

Pre-flight Set-up

Making your model fly right

You and your buddy have two nearly identical models. You're using the same engine/prop/fuel and radio equipment, yet his performs better than yours. It flies straighter, is more agile and lands more slowly. Why is there a difference in performance? More than likely, the disparity can be traced back to the building set-up and flight-trim adjustments—very important performance aspects that many modellers don't fully understand.



As your plane moves through the air, many forces are acting on it that influences its flight path. The model may look like it's flying straight and level, when in fact it could be yawing slightly and simultaneously climbing or diving a little. Is the yaw issue a rudder-alignment problem or a lateral balance issue? To isolate and correct the trim problems, many flights must be made, with minor changes made between each. But how and where do you start? I collaborated with my colleagues—senior technical editor Gerry Yarrish and West Coast associate editor John Reid—and we came up with the following flight-trimming steps for optimum flight characteristics.

It takes time to properly trim a model, and the process can be divided into two stages: static trimming and flight trimming. In this article, we'll cover the static-trimming procedure so that your model will be perfectly aligned. In a future issue, we'll get into flight trimming a model and describe what to test for and how to recognize—and solve—any problems that you might encounter.



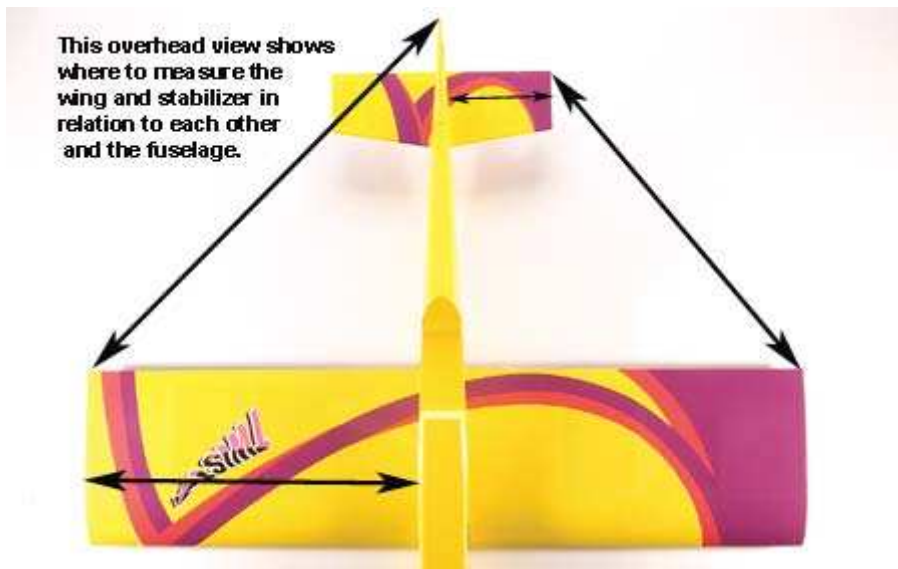
Static Trimming

What I call “static trimming” all begins on the workbench. If you're building from a kit, you have total control over the model's final outcome. The story is somewhat different if the model is an ARF, as all of the components are already built and covered. Fortunately, though, as you assemble the model, there are steps you can take to ensure that it's properly aligned.

Wing Alignment



Step 1 Most ARFs are built wing first, and this establishes a good foundation to build from. If your wing is in two panels that need to be joined, it's most important to make sure that they are aligned with each other; the trailing and leading edges should be even. If they aren't, the wing will appear to be warped or twisted, and that will cause the model to roll in flight. If your wing is one piece, sight down its trailing edge, and check for warps; or place a Robart incidence meter at various points along it. Place the meter at each wingtip and take a reading. If the numbers don't match, you'll know it's warped. To remove the warp, twist the wing in the direction opposite to the warp, and apply heat.



Step 2 After you have attached the wing to the fuselage, check for three things:

- Is it centered from side to side?
- Are the wingtips an equal distance from the centreline of the fuselage at the tail post?
- When viewed from the rear of the model, is the wing horizontal?



First check the wing to see whether it's centered from side to side.

Step 3

Check the cantering by measuring from the side of the fuselage to the wingtips. Use the same reference point on both sides; the distance to each tip should be the same. If it isn't, slightly enlarge the holes for the wing hold-down dowels in the fuselage and the boltholes in the wing until you can center the wing.



To see whether the wing is skewed, pin a length of string to the rear of the fuselage. Place a piece of masking tape on the string and mark it. Swing the string over to the other tip; the mark should line up with the tip.

Step 4

Next, take a length of string or Kevlar thread (use something that doesn't stretch under tension) and tie it to a large T-pin. Insert the pin at the fuselage's centreline at the rear and stretch it to a wingtip. Wrap a piece of masking tape around the string, and mark it where the wingtip and trailing edge meet. Swing the string over to the opposite wingtip; if you're lucky, the mark will line up on the corner. If it doesn't, mark it again and measure the distance. If it measures 1/4 inch between the

marks, for example, you will need to move the wing by half of that, or 1/8 inch. If you enlarged the dowel or the boltholes, fill in any excess gaps with scrap wood so the wing will be in the same position each time you mount it.



Step 5 Last, check that the wing is horizontal. With the wing installed in the fuselage, stand several feet behind it and see whether the fuselage leans to one side or the other. If it's crooked, sand the low side of the wing saddle to raise the low wingtip. If the joint between the wing and fuselage is supposed to be 90 degrees, use a 90-degree triangle to ensure that the wing is horizontal.

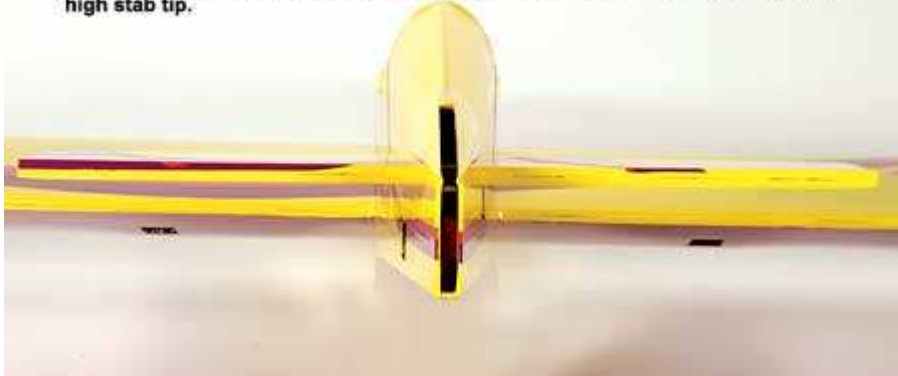


Setting up the tail feathers

Now that the wing is square and level, you can use it as a reference to align the stabilizer. The stab's alignment process is almost identical to the wings. First, center it in the fuselage by measuring it at the trailing edge. When it's centred, if possible, stick a T-pin through its leading edge and into the fuselage; this will act as a pivot for the next step.

Step 6 Next, equalize the distances from the corners of the wing to the trailing-edge corner of the stab. You can measure a small model with a tape measure or a yardstick, or you can use a length of string. This time, though, if you use string, you'll need to wrap two pieces of masking tape around it. As you did before, mark one piece of tape, stretch the string from stab to wing, and then mark the other piece. Move the string to the other tip and see whether the marks line up. Adjust, if necessary. When the stab tips are equidistant from the wingtips, pin the stab's trailing edge to the fuselage, and draw lines on the stab where it meets the fuselage; you'll now be able to position it in exactly the same spot when you glue it into place.

View the model from the rear and check whether the stab is parallel to the wing. This stab is tilted slightly, and the slot in the fuselage must be sanded to lower the high stab tip.

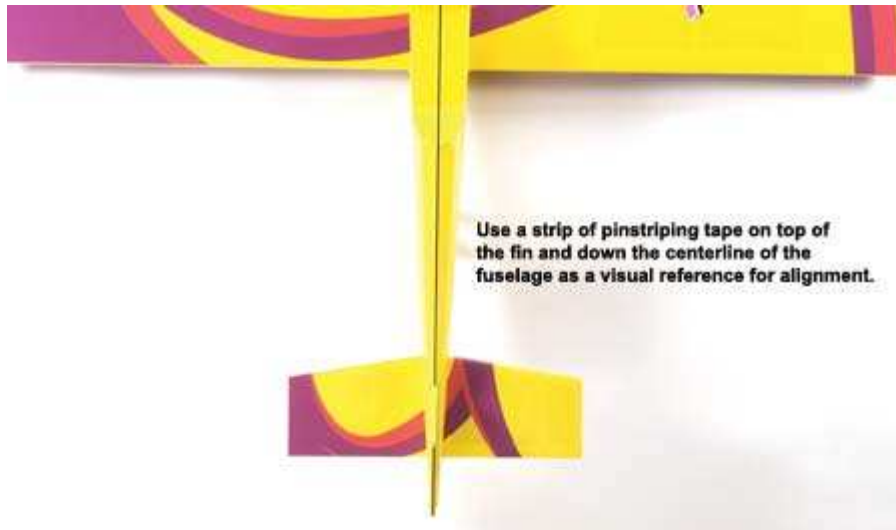


Step 7 The last alignment step is to make sure that the stab is Parallel to the wing. Again, stand back several feet and sight the model from the rear. If the stab is tilted, lightly sand the stab slot in the fuselage until the stab is level with the wings.

Use a 90-degree triangle to ensure that the fin is perpendicular to the stab.



Step 8 The vertical fin must be properly aligned and positioned at 90 degrees to the stab. Use a 90-degree triangle to ensure that the fin is perpendicular to the stab (if necessary, sand the fin slot).



Step 9 To see whether the fin is off location, stick a thin piece of tape down the centreline of the fuselage and on the top of the fin. Install the fin in its slot and view it from overhead; then align it with the fuselage's centreline.

Balancing the model





Laterally balance your model before you adjust the fore/aft CG. Remove the glow plug from the engine, and have a buddy help you. A little weight was needed in the right wingtip to level the wing.

Step 10 Before checking the center of gravity (CG), balance the model laterally. If the fore/aft CG has been set, chances are that it will change because the weight that's added to correct the lateral balance won't be exactly on the CG. To laterally balance your model, make a bridle to support the model by its nose and tail, or have a friend hold one end while you hold the other end by the spinner or the prop. Be sure to remove the glow plug from the engine so its compression doesn't prevent the model from tilting. If one wing panel is heavier than the other, it will hang low. Add weight to the lighter wing panel to correct this.



Use your favorite method to check the CG before attempting to fly your model.

Step 11 The model's CG plays a big role in how it flies. Initially, balance the model according to the manufacturer's recommendations. But quite honestly, this represents only a starting point to safely fly it during the first few flights. The Great Planes CG Machine is a very handy balancing tool. It allows very precise CG adjustments, and it balances just about any model. If at all possible, don't add weight to the model to balance it; shift the battery and receiver first.

For best performance, all hinge gaps should be sealed. Clear packing tape works very well.



Step 12 A last point before you head to the flying field: seal all of the hinge gaps. Sealing the gaps not only makes the control surfaces more responsive but also makes control-surface flutter less likely. Use clear packing tape or matching MonoKote or UltraCote. The easiest way is to unhook the pushrods from the control surfaces, fold them over toward the top of the flying surface as far as you can and then apply a strip of material along the hinge line. When the control surface is returned to neutral, the gap seal will hardly be visible. At this point, your model is statically trimmed and ready for flight-testing.

Summary

Although pre-flight set-up may sound like a lot of effort, it really doesn't take much more effort than just slapping your model together. And in the end, you'll have a model that's easier to flight trim and more fun to fly!