Mr. Mulligan

SIGF23 CLASSIC SERIES

BUILDING AND FLYING INSTRUCTIONS

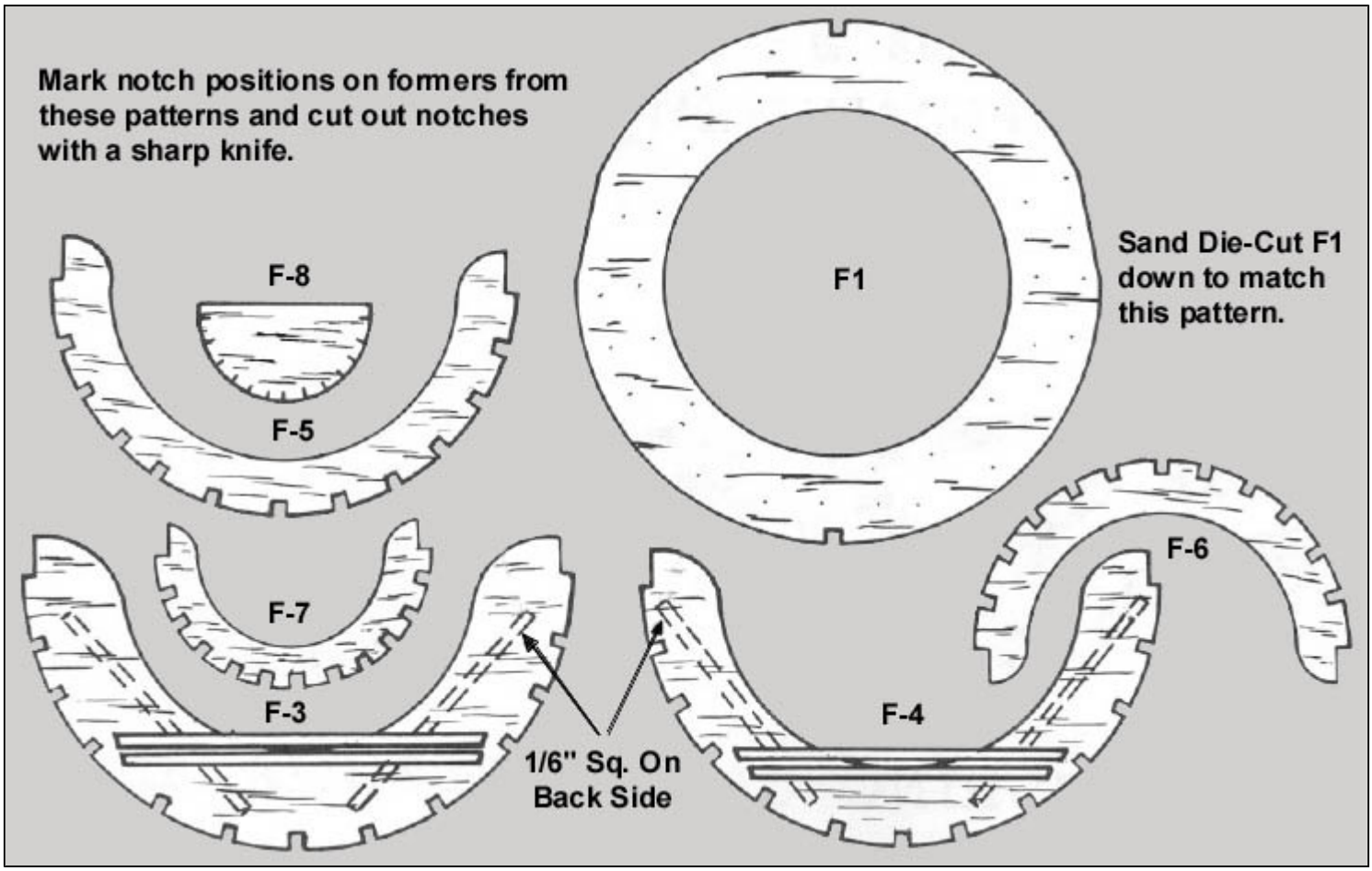
General Notes

Mr. Mulligan is both an accurate scale model and a high performance flying model. Its lightness contributes to its durability, since a light model flies slower and if it hits something it does so with less force.

The real Mr. Mulligan was a very successful and unusual racing airplane. It was built in 1934 by Ben Howard. In 1935 it won both the Bendix Trophy race and the Thompson Trophy race. What made the aircraft so different was that it could carry four people and luggage yet beat the special purpose single place racing planes of the time. It was also faster than the best Army Air Corps fighters of its day. In 1936 it lost a propeller blade during the Bendix race and crashed in the mountains of New Mexico. The remains were recovered by an airline pilot in 1972. Construction of the model is generally conventional but there are a few unusual features to make it easier to build and stronger. Please read these instructions carefully so that you do not overlook the unique features and make time consuming errors. Figure A shows the uncovered structure. Begin by building the fuselage, wing or tail first as preferred.

Fuselage

- The sides of the fuselage are built separately, directly over the plan. Pin the 1/16" sheet side pieces to the plan, making sure you have the proper one on the correct side as they differ slightly around the windows. Add the 1/16" square side outlines and the rest of the 1/16" square pieces and stringers. Note that the uprights are not added until the sides are completed and removed from the plans. They go on the side that was next to the plans - on the inside of the fuselage. This makes the covering smoother.



- Join the two sides at the tail at F19. Then cement in F-l between the sides at the front. Note that the sides aren't square in the front, forward of F-3. Be particularly careful that everything is aligned properly at this point so you'll have a straight fuselage. Beginning at F-2T and F -2B start installing cross pieces and formers. Small rubber bands will be helpful for holding the sides against the formers during this operation . Be sure to add 1/16" square strips to F-3 and F-4 as shown for the landing gear mounting. Note: cross pieces on the fuselage top behind the wing are installed 1/16" below the top surface so that the 1/16" square stringers on the fuselage top will be flush with the surface when they are installed after attaching the wings to the fuselage.
- Bend the landing gear flat over the pattern on the plan. Then bend to the shape seen in the front view of the airplane. Cement the landing gear into the slots made by the 1/16" square pieces added to F-3 and F-4. Bend axle wire over the pattern seen in the front view of the airplane. Attach it to the landing gear with solder or bind with thread and epoxy to the landing gear.
- Notches in the formers for the stringers can be easily made by cementing a 1/16" wide strip of sandpaper to a piece of 1/16" scrap balsa and sanding out the notches. Glue the 1/16" square bottom stringers in place.
- Now cover the front portions of the fuselage with 1/32" sheet. Neatness is essential so take your time in making sure the sheets fit well. Patterns are shown on the plan for the sheets between F-l and F-2T and F -2B. The sheet covering between F-2B and F-3 is a straight wrap and doesn't require a pattern. Bevel the edge of the planking where it passes over F -3 so that the covering will blend onto the bottom stringers neatly.
- Add the tail wheel housing parts and sand to shape. Sand all the rough edges and round the corners at the nose slightly. It is a good idea to scallop the formers between the stringers with a rounded piece of sandpaper. This keeps the tissue from contacting the formers and makes for a smoother covering job.

Cowling

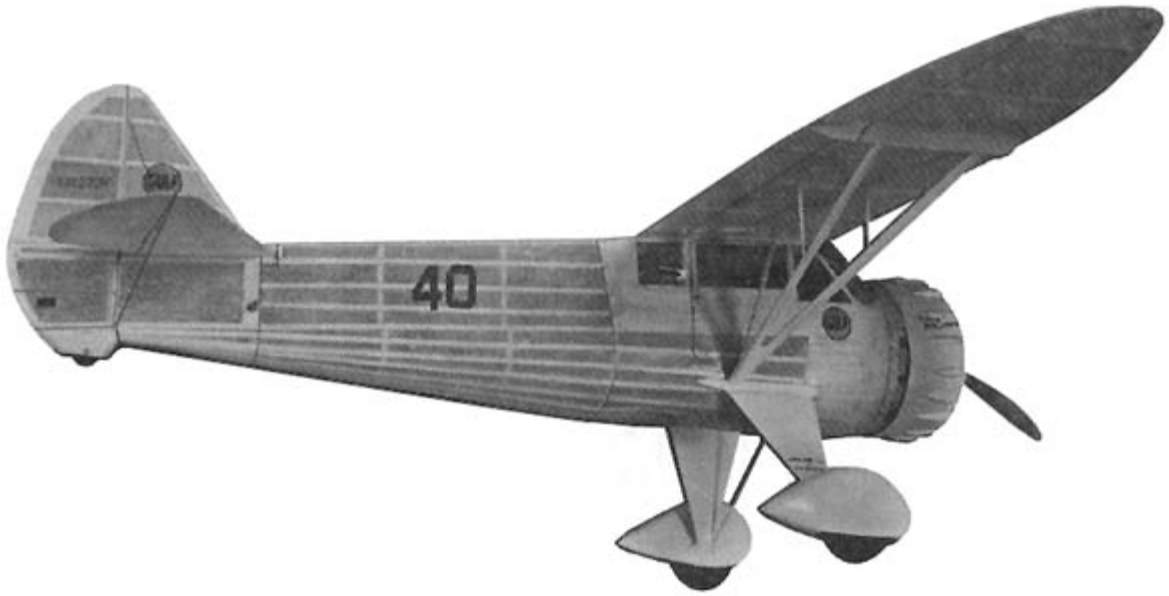
- Examine the Cowling detail on the plan. Now carefully cut four 3/32"x1/4" pieces to the length seen in the dotted lines on the side view. Cement these parts to C-3 and then add one C-2. Cement on the other C-2 with the grain running crosswise to the first C-2, making sure the square hole in the center lines up.
- Add C-l pieces, also crossing the grain for strength. When dry, cover with 1/32" sheet, lapping over both C-2s to allow sanding room. Note that the covering extends 3/32" beyond C-3. Sand the front round. The rocker arm covers, made from scrap balsa, aren't essential but add a great deal to the appearance.
- Paint the cowl with sanding sealer or a sealer made of a teaspoon of talcum powder in one ounce of clear dope. Apply two or three coats of sealer, sanding between coats. Then paint outside of the cowling with white dope. The inside of the cowling front is black. Dummy cylinders can be added as indicated on the plan.

Wing

- Build the center section over the plan, holding parts in place with pins until after the wing is completely assembled. The center section leading edge is 3/32"x3/16". A piece of 1/16" square is glued between the center section ribs and flush with their top surface to provide a place to cement on the three top fuselage stringers (see top view of fuselage on plan) after the completed wing is glued to the fuselage. The gussets hold the center section trailing edge in place until the outer panels are added.
- Pre-assemble parts W-l, W-2, and W-3 into complete wing tips and remove them from the plan when dry. Cut two spars to shape from 3/32"x3/16" balsa strip, using the pattern of the spar on the plan. Pin the spar in place on the wing plan. Add the leading and trailing edges. Fit W-5 ribs in place over the spar and against the leading and trailing edges. Trim where necessary for perfect fit. Glue in place. Add the pre-assembled wing tips, cracking them at the break point indicated on the plans and incorporating the required 5/32" of tip dihedral.
- The spar, and the leading and trailing edges all rest against the center section but are not glued to it.
- When the wing panels are dry, loosen them from the plastic protecting your plans and lift them away from the center section, leaving it still pinned firmly in place.
- While the panels are off the work bench, round the leading edges with a sandpaper block and do any other necessary touch-up work with glue and sandpaper.
- Now the wing panels are ready to be attached to the center section. White glue is recommended for this job. Put small dabs of glue on the parts of the wing panel that will contact the center section. Then put the wing panel back in place over the plan.
- Lift up the tip of the wing panel and slide a 1/4" sq. piece of scrap balsa up to the outer W-5 ribs on each panel. (See wing spar drawing for dihedral details). Be sure that the inner end of the wing fits neatly against the center section. Don't use pins or heavy weights to hold it in place - they might cause a permanent twist in the wing.
- When all joints have had plenty of time to dry, the wing can be removed from the work bench.
- Taper the leading edge of the center section and the wing is ready for covering.
- Make the wing struts directly on the plan. When they are dry, round the edges and finish them in the same way as the cowling.

Tail Surfaces

The stabilizer and fin are made over the plan much in the same manner as the fuselage sides. When dry, remove them and sand the edges to make a streamlined shape.



Covering And Assembly

It's important to follow this sequence to avoid time consuming mistakes. First cover the wing except for the center section, the tail surfaces, and the fuselage sides and bottom. Also cover the fuselage from F2T to F1. Covering should be an unhurried job. The tissue grain should run lengthwise in the area being covered. Tissue doesn't go around compound curves well so use several pieces in areas such as the fuselage bottom. Cement tissue with clear dope to the outline of the area you're covering, not to every rib or stringer.

The fuselage side windows can be installed before or after covering the fuselage with tissue. A more professional looking job results when they are installed before covering but more care must be taken in cutting the tissue to fit around the windows.

Where a part must be glued during assembly to an area that has been covered with tissue, trim away the tissue so that there is wood-to-wood contact in the joint. Glue wing and tail on lightly at several spots only so that the joints will separate in a hard landing without damaging the structure.

You can now cement the wing to the fuselage. After the wing is installed the top three fuselage stringers are added. Paint the area behind the windshield gray and add the instrument panel. Install the windshield struts which are also painted gray. You can make gray by mixing a little black in some white paint. Now cut out the plastic windshield and carefully try it for fit. Trim where necessary. Use a small amount of Sig-Ment or Contact Cement to attach. Extreme care should be exercised to keep cement from blemishing the windshield. You can now finish covering the wing center section and top of the fuselage. Next install the tail surfaces. After the stabilizer is cemented into its slot in the fuselage cover the open part of the slot with a small piece of tissue. Be sure that the tail looks straight with the wing when sighting from the front of the airplane.

Spray the tissue with a light coat of water. A sprayer from a window cleaner or a liquid household cleanser works well. This will tighten the tissue. When dry give the airplane a single coat of clear dope.

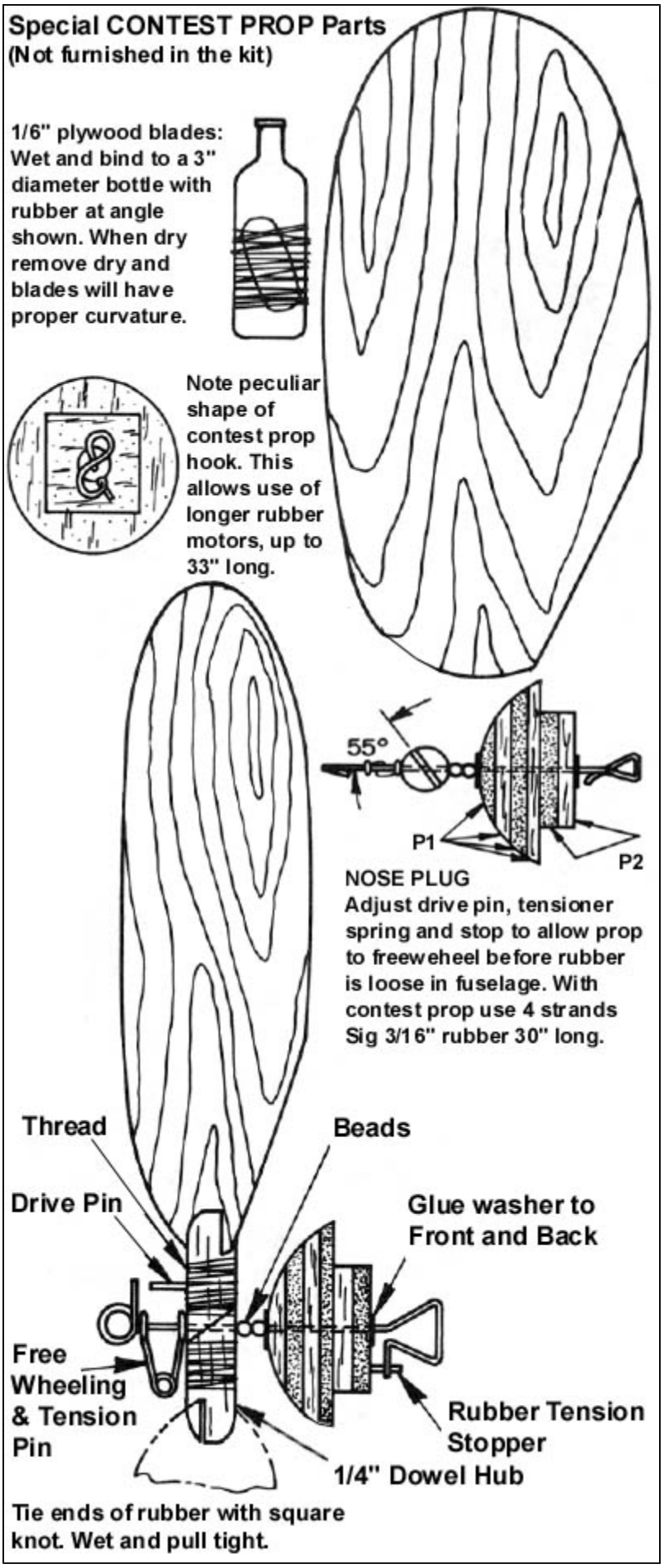
It is likely that some warps will appear and these are easily removed by twisting the warped surface opposite from the warp while holding over the spout of a steaming tea kettle. Wear gloves as steam can give nasty burns.

Add strut attach fitting to underside of the wings. Trim struts to proper length and install. The struts will prevent further warping of the inboard part of the wing, but if the wing is warped before you install the struts it will be impossible to remove the warp without first taking off the strut.

Cement the cowl in place on front of fuselage. Add the landing gear strut fairings, wheels and wheel pants. The fairings and pants are painted after installation.

To make a more attractive model vou can add outlines of the control surfaces, doors, lights, etc. This can be done with India ink and a drafting pen or with thin strips of black tissue. When the markings are done apply another coat of clear dope to the tissue covered areas. Now add the decals to the places shown on the plan. Refer to the pictures of the model for additional help on decal location. Exhaust stacks can be made from paper tubes painted gray. The rigging on the tail is made of gray thread.

The nose plug is made of laminated parts P1 and P2. When cementing them together make sure the grain runs in opposite directions on alternate pieces. The hole through the center can be made with a 1/16" drill or a large needle. Round the front of the plug with sandpaper. Cement the eyelets in place, preferably with epoxy glue. Finish the nose plug in the same manner as the cowl and paint gray or dark blue. Install propeller hook, bead, and plastic propeller.



Tie a square knot in the rubber to make a loop. It's best to lubricate it with Sig Rubber Lube. The rubber is installed through the opening in the cowl and held in back with a 1/16" dowel.

Contest Tips

The Mr. Mulligan has had considerable success in contests, winning first place in the 1972 National Model Airplane Championships. Academy of Model Aeronautics rules require that you prove that your model is an accurate reproduction. "Proof of Scale" must include a three-view drawing of the real airplane and photographs. The April, 1972, issue of "Wings" magazine has excellent photos. A three-view and photos can be found in "The Golden Age of Air Racing", available for $4.00 from the Experimental Aircraft Association in Hales Corners, Wise. An excellent three.view of Mr. Mulligan is available from. Hal Osborne, 1932 Conejo Lane, Fullerton, California, for $2.50.

A small three-view of Mr. Mulligan appears in the book "The National Air Racers in 3-Views 1929-1949" by Charles A. Mendenhall, available from The Diane Publishing Co., Box 2726, Rochester, New York, N. Y. 14626. Photos of Mr. Mulligan, taken at different times show differences in markings. Some photos show "40" on both sides of the fuselage but not on the wing tips. Later pictures show "40" also on the upper left and lower right wing tips.

The plastic propeller provided in the kit is for general sport flying purposes. For contest use the special hand made propeller (parts not furnished) will give extra performance for experienced modelers. (See previous diagram) The propeller hook may be unfamiliar. It is designed to prevent the rubber from "climbing" the prop shaft and allows the use of rubber motors up to 33 inches long. The model depends on a long motor run for its endurance. Typically it will fly fifty seconds fully wound. The glide with the contest propeller is poor due to the drag of the wide blades. This has not detracted from the model's winning ways, however.

Modifications

By adding a small plywood firewall to C2 the Mr. Mulligan will be quite well suited to the Brown Co2 motor. Mr. Muligan can be adapted to indoor scale by building a lighter structure. Reduce the size of the stringers to 1/32"x1/16". Make the wing spar of 1/32"x1/16". Use only the lightest indoor wood. Use only one coat of clear dope or two coats thinned 50% with thinner. The contest prop should be used but without free-wheeling and with 1/32" plywood blades. The rubber size should be reduced and adjusted to the height of the ceiling under which you are flying.

Decals

Dip the decals in water for a few seconds, remove and allow the moisture to soak into the backing to completely loosen the glue. Don't slide the decal off too soon or it may tear. Slide about 1/4" of decal at the bottom over the edge of the backing and align on the surface. Hold the decal and carefully slide away the backing from underneath. Use a small paddle of 1/8" sheet balsa about 3/8" wide as a squeegee to remove excess water from under the decal. Hold down one edge with a similar paddle while squeegeeing to prevent the decal from being moved. Allow plenty of time for the glue under the decal to dry before wiping away the excess glue remaining on the surface of the model with a damp cloth.

The decals are fuel proof with most fuels but will dissolve in dope or cement. Do not try to dope over the decals. Some types of clear fuel proofer may be used over the decals to increase durability but test them in advance before applying.

FLYING YOUR SIG CLASSIC

Now you are ready to fly your plane, and FLYING is what the Sig Classic models are designed for. Most models as realistic looking as your Classic make poor flyers. They're often tricky to adjust and clumsy in the air. But Sig's Classic kits give you three important features that assure you of successful flights:

1. A PROVEN flyable design.
2. A reliable way to make flight adjustments.
3. Complete flying instructions.

Read and follow these instructions carefully. They are the key to satisfying flying.

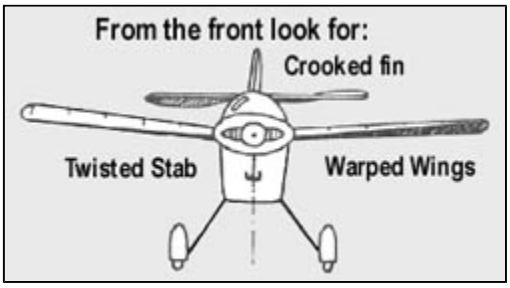
Testing And Adjusting

You have invested a lot of time and effort in building your model, don't waste it all now with careless testing. Most models fail to fly because of poor adjustment, not poor craftsmanship. Be as careful in your testing as you were in your building.

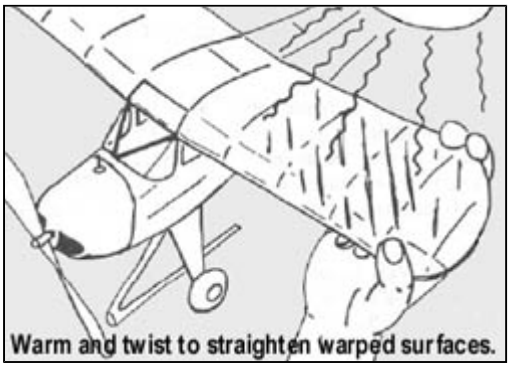
Every model is a little different and needs its own special set of adjustments. Contest winning flyers make dozens, even hundreds, of test flights "trimming" a model for best performance. So don't give up if your first flights aren't perfect.

Preflight Preparations

Before you leave the workshop for the flying field, take these important steps.



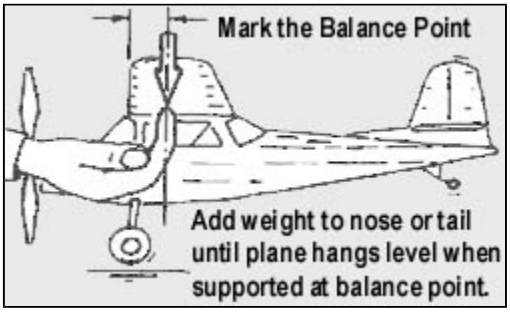
Looking from the front of the model, check that the bottom of the wing and tail surfaces are flat - not twisted. Sight down the center line of the fuselage as shown in the drawing. Right and left wing should look alike; you shouldn't see the top of one wing and the bottom of the other. The fin should point straight ahead, and the stabilizer should be flat. (This does not mean that the stabilizer and the wing sit on the fuselage at the same angle. The wing will be tilted upward more than the tail).



A model can be made to fly with twisted surfaces, but it's confusing to adjust and if the warps change from day to day, you can't detect it. The drawing shows how a surface can be straightened by twisting it in the desired direction while holding it under a heat lamp or other electric heater. Work with it until it is as flat as possible. If your wing has struts, loosen them before bending and re-cement them afterward.

The correct "Balance Point" for your ship is shown on the plans. Mark this point on the bottom surface of each wing. When supporting your plane on your finger tips at these points, the fuselage should hang level. See the drawing. Add weight to the nose or tail until it DOES hang level. Don't be afraid to add the necessary weight. CORRECT BALANCE IS MORE IMPORTANT THAN LIGHT WEIGHT.

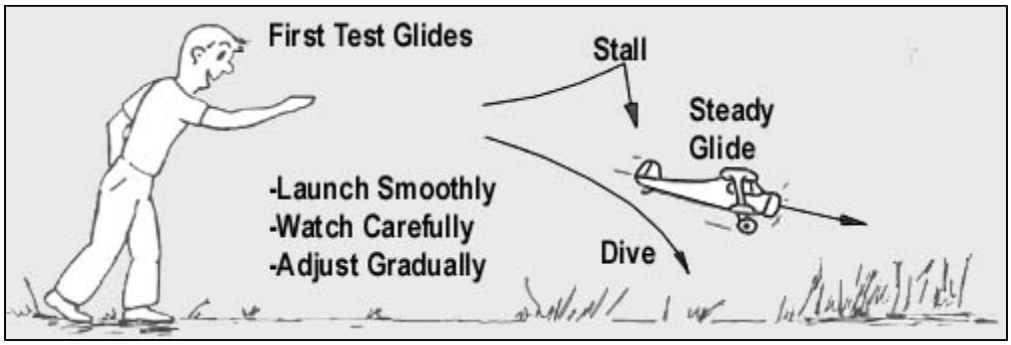
Modeling clay makes handy balancing weight - it can be pressed permanently in any corner. Wire solder or BB shot can be used by cementing in place.



If one blade of your propeller always swings to the bottom, a tiny smear of clay on the other tip will improve the prop's balance and reduce vibration.

Power-Off Tests

A rubber-powered model is adjusted in two steps. First, the tail surfaces are adjusted to produce a good glide. Then the propeller assembly is adjusted to give a smooth, powered flight. Wait for a calm day.

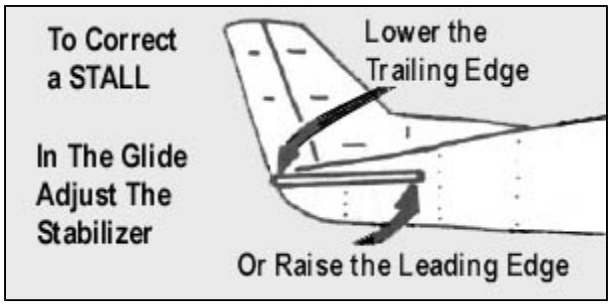


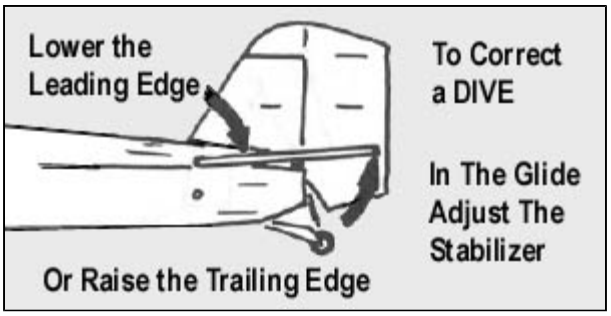
Begin by gliding the model from your hand into a patch of tall grass. Grasp the ship by the fuselage near the balance point, and aim the nose at a spot on the ground about twenty feet in front of you. Launch the ship forward about the way you would a paper dart airplane, nose down.

Your goal is a steady glide to the ground, moving at a CONSTANT SPEED, and travelling straight ahead or turning gently. You will find the trick is to launch the model at its natural speed and glide angle. If the glide is poor, it can mean that the ship needs adjustment or that you need more launching practice. So try several launches before deciding on adjustment changes. When your ship acts the same way on each launch, you can be pretty sure that you are seeing its true characteristics, and not just a poor launch.

Stalling

If your plane noses up, LOSES SPEED, and then falls clumsily or dives, that is a STALL. To cure a stall, adjust the angle of the stabilizer by changing the thickness of the incidence block under it. Lower the front edge or raise the rear edge. See drawing. But make SMALL changes - 1/32" at a time. If a change of more than 1/16" is needed, go back and perform the Preflight checks again. It's likely your Classic is incorrectly balanced (tail-heavy) or the surfaces are warped.





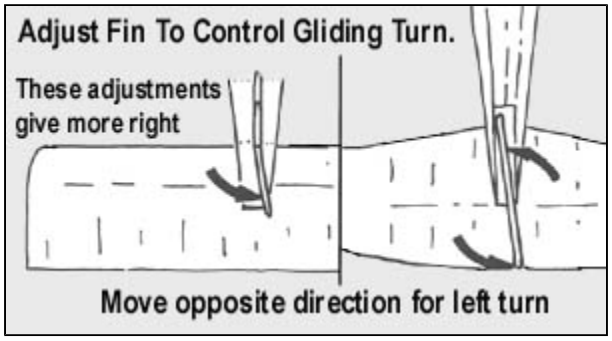
Diving

A model that darts quickly into the ground without swooping or stalling, is diving. The dive can be cured by adjusting the stabilizer in the direction shown in figure 5 (in 1/32" steps). Here again, don't change the height of the incidence block more than 1/16" without first re-checking the Pre-flight steps. Warps or nose-heaviness may be causing the dive.

Turning

A plane that glides in a straight line takes a lot of flying space and a lot of chasing, so it's best to adjust the glide for a slight turn. The plans for your model will tell which direction.

The size and direction of the glide circle can be controlled by adjusting the fin. The drawing shows adjustment for a right turn. Moving the fin opposite, of course, gives left turn.



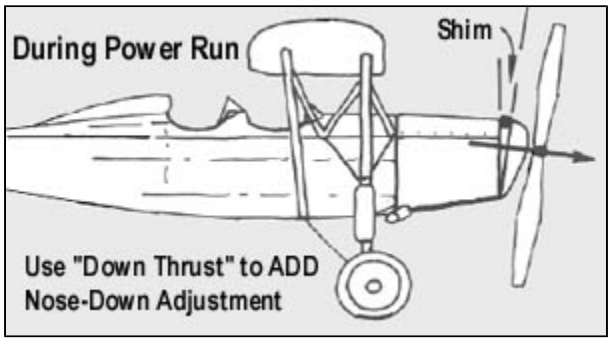
Small changes in fin setting can be made by bending the surface. But if more than 1/32" or so of change is required, cut the fin loose and re-cement it at the desired angle. When the glide is smooth and steady, you are ready to go on to powered tests.

Power-On Flight

ALL ADJUSTMENTS TO THE "WOUND UP" PART OF THE FLIGHT ARE MADE BY POINTING THE PROPELLER AND NOSEBLOCK IN THE DIRECTION YOU WANT THE PLANE TO GO. This kind of adjustment affects only the powered flight, and will not upset the glide pattern you have developed.

Now - wind the propeller l-50 turns and launch your Classic into the wind with the same motion you used in glide testing. The model should cruise steadily forward, turning in the desired direction, and gaining or loosing altitude gently.

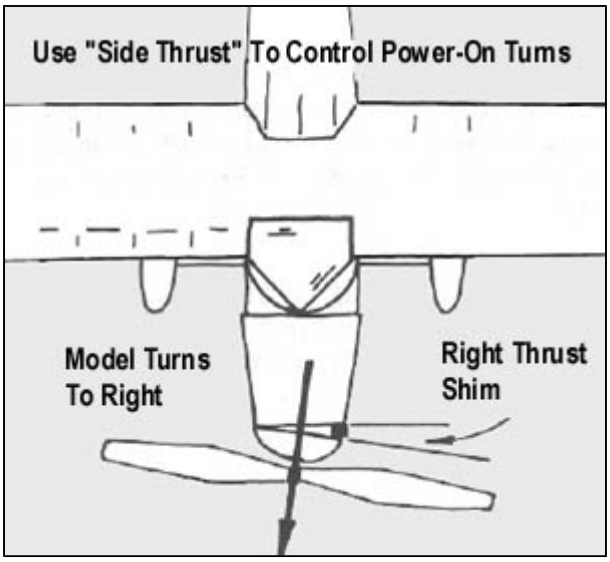
If your ship tries to climb, but loses speed and stalls, point the propeller downward by slipping a scrap of 1/32" balsa or a paper book match between the top of the noseblock and the front of the fuselage. The wedge is called a "shim" and the adjustment is called "downthrust". Downthrust is illustrated in the drawing.



It's not likely that your plane will dive on first power flights, but if it should, put the shim at the bottom of the noseblock, tipping the propeller upward (upthrust).

Downthrust is the "magic adjustment" that can make experts out of beginners. Learning to use it is the most important part of your test program.

Increase or decrease the amount of downthrust (by changing the thickness of the shim behind the noseblock) until power flights are smooth and free of stalling with 150 winds in the motor. Don't wind the motor any tighter until the lower-powered flights are under control.



Power-On Turns

Because of the effects of the rotating propeller, models usually turn better in one direction than the other. Your plans will say which way to circle.

Don't circle any tighter than necessary. Circles smaller than about 50 ft. diameter are tricky. If you have plenty of flying space, turns can be as large as you like.

The drawing shows how side thrust is used to control power-on turning. Making small changes, 1/32 at a time, adjust downthrust and sidethrust together to produce smooth flights on 150 winds.

You may notice that turning to the right tends to hold the nose down-right thrust acting a little like downthrust. If your plane begins to circle so sharply that it loses altitude in a steep bank, reduce the amount of sidethrust until the turn opens up to a safer size.

Longer, Higher Flights

When your Classic is flying smoothly with 150 turns in the motor, wind to 175 and try it. Make any necessary noseblock adjustments, and then wind to 200, and so on. The safe number of turns that your motor will stand is shown below.

Rubber Motor Winding Chart								
Length of Loop 1/4"		10	11	12	13	14	15	16
Safe Number of Turns	Hand Wound	180	200	220	235	250	270	290
	Stretch Wound	440	485	525	570	615	660	700

A plane's weight determines how much power it needs. If your ship is huskier than average, it may not climb, even when fully wound. In that case, add one strand (not a complete loop) of 1/8" Sig rubber to the motor. Tie an eye (like a slip knot) in each end. This will provide the extra horse power needed for higher climb.

Whenever you add rubber, re-balance your model as outlined in the pre-flight instructions. Additional rubber tends to make a plane tail heavy.

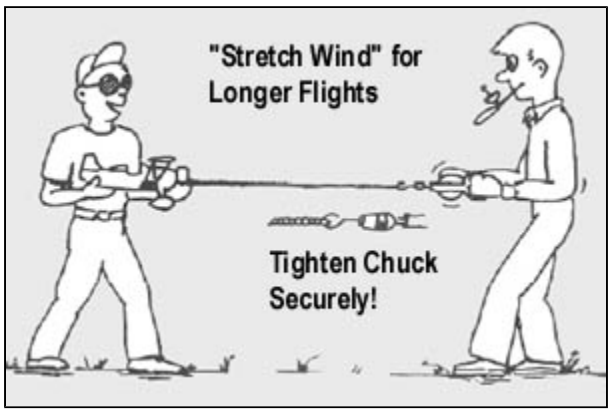
Take-Offs

When your Classic has been adjusted according to instructions, it should have no trouble taking off by itself from a smooth surface. No adjustment changes should be necessary. You may find that take-offs are better if you release the ship pointed at a slight angle to the wind instead of headed straight into it. Experiment to find the best system.

Rubber Motor Hints

The rubber motor in your Classic kit will safely give you a whole season of flying if you stick to the chart. "Hand Wound" means winding the propeller with your finger while the rubber is inside of the fuselage. "Stretch winding" is a more complicated two-man operation, but gives longer flights.

Before a motor can be safely stretch wound, it must be lubricated. Rub a few drops of Sig Rubber lubricant into the rubber (AFTER the knot has been securely tied). Use just enough to make the motor barely damp. If it's too juicy, it will splatter all over the inside of the fuselage. Next, make a strong wire hook, like a teacup hook, and lock it VERY TIGHTLY in the chuck of a hand drill.

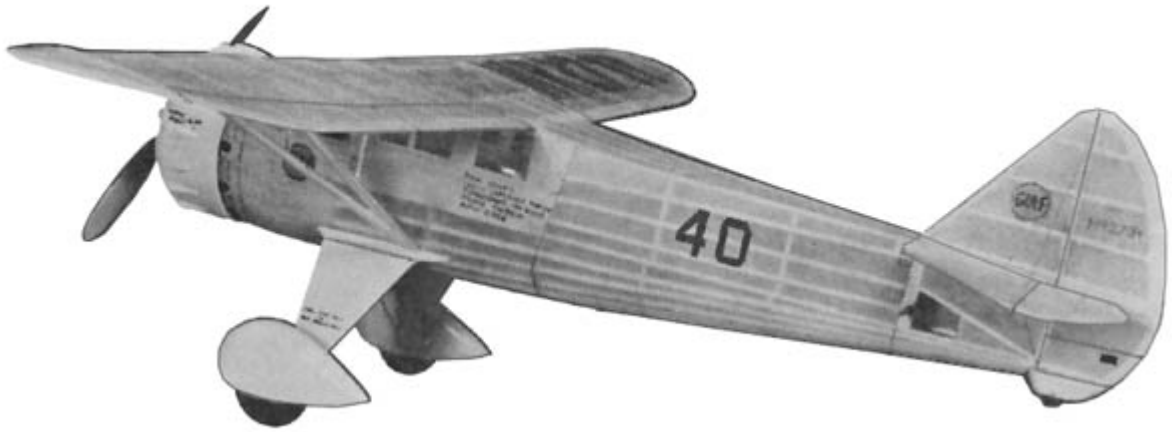


Then, while your helper holds the model by the rear rubber peg and the cowling, stretch the motor out the front of the model to about twice its normal length, unhook the propeller, hook up the winder, and wind while slowly walking back toward the plane.

All the models in Sig's Classic series have been carefully designed and flight tested to assure flying ability. Hand wound, you can expect flights of 10 to 25 seconds and stretch wound, 20 to 50 seconds. Like model builders, some of the designs have more ability than others, but all are proven dependable flyers.

A Classic flying model is not a ready-to-fly toy. Your skill in building and flying DOES make a difference. So whether your flights are short or long, you can be proud of completing a job which was successful because of your own effort and ability.

Good Flying!



SIG MFG. CO., INC. is totally committed to your success in both assembling and flying the Mr Mulligan. Should you encounter any problem building this kit or discover any missing or damaged parts, please feel free to contact us by mail or telephone.

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