TRIMMING SMALL SCALE MODELS

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Judging by my own observances and the staggering number of articles that have been written on the subject, the process of trimming small scale models can still be problematical to even experienced modelers. At every local contest or flying session I see others struggling to get their models to fly in a predetermined, stable manner. They can be seen adding ballast, using shims to adjust thrust, twisting control surfaces, bending tabs and even adding weight to wing tips. When a stable power pattern is finally achieved, it is not uncommon to see the model spiral in after the motor runs out and the model starts to glide. The corrective measures some use to resolve these problems frequently make things worse and they would be better off starting from scratch.

Most of these problems would never occur if the center of gravity, thrust lines and alignment had been adjusted as close to optimum as possible prior to power testing--a simple procedure. Since most of my models have generous stabilizer areas approaching 20-25% of the wing area and long tail moments, I can usually get away with setting the c.g. at about 35% of the root chord. In regards to thrust, three degrees down and three degrees right usually works well for my shoulder and high wing models which fly to the right under power. My low-wingers are adjusted to fly left under power with three degrees down thrust and zero to one degree right. (*Ed. Note: Many highly successful fliers feel strongly that all models should be trimmed to fly right*) It should not be necessary to use shims to adjust thrust. Build the nose of the model 1/16" longer and use a flat sanding block to sand in the initial thrust adjustments. Take the sanding block along when you go to the field to make any minor adjustments which may become necessary. When building models with high aspect wings like the Focke- Wulf TA152H-1, I build a little washout into each wing while it is on the building board. For subjects with low aspect wings like my Chambermaids and Dornier DO-F Falke, the wings can be built flat as it is unlikely that they will require any washout.

My trimming procedure differs from most others that I have read or heard about because my models are test glided without props or motors. I first tried this method way back in 1976 on my first Chambermaid. It worked so well that I have used it on every scale model built since then. Critics often condemn this procedure because they say this is not representative of how the model will glide with a freewheeling prop after the motor run is over. Of course they are correct but what they fail to recognize is that this is not relevant to the task on hand. The purpose of test gliding small scale models should be to neutralize surface alignment so the models will glide in a straight, flat floating glide. I fail to understand how one can accurately evaluate the glide of a small scale model launched by hand at shoulder height with the motor and freewheeling prop installed because the sink rate is so high. Test gliding with a few turns in the motor is another popular procedure that has questionable results. The excessive sink rate problem is especially true with heavy, draggy models such as twins. Even with the props and motors removed from my twin boom Arado E-530, I could not tell what is was doing when launching from shoulder height. It was not until the model was launched from the top of a 10-foot sand dune that the glide could be evaluated. After the glide was set it only took 3-4 powered flights to finalize the trimming process. Careful trimming procedures paid off in this case since the model won Jumbo Scale twice at the Geneseo FAC Nationals with only a total of about a dozen powered flights under its belt.

Test gliding in the manner described above will usually reveal undesired surface alignment which may be undetected by the eye. If the model swerves to either direction it may be necessary to remove a subtle wing warp or slight rudder offset. Stalling or diving should be eliminated by adjusting the incidence on the stabilizer, not by adding or subtracting ballast. Once the glide is set properly, rarely will any further adjustment of the stabilizer or addition of ballast be necessary.

After you are completely sure that the glide has been adjusted properly, power testing can begin. Install the propeller and motor and wind in enough turns to remove slack. Use a large pin to lock the prop and readjust the C.G. with ballast if necessary. Using the aforementioned thrust settings, few additional adjustments may be necessary. Try to get the power pattern correct by using only small readjustments to thrust. Gradually increase turns while carefully observing how the model performs at the beginning and end of the power run. If the model circles close to the ground during the power burst and then begins to climb as the thrust diminishes, remove a little down thrust. If the model has a tendency to loop or stall, the side and/or down thrust may have to be increased. If the model banks excessively while turning, it may be necessary to add some washout to the outboard wing. Of course tabs could be used to simulate washout but they detract from the appearance. The only scale model I ever had to use tabs on was a Hughes H-1. This particular design exhibited considerable instability on the roll axis due to its high fin and short, stubby wings. It tended to fly in a different manner at each session. Tapered wedges, hidden under the wing tips can be used instead of tabs or the wing tip can be easily washed out at the field. This can be done by twisting the tip to the desired while the wing is held directly behind the tail pipe of a car with the accelerator propped to keep the engine running at fast ldle. The few wrinkles that may develop will gradually disappear as the tissue continues its endless shrinking process. Extreme care must be used when adding washout to counter torque because excessive washout can cause a model to spiral in after the motor runs out.

Once the power pattern has been set properly and the model is getting up high at the end of the run, the glide can be evaluated under actual conditions. If no warps have developed, there should be no reason for the model to dive or spiral in. The worst that is likely to happen is that it will fly straight, performing a series of short, bumpy stalls. Minor deflection of the rudder to induce turn in the same direction as during the power mode will generally cure the problem. Stalling problems can also be caused by the rubber bunching up near the rear peg which can be eliminated by braiding or shortening the motor. The option of stabilizer adjustment or the addition

of ballast should only be considered if the model continues to stall while turning. This brings back the memory of my very first SAM contest at Lakehurst, New Jersey almost 40 years ago. I was testing my first high performance duration model, a Lanzo Stick set for a Right power-Left glide pattern. After the prop folded, the model performed a big "S" turn and then transitioned into a very wide left circle, stalling and losing altitude fast. I was not sure what to do and asked my mentor, the famous Don Garofalo, former designer for Scientific Models. Don advised me to remove the stall by tightening up the turn using more rudder deflection. This cured the problem and the model easily maxed three times, winning the contest.

I prefer to set the glide on my scale models so they turn in the same direction as when under power. A R-R pattern for shoulder- and high-wing subjects and a L-L pattern for low wingers has worked well. Since the diameter of the glide circle is often the same as during the end of the power pattern, it is difficult to tell how long the motor actually runs. This is not to say that, if the model is gliding in a stable fashion in the opposite direction as when under power, it would be advisable to change the direction of the turn. In such a case, just leave well enough alone.

A word of caution: Any rudder adjustment made after the power testing is completed is likely to change the power pattern. If right rudder is added to prevent stalling, it may be necessary to remove a little right thrust and vice versa. This is about the only part of the procedure that is a little touchy but, like everything else, the more you do it, the easier it becomes.

This article would not be complete without mention of twins. I only built three but all were very simple to trim, flew well and were repeated first place winners in the Jumbo and Giant Scale events at the Geneseo FAC Nationals, and off-year Non-Nats: 2005,2006 and 2007. All three used contra-rotating propellers with the tips of the props turning outwards at the top. These three models were long nosed subjects with twin booms. As explained in the foregoing, the initial glide testing was done with the motors and props removed. Thrust was set at three degrees down on each side and zero side thrust. Since the contra-rotating props eliminated torque effects, I decided not to mess with side thrust adjustments to avoid complicating the trim procedure. After glide testing was completed the first powered flights were made with only enough turns in the motors to keep the models flying in a straight line close to the ground for about 50- 60 feet. It is very important to keep the power at a low level at this point because of the possibility of a stall. As turns were increased, enough rudder deflection was added to induce a very wide left turn. As turns were further increased, a little more rudder deflection was necessary to prevent stalling during the climb. It only took about five powered flights on each twin to finalize the trim procedure. I never built any twins with short nacelles but would think more down thrust would be necessary because the props were closer to the CG position.

While the forgoing procedure may be contradictory to that described in the myriad articles written on the subject, it has been proven to work on the dozens of scale models I built over the last three decades. It is a very reliable, quick and safe way to trim a small scale model.

Ed. Note: Bill Henn, an old hand at SAM type airplanes who shifted to scale, has won more contests than most of us can count. I must, however, wonder how the average flyer can match his ability to have low wing models fly left-left. If you trim the model to fly left, it would seem that you need more washout in the right wing than left and perhaps a bit of right rudder. When the motor runs down, those two forces, when combined with the tendency of the prop to rotate the model to the right, sound like a receipt for a graveyard spiral to the right — something seen all too often at scale meets. Right thrust, more washout on the left wing than the right, and a tad of left rudder is the formula for me until I figure out what Bill's secret is.