How to Adjust a Rubber Model

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Most rubber models are flown with right-right adjustments, which means that the power circle as well as the glide is in the clockwise direction. This is the easiest method. Almost invariably, both right rudder and right thrust are required. Other systems, popular in free flight, such as left power and right glide, are far more difficult in rubber due to ever-changing thrust and torque, as well as the changing slipstream from a big fan of a prop. The general idea is to adjust the glide, then, by means of offset and/or down thrust, to adjust the power.

When you begin your test glides, try to find a slope or some high starting point from which the ship can be launched. First make a few hand glides over level ground. It is the old story of correcting tail heaviness (the nose rises abruptly) by any, or any combination of the following measures: move the wing back, remove incidence from the wing (decreasing its angular setting relative to the thrust line), add incidence to the stabilizer (raising its leading edge). However, always try to keep a few more degrees of incidence in the wing than in the tail. This may be in any combination, such as zero degrees for the wing and minus two degrees for the tail, or plus two in the wing and zero in the tail, and so on.

Though some excellent models are flown with zero-zero, for wing and tail, the angular difference opposes the development of a stall (since the tail continues to work as the wing lift fades out). Too much positive angle in the tail may produce stabilizer stalls, or an abrupt stall of the ship. Thus, if the ship remains badly tail heavy, and its wing position is fixed, or nearly so, save yourself time and make structural alterations. Shorten the motor to bring the C G. forward, or alter the wing position.

If the ship seems nose heavy, the opposite corrections are required: move the wing forward, add incidence to the wing, remove incidence from the stabilizer (which may have to be done by inserting a shim under the trailing edge of the stab). The proper hand glide will be a straight line, from the time the model leaves the hand until it touches down. It should glide slightly nose down and land on the wheels.

If from the glide the ship swoops in for a pretty landing, the plane is tail heavy. However, be sure that you are not causing stalls by heaving the ship too strongly or causing dives by launching it too weakly. If it dives, try a slightly harder launch; if it stalls, launch it more gently. Never launch with the nose pointed up, as stalls always result. Put the nose down slightly and aim at a spot on the ground about 40-50 feet away.

Having made short hand glides, try longer hand glides from some elevation. This will give a truer picture of the glide and will save you much confusion when you begin to use power. If long hand glides are made you can feel free to make thrust line adjustments as soon as you use power, without having an out-of-adjustment glide hanging over to upset you.

Take advantage of long hand glides to put in some turns. Bend the rudder tab to the right to produce a noticeable and steady turn. This turn may be increased later when testing under power. It should not be sufficient to cause a spiral dive.

Fly the ship in a large cleared area, preferably over tall grass, as early power flights may dive in after a stall. Begin with 50 turns—if possible work with the winder from the beginning—and hand launch gently. The ship should almost fly off your hand as you move your arm forward.

Power stalls are corrected by adding down thrust in the form of hardwood shims behind the top of the nose block where it rests against the fuselage. Book match covers or the matches themselves may be used temporarily if they are replaced with glued-on permanent shims before the next flying session. Although you have the plane gliding slightly to the right, right thrust undoubtedly will be needed to make a right turn with the prop running. Shims will be added behind the left side of the nose block to produce right thrust

While you have to kill off severe stalling tendencies under power with down thrust, keep in mind that a plane which stalls in straight flight may fly properly when in a turn (its lift is devoted less and less to support in a turn), or even may dive. So, if your model is going fairly straight at this stage, permit it to tend to stall without actually letting it stall. In other words, it should be permitted to fly rather nose high, or mush, when you can see that a shade more down-thrust would cause it to fly cleanly.

While the theory is to adjust glide, then the power, it is not possible to do so and reach final results without pausing to make slight improvements or readjustments. in the glide. Thus, while working with power, gradually increasing turns by, say, five winder turns a flight (20 rubber turns by a 4-1 winder), the immediate objective is simply to make power behave well enough to allow you to get the ship high enough, without aerobatics, to really see the glide.

For example, if, say, 60 turns of your winder get the ship high enough for it to steady out and glide uninfluenced by the after-effects of power (as a slight stall when the prop stopped), note whether the model glides straight or in a circle as desired. Is it slow and stally, or fast, tending to dive? Use the same number of winder turns on succeeding flights until, by means of your rudder trim tab, you have obtained the tightest possible circle without a dive.

This is one point where the veteran doesn't take no for an answer. If his model begins to dive as more and more rudder is applied, he will begin to treat the ship for nose heaviness, either adding incidence to the wing or raising the rear edge of the stabilizer. If the glide is a trifle slow he will add rudder! Make enough flights with the same number of turns until you learn how far you can safely push the combination of more rudder and more tail-heavy trim.

The ship may stall and spin to the right. when pushed too far. It is a good idea to back off slightly from the slowest gliding turn you can obtain, because any wind will cause a stall. (If windy the next flying session, begin with the number of winder turns that get enough altitude for a glide, then adjust the windy weather stall out of the plane by making it nose heavy as required.)

When, finally, the glide is to your liking, step -up the winder turns, steadily adding down thrust and offset thrust as required to prevent power stalls and to make the ship stay in the right turn under power. Now, again, this is where the expert does not stop.

Say your ship is "adjusted." Get critical. Make believe it belongs to a friend and is a model that climbs, hangs and loses time without really getting up. Maybe it will take more right thrust. (The measure of that is the very first turn after take-off; if it rolls nose high you can add right thrust if necessary, but if it flies on its side, racing around the first turn with very slight climb, look out!).

This is tied in with design. Ships with low areas toward the rear, down swept fuselages, sub-rudders, etc., and with high areas forward, tend to roll nose up on that first turn and give you more latitude for thrust adjustment

Does the glide drag its feet? Maybe your clocked time is nothing to rave about. Most of your duration comes in the glide. After getting as high as possible, it all depends on the ship and how you adjusted it. If that first power turn isn't dangerously tight, you can add slight right rudder to take out that mush in the glide or, if the glide turn is already tight, trim the model a shade more nose heavy. After such changes make half power flights, then step up winder turns again, just so you won’t pile in.

How much down and how much offset thrust? That varies, ship to ship. As a rule, a 1/16" thick shim for right thrust is plenty, 3/32" is an extreme. For down thrust, 1/32" usually is enough, and 1/16" asks for it

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If possible, make thrust corrections 1/32" at a time. Many experts make changes 1/64" at a time using brass shims. The danger in bold thrust adjustments with few winder turns is that a flight at nearly full power increases effects of all adjustments and you may spiral in.

Be patient and methodical. Cement in the shims when done, but allow for the fact that the cement will contribute thickness.

How can you tell when you have too much down thrust? Easy. The early part of the flight, the first turn, or even two or three turns may be racy without the ship picking up decent altitude. At high speed, which means high power, down thrust always takes more effect. This is why the less power your plane uses the more down thrust it requires.

This startling fact is true. What happens is that as a low-powered ship edges toward a power stall, it lacks the thrust to pull itself up in the climb. Thus, added down thrust is required to keep its nose from reaching that danger point. But pour on the power and the nose will be pulled down with that same down thrust. Right thrust works the same way. Thus, half-power flights do not reveal what a rubber job will do fully wound. Sooner or later you must pack in the turns to find out. After that, if the model has sure rigging, you can wind it up any time.

For consistent results give close attention to these features:

Nose block. If one piece of wood, set the grain fore and aft, never up and down. Experts laminate their nose blocks from sheet (like 1/8") with each lamination having its grain at 90 degrees to the next lamination. The block must 'fit snugly to prevent rocking back and forth, or even revolving under vibration. The key, that portion fitting within the nose of the fuselage, should be thick, of hardwood or plywood. The shoulders of a balsa key wear away. Balsa provides a poor foundation for a tensioner screw.

Wing mounting. Key the wing so that it goes on at right angles to the fuselage every time. A panel forward of the opposite panel will turn the machine. A slightly low tip will do the same thing. (The plane will always bank in the direction of the high side of stabilizer.) A short piece of 1/2" dowel, half rounded and cemented to the bottom of the wing at the center, is one key that does not restrict the wing coming off in a crack-up. The dowel rests lengthwise in a slot. Use a short piece at the leading edge and another at the trailing edge. Replace temporary shims with a balsa sheet filling under the wing, holding it at the same angle. Place the sheet edgewise on the top longerons.

Stabilizer. A pop-up tail provides some degree of keyed mounting. If possible, provide permanent rigging by sliding the stab through a slot or even cementing it in place. Provide for a mounting that never tilts the stab one way or the other; this is the same as applying rudder.

Rudder. If possible, build in the fin and rudder to prevent any accidental movement. If a trim tab is used, make it of metal, cemented well in place so that any alterations are firm and unchanging. However, turn may be adjusted as well by tilting the stabilizer.

For really tight turns without spins, it will be necessary to warp the right wing tip, which is the tip on the inside of the turn. The leading edge is raised slightly (about 1/16") by loosening the covering toward the tip by holding the panel over a jet of steam, then twisting it slightly in the hands 'and holding until dry. Hold the wing in front of you so that it is convenient to sight along the trailing edge. Sight chord-wise, looking toward the front. Since you want the leading edge up, look for a slight downward warp of the trailing edge (the same thing). Any warp positive enough for you to see, should be enough. All other warps must be removed.

Another point to keep in mind for consistency is to make all your motors alike so that replacements won't upset the trim. If possible weigh the rubber each time. Use the same number of strands, tension exactly the same.

Use the same number of turns in tensioning, and stretch to the same length. Loose tensioning just means bunching - which may occur anywhere along the motor - for disastrous stalls and dives. If landing gear struts bend out of line, always twist them back before the next flight If a wheel is out of line it causes a side drag - if bent back it may spoil the glide.

Always keep in mind that any tightening of a turn tends to make the model more nose heavy; taking off turn will increase tail heaviness.