

Rudder shy? You'll need to become closely acquainted to deal with crosswind flying - Join Martin Bedding's teach-in



Learn how to use the rudder and your ability will increase tenfold.

This month we'll take a closer look at aerobatic crosswind flying, and I'll introduce you to some of the tricks and tips I've found useful over the years.

Of the three primary surfaces - aileron, elevator and rudder - it's the rudder that causes most problems. Many pilots are unsure when to use it, how much to apply, and in which direction. This insecurity is heightened when the model is inverted; the rudder's effect is, of course, then reversed, which complicates things further to the point where many pilots leave the rudder alone completely and rely solely on aileron and elevator. Even a simple loop can be complicated by applying rudder. At the top a model may require rudder to keep it on track and stop it from drifting in or out relative to the pilot. However, with the model inverted at this point, if you're unsure about the rudder it's all too easy to apply it in the wrong direction and make the drift even worse, maybe even ending up with the model at 90° to the flightline. Many Sunday flyers leave it alone for this very reason.

My advice concerning rudder is to learn to use it, and use it well. Rewards are there to be had by doing so. Master the use of rudder and you'll have control of the model in the three dimensions of flight - roll, pitch and yaw - and your flying will become smoother, with direction and tracking being dead on line. The ability to use rudder is particularly important in crosswind flying, in fact it's impossible to fly crosswind aerobatics without its constant use. A well-flown aerobatic model in a 10mph crosswind is a joy to watch.



Since our model's fly in three dimensions, it's very handy if your ability can match.

There's no black art in learning to use rudder - practice and perseverance is the name of the game. Use it on every flight; try leaving the ailerons alone when making turns and use rudder instead, then practice until it becomes second nature.

TIME IN THE LINE

Right, let's fly some manoeuvres in crosswind conditions. Imagine standing in the pilot box to the side of the runway, looking across it and with a light wind blowing on your face - i.e. there's a 90° crosswind. The first thing to do is establish a base line approximately 100 - 125m out from the pilot position. This is the distance the model will fly relative to the pilot, and the aim is to keep the model on this line throughout the flight. This is why it's important to practice straight and level flight, for if you can't keep the model on this line on a single, level pass, imagine how much more difficult it will be to keep aerobatic manoeuvres on line.



Even a simple loop can be complicated by applying rudder.

It's worth noting here that your model should be adequately powered. An IMAC model will have a power-to-weight ratio of 2:1, which will provide unlimited vertical flight. The longer you can make the vertical line - both up and down - the more time you have to think about what's happening and to correct any deviation from the line; this is known as 'time in the line'. There's nothing more frustrating than discovering that your model has insufficient power to travel the necessary distance in the vertical line for the manoeuvre to look tidy. Taking a vertical line with one roll and a stall turn at the top as an example, if the model doesn't have sufficient power you won't be able to perform the manoeuvre safely; the model may start to drift off, or simply fall out of the vertical line before reaching the stall turn.

TURNAROUND

The above manoeuvre is used as a 'turnaround' figure for the model to return in the opposite direction. The roll should be positioned halfway between the point at which you pull to the vertical and the stall turn at the top. So, at the end of the roll the aircraft should continue to travel up the vertical line before performing the stall turn. Let's go through the manoeuvre in detail and see what can be done to prevent the model from drifting in towards the pilot. Your aircraft should enter the manoeuvre with the wings straight and level, and the fuselage horizontal. At the required point carefully pull the nose vertical and at the same time open the throttle to full power. As the model approaches the vertical, the nose will want to weathercock into wind, and at the same time the wind will blow the model off line towards the pilot (remember the wind is blowing towards you as you face the runway). What we're aiming for is a straight vertical line; note that the model won't be in a true vertical position as the nose will be slightly into wind, but the line it travels will be straight - or at least it should be! The



Competition pilots use these stick models to visualise their routines and I commend them to you, too.

model should be crabbing ('crabbing' a.k.a. 'wind correction'). Think of your aeroplane as a pen or pencil, drawing either straight or circular lines.

Roll direction isn't usually specified in an aerobatic competition schedule, and we can use this to our advantage. In a crosswind condition, if the direction of the roll isn't stated, always roll the canopy into wind when starting from the upright position. This will have the effect of helping to keep the model out and on line as it rolls into wind. If you roll in the other direction, this will help the wind blow the model towards you. The same is true for horizontal rolls or point rolls; in crosswind conditions always roll the canopy into wind.

As the model continues to travel the vertical line, use rudder to keep it on line, whichever direction is required. In our scenario the wind will be trying to blow the model towards you, so roll to the right and continue to use rudder to make small changes as they happen. After many hours of practice you'll get to know what changes are required for any given conditions and you can anticipate the corrective measures required.



The duration of a slow roll should be about five seconds. Practice counting the seconds off as you fly the manoeuvre.

STALL TURN

The stall turn is next and by now you should have plenty of height. Reduce power gradually and very carefully watch the model as it begins to slow. At the point where the aircraft is stationary, apply right rudder. This will keep the model into wind and help to prevent it from blowing in towards you. It's the wash from the propeller that kicks the tail over in a stall turn, and in some cases you'll need to give a short blast of power to make this happen. When a stall turn is performed correctly the model should pivot around a centre point on the fuselage, the turn itself being about one wingspan in length. This all sounds very simple, doesn't it? A bootful of rudder at the top of a vertical line and the model is on the way down again, no problem. Wrong!

Something else happens during a stall turn. As the model pivots around, the inside wing is moving more slowly relative to the outside wing. As the latter is moving faster it's also creating more lift than the inside wing, which in turn creates unequal lift and the model starts to roll. Opposite aileron will therefore need to be applied to prevent this from happening.



As the model starts to descend you'll have to cancel both the aileron input and the rudder, although note that you'll need to release the rudder slowly to prevent the tail from wagging on the down line. Remember that all control movements should be smooth and precise - avoid letting the sticks return to centre under spring tension as this will show up in flight like a sore thumb.

At this point the aircraft will be travelling the vertical down line with the engine at idle. Continue to use the rudder to keep the line straight. Down elevator may also be required to maintain a vertical line. Begin the pull-out to level flight at the same point of entry and as the model levels out, smoothly apply power to about half throttle. Never use full power for straight and level flight, half throttle is ample and gives you time to think and prepare for the next manoeuvre. As you can see there's a lot going on with a stall turn. Make it neat and tidy and you'll earn good points in a competition flight.

The longer you can make the vertical line, the more time you have to think about what's happening and to correct any deviation.

SLOW ROLL

Now let's try a horizontal slow roll, again with the wind blowing on your face and the model travelling from right to left. The correct position for this manoeuvre should have the model inverted as it passes in front of you. To achieve this, the roll must begin before the model approaches the centre point. Practice and experience will dictate the point at which the roll should begin. Duration of the roll should be five seconds. Practice counting the seconds off as you fly the roll. Once again, roll the canopy into wind. In our case this will be to the right, and be prepared to take the necessary corrective action as the model begins to roll. Remember the wind will be trying to blow the model towards you. As the aircraft approaches the knife-edge position use elevator to push the model on line; top (left) rudder will also be required to keep the nose of the aircraft slightly above the horizon. Holding the aileron in the same position throughout to keep the roll rate constant, with the aeroplane rolling past the knife-edge position, slowly reduce the elevator and the rudder... but don't relax yet! You'll now be approaching inverted flight (in front of yourself) and both elevator and rudder will be reversed. Continue the roll, through the opposite knife-edge and back to upright flight.



Flying a draggy scale biplane in a crosswind requires a huge amount of rudder manipulation.

TWO MISTAKES HIGH

It should be apparent by now why the small hand-held model and simulator mentioned last time are required for serious aerobatics. When practicing any manoeuvre for the first time, always fly two mistakes high, that way you'll have time to recover from any errors. Trying a slow roll for the first time whilst blasting down the strip at warp factor 7 and 5m altitude really isn't a good idea.

Did you know the stalling speed increases by approximately 40% when a model is banked to 60°? No? Well, we'll be looking closer at that fact (and more) next time, when the subject will be stalling speed. Until then, keep practicing and enjoy your flying.