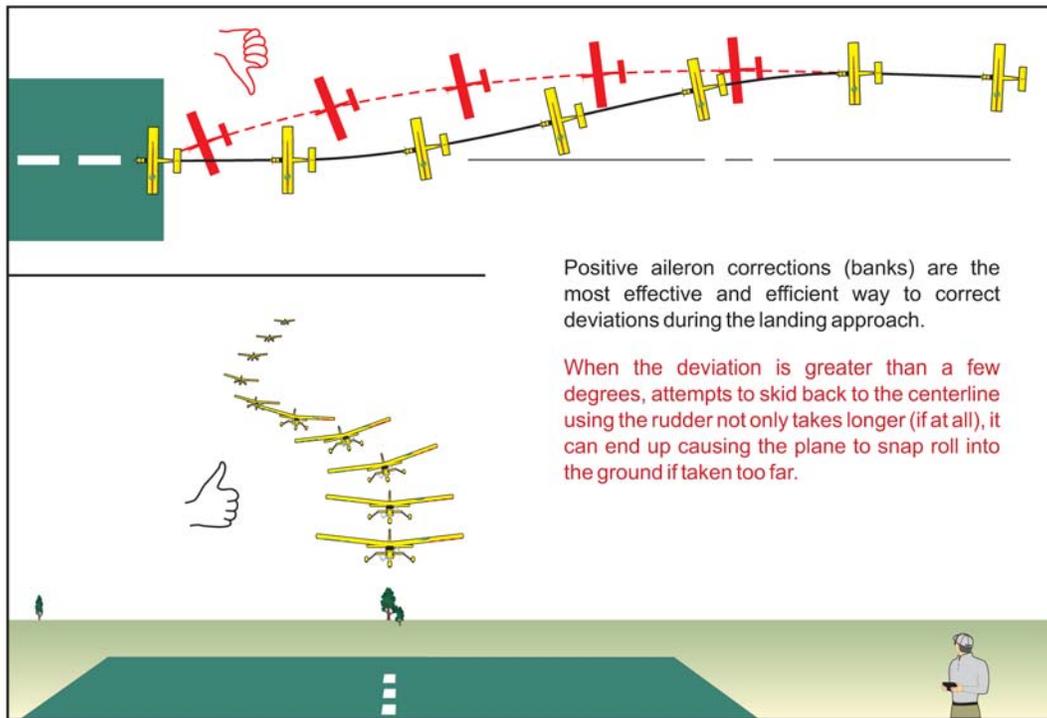


Best Landing Practices and Wind Advice

Since the early days of R/C flying pilots have been giving others landing advice, particularly if there is any sort of wind involved. However, some have recently been getting it backwards when they state that during a normal landing the ailerons should be used to keep the wings level, and the rudder should be used to steer the plane as it approaches the runway. It is trying to correct deviations greater than a few degrees with the rudder that has in fact led to hundreds of full-scale fatalities and countless crashed models over the years. While this misplaced advice might be "good for business" for some, since it leads to more replacement fuselages and airplanes being sold, it's extremely wasteful and largely avoidable with proper instruction.

When listening to sport flyers, it's obvious that the over emphasis on rudder during landing is due to the assumption that expert pilots use the rudder a lot in general, especially to counter wind during aerobatics. Since a landing in wind supposedly requires more skill, the belief is that the key to good landings must lie in mastering the rudder like the pros.

The reality is that the pros primarily use the ailerons to line up and to correct deviations during the approach to landing whether there's a crosswind or not (figure 1). If there's a stiff crosswind, they will then use the rudder to smoothly "kick out the crab" right before the wheels touch, and then obviously continue using the rudder to steer after touchdown.



It is true that a pro will sometimes use tiny amounts of rudder during the landing approach to correct (hide) small deviations off of the centerline, however, if the deviation is more than a few degrees, it's understood that correcting with the ailerons, i.e., banking the wings, is the most effective way to get back on course. As we say in full-scale aviation, "use the ailerons to control drift (movement side-to-side), and use the rudder to align the fuselage parallel with the centerline at touchdown." One exception is when it becomes necessary to mix or coordinate rudder with the aileron to prevent adverse yaw while making course corrections, such as when landing a flat-bottom airfoil trainer at slow speed.

Pilots who try to use the rudder to correct deviations greater than a few degrees during the approach will run into the fact that the rudder tends to have a marginal effect, i.e., the plane will immediately yaw when rudder is applied, yet the initial response is a skid rather than a course change. This is particularly true when the airplane features a semi or fully symmetrical airfoil and

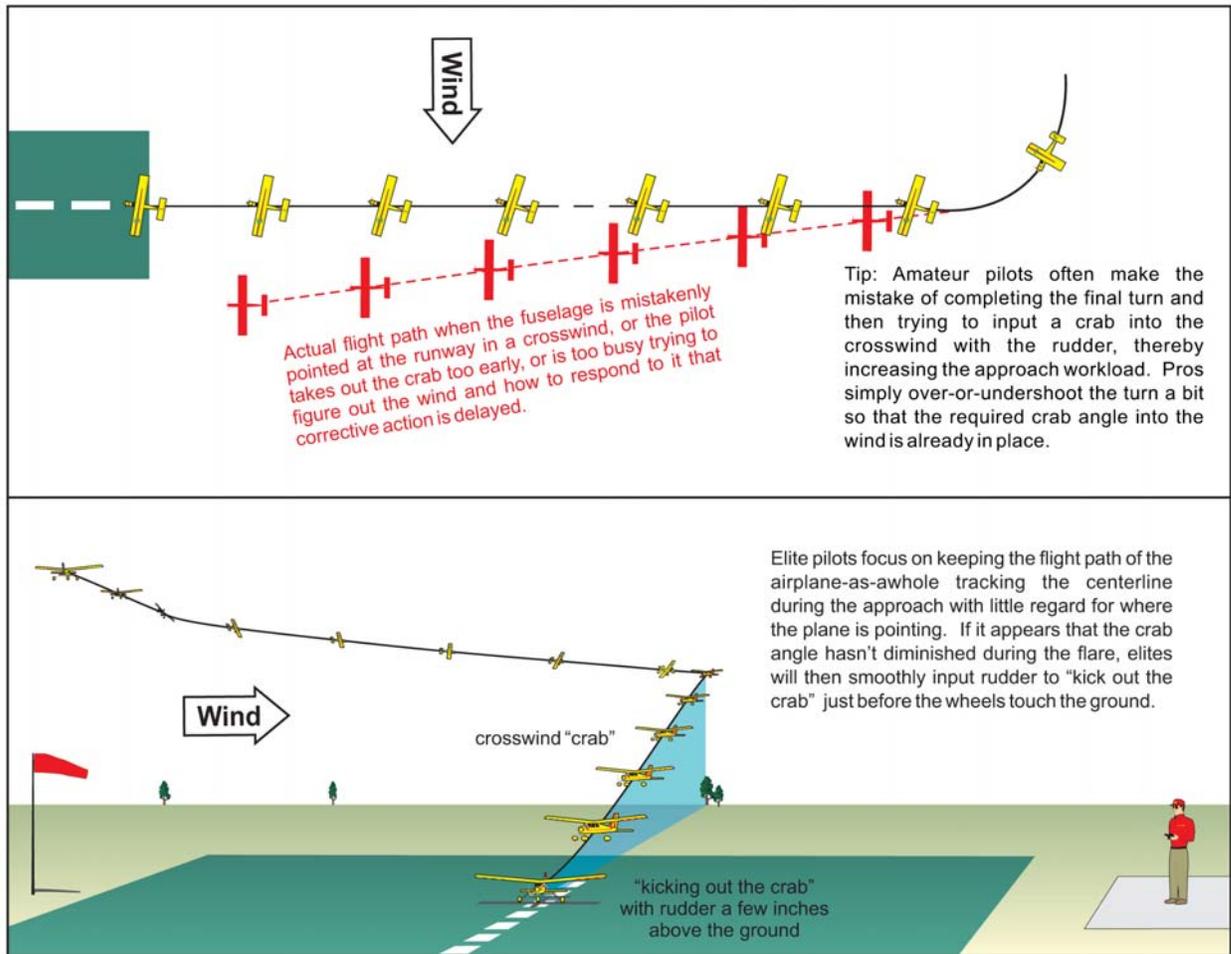
not a lot of dihedral. As a consequence, pilots will often resort to inputting more and more rudder, especially if the plane is headed toward the pits or an obstacle. In addition to scrubbing off speed, the combination of the larger rudder input while also holding in up elevator is the perfect recipe for a tip stall and snap roll into the ground (typically blamed on a gust of wind)! Sadly, this experience reinforces in peoples' minds the necessity of keeping the wings level close to the ground and using the rudder to steer(!), when the reality is that a small bump of aileron (slight bank) quickly remedies most deviations and thus prevents having to resort to larger inputs.

As a rule, elite pilots view the rudder as a refinement used to fine tune maneuvers, whereas the ailerons are used when a more "positive" or immediate response is called for. For example, when landing into a stiff headwind, rather than continuing to fly into the wind, an airplane would rather take the path-of-least-resistance and slide off to the side. It is therefore crucial that every deviation (drift) be corrected immediately, since any lag will result in the deviation becoming exponentially greater. The same can be said during a crosswind landing if the deviation is downwind. In short, the principle effect of wind is not that it causes a lot of deviations, but that it will help to exaggerate deviations that would have been minor or afforded more time to correct on a calm day, hence the necessity of positive aileron corrections when flying in wind. Of course, this is one of the main reasons why airplanes without ailerons tend to be much harder to land in wind.

Crosswind landings

There are two main schools of thought about the best way to set up a landing in a crosswind. The first is the wing-low "side-slip" approach, in which a pilot attempts to prevent wind drift by keeping the wings banking into the wind while cross-controlling the rudder to keep the fuselage aligned with the runway centerline. However, akin to balancing a marble on a bowling ball, probably fewer than 1% of R/C pilots have the skill to attempt this (it's easier in full-scale aviation because heavier airplanes are more stable in wind and thus easier to slip). Furthermore, as the majority of expert pilots know, it's often a waste of time and mental energy to side-slip before getting near the ground because the winds are constantly changing the closer the plane gets to the ground due to the influence of the terrain and surface friction. Consequently, while it's always good to anticipate what is coming next, a pilot won't actually know what wind corrections will be needed until shortly before touchdown.

The pros, i.e., the ones who make everything look easy, use the easier approach of allowing the airplane to crab into the wind until shortly before touchdown (figure 2). In reality, expert pilots pay little attention to where the plane is pointing or how much it is crabbing during the approach. Instead, our only concern is keeping the airplane-as-a-whole tracking the centerline and executing a perfect flare. We will then smoothly kick out the crab right before the wheels touch while continuing to counter any drifting with the ailerons as needed. The great thing about R/C is that our vantage point outside the airplane makes it easy to see when the wheels are about to touch, and thus exactly when to kick out the crab.



In short, the main reason why elite pilots are able to maintain a straighter centerline approach is they don't concern themselves with why the plane is drifting left or right, only that we recognize it immediately and correct before anyone notices -- no different than what you would do on a calm day.

Along the lines of the best solutions are usually the simple ones, expert pilots don't pay much attention to whether the wings are banked into the wind or care which wheels touch the ground first, only that we distinguish ourselves by touching down smoothly and perfectly tracking the centerline. If the upwind wheel happens to touch down first while we're making the necessary aileron inputs to keep the airplane over the centerline, that's fine, but maintaining the centerline and smoothest possible touchdown are always our primary concerns.

Another reason why highly proficient pilots don't get too caught up worrying about wind is the fact that the crab angle will often diminish or disappear completely within a foot of the ground due to the surrounding terrain and surface friction retarding the wind. Thus, those who arbitrarily start correcting for wind might actually cause a deviation, not prevent one! In case you're wondering, the reason why more emphasis is placed on wind corrections in full-scale is because the fuselage and tail are much higher compared to our models, and thus tend to be more affected by a crosswind during landing. Furthermore, if you're on the fence about this because your local guru has a habit of parroting a different technique, you might try asking him to demo it for you, and then don't be surprised if his plane suddenly develops a problem that prohibits him from flying.

Altogether, as hard as it will be for some to believe, the best pilots effectively approach a landing as if there is no wind, that is, only paying attention to keep the airplane as-a-whole tracking the centerline, irrespective of where it's pointing. Then, if we observe the plane is crabbed into the wind as we're about to grease the centerline, we'll use the rudder to smoothly kick out the crab.

Keep in mind that, unless the crosswind is quite strong, it rarely does any harm to touch down in a crab as long as the touchdown is smooth. I.e., far far more airplanes are damaged because of overcorrecting after misjudging the centerline and poor flares than due to crabbing at touchdown.

Thus, pilots will do far better to concentrate on touching down smoothly on the centerline before worrying about trying to correct the crab. Once that has become routine, learning to “kick out the crab” will become a piece of cake. Conversely, those who can't consistently touch down smoothly on the centerline truly have no business trying to add rudder to their landings!

In conclusion, there are always exceptions to the rules and the variables can be as wide ranging as the wind and planes themselves. However, as long as your priorities are in order, you'll find that everything else fits into the category of fine-tuning your already good landings, rather than keeping you from what is most important. Good luck!