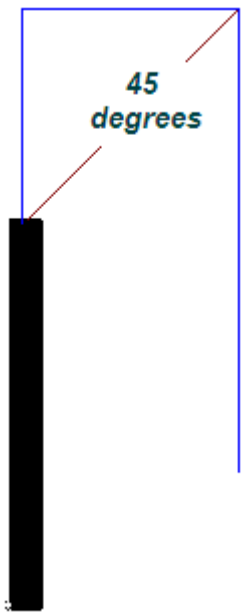
Spring Landings

By Chris Hope, Master CFI

After a warm dry winter, and then a very snowy winter, spring has finally returned to the Midwest. And not a moment too soon. I am tired of flight cancellations due to winds, low temperatures, and snow. But, as we get back into the air, its time to review some tricks, tips, and, techniques to bring those landings back up to straight, on center-line, at the desired touchdown spot, and squeaky perfect.

I sometimes think landing and baking have a lot in common: If you make a mistake at the beginning, it may not be possible to get a successful conclusion. But, no matter how good the initial steps, and all of the steps leading up to the end, if the last step is poorly executed you might end up with a pie all over the bottom of the oven – or an airplane sitting at an angle to the runway, resting on two main gear and a propeller. So let's look at the steps that are going to lead to us feeling good about our landing.

The source that I still like to use as my how-to-fly reference is the FAA Manual H-8083-3A, "Airplane Flying Handbook". There are a myriad of on-line, DVD, and printed publications dedicated to explaining how to fly an airplane. And many of them are good. But for a written how-to guide, I still like this one. So, much of what I am going to suggest here comes out of chapters 7 and 8 of this manual.



So, where does the perfect landing begin? I contend that it begins on downwind. And for most single-engine aircraft, this should be flown parallel to the runway, ½ to 1 mile offset, at 1,000 feet above the ground with the landing gear down and checked. This track is held until the desired touchdown point is at a 45° angle behind us, at which point we make a medium bank turn to fly a ground track that is perpendicular to the runway. Airspeed is not specified in the "Airplane Flying Handbook", but generally we will fly final approach at 1.3 times Vs. For an airplane that stalls at 50 kias, that would mean we would fly final approach at 65 kias. Backing up a bit to the downwind, I like to stabilize the downwind airspeed in most aircraft to the speed at the top of the white arc. This allows me lower the flaps as soon as I reduce power.

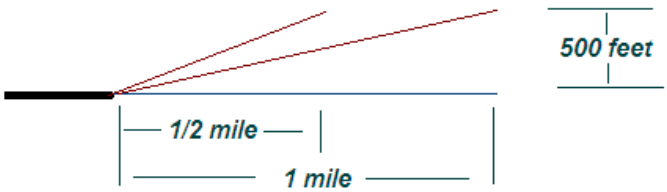
So here is where we have the first opportunity to work to a perfect landing. Let's hit this point in space that is 1,000 feet AGL and 45° past the runway dead-on, and on our desired airspeed. And in order to do this, we will need to be practicing those rectangular pattern techniques. Remember that maneuver we did as students where we found a series of points on the ground and adjusted our crab angle to allow us to fly across them all? Here is an opportunity to put that skill to use. And we continue that skill on base as we continue to adjust for the wind, flying our ground track that is perpendicular to the runway. In a normal situation, landing with a headwind, the base leg heading will be anywhere from 90° to the runway to angling toward the runway.

Note that I stated that the gear should be extended on downwind, but I did not mention flaps. I know that some pilots will also lower flaps to the approach

setting while on downwind. I don't. I lower them as I begin the turn to base, and here is why.

While I am flying the downwind leg, I have my power and trim set, and I don't need to change a thing. I know that I will make a power change when I turn base, but until that time everything is stable, and I can use the time to check for other traffic and continually check my downwind track relative to the runway. If I decide to lower flaps while I am still on downwind, I would have a corresponding power change to make, as well as a pitch and trim change. And then, I need to make another set of changes as soon as I make my descending base turn. I would rather start my turn to base and then, in quick order, reduce power to idle (I will bring power back in if necessary) and make my flap change. In most Cessna, Beech, and Piper single engine aircraft, a trim change will not be necessary. The reduction in power results in nose-lowering. The flap extension results in nose-up effect. The two nearly cancel each other out, resulting in less work with hands and more opportunity to judge the ground track and glideslope.

Now is good opportunity to look at some basic geometry. Assuming that we have turned from a 45° point, about half of our altitude loss will come on the base leg, and the rest will come after we roll out on final. Therefore, (neglecting the altitude lost in the turns) we will roll out on base at 1,000' agl, and on final at 500' agl. And if we have held our downwind leg at ½ to 1 mile from the runway, the rollout onto final will also be ½ to 1 mile from the touchdown point. So one more look at geometry.



At 500' AGL and ½ mile from the runway, our glideslope will be approximately 10°. At 1 mile from the runway, the glideslope will be about half that. Either of these glide slopes will result in glide slope that is noticeably steeper than the 3° indicated by the VASI lights. An indication of white over white on the VASI lights is not a problem. It merely indicates that our final approach glide slope is steeper than the glide slope of the instrument pilots.

A comment to my friends who argue that the FAA preaches "stabilized approaches", so we need to fly a glideslope that results in red-over-white on the VASIs. Nothing wrong with that attitude. (It will take noticeable power to maintain that glideslope.) However. the FAA does not specify the glideslope required for a stabilized approach. They only state that we should fly our approach such that only small adjustments are required for pitch and lateral control, and that the airspeed is stable between Vref and Vref plus 20 kias.

I like the steeper approach angle for two reasons. First, the steeper approach allows me control my approach to my exact desired touchdown spot more precisely. If you don't care where on that 5,000' runway you touch down, maybe that is not important. But I pride myself on my ability to pick a touchdown spot and then make it (most of the time, anyway.)

Secondly, if you have not yet had the thrill of making a landing with no correlation between the throttle and the engine, you have not had the joy(?) of proving to yourself that you can put the plane where you want it solely with your flying skills. Glider pilots do this on every flight of

course, and I have had several opportunities over the years to prove that the no-engine-landing skill is also useful in airplanes with a (non-working) engine in front.

So now we have turned from base to final, somewhere around 500' agl, about ¾ of a mile from the runway. For the next few seconds, we only have to attend to four things: maintain the glideslope, maintain the airspeed, fly a ground track that keeps us lined up with the center line of the runway, and (at least at touchdown) keep the nose going straight down the runway. Nothing to it – right?

Well, of course, when any of these things gets off, they all go off. So here are a couple of tricks on keeping this all straight.

I refuse to be drawn into the argument of pitch and power controlling airspeed and descent rate. By now you have figured out that they are all inter-related – change one and you will probably need to change the other. So, let's look first at pitch.

Go back to the old spot on the windscreen trick. Pick a point on the ground about 100' short of your desired touchdown point. This will become your aim point. Using the point in the windscreen that is normally on the horizon in level flight, superimpose this windscreen spot over the point that you have chosen as your aim point and keep it there. Many pilots I fly with begin to flare prematurely. I suggest that you keep this windscreen spot superimposed on your aim point until the aim point goes out of sight under the nose. At this time, you will ensure that the power is idle, and you can bring the nose up to a level-flight attitude picture. If your airspeed is at 1.3 Vs, you should be able to raise the nose to your touchdown attitude picture on a count of 3.

So much for glide slope. What about alignment? Two schools of thought here, and an experienced pilot should be able to perform either. The first is the wing-low method. Look at the entire runway, both far end and near end, and line those two points up with your own position. With a little practice you will be able to ascertain two issues with your position. First, is the airplane aligned with the centerline of the runway? ((Mentally extending the centerline of the runway will help visualize this.) If not, using aileron will move the airplane left or right to move it over to the line. Secondly, is the axis of the airplane parallel with the centerline? (And if you are in a side-by-side airplane, you are looking straight ahead, not over the center of cowling.) If the axis is not parallel with the center line, using left or right rudder will make it so. And since we have just introduced a slip (without naming it so) the additional drag will increase the descent rate. Which may result in a descent below the desired glide slope. Which may incur the need for more power. Which may induce the nose to move to the left. AARGH.

The alternative to this "wing-low" technique is the crab technique. This of course is no different than our old friend, the rectangular pattern. The good side of this technique is that we do not need to worry about keep the nose straight while on final, and we don't have the resulting drag from the slip. We just need to use aileron and rudder to keep us lined up with the runway centerline. The bad side is that we are still going to need straighten the nose to align the plane with the runway. It is just that we are going to have to do it at the last minute when we are trying also to raise the nose to the landing picture.

And one last note about the perfect landings. I stated at the outset of this discussion that you can fail at the beginning of the landing process, or you can do everything correctly to this point and still fail. And here is the reason that most of the pilots I fly with lose it at the end.

There is a subconscious thought that when it is time to move the yoke or stick back to flare, any rudder or aileron inputs that we have been holding need to be neutralized. And actually, this is exactly the point to increase rudder and aileron inputs. Assuming that the winds have not changed (poor assumption), the fact that the airspeed is dissipating is cause for us to increase all control inputs. All control deflections are becoming less effective as the aircraft slows, so there is a need for more and more input of all three controls just to maintain the status quo.

Try these tips. After all, spring should be in your step, not in your landings.

Don't just practice until you get right. Practice until you don't get it wrong

Chris Hope has taught fledgling and experienced pilots for more nearly 40 years, mostly in the Kansas City area. Chris holds flight instructor certificates for single engine land and sea airplanes and multi-engine land planes, as well as for instrument training. He holds ground instructor certificates for advanced and instrument training. Chris is an FAA Gold Seal Instructor and a Master Certified Flight Instructor. Chris serves as a member of the FAASTeam in the Kansas City area. His website is www.ChrisHopeFAAFlightInstructor.com