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Sal Taibi's 600 Sq. In. SPACER

The Spacer was Designed by Sal Taibi
As a favor to Bill Baker at California Models who needed a new product.
The rehash with side and down thrust was done by several flyers in Central California in the mid 1950s.

Congratulations, you've made the right choice. The Spacer is one of the very best designs for the Nostalgia events. This model is quick and easy to build and does not have a whole lot of lumber in it. This is a clean low drag design with nothing complicated about the building or flying. The most outstanding characteristic of the Spacer design is that it is very easy to adjust and fly safely. When built as shown on the plans. Your Spacer will handle unbelievable amounts of power with no trim problems.

The decaiage and thrust changes were developed in the 1954-55 era and the 435-inch version with a Torp .15 was on the *FAI* team. The Spacer on the drawings is contest legal. The Lucky Lindy is the only other design that matches the spacer in performance. But the Lucky Lindy is a higher drag design with way too much lumber, and of course it is more difficult to adjust and fly.

The 600-inch Spacer was originally designed to use the Torp .19 engine. The larger, more powerful engines now recommended is due to the new rules with shorter engine runs. In the good old days most of the competition could be counted on to fly overweight, out of trim models so that *3* maxs and a decent fourth flight was usually good enough to win. NO MORE ! Most of the contest today will limit motor runs to no more than 15 sec and sometimes as little as 9 sec. It is not unusual to have 5 or 6 competitors making it to the seventh flight. You don't luck out anymore.

The short motor runs have forced us to VTO and climb much faster. *Climb is a function of weight and drag. Glide* ***is*** *function of wing loading and drag. increases on the square of the Girspeed^_And on the of the weight.* The only sensible response to the current rules is build models to weight and not a bit over weight, and of course put in all the horses you can find. Light weight, small size, minimum wing loading, *&* more power. It is the same compromise we have always faced when trying to improve the performance of our models.

Basically, we got a fresh set of plans from Sal and added the thrust changes and the missing rib patterns. Note that I did not change the pylon incidence. You will probably want to *reduce* the pylon incidence and move the balance point aft about a half inch.

Looking at the drawings, you will notice two types of lettering, this is so you can see *where* the changes are.

I have also added a chart of suitable engines and props along with the recommended fuel for each engine. These Nostalgia legal engines are all iron pistons and plain *bearings.* They should never ever be run on synthetic oil based fuels. And you should never use an electric starter on these engines.

Build it like the drawings, keep it light, and straight, put in plenty of power and you will have a winner. I would suggest you omit the 3/16 square framework in the fuselage, just go with the heavier sheet wood in the fuselage. If you build the model per plans it will come out at about 26-29 ounces, which does not leave much room for adding unneeded tricks or fancy paint.

The only major revision you will need to consider is the incidence in the pylon. The plans show the original incidence setting. This does work fine, but it will produce a model that makes perhaps 10-15 turns under power and glides well in the wind. I build all of mine with only .250 incidence in the wing platform and sometimes trim some of that out during testing.

The absolute minimum incidence this model will safety fly with is .175 *incidence* in the wing platform with the stabilizer set at zero. Note that the plans show the bottom of the fuselage is a straight line and the stabilizer is set parallel to the bottom, so you can do all your measuring from the bottom of the fuselage to the wing platform.

If you do chose to build your model with the .250 incidence you will also need to move the balance point aft somewhat to achieve a good slow glide. I believe this change adds 100-150 feet to the climb and allows a slower glide.

which all results in a model capable of dead air flights in the range of 7 - 7-1/2 min.

Do not get carried away and start adding

need to add anything else.

Put in the side and down thrust as shown, use the square 1/8 *A\. engine* mounting plate with the square hole pattern to the firewall. You can then use thrust plate wedges of the same size and hole pattern to make easy thrust adjustments on the field. Don't screw around with thrust washers. At the speed this model f lys you don't need the extra excitement that inconsistent thrust adjustments can add.

/Make sure you get the pylon attached firmly to each former and at the rear of the pylon. Do not count on the glue joint at the fuselage top to retain the pylon, the fuselage top will flex and allow the wing incidence to change under high *speed,* and that's not fun.

I like to cover my Spacers with the lightweight MRL .0015 Mylar on the flying surfaces. By using this .0015 Mylar on the flying surfaces I can easily control warps forever. Whatever you cover with, keep the bottom of the wing smooth and slick. Its OK to have a bit of tooth on the top surface of the wing. I *prefer* to cover the fuselage with MRL Polyester tissue, (Polyspan). I Use 3-4 coats of clear dope and a coat of Superpoxy.

Perhaps 80% of the lift is produced on the bottom surface of this wing. You should probably just forget all the rumors you learned in school about Bernoulli's Law. It does not apply to this wing under these conditions. Way back in the 17th century Bernoulli proved only that the sum of static and dynamic pressures over a streamline shape always remains constant.

Incidentally, as a side note; By far the best method of cutting out ribs is with a 10" disk sender and a box type template that holds the stack of ribs up vertical to the disk I constructed a special machine for this purpose, but now I think you would be better off using a 10" table saw with a disk in place of the blade. That little piece of metal that normally fits around the blade could be made of plywood and serve as part of the template stop system.

There is an engine, prop, and fuel selection chart on the plans that should help you select the best available engine. The cut off date in the rules is 1956 or 1962 and that eliminates most of the imported engines. The exception that is not shown on the chart is the OS MAX I3J both .29 and .35. These engines were not anything really outstanding and very few were imported.

Other than the McCoy, Dooling, and the .29R or .29X racing engines, nostalgia engines all produce their maximum power in the 10,000 to 12,000 RPM range. Do not under prop these engines. I think thrust increases on the square of the RPM, and/or on the cube of the prop diameter. Changing from a 10 x 6 down to a 9 x 4 prop will not *increase* the RPM enough to make up for the loss in prop diameter on these engines.

The only sure way to select the best prop is by flying and timing. Do not be influenced by the noise. These engines are not ported for the higher RPM range, and even if we change the timing, the bypass volume is too small to feed mixture at higher RPMs. Polishing ports, bypasses, etc. is a waste of time as the velocity of fuel mixture through these areas is too slow to make any *difference* in the real world.

The one thing you should do to these *engines is* remove the restrictor from the intake. Changing from the stock spray bar type needle valve to a dump tube type is also worth while on any of the higher performance engines such as the combat specials or the racing engines.

Most of the old K *& B* .29R and Fox 29R engines were used in controline speed with pen bladder tanks. We all started our models by hooking up the plug, shoving the spinner into the starter and slowly opening the *needle valve.* Our starters all had big heavy flywheels that ensured we had enough *energy stored* to start the engine, AND tear up the main bearing if anything was out of alignment.

Before you spend money on one of these old controline speed engines be sure to check the main bearing and lower end of the rod. These

two engines ore worth searching for. as they are about 30% more powerful than any other .29 size engine produced in the legal time frame. No engine even come close to equaling the K *& B* .29R until the Super Tiger .29 with the flat top piston and the double ball bearings arrived. The K A B .29R is far more powerful than any of the .35 combat specials, and in addition you are flying a 5 oz. lighter model.

The Fox .29R is a problem engine in that Fox never did learn how to fit pistons for the application and very few of them will run really good. Also Fox made a lot of different ,29R and .29X engines. The only one suitable is the one with a plain bearing and a round intake tube; it sort of resembles a standard stunt engine. Most of these had a number and an R stamped on the *engine* somewhere.

The McCoy .29 referred to in the chart is the Series 20 racing engine with the rear rotor and silver case. It ranks above the boo ling only because of the more useabfe toque curve. Note that the McCoy and Dooling are not very high up on the chart, they are impressive noisemakers but seldom contest winners.

Any engine in the chart will produce a ***contest-winning*** *model.*

The other thing to really remember is that these are nostalgia engines and good ones are becoming rare, take good care of what you can find. They are Iron pistons running in Iron cylinders, they need at least 20% castor oil in the fuel. Do not abuse these engines by using synthetic oil based fuels and do not use the electric starter, as it is very hard on the bronze main bearings.

The biggest advantage to the Spacer design is that they are very easy to adjust and very seldom crash. The low pylon and bottom rudder produces a model with a strong right turn under power. We can use this right turn tendency and adjust the model to perfection by sort of leaning on and counteracting this turn with left thrust which will produce an almost constant flight path.

From a VTO launch the Spacer can be adjusted so that the first 50-100 feet of climb are almost straight and may even appear to have a bit of outside loop tendency. As the airspeed increases, the nose comes up and the right turn will take over so the model will complete one turn ever 3-5 seconds of climb.

Warning; Any Spacer that turns to the left utsder flayer Is goiiy to real soon. Any Spacer that dimbs straight away all the way up with no right turn will not live for more than a few contests. And while in the cauticf} mode, Nev& launch year Spacer* in a Horizontal attitude, as it will dive into the around within about 25 feet. This is because the wing and its incidence does not become effective until the model has some airspeed. The down thrust is effective anytime the engine is running good. I have personally tested this on several occasions and found it to be a true fact of life.*

In order to get a good transition from climb to the glide mode, the model must have a right turn in the glide. The ideal glide circle for this size model appears to be around 4OO feet in diameter. With a fast climb and this 400-foot right glide circle, your model will be able to perform a bit of a slip, and slide out into a slow glide with absolutely no loss or altitude. Slow the glide down and you will get around a 7-min. flight on a 17-sec motor run. (7 for 17).

This model is adjusted just like a big hand launch glider. Trim the power phase using the thrust adjustments and incidence shims, nothing else. It is not a good idea to use the rudder trim tab as in most cases this tab will screw up the transition to the glide. Trim the glide phase using ballast to move the *CG,* nothing else. Very simple. DQ NOT charge incidence to trim the glide.

Step one is make sure there are no warps in the flying surfaces. The stabilizer should be absolutely flat, no warps at all. The main panels of the wing should be f kit, no warps, and no wash-in. The tip panels of the wing are going to have some washout due to their internal construction. Keep the tip washout to a minimum and make certain that both tips have the SAME amount of washout.

With these new covering materials you can remove any warps with a hot iron or hot air gun. I use a Monocote type iron and a glass top table as a flat surface so I can really get rid of

the warps. I then know each wing pane! is flat when it does not rock on the glass top surface. With the MRL .0015 Mylar, the warps will never return. With the Polyester tissue, (Polyspan) whether or not the warps return is largely a matter of your covering job and the amount of dope shrinkage that will occur. Warps are sort of an indication of your building skills. Be sure to plasticsize your dope. The best dope is Randolph's nitrate and if s available at the local airport for about $30 gal.

Do not use wash-in on either of the main panels. On a high-speed model, such wash-in tends to straighten out the climb in the later stages and sometimes causes the model to attempt to loop over. Note that I said attempt, as this model should not have enough incidence to complete a loop.

Step two is to make certain the wing incidence is what you wanted it to be. Measure from the bottom of the fuselage to the wing platform and make certain you have at least .250 of incidence in the wing.

Step three is to glide test and trim for a reasonable glide with at least some indication of a right turn in the glide. Use stab tilt for a very wide turn, not much turn is required at this stage. Use ballast in the box under the stab, or on the engine motor mount lugs to trim for a slow nose high glide. Do not change the incidence in the wing or stab !

Step four is short burst power test. I like to use a two-function timer and set the timer to pop the tail about one second after the *engine* cutoff. I like the Texas Timers, as they are good sturdy units.

Run your engine at a fast four cycle, just below the two-cycle break point. Engine run timer should be set at about 3 to 5 seconds. Point the nose straight into any breeze and with the nose up about 45 degrees. Launch with a good solid PUSH so the model is flying as it leaves your hand. Your model will get about 100 feet of altitude and complete perhaps £ of a turn to the right. At such low power settings it will appear that your model turns too much and does not have enough left thrust.

In the event that your model goes straight and does not demonstrate a positive right turn under power you have a problem. The best fix is to go back to step one and remove the warps like you were suppose to.

Step five is to *increase* the power setting on successive flights until you can go full power for the same 3-5 seconds motor run. Only when you are flying full *power* for a 5 sec motor run and it looks safe with a bit of right turn under power, then you can slowly *increase* the motor run times until you can go full power for 20-25 seconds. Watch out for any looping over the top *tendencies* towards the end of the motor run, as this indicates a warped wing. This is the *expected* result of a tiny bit of washin in the right main panel.

Step six is to reset the DT so as to get a bit of glide time, about 20 sec of glide is enough to demonstrate a good transition to glide. This short glide time is also a safe way of checking to make certain there really is enough decalage between the wing and tail for a safe recovery. Decalage is the absolute angular *difference between the wing and* stab. *A model of* this size needs a minimum of about one-degree of decalage. One degree is equal to .0175 inch per inch of chord.

Step seven is better trimming of the climb phase. We both know the model is going up like crazy, but it can be improved.

VTO with full power and a 20-sec run. Carefully watch the climb all the way up to the top and watch the transition to glide.

If the model is completing less than three full turns, you should add a shim under the trailing edge of the stabilizer. (.010-. 015 is a reasonable shim for this purpose.). Try it again.

If the model is completing more than 5-6 turns you may want to open this up by putting a shim under the ieading edge of the stabilizer or by increasing *the* downthrust by 1 *degree.* Whether to use the shim or the downthrust is determined by the first 100 feet after the VTO and the type of weather you will be flying in.

In order to VTO consistently in the wind you will need enough downthrust to nose the model over from the 85-90 degree launch position to about a 45-60 degree angle that permits the model to accelerate easily to the best climb speed. If you are not too concerned about VTOs in the wind or if the model is

already nosing over a bit at launch, go ahead and put in the shim.

Fly it again and confirm the result. In the event the model is just flat blasting off the launch pad, that is a pretty good indication you have under proped the *engine* and should experiment with a bit more prop and more pitch in that prop. If s lite you have the model in too low of a gear and the top end is not as fast as it could be. Be careful when changing props, as the faster model will behave differently in the latter stages of the climb.

At this point you should have a model that is doing 5-6 turns and getting about 1000 feet in 20 seconds. If this is not the case with your model you may want to use thrust adjustments to complete the trimming. I sometimes change the side thrust but usually end up removing the shim in the later stages of trimming.

When I go test flying these models I always carry two of the one-degree shims and only one of the two-degree shims. I like to use the plastic shims sold by Ernst Products. I cut them to the size of the 1/8 Al. motor mounting plate and drill holes to match. These shims will then work for thrust adjustment in either direction and by stacking you can get up to four degrees.

Step eight is to trim the glide to go with that great climb. Still using the 20-Second motor run, increase the DT time to about two minutes and watch the transition and glide circle to make certain all is safe. Reduce the motor run to about 5-7 seconds so the model will be low enough for you to actually be able to see the glide. Now remove or add ballast until you have a slow, flat, mushy glide, with a circle of from 200 feet to about 400 feet diameter. You are not allowed to go to any big contest with a glide circle any smaller that 200 feet diameter.

Glide circle diameter control is best accomplished with wing tip weight and, or stab tilt. The problem with stab tilt is that it does change the incidence a tiny bit and *affects -the power* climb you just got finished trimming. The problem with wing tip weight is that you can only use an ounce or so *before* it begins to *affect* the VTO. This is due to having too much mass too far off center from the thrust line and the *CG.* The wing tip weight generally helps the power to glide transition, stall recovery, and thermaiing ability of the model.

If you have a model that*s wants to circle to the left, don't fight it, let it circle left. Forcing an unwelcome glide turn or too tight a glide turn is a major reason for poor glide times with any duration model. There is something wrong with the model that insist on going to the left, but if everything else is perfect, let it go left. If you detect some other problems with the trim you should go back to fixing warps and making certain you actually built it straight.

Good glide trim is very important but it is always a compromise of some sort. A lot of the models I see at contest seem to be trying to glide sideways like a crooked walking dog. It requires considerable *effort* to get a good glide circle. If you want to be a regular contest winner you should learn how to trim your models.

When you have the absolute best glide you can get, add a bit more ballast to the tail and slow the glide down a tiny bit more, remember that drag increases on the cube of the airspeed. The best-trimmed model usually wins the contest.

In Order to fly competitively you need good models, well trimmed, good fuel, good props, good engines, good luck, and contest flying experience picking good air. There is no magic; the thing that makes the big difference is the desire to win....

Decide why you are going to the contest.

The vast majority of Nostalgia flyers have decided they don't need to win to have a good time. Put up a few good flights and set in the shade and talk of the good old days, that's all they need for a successful contest. Some of them appear to be *getting* fat and old at the same time. If you decide you want to win most of the time and be in the top three all of time, you must get your act *together and* be ready to win. You will never be a consistent winner until you are able to go to the contest fully prepared and fully expecting to win. When you are prepared to win you can expect to win.

At this point you need to get serious about trimming those models out perfectly and flying them until you know how, and what to expect every time. You will need to either mix your own fuel or find some one who will mix it for you. You need good props. You need to get a good *TAC* and *I* think the best is the Futaba. You need to work on the engine problem until you have the best engines and you know when they are right. You need a place to test run engines. I have a small motorcycle trailer that 1 mount a test stand on and drive to an empty road by the local dump, not even the cows complain.

The only way to get contest experience is to experience it on a regular basis. This is also where you learn about the good air, bad air thing. Don't ever expect to do any test flying or check it out flying on the day of the contest. You simply must do all that before the contest. You must be able to take the model out of the car. put it together and put up the first official flight of the contest and know its going to be a max. You can not expect to win if you are not ready to win.

The good air. Bad air thing will be with us forever and ever, so learn about it. Experience is the only way you really learn very much about air, but there are some basics you should understand: For every bit of up air there has to be an equal amount of down air or sideways air. Don't fly in down air. Down air can be as bad as 500 feet per min, which means even the best model will be back on the ground in a little over 2 min. Strong up air can be even worse because not only do you go out of sight in 2-3 min, you also have a major problem finding the model. Don't fly into trash mover type thermals.

These Spacers glide well and thermal *better* than most other models. You must be careful about launching into any strong thermals. Watch the other models and judge the thermal *before* you launch. These Spacers get a lot altitude on the motor run and will occasionally go out of sight overhead in less than 5 min. A few years ago one of my 200 inch Spacers went out of sight in 2 min. 13 sec on my first official flight of the contest. I was out of the contest and ready to go home by 8:30 AM that day. I had a 3-hour drive home to think about stupid thermals and blind timers.

In calm weather, sideways moving air means there is a serious thermal in the area, so pay attention. These Spacers get so high that you are seldom able to place the model into the thermal you feel at ground level, but look around you and if it is a large thermal, go for it. Be careful, if it was only a small sized thermal that already passed through, there is always the danger of going up into the hole of down air behind the thermal. Experience counts, watch what the other guys do, especially the local guys.

In windy weather about the only thing you can go by is the gust and the time *between* gust, but remember that you model is going to be about 1000 feet from where you are *feeling* the gust. The good news is that gust usually mean things are changing and the wind is going to die down or maybe get much worse and blow the contest out. You must decide to either fly right now or chance it by waiting for the clam, I always waited, Taibi never waited, Taibi usually won. In the contest where the wind did calm down I really cleaned up properly. The Internet has some good weather maps. Check them out before you go flying each and every time so you can gain experience with these maps.

In any kind of weather the very best indication of up-down air *Is* the other modeis in the air.

Now we come to the real reason these Spacers are *better* than most of the other Nostalgia designs

Generally speaking in most parts of the world, early morning air is very stable with little up or down air. The air is normally quite buoyant until the sun starts the convection heating of the earth. The air is ideal for your Spacer, nothing to lose and much to gain. You can fly early when you are confident that you model can easily make the maxes with out a thermal. Fly early and fly often, make as many official flights as possible before the thermals break out.

The early thermals are generally mild and of a very large size at ground level. By *watching your altitude and flight times you can judge the thermal conditions and know when to become very cautious about picking air.*

Within a year you will be a serious threat in any contest. Within two years you should be winning or within the first three places at every contest you get ready for.

You must hold yourself accountable for the results of your efforts or lack of effort.

We are also providing Spacer plans in the following sizes for Nostalgia gas contest.

145so. in. for Cox Tee Dee .020 engines 2OOsq. in. for .O49-.O51 engines
435 sq. in. for .15 engines
SOOsq. in. for .19-.2O1-.23 engines
6OOsq. in. for .29-.3S engines
125Osq. in. for .60 engines.