simulator by selecting the side window view long enough to view the runway, and then switching back to the forward view. (Or, you could use the handy Virtual Cockpit feature we discussed earlier. Neat, huh?) You can also guess the distance by doing a little math. At 60 knots ground speed, the airplane covers one nautical mile in one minute. Therefore, you'd want to begin the downwind turn anywhere between 30 and 60 seconds after turning crosswind. Since your airplane is climbing at 75 knots (75 knots ground speed assumed), you'll want to begin the turn sooner, perhaps between 24 and 48 seconds after turning crosswind. Perhaps the easiest way is to use Flight Simulator's Top-Down view to estimate the turning point.

Finally, how do you know what direction to fly the downwind leg? That's an easy answer. Fly a heading exactly opposite of that used for takeoff. Without doing any math, just look at the number shown at the bottom of the heading indicator when you're aligned with the runway. That's the heading you'll fly on the downwind leg.

Preparing for the Base Leg Turn

You'll continue downwind until passing a point abeam the threshold of the landing runway. At this point, you want to begin preparation for landing by applying 10 degrees of flaps. (Make sure you're below 95 knots when applying flaps. The end of the white arc on the airspeed indicator is the airplane's maximum flap-extension speed.)

To prepare for landing

1. When you are abeam of the end of the runway, apply 10 degrees of flaps.
2. Adjust the pitch using the joystick to hold altitude.
3. Trim the airplane.

Remember, don't use trim to change the pitch. That's what the joystick's for. Use trim to take the pressure off the joystick once the desired attitude is established.

It's important to hold your altitude on the downwind leg. After all, airplanes are entering the pattern on the downwind leg, and a premature descent from TPA could result in a landing on top of someone's airplane (perhaps this is how biplanes were invented).

The Base Leg

Now it's time for another 90-degree turn to the left. We call this base leg, and from here you have only one more 90-degree turn before you're on final approach. But where should you start your turn to base leg?

Assuming airplane traffic isn't a factor, it's convenient and practical to start your turn onto base leg when the landing threshold appears about 45 degrees between the wing (left wing in this instance) and the tail of your airplane. In other words, as you look out the left window, the runway's threshold appears to be at a 45-degree angle to the left of the wing (or midway between the wing and the tail), as shown in Figure 4-2.

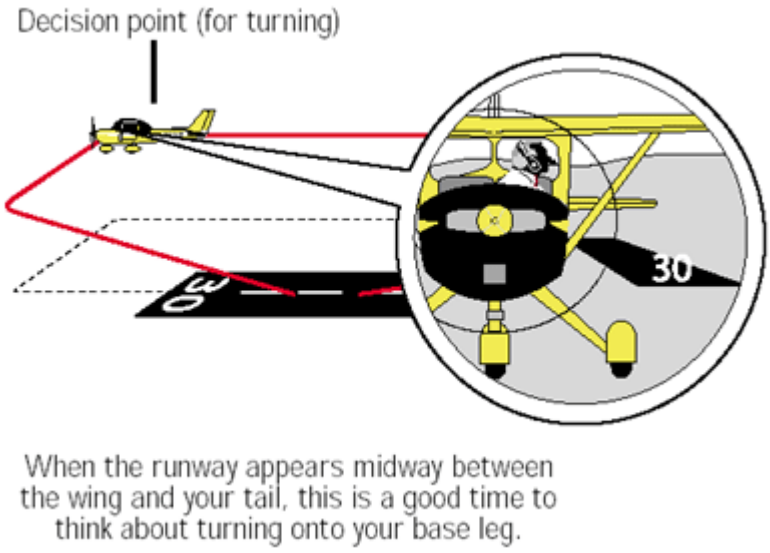

Figure 4-2 The traffic pattern decision point

This provides for a symmetrical, rectangular traffic pattern, instead of one having the shape of an enormous amoeba. Additionally, it provides you with enough distance from the runway to make a comfortable approach.

Yes, if you need to, you can look out the left window to estimate when you're in the position to turn onto the base leg. However, you might be better off using Flight Simulator's Top-Down view to estimate the turning point, as shown in Figure 4-3.

Figure 4-3

Base leg is a point of transition for landing. It's the place where important adjustments are made in the airplane's speed and landing configuration. This is why, even when you're not following other traffic (airplanes) on the downwind leg, you should avoid turning base too early. Things happen mighty fast as you approach the runway. You want to give yourself enough time to adjust your airspeed, flaps, and glide path. That's why I recommend you give yourself a final approach length of at least a mile. Sometimes, it's preferable to modify the pattern and fly the downwind leg long enough so you'll have a final approach length of two miles. Assuming that you aren't following other airplanes in the pattern (or being followed), a longer final approach gives you much more time to configure the airplane for landing. When I'm introducing a pilot to a new and perhaps faster airplane, I typically tend to prefer to fly a longer final approach.

The descent for landing is normally started on the base leg and continues throughout the final approach. Here's the sequence:

When the airplane is in the desired position to begin the base leg turn (as you look straight down in Top-Down view), make a 90-degree turn to the left. To easily identify the proper heading to fly, look at the heading that is 90 degrees to the left of the downwind

heading. That's the heading to fly on the base leg.

1. Roll out on this heading.
2. Reduce power to flight idle.
3. Establish a glide at 70 knots.
   (When possible, I like to use a speed 40 percent above the no-flap stall speed on base leg).
4. Make sure you trim for 70 knots.

Now you're ready to intercept the final approach leg.

Final Approach

The final approach (sometimes just called final) is a critical part of the landing sequence. Generally, a square turn from the base leg onto final approach is best. This provides you with enough time to observe and modify your airplane's descent path and alignment with the runway. During the final approach, the airplane is configured for landing and the speed is adjusted for the final approach speed (usually 30 percent above the airplane's present stall speed). Once the airplane is established and stabilized on a final approach descent, you're now in a position to estimate whether or not your glide path is too high, too low, or just perfect for landing on the desired portion of the runway.

When turning from base leg onto final approach, you have an opportunity to correct your glide path for any obvious indications of being too high or too low.

Let's assume that you are making a power-off approach from the base leg. After turning base, you reduced the power and commenced a descent. Let's also assume that your objective is to land on a specific spot on the runway. If you're too low, you can cut short the turn from the base leg to final approach, as shown in Figure 4-4.

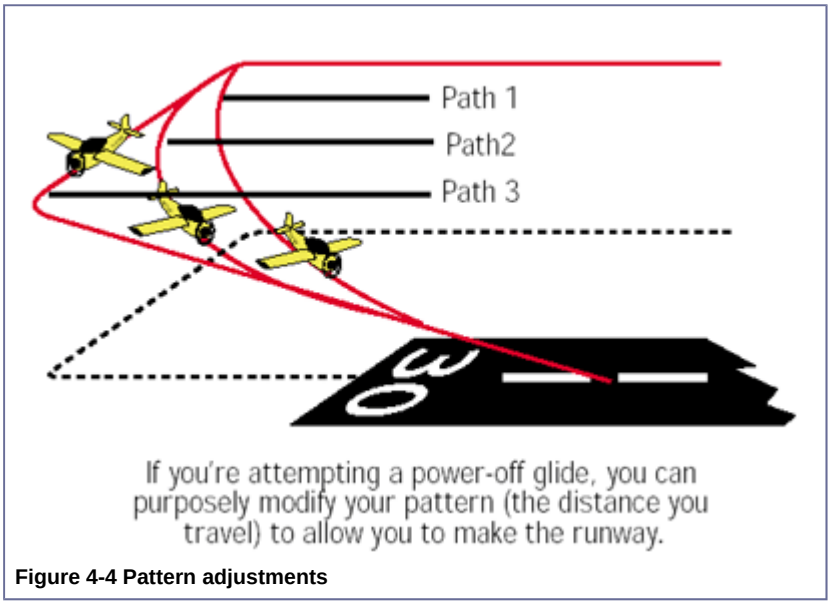

Figure 4-4 Pattern adjustments

Flying Path 1 allows you to fly less distance during the descent, thus increasing your chances of landing on the desired spot. Path 2 is longer, and Path 3 is a nice, square turn onto final.

If you're too high, you can deliberately overshoot the turn onto final approach, giving you more distance to cover during your descent, as shown in Figure 4-5.

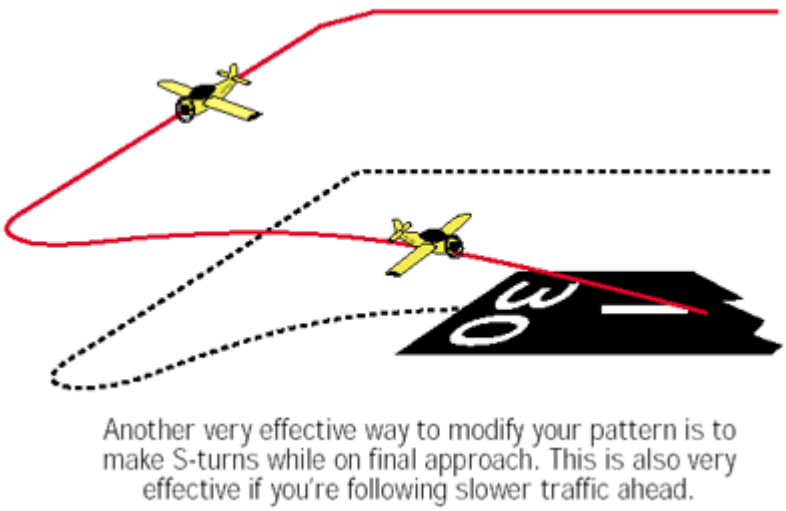

Figure 4-5 Pattern adjustments

Another option is to S-turn on final (Figure 4-6).

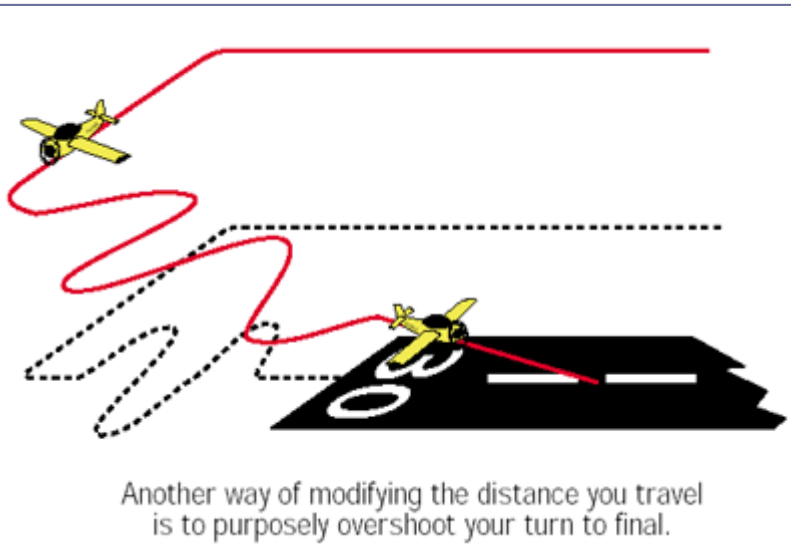

Figure 4-6 Pattern adjustments

S-turns are a series of alternating turns left and right of the direct glide path. (They may make it look like you've had one too many Mai Tais!) Since the shortest distance between any two points is a straight line, anything you do to fly other than a straight line lengthens the trip. Assuming a constant rate of descent, taking the long way home will allow you to lose more altitude.

Once you're lined up on final approach, establish a speed of 65 knots (if you decide to use 20 or 30 degrees of flaps, I recommend an approach speed of 60 knots). Don't forget to trim. Now you're ready to handle the landing from here! Click the **Fly This Lesson Now** link to practice what you just learned.

Fly This Lesson Now
- top -