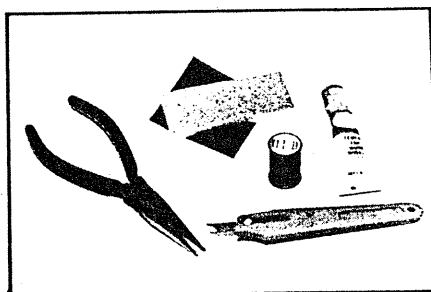


This is the first in a series of articles for the beginning modeler. The author is Bill Warner. He has been a modeler for fifty years and has helped hundreds of kids get into the air, most of them right-side-up. Future articles will deal with how to build stick-and-tissue models, how to make 'em fly, and a bit of the "why" behind it all. When you finish the series about this time next year, you'll be building models that can and will win contests! Maybe you can use this series to get the kid next door building. The techniques Bill will be giving you are the same ones he uses in his Aeronautics Education classes at Paul Revere Junior High in Los Angeles.

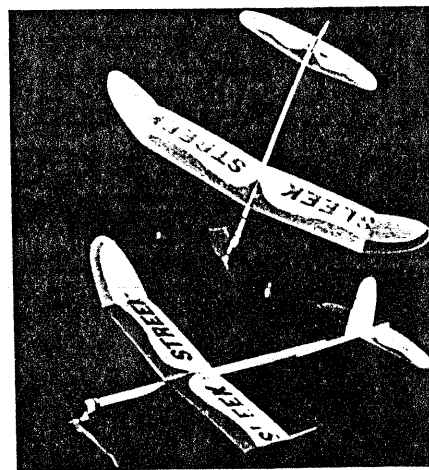
- My first miniature airplane was a silk-covered, windup, made-in-Japan model that refused to fly, but which made a great fire when I put a match to it. My grandmother had bought it for me with the assurance that it was, "... ready to fly!" Well, it wasn't, and not much has changed since that fateful day in 1937. Millions of kids buy little balsa "B.A.R.F." R.O.G. (rise-off-ground) models and later blame themselves when they crash again and again. Soon, they go on their way to other things, leaving a trail of broken balsa bits behind them. So what's wrong? They need someone to help them over the rough spots and give them a basic course in making 'em and



Materials needed for Sleek Streak hop-up: pliers, knife, sanding block, thread, pin, and cellulose cement.

making 'em fly! That's what we're going to try to do for you kids from nine to ninety. . . share fifty years worth of painfully-gotten knowledge. If your head is in the clouds and you can't seem to get your butt off the ground, read on!

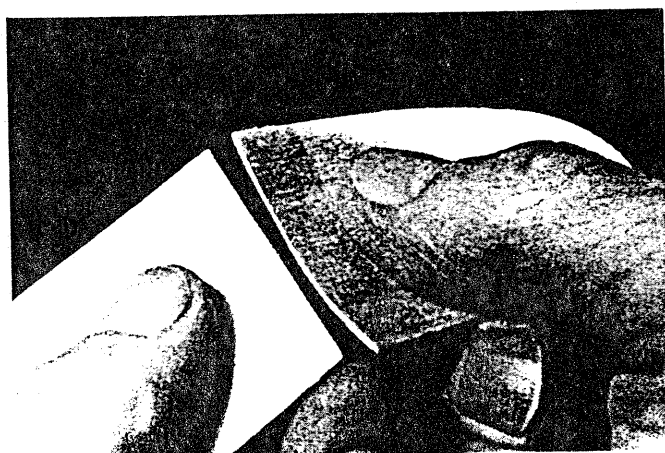
To begin with, those little B.A.R.F.s you buy at the corner drugstore are seldom more than a toy item designed by a good modeler and then messed up by companies who cut corners to make a buck. After they are relieved of some excess weight, given a decent motor, and hopped-up here and there, they fly pretty darned well. About half an hour ago my test pilot, Kris Samonas, age 10, put a stretched version on top of a two-story building after a flight of about a minute from a beach parking lot here in Santa Monica. That is not an un-



Upper model is sport version for R.O.G. (Rise Off Ground). Lower version is for high performance: no landing gear, and has four inches added to fuselage.

usual flight, and when there are thermals out, flights of several minutes are fairly common. I picked this model to start this beginners' series for just this reason. It flies well, and it can teach you a lot about how any model flies. It can be repaired easier than tissue-covered models, and if you lose one or two in a morning's flying, you aren't out a great deal of money for the fun you had. In my many years of teaching classes in modeling and sponsoring model clubs, I have seen a couple thousand Sleek Streaks made and flown in various degrees of modification with more success than any other model I can think of, except the late JASCO X-18.

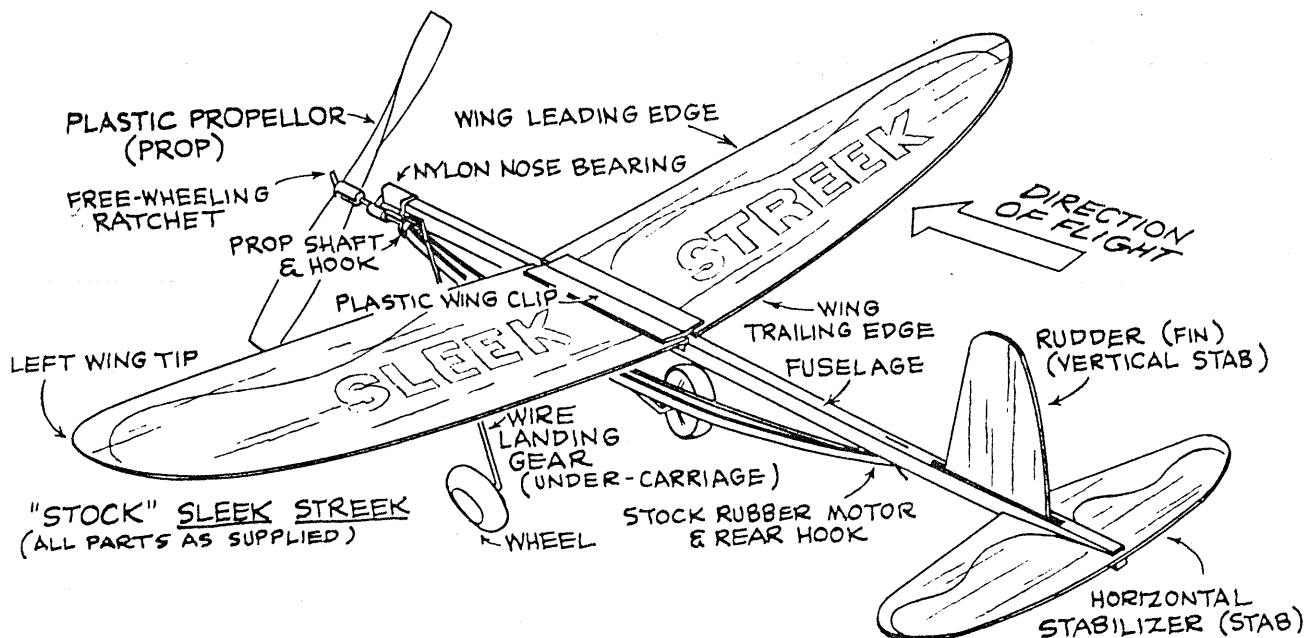
Bob Peck of Peck Polymers has agreed to add Sleek Streaks to his line of model kits, plans, and supplies for those of you who can't find 'em at your neighborhood drugstore. He will send you a sheet with all the models and materials that we will be using in this series from rubber strip to peanut scale model. I have decided to use Peck models in this attempt to get you started for the simple reason that many of you do not live near a good hobby shop, and, besides that, they fly great! Send Bob a self-addressed, stamped envelope for a price list of all the models and stuff we'll be using in future articles. Send to: PECK POLYMERS/ Beginners, P.O. Box 2498, La Mesa, California 92041.



Join wing parts like this to keep the wing cambered. Do not flatten it out on the table!



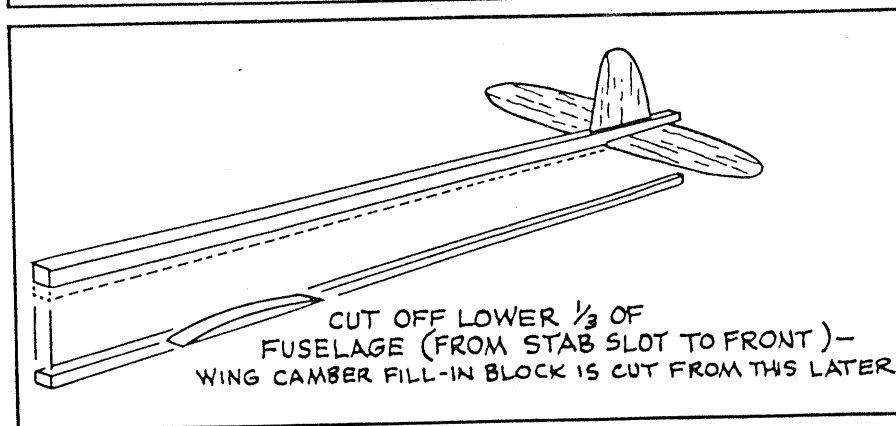
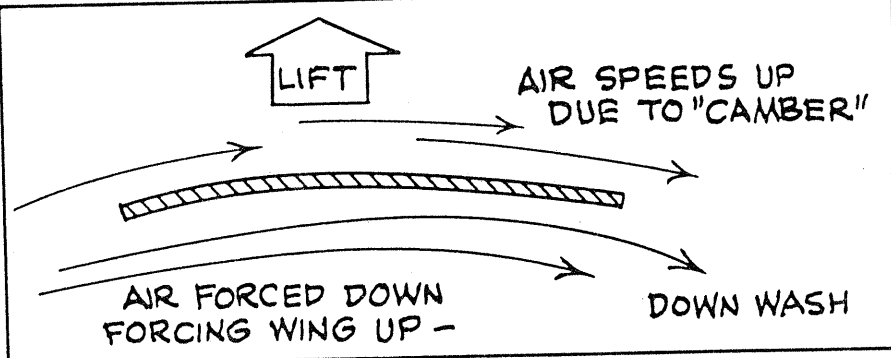
A 'V' between thumb and first finger leaves thin line of cement on the edge of the joint, and wipes off extra glue.



MODIFYING THE SLEEK STREEK

To start with, you should realize that the wing gives the model its "lift." The top of the wing is "cambered" (curved) so as to speed up the flow of air on the top surface of the wing. This makes the air pressure lower there. The "undercambered" lower surface of the wing helps create higher pressure under the wing as a result of forcing the air downward (downwash) at the trailing edge. The leading edge of the wing will be kept a little higher than the trailing edge while the model is flying (this angle is called the "angle of attack" or "alpha"—about five or six degrees in most cases) by the action of the horizontal stabilizer. About 200 years ago, a Swiss physicist named Bernoulli found that when you moved a fluid over a surface, it lowered the pressure on the surface. That's why most wings have curved or cambered top surfaces—to force the air to speed up. If we keep our wing nicely cambered, it will lift more than a flat wing. Guess why the first thing we throw away is the heavy plastic wing clip that flattens the part of the wing nearest the fuselage? It also saves weight, which makes it easier for the wing to lift the model.

Continuing our crusade against weight, take a pair of pliers and straighten out the curved part of the staple which holds the rear of the rubber band motor. Shove it out and throw it away. A bent pin will work much better. Now try and dent the balsa fuselage with your thumbnail. Do it under the slot where the "stab" goes, as this will get cut away soon. If it is easy to dent, only cut off the lower one-third of the fuselage material to lighten it up. If it's hard to dent, you can probably cut off the lower half of the fuselage and still have enough strength. You have to balance your need for lightness with your need for strength. Cautions: Save part of what you cut off for the "fill-in camber block" (if you find this too difficult, you can make the camber block from a piece of scrap balsa), and also leave the top part of the stab slot so you can glue the stab to it

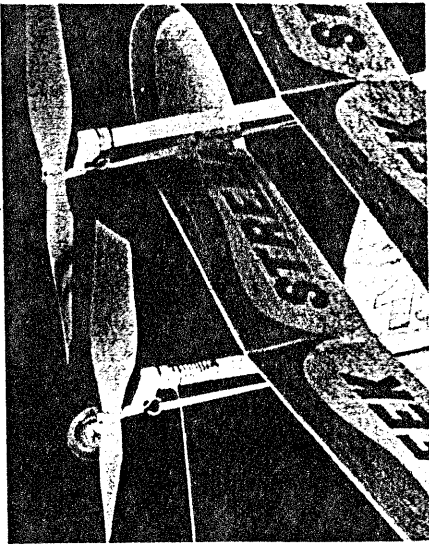


and keep the angle correct, even though the bottom half of the slot has been cut away. This angle is terribly important because it controls the angle of attack of the wing. Too little or no angle, and you don't get much lift!

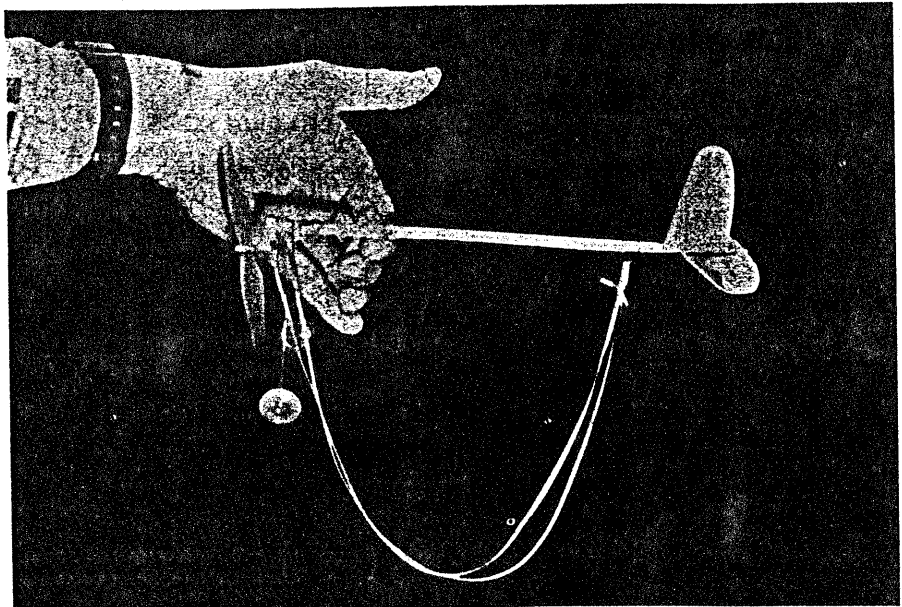
Cut a chunk out of the nylon nose bearing and glue it to the fuselage with cellulose glue such as Testors "Green tube" (fast-drying) or Duco cement. For youngsters building without adult supervision, I advise against the use of "instant glues." Bind with a few winds of thread and rub glue into the thread to hold it. Make a bent pin for the rear rubber motor hook and glue and bind it the same way. Now you have clearance and more for your longer, weaker, and

longer-running rubber motor (an 18-inch loop of 1/8-inch Sig rubber or 3/32-inch FAI rubber which can be mail-ordered if your hobby shop is out).

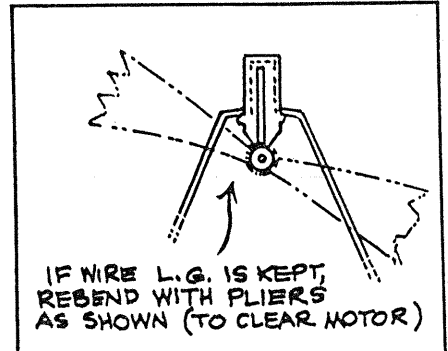
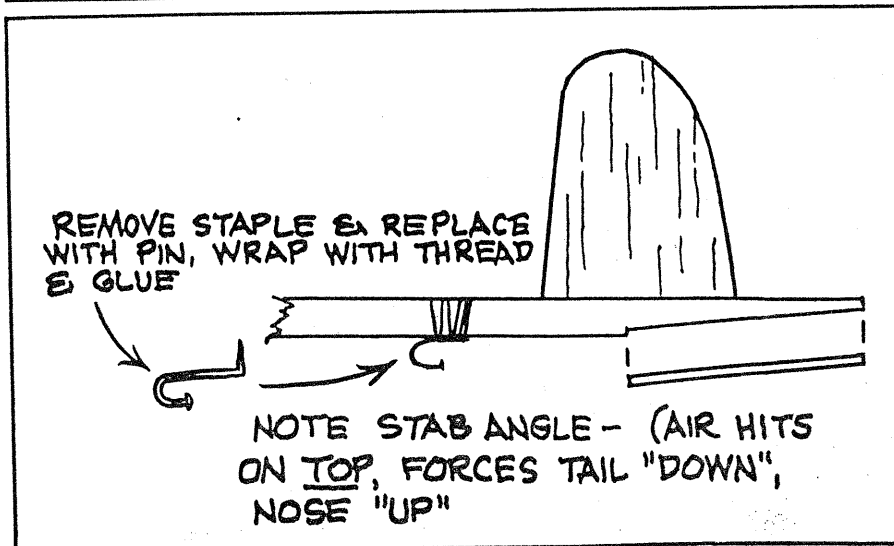
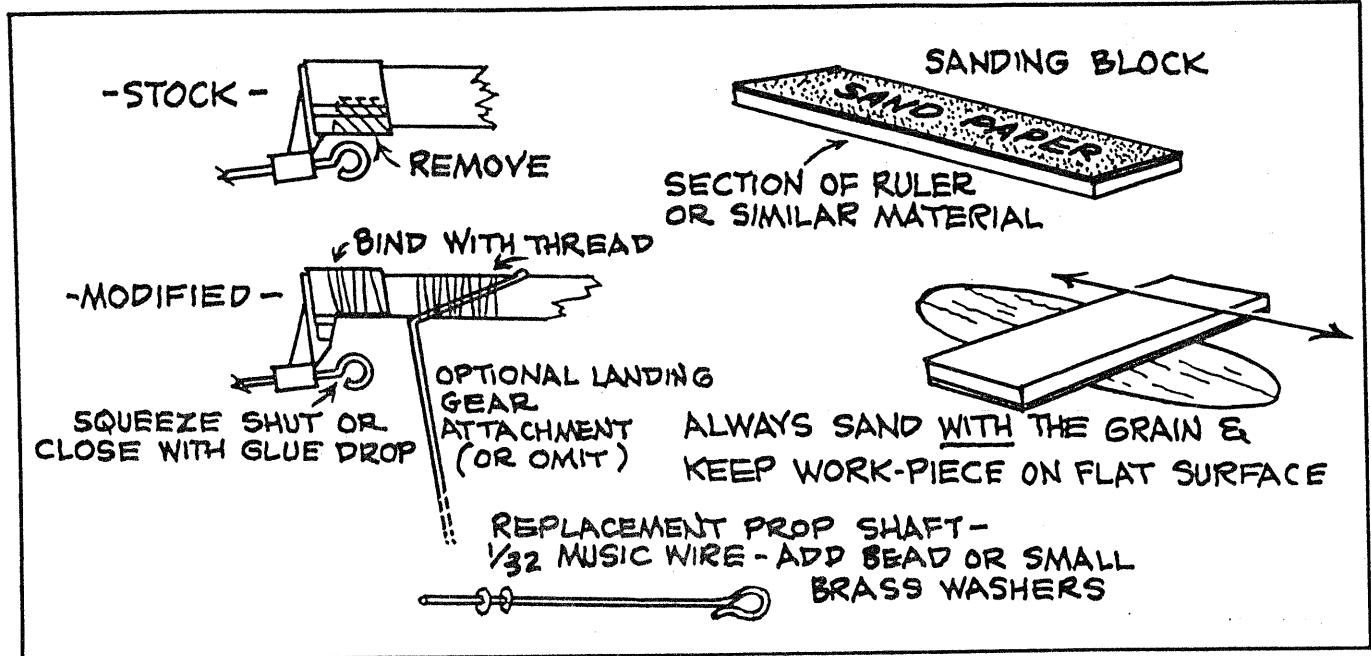
Further lightening can be done by sanding the wing and tail parts, especially if they are of heavy balsa. Sometimes, the balsa in the package is so heavy as to require replacement. If you do use lighter balsa, it can be cambered by wetting the top surface a bit and then gluing a couple of extra "fill-in camber blocks" under the wing positioned between the third and fourth letters of "Sleek Streek" on each side. Our artist, Jim Kaman, made some up with wings that were pretty flat, and he says they flew great for him. I notice that cambered wings have



Note how balance point (and therefore wing position) varies with and without landing gear. Top version is good candidate for added tail boom.



'Teeter-Totter' balance entire model minus with, but with rubber, to see where wing will go.

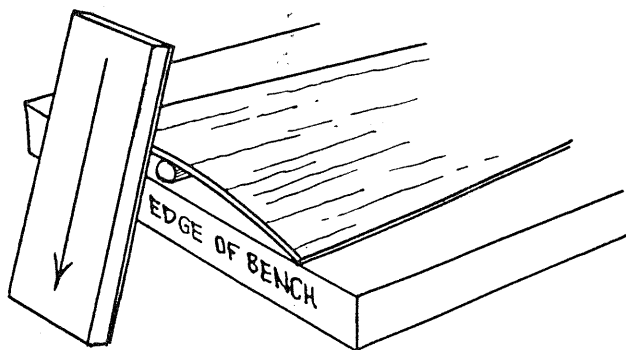
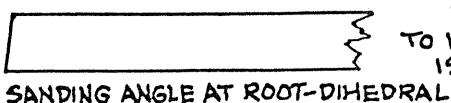
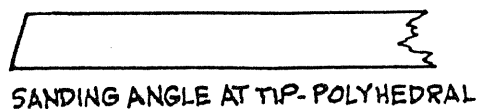
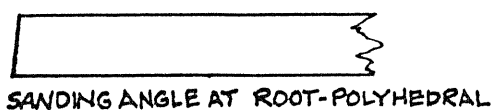


less tendency to warp.

For the Sport version, glue the stab under the rear of the fuselage where the slot was. For the Stretched version, make a tail boom

about four inches long out of the scrap you cut from the fuselage, gluing the front of the boom to the slot angle. Be sure to wipe off all extra glue. A thin coat dries a hundred

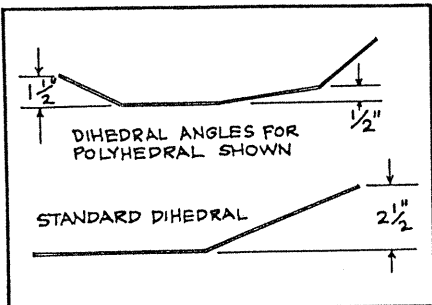
times faster than a thick one. Gobs of glue stay gooey inside. "Double-gluing" is a good plan. Put on some glue, put the parts together, wipe off the glue that squeezes out of the joint, and then take them apart and let them dry. This lets the glue soak into the wood and fill up the pores. Then, glue it again the same way, but this time do not take them apart. Sometimes it helps to wait about 20 seconds until the glue gets "tacky," as it will grab better than wet glue.



BLOCK UP UNDER SIDE OF WING
TO KEEP CAMBER. SANDING BLOCK
IS HELD AT ANGLE



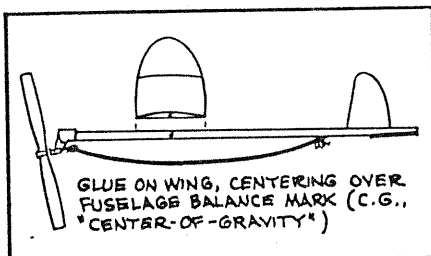
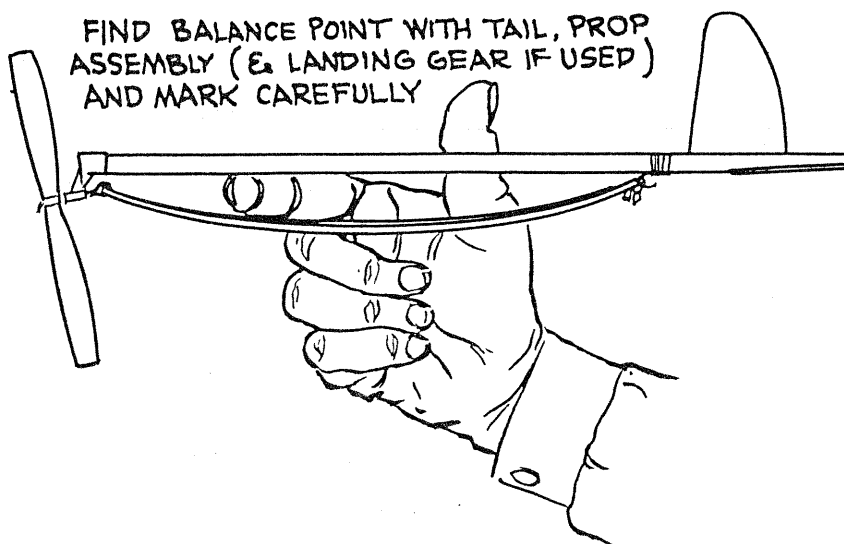
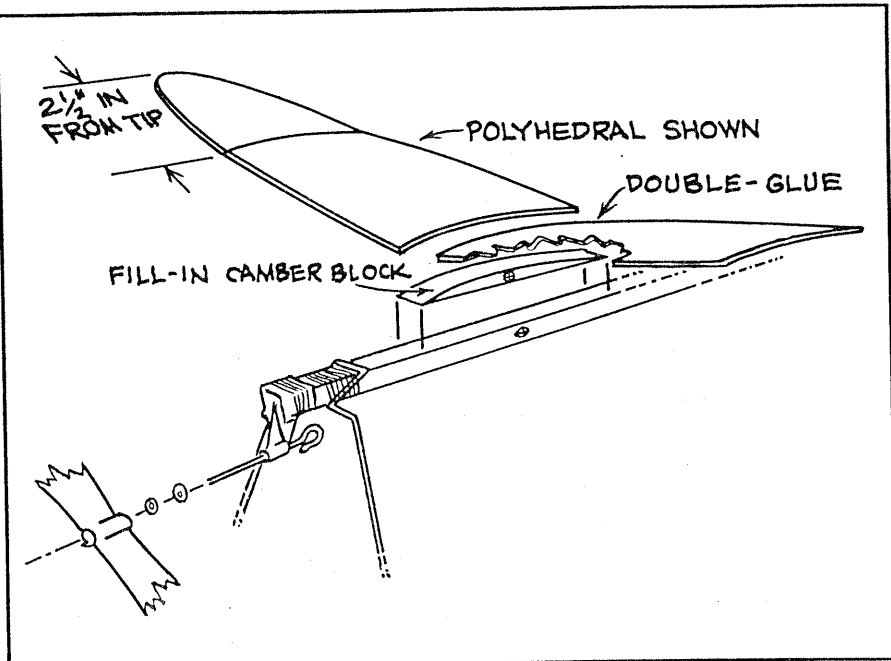
AFTER SANDING FLATTENED WING SHOULD
SLIGHTLY CURVE IN



You can make a "Sport" version with landing gear, or a "Stretched" high-performance version without undercarriage. The longer fuselage, gearless version has less weight and drag. The R.O.G. (Rise-Off-Ground) version is fun, and performs almost as well. If you make the sport version, be sure and bind the landing gear wire with thread and use enough glue so that it will not move around. It is "shouldered" out to keep the longer motor from hitting it.

The wing, being the heart of the model, deserves special attention. Using your sanding block (bit of yard stick of the like with some 100-grit garnet paper glued on), sand the wing thinner if it is hard balsa. Finish it up with 400-grit wet-or-dry paper (your hardware store will know what that is) until it is "...smooth as a moth's nose." Some modelers believe that you should leave the first 3/4-inch behind the leading edge on top (printed red) rough, as it helps stir up the air on top of the wing and thereby keeps it from peeling off about halfway back, giving more lift. This is called keeping the "boundary layer" (air that sticks to

Continued on page 70





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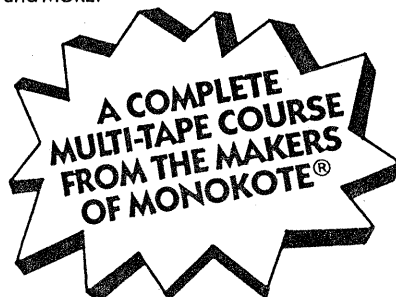
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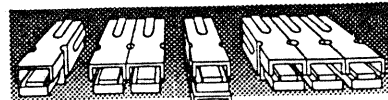
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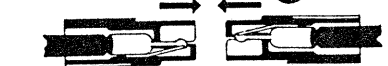
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ture articles, on how to go about handcrafting mufflers for diesels; all the intricate details along with engineering pros and cons on diesel mufflers, their limitations as to length, design, etc."

I wrote back to Charles and suggested he buy heavy K & S brass shim stock and Sta-Brite silver-bearing solder at his local hobby shop and make his own muffler, remembering that the volume inside his homemade muffler should be at least ten times the engine's displacement to prevent excessive backpressure which will rob power.

It's easier to simply adapt a K & B Sportster muffler where possible. We're seeing some advanced muffler and tuned pipe work being done in carbon fiber material rather than metal. Weight is less but efficiency and costs are higher.

In the February '86 column I showed you an engine that had major plastic parts. That same engine has an experimental fiber-filled plastic muffler. A new ceramic material called "Syalon" is coming from Britain. Syalon can be machined, molded, and press-formed to shape. Then it is baked at something over 3,000 degrees to link, in a

patented peculiar method the silicon, aluminum, oxygen, and nitrogen. Present-day mufflers for model engines are usually made from die cast metal, only because it's "convenient" for the manufacturers!

Don Lefferts wrote, "I really enjoy your column. In looking in back issues I read your writeup on the Laser 61 (September '86 and July '87), and I'd sure like to own one. I've been flying four-stroke Saito 40s for three years (one of them, an MK I, has over 35 hours on it). I love the damn things, and I believe the quietness of engines like the Saito will be instrumental in saving our flying sites. While I've got your ear, let me get on my soapbox concerning noise. I find there is a definite prejudice against four-cycle engines. If it takes me three flips to start my engine, a fellow club member is sure to say, 'are all those four-strokes that hard to start?' Whereupon he engages his starter and spins the \$*! out of his two-stroke. On the other hand, once I've gotten into the air, most of the guys admit my engine is the quietest at the field. I think we need to measure sound some other way. Maybe instead of a DB meter we need an 'Annoyance Scale.'"

I've received some nice mail concerning the British Laser engines, and the G.H.Q. article a few months ago drew some "real choice stuff," and isn't Giovanni's Italian Wasp pretty special?

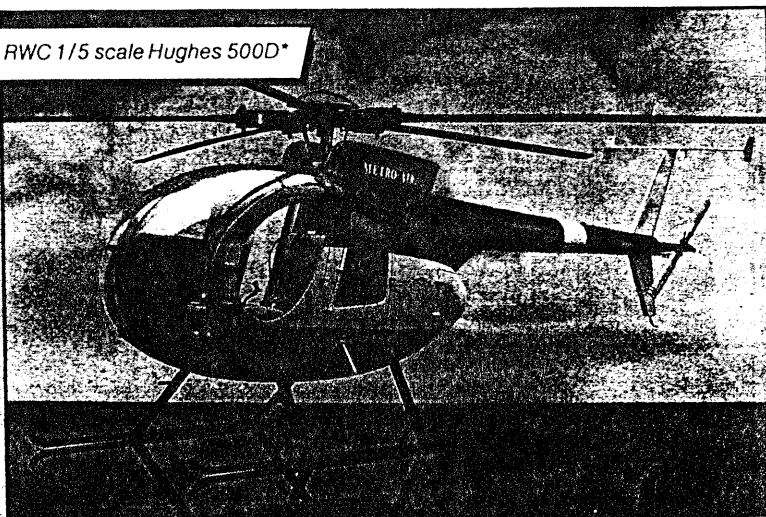
Hey Kid. . . . Continued from page 35

the wing) "turbulent" or stirred up.

The hardest part of the model is the wing joints, so pay close attention. As you look at the model from the front, you will notice that the stock model has "dihedral," that is the tips of the wings are higher than the center or "roots" of the wings. This is important to have in a model that flies all by itself. In a turn, the wing on the outside of the turn travels a little faster and therefore make too much lift for the plane to stay level. The dihedral automatically lifts the inside wing which drops in a turn. As the inside wing in the turn drops more and more toward the horizontal position, it gets more and more lift. At the same time, the outside-of-turn wing has its tip getting higher and higher, which makes it lose lift (if it went all the way up vertical, it would have no more lift at all; right?). This dihedral effect also helps if your model gets upset by a gust of wind. This tendency to level the wings side-to-side is called "lateral stability." You can put in the same dihedral as the wing had in its "stock" form, or you can add "polyhedral" (more than one dihedral break), which allows more lift in the center section, where you need efficiency.

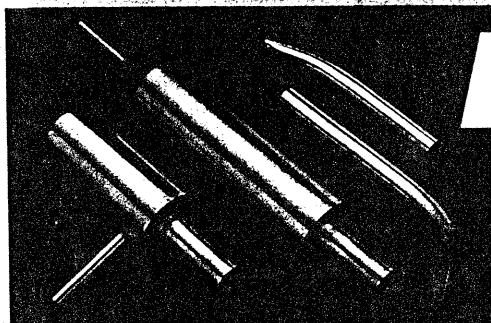
To sand the correct angle at the root while keeping the camber in the wing, you will need to block up the camber as shown in the diagram, and sand carefully at the edge of your workbench with the sanding block held at the angle shown in the sketch. When you finish sanding, you'll notice the root where you have been sanding will be slightly curved inward at the center if you have done it right. Sand a little and try wing parts together for correct fit often. Poly-

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hedral wings are not much different, you just cut the wing tips off about 2-1/2 inches in from the end and sand the same way. Change the angle on the sanding block to match the sketch so you'll wind up with a 1-1/2-inch rise from the center panel to the tip, and about 1/2 inch from one center panel to the other (see sketch or Figure 9).

Spread a little glue on the edge of each part that fits together, using the "double-gluing" technique. Use great care not to flatten out the camber. Before the wing is dry, check the measurements for the dihedral and take apart and do it over if it is not fairly close (within 1/4 inch). Set the wing on its leading edge on the table to dry so it will not droop. When completely dry, you can smear a thin glue "skin" on the top and bottom of each joint, but keep the glue skin

narrow (1/4 inch) or you will wind up with a warp in your wing. Cellulose glue *shrinks* when it dries, and should not get smeared about carelessly.

While this is drying, make a little block to fill in the space between the wing and the fuselage. You can use the balsa you trimmed off the fuselage earlier for this. Glue it under the center of the wing, let dry, and then level it even with the leading and trailing edges with your sanding block.

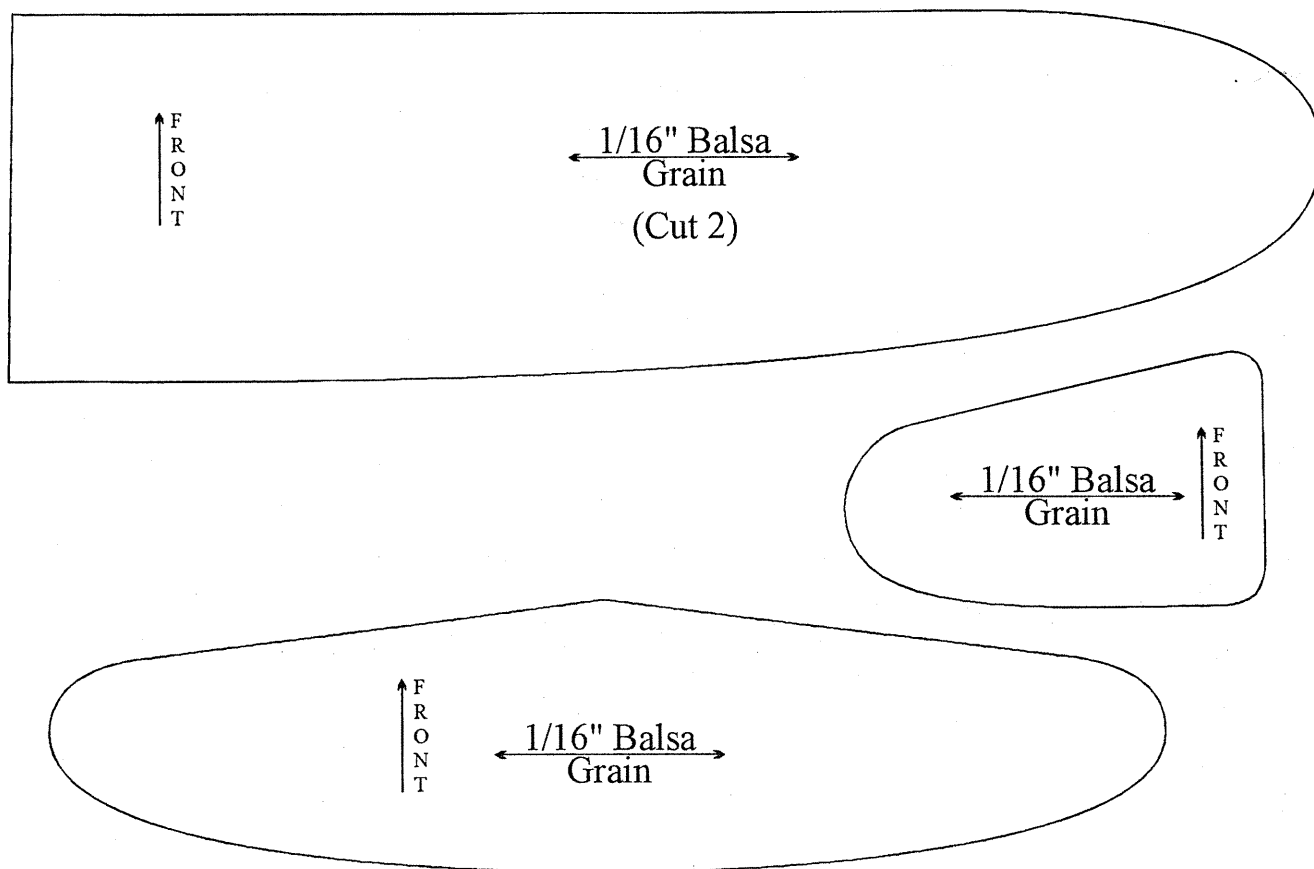
Attach your rubber motor to the fuselage, complete with everything on it that you are going to fly with, and balance it like a teeter-totter on your finger. Mark where it balances. Now glue the wing, red part facing forward, over the mark. *Attaching the wing is always done LAST* because you have to have the fuselage *finished* with the rubber installed before you know where your CG will be. The center of the lift (about halfway between the leading and trailing edges) on the wing must be located right over the balance point (CG) of the fuselage. If the wing is too far forward, the tail will be too long and will hang down giving your wing too much angle of attack and probably a loop or "stall" in flight. Too far back means too much nose out there taking out alpha, lift, and giving you a dive into the ground. On the stock model you could slide the center of lift front or back to get it right, but not now. Double check to make sure that the model balances about halfway back under the wing. Before the wing dries on the fuselage, sight from the front or back and make sure the stab is level with the wings. The model will want to turn toward the high side of the stab, so better have it flat for right now.

Remember why I told you to get more than one Slick Streak? Now you'll find out why. You're going to take the one you just made right outside and try it before I've given you flying instructions, right? It can still crash unless you've taken out the warps and a few other things, so if you want to have at least one good one for *next month's flying lesson*, you'd better start with more than one! Happy landings!

Choppers. . . . Continued from page 13

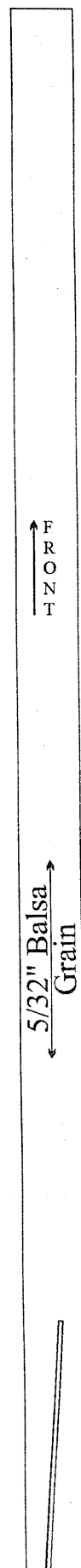
the maximum mechanical throws. In actual flight, we won't be at those extremes. You will actually have to hover the copter to be sure that your tail rotor setting is right. If you feel you have too much right or left tail rotor, use the end point adjustment (ATV). For my taste, I don't want less tail rotor than I get using this method, so I set the low rate the same as the high rate. In other words, I have dialed out low rate adjustment altogether. If this is too much tail rotor control for you, by all means use the dual rate, shorten the servo horn, or use the outside hole on the pitch control lever for the tail rotor gearbox. But be sure to leave yourself enough control to handle a strong wind or unexpected mechanical problem. Robert's version of tail rotor (rudder) dual rate is accomplished through the gyro. With gyro on high rate (appropriate for hovering) tail rotor response is usually deadened. This is true for all gyros, even those that are "stick preferential." Kicking the gyro down to low for for-

SLEEK STREAK

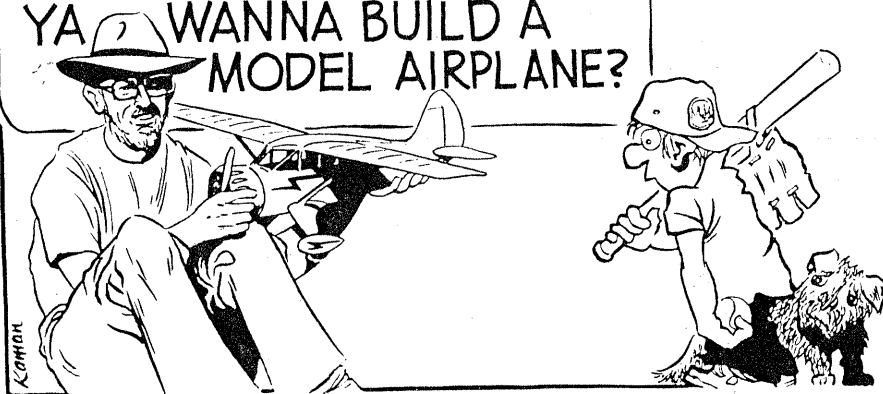


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HEY, KID!... YA WANNA BUILD A MODEL AIRPLANE?



By BILL WARNER

Illustrations by JIM KAMAN

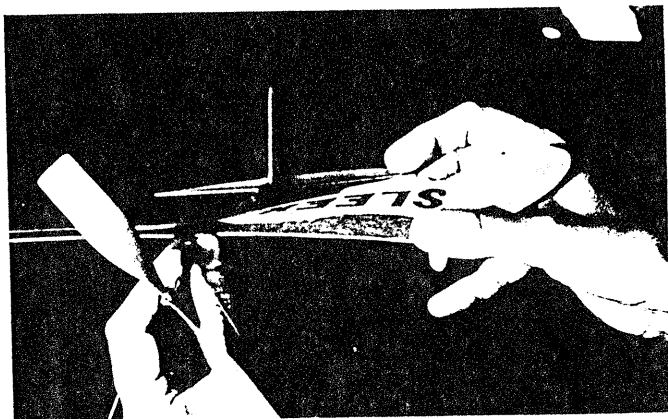
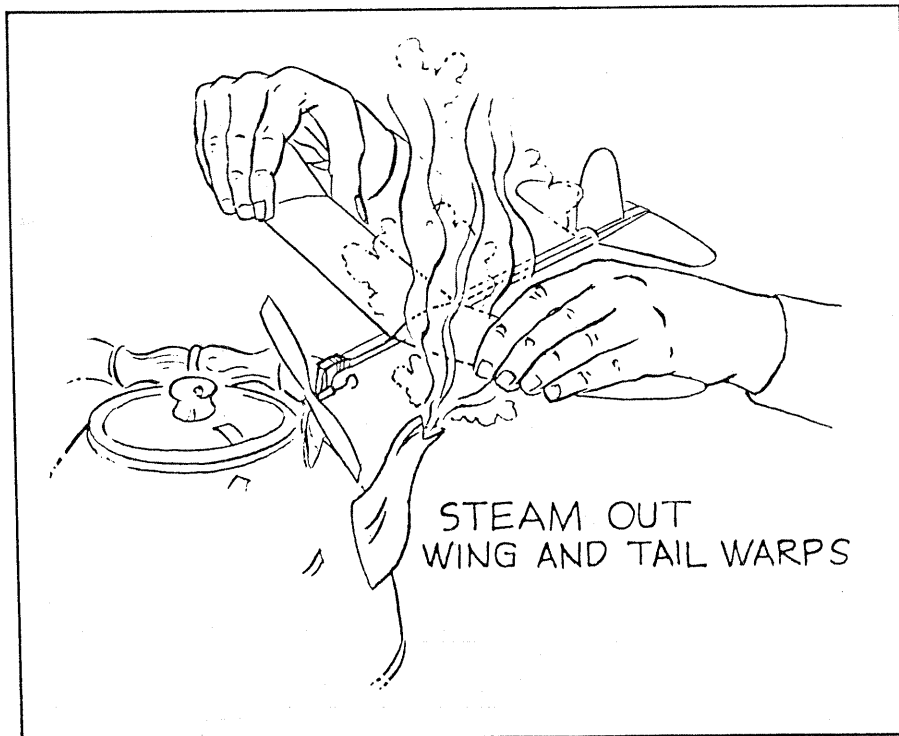
• Of the first fifty models I made in my life, one flew. The one that did, did so purely by accident. I just sort of got everything close to "right," and it pattered off over the daisies with its little rubber motor spinning gaily. Wow! What a thrill! Unfortunately, because I didn't really know what I had done right, it was over a decade before I got another one to fly! That's the problem, flying, or trying to fly, all by yourself. The second model that flew for me inspired the same feelings in me as seeing your mother-in-law drive off a cliff in your new Porsche. Here's how it happened.

After a number of years in the Marines, in college, and being a motorcycle fanatic, I settled down to teaching junior high school. The first thing they ask you is, "Can you sponsor any clubs?" As there was no motorcycle club at this particular school, I replied that I could probably start a model aeroplane club. That meant that I had to get back into the swing, so I stopped by my local model shop and picked up the ideal beginner's model, an engine-powered three-foot span free flight gas model. Building it was not a problem, I was good at that. But getting it to fly, haw-w-w-w-w! I took that cotton picker out to the flying field every day for six weeks, with no success! The engine gave me fits, either due to plugged fuel passages, blown gaskets, or other gremlins. When I finally got that sorted out, the crashes began. Every flight was fast, short,

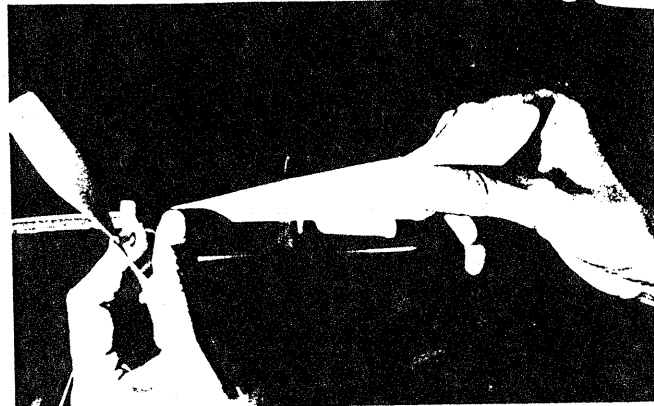
and discouraging. Then one night as I was repairing the wing while working my second job (most teachers have 'em!), one of the chaps who happened by got into a conversation about planes. I told him what my

problem was, and he asked me if I had taken the warps out of the wing. Warps? What are warps? We heated the wing over a hot plate and twisted it in the opposite direction from the way it had twisted itself and checked it on the flat top of a desk. On my way home that night I lost it out-of-sight. "Full tank" Warner had never dreamed such a little thing would make such a difference! Well, that guy sure knew his stuff.

His next advice to me was to get a *Sleek Streak* and bring it to work. He made up some little tabs from the gummed flap of an envelope and stuck them on the trailing edge of the wings, the rubber, and the stab. After taking the warps out, we flew it inside the office space. He showed me how to make adjustments to keep it from hitting the ceiling or the walls. By the time the night was over, I had learned more about flying models than I had in the previous twenty years! Since then, having had the good fortune to live in Los Angeles and fly models with some of the best, I have learned a great deal more, but that session with the *Sleek Streak* was the turning point. If you pay close attention, maybe I can pass on some of these "secrets" to you so that



A wing twisted like this is said to have 'wash-out.' In flight, airflow will push this wing downward, in this case rolling plane to the left.



A wing twisted like this is said to have 'wash-in.' In flight, airflow will push this wing up and roll the plane, in this case to the right.

you too can start losing your models instead of just smashing them up!

SOME BASICS

Assuming that you made your B.A.R.F. just right from last month's article, you will want to stop and think of why each part of the aeroplane is there. Nothing is for decoration. Even the printing on the wing is to make sure you put it on facing the right direction! So, recheck each part. The fuselage not only holds the motor, but keeps the wing and the tail in just the right position. The rudder is on straight to keep the plane flying straight ahead. The stabilizer is positioned with the leading edge lower than the trailing edge so that the airflow (which is called the "relative wind," coming from the front) "sees" the top side of the stab and not the bottom. This makes it hit the top side and it pushes on it a bit, creating higher pressure and forcing the tail to go downward a little until it is flat in the airflow. Guess what this does to the position of the fuselage with the wing glued to it? Yep! When the tail is forced down, the nose goes up. . . are you still with me? Now, guess which side of the wing the relative wind "sees"? The *underside* of the wing is now being hit by the wind and higher pressure created, which forces the wing up, which is exactly what you want! Can you see why the stab must be set as it is? We say the stab has *negative incidence*. Some people prefer to set the stab flat and put *positive incidence* in the wing (leading edge higher than the trailing edge). The important thing is to make sure the wing is going to have a positive (leading edge higher) angle of attack as the model flies through the air. Full-size aeroplanes are no different.

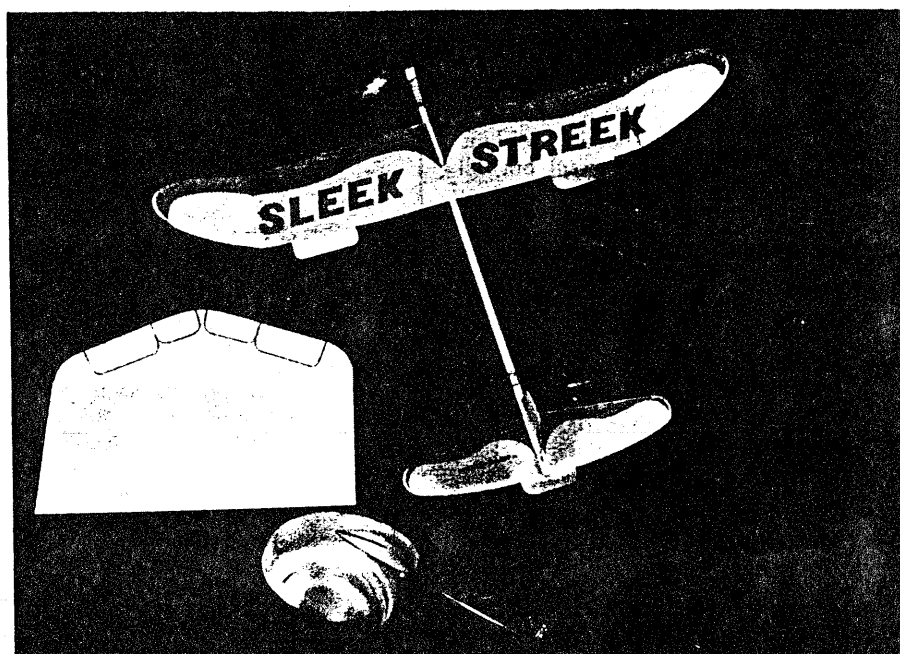
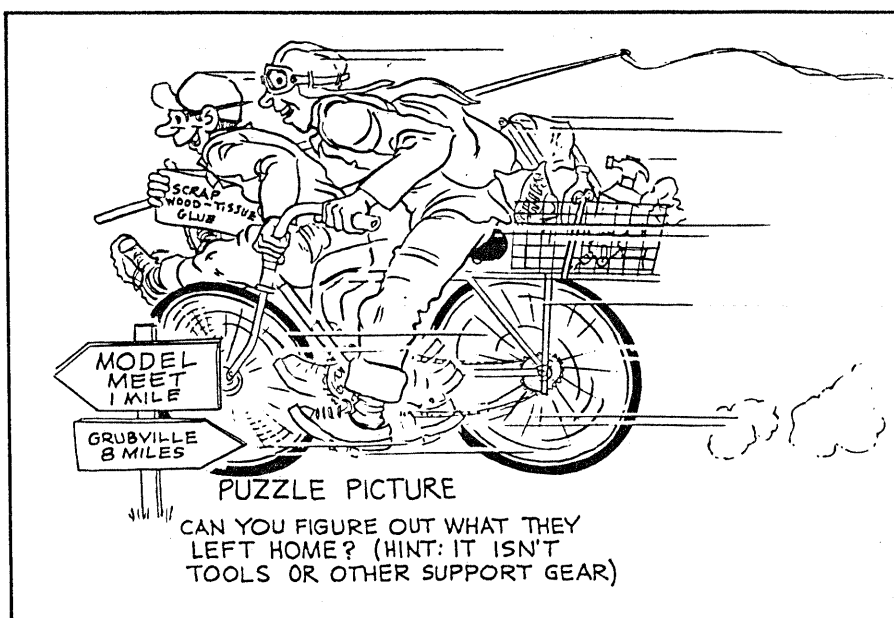
The *center of gravity* (C.G.), which is often shown on a model plan as a little circle with a cross in it with two of the sections filled in, is located under your wing. If the lift of the model is not over the center of gravity, the model will not want to fly level. If you don't believe me, add some lead to the nose and see if the model doesn't dive in. Add some to the tail and see if the model doesn't swoop upward just the same as if you'd built in too much negative incidence in the stab. You have to balance the weight and the aerodynamic forces (the push and pull of the air on various parts of the plane).

You will notice that, on close inspection, the propeller shaft is pointed downward toward the front a few degrees. When the plane starts on its flight, the rubber is wound tight, and puts out a great burst of power which gradually runs down as the motor unwinds. That means that the model flies much faster in the first few seconds of flight. Adding this built-in *downthrust* to the propeller makes it want to pull the front of the model down during this power burst, when the faster-flying wing is making more lift than we need. If you did not have it, the plane would loop or *stall* (nose comes up, then drops like a roller coaster).

If you have everything put together exactly right, the model will fly. But what if it is *almost*, but not quite, right? That's where "trimming," or making small adjustments comes into the picture.

BEFORE YOU GO TO THE FIELD

I once spent a half hour taking all the



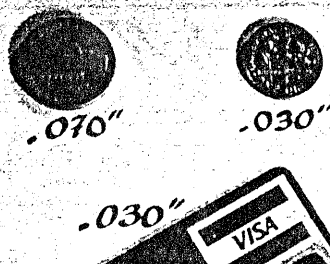
Adjustment tabs can make the model easier to get flying. They are not necessary if you don't want to try them. Envelope-flap tabs will work. Aluminum soda cans keep adjustments put.

warps out of a six-foot gas job's wing and tail parts only to find that when I got to the field I had left the fuselage at home. The moral of the story is to have a checklist just like pilots of full-size planes do before even thinking about taking off. The first thing to do is to gather some supplies together.

For the Sleek Streak, you have to have a rubber motor, and the one it comes with is not very good. You can link a bunch of smaller rubber bands together to get lower power, but the best thing to do is get some 3/32-inch or 1/8-inch flat rubber and make it up into loops. A loop 10 inches long will provide a *shorter run* than one 13 inches long. A motor 13 inches long will give *less power* than one 10 inches long. Start by making three motors; a 10-inch loop, a 13-inch loop, and a 16-inch loop. You will start with the longest, as tests should be made under low power. A motor made from 3/32-inch rubber gives less power than one from 1/8 inch. There are also power differences in certain brands. FAI rubber (available in

small amounts from Peck-Polymers or Hannan's Runway) is a heavier rubber than Sig contest rubber, and therefore a 1/8-inch wide Sig strip can be expected to be less powerful, but run longer, than FAI. Some modelers prefer to buy smaller-sized rubber and use a couple of loops. Just remember that too much power is worse than not enough for *testing*, because a *small twist* in a wing can cause *lots* of trouble at high speed.

After you make up some different length motors, *lubricate* them with either ready-made rubber lube such as FAI's "Slick" or Peck's "Super Slippery." Actually, I use a mixture of glycerin and green soap made by boiling tincture of green soap (from your local drugstore) to get rid of the alcohol and then mixing it with castor oil (from the same drugstore). In a pinch, you can use just castor oil or other slippery stuff like baby shampoo, though you will probably want to throw the rubber away after flying, as this is not good for it in the long run. One



How much is 'just a bit'? To give you an idea about how much to bend in twists and adjustments, we'll use the thicknesses of a nickel, a dime, and a credit card.

way of lubing motors is first to tie them with square knots. Chew some saliva into the knot and pull it up *tight*. You can even stretch the ends and have a friend throw a few tight turns of thread and tie to prevent the knot loosening. A little lube in a "Baggie" with your motor makes it easier to lube it without getting so much on your hands. If the knot comes out, you'll have to wash the motor off well and retie it again.

To wind the motor, a mechanical winder is very helpful. Peck's five to one winder is excellent. You can get their plastic sixteen to one, but I advise against it as the handles tend to break off easily. A hand drill will work, using a bent nail (head *behind* the chuck jaws to prevent pulling out), but will only wind at three to one; sort of slow for this size rubber. If you use the hand drill, check how the chuck end is put together. Some cheapie brands let the whole front end slip out when the cranked gear wheel gets loose from wear. You can get by without a winder, but it takes *forever* to put in over 1,000 turns. . . .

The last stuff to throw in your "go" box of junk you are taking to the field is a tube of quick-drying (*not* instant) glue, a bit of modeling clay for balance, and some extra rubber. A copy of this magazine with the flying advice will top off your equipment. And, by the way, don't forget the model!

PREFLIGHT

Check all the glued parts of the model by wiggling them a bit to see if they break off or are loose. Easier to fix it now than out on the field.

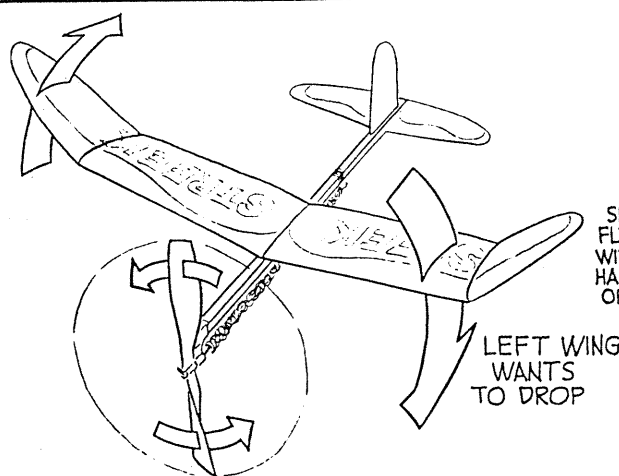
Close one eye and hold the model out about two feet and view under the wing. If you can see any twists, hold the wing over steam and twist in the opposite direction. Repeat this until the wings have no twists in them that you can see. Do this for each panel of the wing. Now, put a little *intentional* warp in the left (the one with "Sleek" printed on it) to give it a little more lift than the right wing. This is because you are going to fly your model in left circles, and the left wing wants to drop because it is flying a little slower than the right one and because the model wants to roll left as the propeller rotates right (called torque reaction). The "wash-in" (increase in the positive incidence) should be about .075 inch (thickness of a nickel) as measured at the front of the wing about where the first "S" in "Sleek Streak" is located. While you are steaming, you might want to put just a little left in the rudder by bending the trailing edge of same to the left about .050 inch (thickness of a dime). Nothing need be done to the stab ex-



Steam and twist in a little wash-in (about a nickel's worth) in the left wing to counteract torque roll. Check on a flat surface.



Putting in a little down aileron tab will give about the same effect as steaming in wash-in to correct for torque.



TORQUE REACTION

BOTH PROP AND PLANE ARE FREE TO ROTATE. IF GIVEN A HUGE PROP THE PLANE WOULD SPIN RAPIDLY-BUT NOT FLY! WITH PLANES (AS WITH PEOPLE) THE ONE HARDEST TO MOVE OFTEN WINS!

cept to make sure that it is flat.

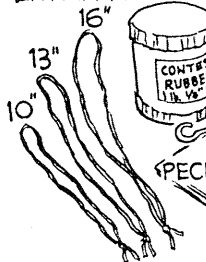
Put a drop of oil on the prop shaft where it passes through the white plastic bearing block and a drop on the place where it comes out through the front of the prop to make certain everything spins freely.

On a full-size aeroplane, there are certain parts of the wings and tail which are moved by the pilot during flight to control the plane. These are called "control surfaces." They are usually things that go up and down or to the side, which deflect the air-stream. When we put some "wash-in" in the L.H. wing, it was to deflect downward more of the air passing under the wing. This extra downwash resulted in forcing the wing upward a bit, giving more "lift." We could do

the same thing by attaching a tab to the rear of the wing and bending it down or up to give the wing on that side of the plane more or less lift. This is what pioneer aviator Glenn Curtiss and others used to control their "roll" (the Wrights used wing-warping to do it). This is adding what we call an "aileron" tab. With it, you can make flight adjustments more easily on the field. You can add a tab on the rudder which can be bent right or left to control the "yaw" of the model (way the nose points). Another on the stab can be used as an "elevator" to control the angle of attack on the wing, giving the whole wing more or less lift.

These control tabs do not *have* to be added, but may make it easier to adjust your

MOTORS OF 3 DIFFERENT LENGTHS PLUS EXTRA RUBBER

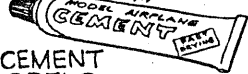


16"
13"
10"

PECK WINDER



3:1 HAND DRILL



FAST DRYING CEMENT FOR WOOD MODELS

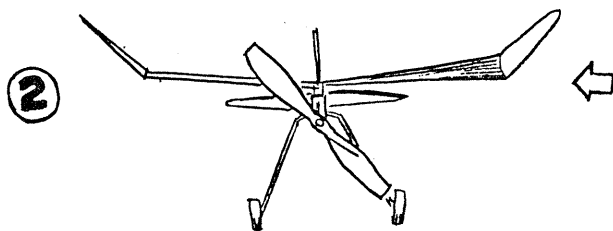
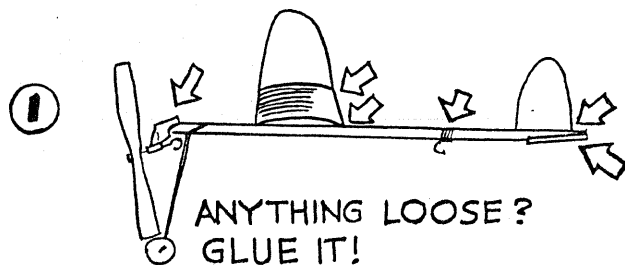
ITEMS FOR YOUR SHOEBOX "GO" BOX (READY-BOX OR FIELD BOX)



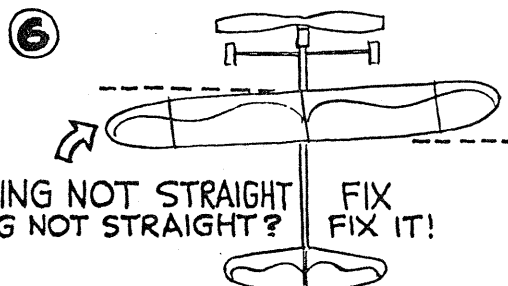
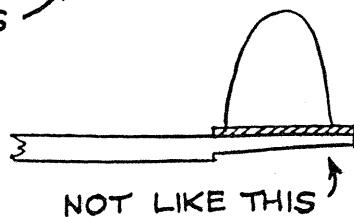
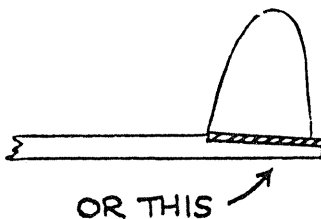
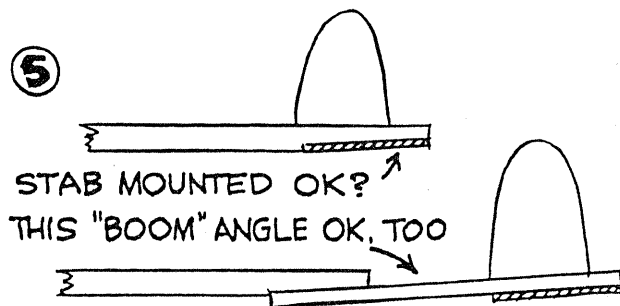
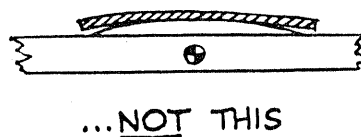
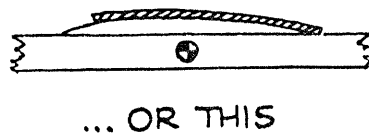
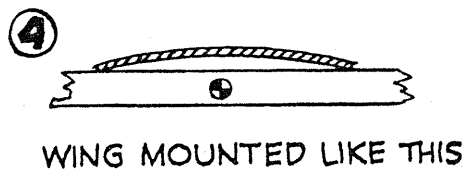
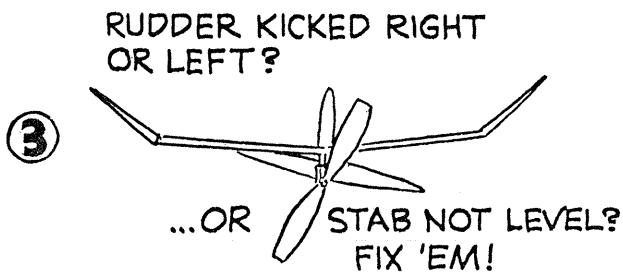
MODELING CLAY



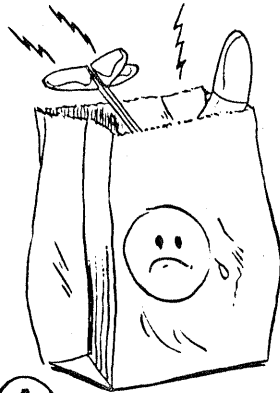
PRE-FLIGHT CHECK



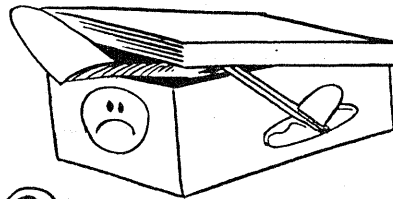
ANY WARPS? STEAM
'EM OUT WHILE TWISTING
IN OPPOSITE DIRECTION



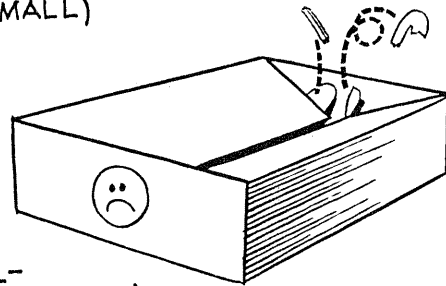
PROTECTING YOUR MODEL



① THE "CRUSHER" BAG

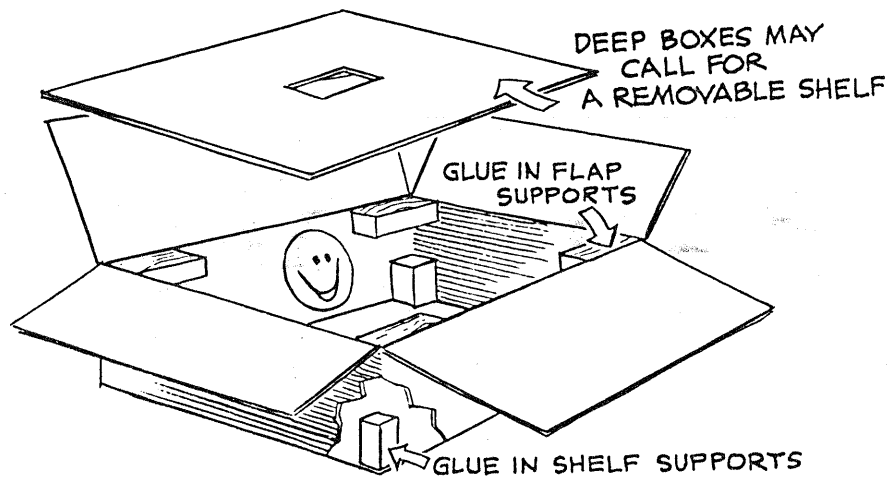


② THE SHOE-BOX GUILLOTINE (TOO SMALL)

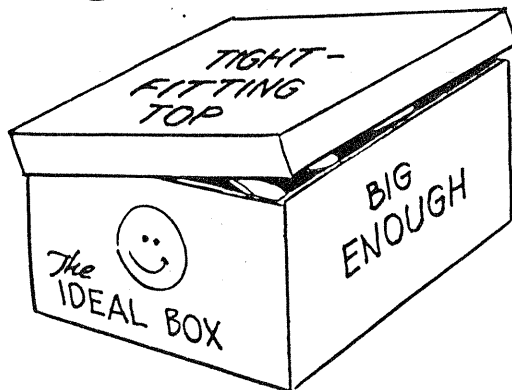


③ THE INWARD-FOLDING MODEL-CRUNCHER (OR "CAT-TRAP")

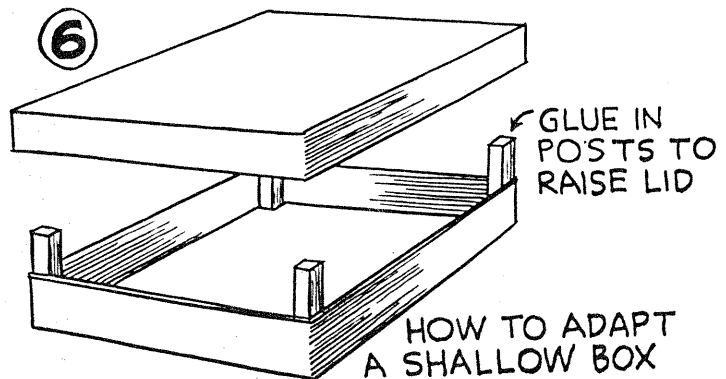
④ THE IMPROVED CAT-TRAP



⑤

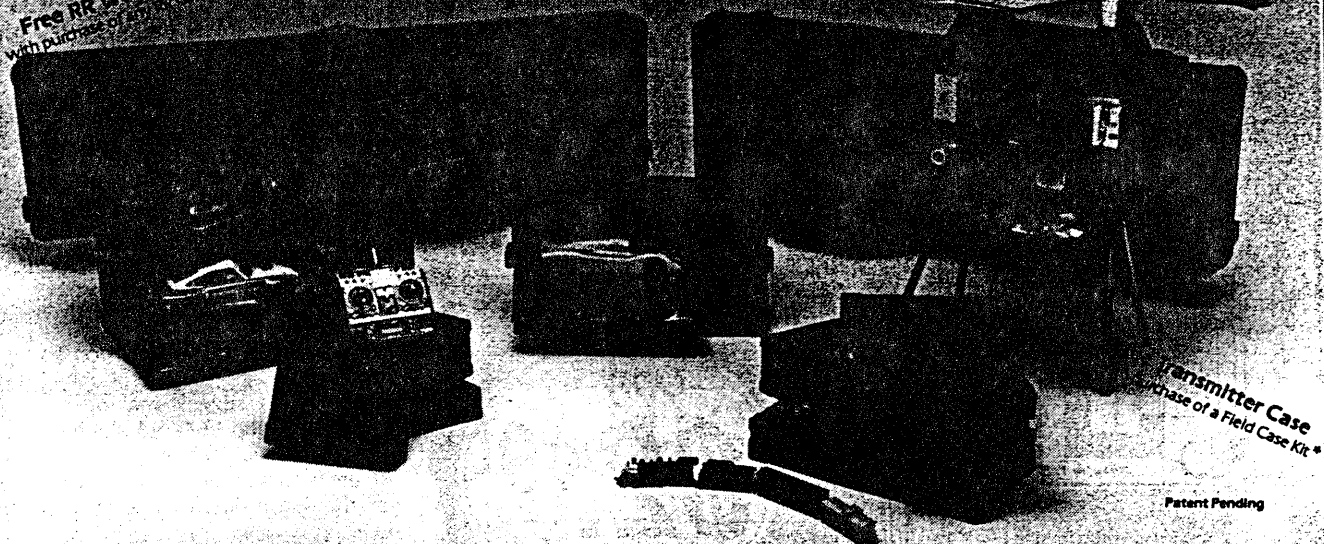


⑥



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plane for the first time out. What one generally does is to breathe heavily on the wing or tail part one wants to bend or twist while holding it twisted in that direction, and then letting it spring back to its new position. This may have to be repeated several times before it stays. Using steam or heat is better, but you may not have a stove on the field! One thing to avoid when using control tabs is to *not crease them*. They are not supposed to flop up and down or be hinged like the surfaces on a full-size plane. If they do flop around, your plane will do something different each time you fly, and that is exactly what you don't want! You could even cut them out of aluminum soda cans instead of paper to make sure they don't bend too easily (rough up the can material well so glue will stick to it). One other problem with using tabs is that you must never bend them without reason, as they *do* affect your flight very seriously. Never bend a tab more than about .050 inch at a time, as too much tab bend is worse than not enough in many cases. If, for example, you bend an aileron tab down 90 degrees (straight down), it will give *lots* of drag, and not much lift, and will pull the wing to the rear, tightening the turn. That may be what you want in some cases, but for right now, start with all your control tabs in a neutral position, neither up, down, right, or left.

PROTECTING YOUR MODEL

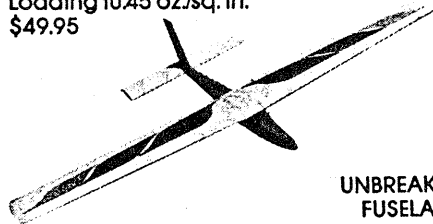
Finally, you should have a box to keep your model(s) in which is not only large enough to get your models in without parts hanging out, but which has a lid that can't

CHEETAH MODELS

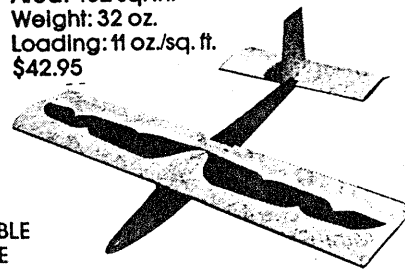
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fold down inside and injure your models. Fold-down flaps can be blocked up with a piece of wood glued inside to stop them. Never use a sack, as they are worse than using nothing at all, guaranteeing a crushed plane. Boxes protect models from accident, cats, and rain. Another tip is to carry your glue, winder, and other heavy stuff in your pockets or in a shoebox, but never in the same box as your models. You'll find out why later, the first time you drop your box and the glue goes through your tissue-covered wing!

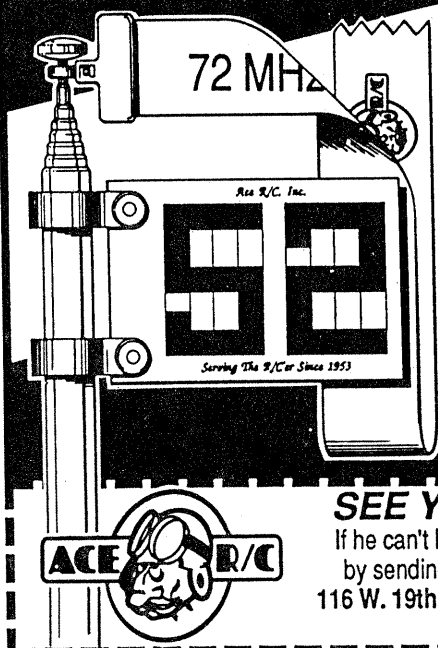
I had hoped to get you into the air this month, as it's starting to get cold outside, but I decided that we just had to spend the

necessary space on preflight. It is so important. Many a flying session has been ruined because the plane was not prepared right, protected, or because something important was left home. Next month, we fly! (In your school gym, if we have to!)

A special order sheet including all the stuff you may not be able to find at your local hobby store is available for a self-addressed, stamped envelope to Peck-Polymers, Beginners, P. O. Box 2498, La Mesa, California 92044; phone (619) 448-1818. They stock Sleek Streaks, winders, small packages of rubber, rubber lube, etc. Their regular catalog, which is \$2, is free with your first order.

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pounds, has 3100 square inches, and a wing loading of 20.8 oz./sq. ft. For power Al stuck an OPS Maxi Twin up front, and it swings a 24 x 8 at 5600 rpm. According to Al, "It's the best-flying airplane I have ever built."

THOUGHT OF THE MONTH

From Doc Mathews, "God does not deduct the time spent building and flying model aircraft from a man's life span."

Al Alman, 16501-4th Avenue Court East, Spanaway, Washington 98387; (206)535-1549. Don't forget that our old 72MHz keys won't be legal after December 21, so get your equipment updated ASAP.

Flying safety is no accident!

Insiders. Continued from page 49

and this new Bostonian design from Bob's drawing board. The photo shows the "bones" of a very attractive bird. If you build it for strictly indoor use (Bostonian on the West Coast is a 14-gram event, mostly flown outdoors), we suggest making it of 1/20-inch squares and 1/64-inch sheet ribs to get it down to about 10 grams.

Here is some ordering info if you want to get the kit now, in time for Christmas building:

Peck-Polymers has just released its new Bostonian "Pup" kit, 16-inch wingspan, rubber-powered model. Designed by Bob Peck for sport or Bostonian contest, features all movable controls for easy adjustment. After adjustments are made, a small drop of glue keeps them in place. Flights of over four minutes are possible outdoors with thermals.

The kit is complete except for glue and paint. You will find high quality balsa, a clear full-size plan, instruction with photos, precision nylon bearing, prop wheel, wire, and tissue.

Pup kit stock number is PP-30, and the price is only \$7.95. Available from your dealer or direct from Peck-Polymers, P. O. Box 2498, La Mesa, California 92044.

Control Line. . . Continued from page 61

the hinge and rub it down good. When all the hinges are on, apply a second coat of glue and let it dry thoroughly. Now, here is a trick. Break out your Monokote iron and iron the hinges around the corner. They iron right down and make joining the two halves a snap. Now tape the two surfaces together and then finish the hinging job.

"If you want the job to go really fast, just apply the aliphatic resin to the wood, and after it's dry, just iron the hinges on! They will iron right down just like Monokote. Apply more glue after ironing to be safe.

"Closing the gap in control surfaces will reduce drag on your model, and it will go faster. But to go really fast, you need to take a hint from the U.S. Government. They have done modelers a great favor without even knowing it. Of course, they probably wouldn't have done it if they had known it would help any of us! They have proved that they could prevent anyone from going too fast in automobiles by the simple idea of requiring that all car speedometers read only 85 mph. We all know that since the 85-mph speedometers have been installed, no one has ever exceeded that speed.

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Until next month, you might want to try making a couple more Sleek Streak B.A.R.F.s to replace the ones that you have put into the neighbor's trees so far, not being able to wait for the upcoming flying lesson!

Happy landings!

Big Birds. Continued from page 11

"Every time I fly either one of these birds the same thing occurs; guys come over looking for the Quadra under the cowl and just can't believe that an O.S. SF .61 flies a 10-foot aircraft with power to spare."

Emil noted out that although these birds fly slow, they aren't floaters, and that no special tools, equipment, or engines are

needed in order to build and fly 'em.

Both the Kitten and Sportster plans are \$24.95, and plans for either fuselage alone are \$14.95. A glass cowl is available for \$17.95, just in case you're not too excited about making your own. And in case you'd like something a bit smaller, \$17.50 will get you a set of 1/4-scale plans.

A REALLY BIG ROBIN HOOD

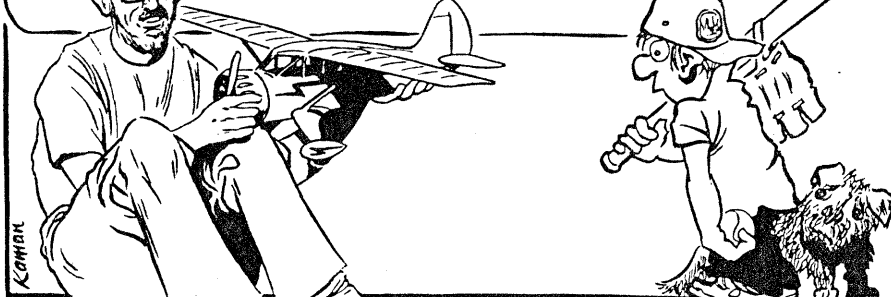
BIG Al Doerr, who loves to build B-I-G Birds, somehow found the time to crank out three different sized Robin Hoods.

Two of them, the "80" and the "99" were built from World Engines kits, but Al wasn't quite satisfied with these "small" birds and just had to go them one better, so he scratch-designed and built a 140 incher.

This great BIG Robin Hood weighs 28

HEY, KID!...

YA WANNA BUILD A MODEL AIRPLANE?



By **BILL WARNER**

Illustrations by **JIM KAMAN**

• Hope you still have our first two episodes in the last two magazines handy. It would be a good idea to reread 'em before you head for the field, just to refresh your memory. Now that you have your modified B.A.R.F. safe in its hangar (box) and your flying equipment in your "go" box, there's only one more thing you need, and that's someone to go flying with. The first reason is that to get to a field big enough, you may need someone with a car, and second, it's nice to have someone to hold the model while you wind it up!

THE IDEAL PLACE TO FLY

For testing, it would be perfect to have a field about the size of Chicago with no trees, buildings, or wind, with about eight inches of nice, soft green grass all over. If you are testing in a gym, it would be nice to have no roof rafters or lights hanging down, no baskets, ropes, or other junk on the sides, no drafts, with the ceiling about 300 feet high and all of this in a round building. These places exist, but usually only in our

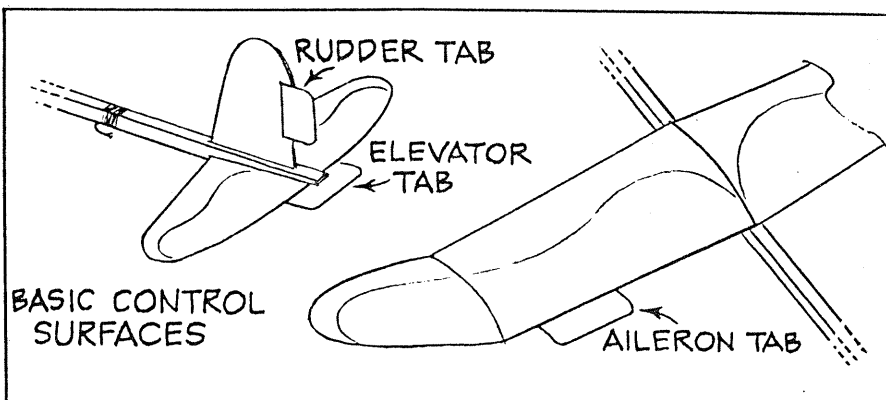
dreams. Therefore, come as close as you can to the ideal and let's go for it!

TIME TO FLY!

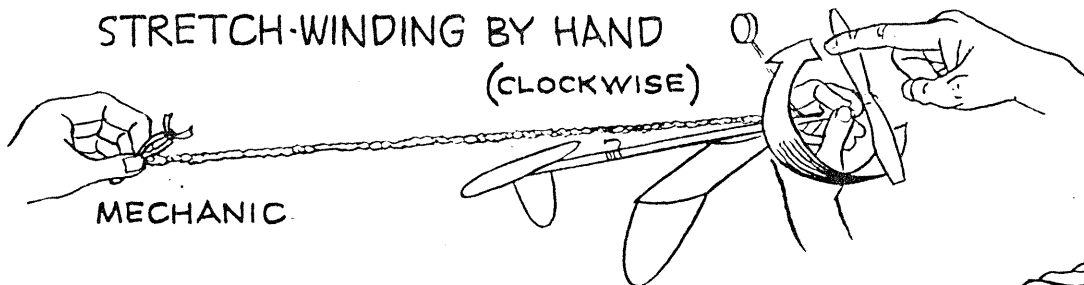
A quick eyeball check over the plane to make sure no warps sneaked back in between your preflight check at home and the field is a good idea. If any have crept back in, breathe on it heavily for about 20 sec-

Breathing moisture on flying surfaces helps to bend them in order to put in or take out warps. Adjustment tabs make the job easier.

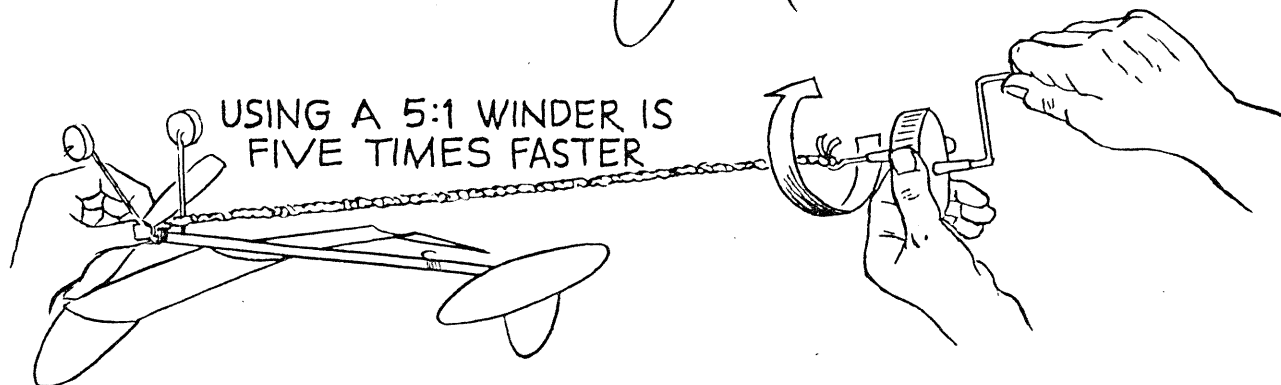
onds while twisting in the opposite direction until it stays where you want it. Now hang your longest and weakest rubber motor on the propeller hook. A drop of glue can be used on the wire to close the opening if you want. (Don't glue the rubber.) If you are using a winder, find the knot in the rudder and hook that end of your motor to the winder (you will want the knot as far back on the plane as possible so it won't go "Thump, thump, thump," as the motor runs down.

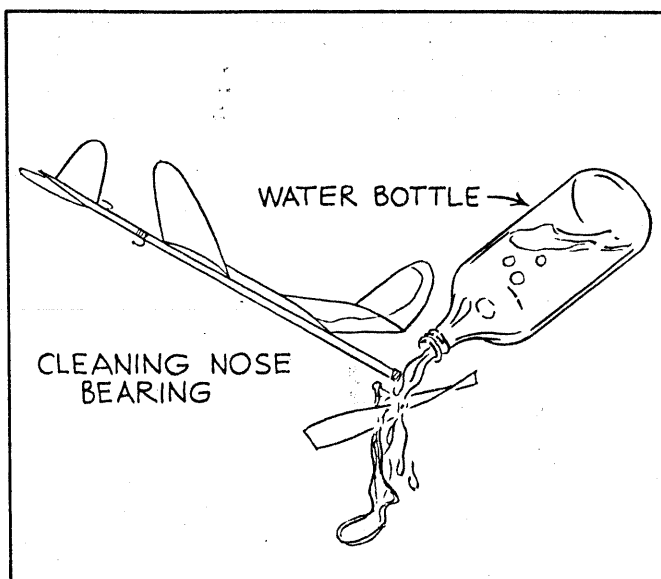
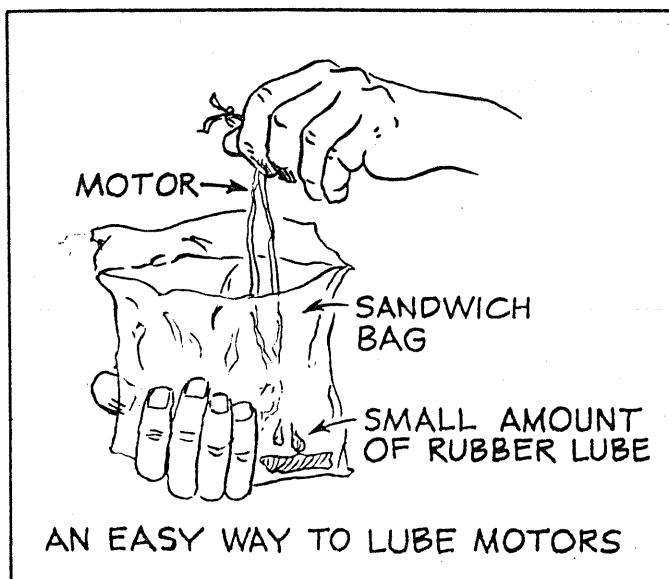


STRETCH-WINDING BY HAND (CLOCKWISE)



USING A 5:1 WINDER IS FIVE TIMES FASTER





WINDING

If you have a winder, have your partner (who some people call a "stooge") hold the plane by the propeller end, thumb and first finger passing over the prop and pinching the rubber on the prop hook so that it can't climb off (in case you neglected the drop of glue). Have him or her hold it so the tail is out of the way so that the rubber, if it breaks, or you, if you get excited, will not break it accidentally. Stretch the motor out at least double its length and begin winding in a clockwise direction. Just in case you don't know which way this is, you will soon know. If nothing happens, you wound it the right way. If there is a fast "Brrrrpppp!" sound, and your partner lets out a yip, you will know you were winding backwards and the freewheeling ratchet device built into the front of the prop just decided to release all those backwards knots. This is not good for the prop, so maybe you should inspect it before you try again.

For your first flight, using a 3/32-inch motor 16 inches long, you should try maybe 40 or 50 turns on your 5:1 winder (200 to 250 turns in the motor). You can increase that later if the model does not go anywhere.



Hand-launching technique: hold model as shown, launch gently with nose raised slightly. **DO NOT THROW STRAIGHT UP!**

Use less if you are starting with a shorter or with a 1/8-inch motor, as they will be more

powerful. Start walking in toward the model when you have about half of the winds packed in, arriving at it just as you put in the last turn. Grab the rubber about a half inch from your winder's hook and back off on the winder until you have a nice loop to hook over the model's rear motor hook. This is where the knot should be. Be especially careful to stay away from the tail while you are hooking on the rubber! It is easy to get so occupied with doing one thing that you bump your tail feathers. They will either break off or rearrange your adjustments for you. Have your mechanic (sounds better than "stooge"; doesn't it?) put the winder back in the box immediately. If you don't step on it or lose it, it will be a great help on your next flight.

If you don't have a winder, you can still wind up those long motors, it just takes a little longer. Give the tail-end of the rubber motor, with the knot, to your partner or loop it over something solid to hold it while you hold your model by the white nose bearing, packing in the turns one at a time by turning the prop with your finger.

READY? EASY DOES IT. . .

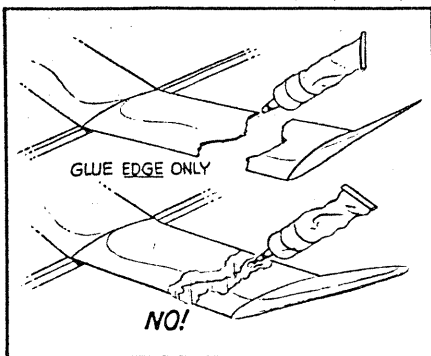
If you are outdoors over grass, hold the



Here Kris Samonas demonstrates the proper way to launch an ROG. Aim a little to the right, facing the wind, let prop start turning, then release your plane.



With proper ROG launch your plane should taxi away as it gains speed, then lift off into the air.



Add a small ball of clay to tail to bring CG aft (rearward) and increase angle of attack, sending the model climbing. Use too much clay, and the model will stall or loop.



Adding clay to nose will cure stalls and looping by moving CG forward, reducing the angle of attack.

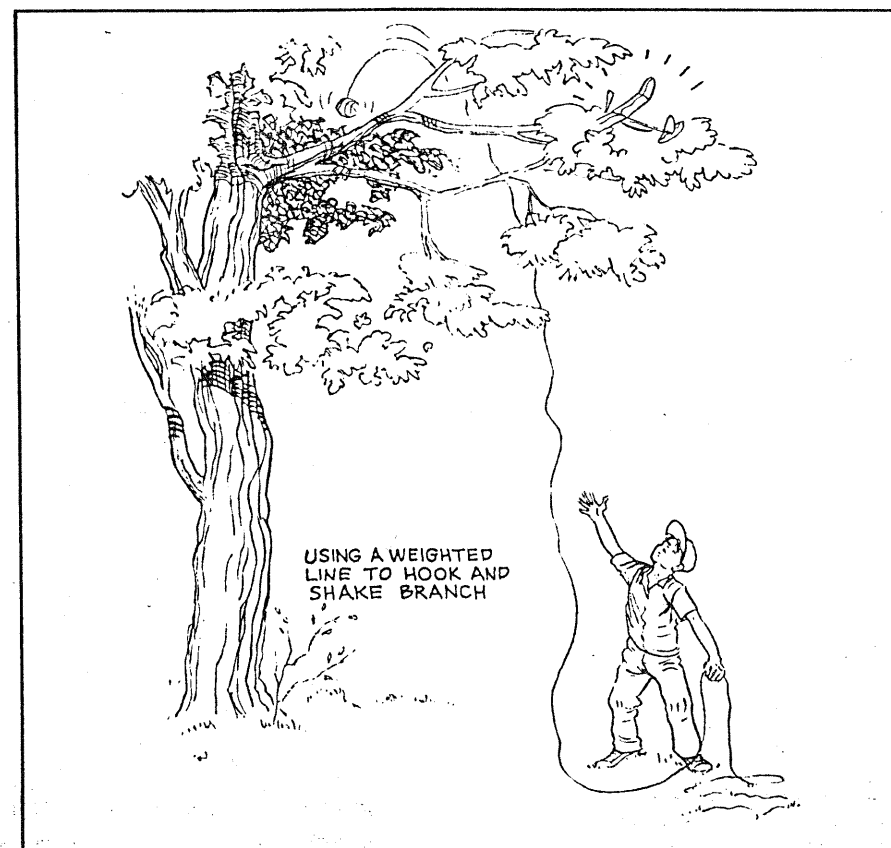
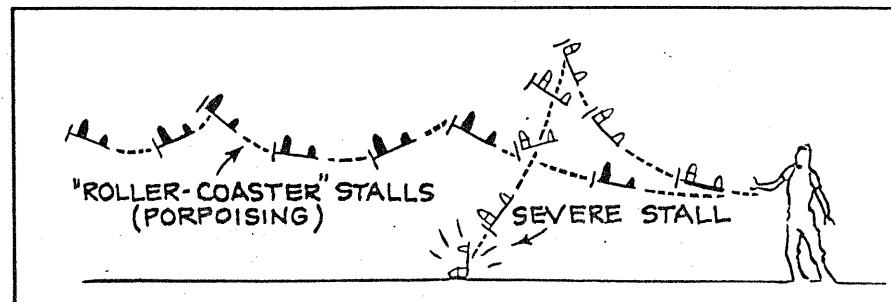
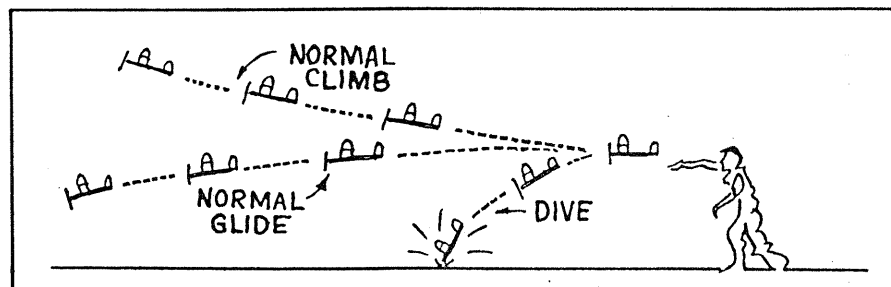
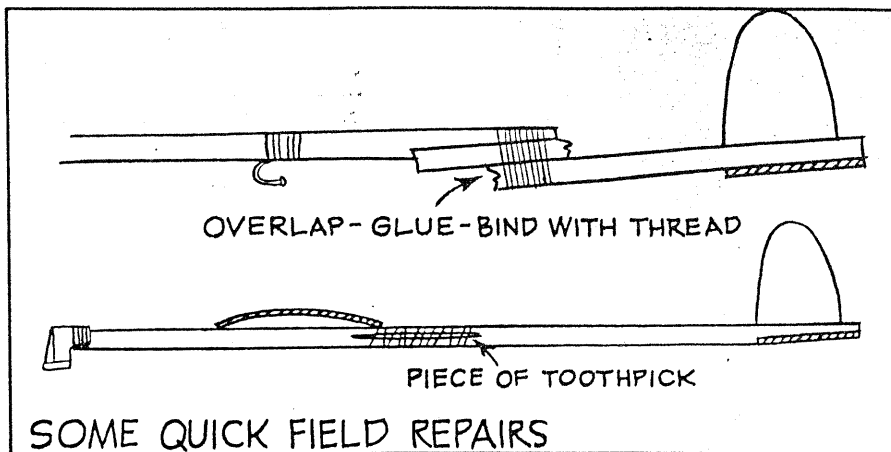


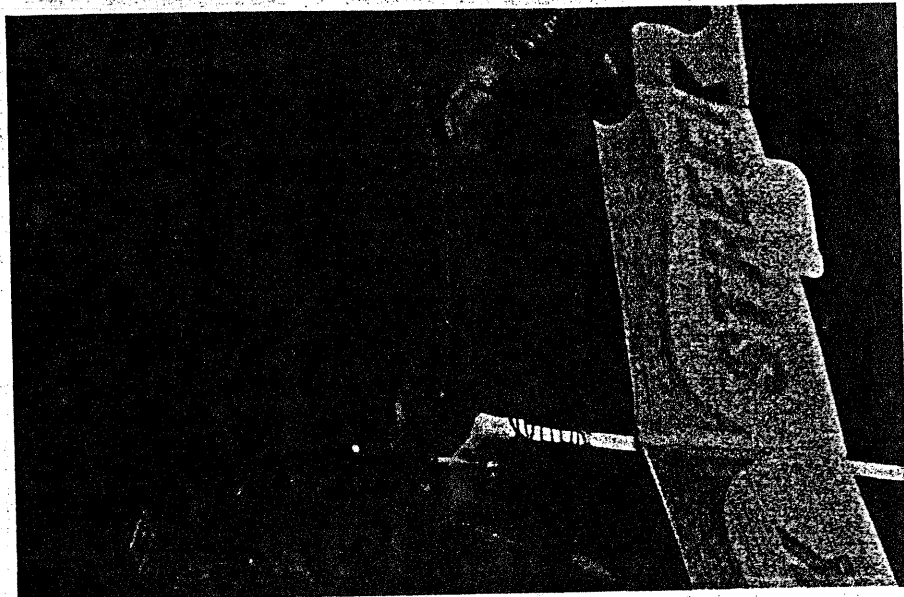
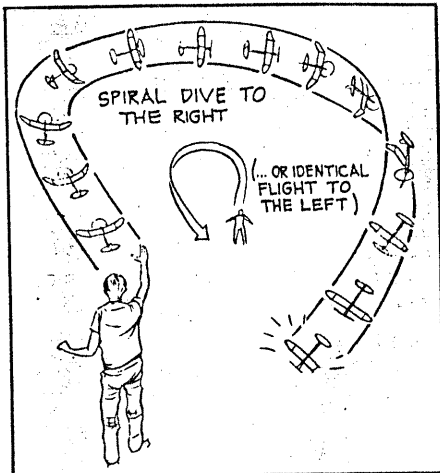
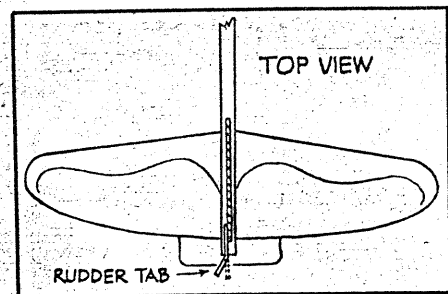
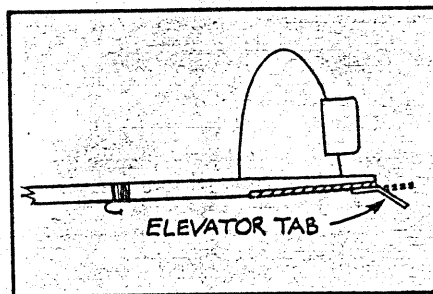
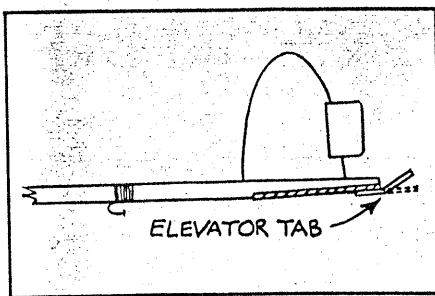
Twisting prop blades into higher pitch gives less power, but a longer motor run.

model with your thumb and first finger *under the wing* at the CG with your right hand, while holding the tip of the prop with your left hand. (Reverse this for southpaws.) Aim the nose up just a tiny bit, and let the prop start a second before you give it a *gentle* toss. *Never* throw it or aim it straight up. Level and easy does it.

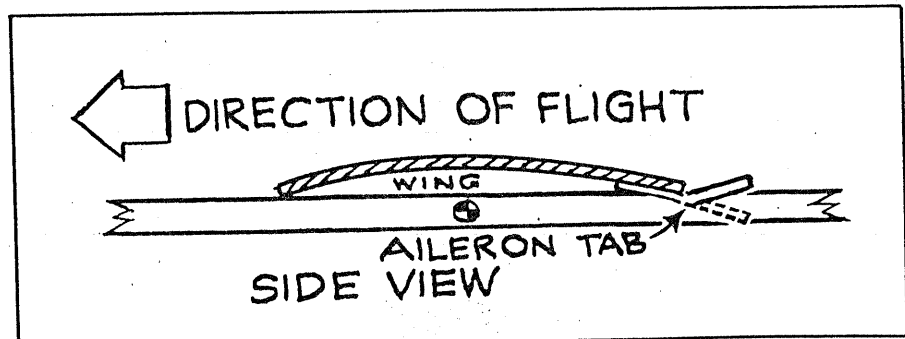
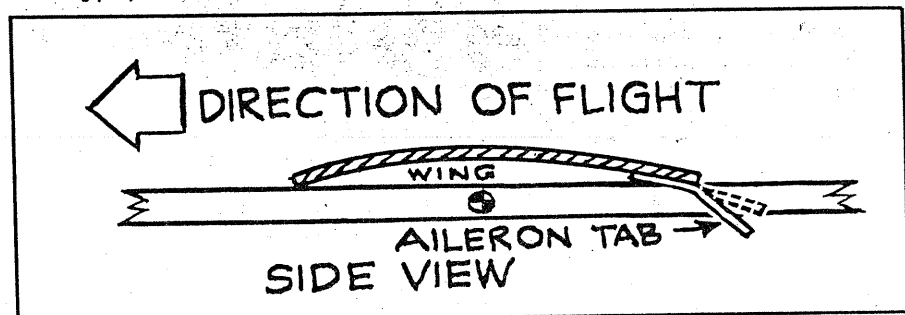
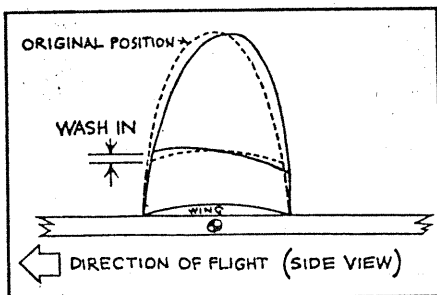
THE SCIENTIFIC METHOD

When a scientist performs an experiment, he/she has to be a *good observer*! You cannot figure out what happened unless you saw what happened and remember it long enough to do something about it. I've asked kids what happened when they come up with an aeroplane that won't fly and had them tell me, "... it went up and down." Oh really? The picture that comes to mind is that of a yo-yo. If the flier said, "The nose went up and then fell towards the





Twisting prop blades into lower pitch gives more power, but runs out the winds sooner.



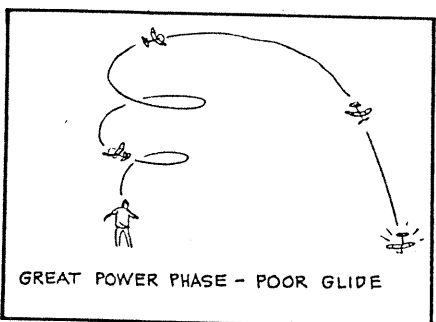
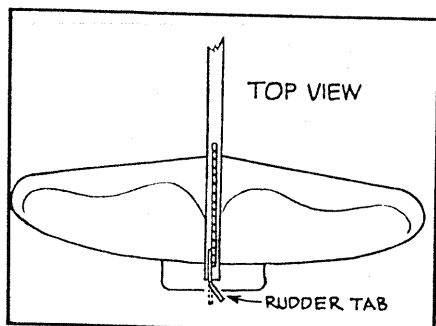
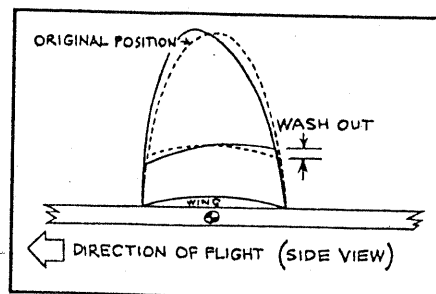
ground," I might have diagnosed a stall, perhaps caused by too hard a launch, a heavy tail, or too much "up" elevator. Whether your model veered off to the left or to the right makes a world of difference as to what you do to correct it! Check the troubleshooting chart and see if you can find exactly what your model did, and then make a correction. It is a good idea to only change one adjustment at a time, so you will know what made the difference. Never wind the model up fully until it is flying nicely, as a model which crashes at high speed with a fully-wound motor will often become very, very short. Some have been known to return themselves to kit form. One thing to remember is that your model will probably not fly well on the first few flights. It's the little adjustments and changes you make intelligently (called "trimming-out") that will make it fly.

SO WHAT DOES A GOOD FLIGHT LOOK LIKE?

Well, I like a model that does left-hand circles about 20 paces wide, with no stall or dive in the glide when the power runs out. Left turn is the normal way that the model wants to roll (opposite the prop rotation direction), and it kills a little of the lift when the model is rotating hard left under the beginning-of-the-flight power burst. You can always take the prop shaft part of the

plastic nose bearing and tweak it a bit to the right if you want a wider left-hand circle and more climb. The left rudder adjustment (about .050 inches) makes you want to go left, while the wash-in of about .075 inches in the L.H. wing panel keeps the left wing up in the turn. The nose block has a bit of right thrust built in when you get it. On indoor models, launch on the side of the floor, allowing the model to go into its left circle without hitting a wall. On a gym floor or on a hard surface outdoors, you can

R.O.G. (rise-off-ground) if you built the version with landing gear. To do this, hold the model with the thumb and first finger just behind the wing from the top. Let the prop start, and then let go of the model. If there is a wind blowing, it is a good idea to aim the model not directly into the wind, but a little to the right, and be sure and let the prop run just a little longer before you let go of the model. The reason for this is the torque of twisting effect of the prop and the beginning of the prop run being so strong that it



may turn your model too much left, letting the wind get under your right wingtip, turning your plane upside down. A good R.O.G. will look very realistic, with the model going into a nice, smooth left-hand spiral up stairs to cuddle the cumulus.

FIXING THE PROBLEMS WITH TAB ADJUSTMENTS

As I mentioned earlier, being a good observer is the most important thing there is when it comes to making a plane fly well. First, recognize a *dive* for what it is; it starts down as soon as it leaves your hand. A *stall* is made up of three parts: 1) the model climbs a bit too steeply or zooms up; 2) it slows down a bit as the air breaks away from the top of the wing due to its too-steep angle of attack; and 3) the nose falls toward the ground (a dive). As it drops earthward, the angle of attack decreases, the model starts flying again, and then repeats the three steps again, sort of like a roller coaster. A *spiral dive* happens when the plane starts banking (rolling to the side by dropping one wing tip or the other) and keeps turning toward the ground until it crashes. You have to note whether it is a spiral dive to the right or to the left. NOTE: when we say "right" or "left," we are pretending there is a pilot in the plane, and it is to the pilot's right or left.

HOW FAR IS "A LITTLE"?

A little for one person is a lot for somebody else. To give you a better idea of how far an adjustment needs to be bent, I decided to use some common items to help you. A credit card is about .030 (thirty

Continued on page 82

TROUBLE SHOOTING CHART—NO WIND BLOWING, MODEL LAUNCH NORMAL

THE PROBLEM	WHAT MIGHT FIX IT
<p>1. Model dives straight in.</p>	<p>1. Bend the trailing edge of the stab or the elevator tab up .030 inches.</p> <p>2. Add a bit of modeling clay about the size of 1/2 a pea to the tail.</p> <p>3. As a last resort, reglue the wing 1/2 inch farther forward.</p>
<p>2. Model stalls. (Nose first goes up, hesitates slightly, then drops to a dive. Roller-coaster.)</p>	<p>1. Bend the trailing edge of the stab or the elevator down .030 inches.</p> <p>2. If the model wasn't turning, bend the rear of the rudder or the rudder tab about .030 inches left (as seen from rear).</p> <p>3. Try a bit of modeling clay about the size of a pea on the nose as far forward as it will go.</p>
<p>3. Spiral dive to the right. (Model raises its left wing—pilot's left—and finally crashes to the right.)</p>	<p>1. Hold model at arms length. Close one eye and see if wings are warped. The right wing should be untwisted, but the left should have about .070 inches wash-in. If too much wash-in, breathe on it and twist in opposite direction. Recheck.</p> <p>2. Bend rear of rudder or tab about .030 inches to the left.</p> <p>3. Bend the trailing edge of the stab up about .050 inches (or a tab).</p> <p>4. Add about a 1/2 a pea of clay to the tail.</p> <p>5. Bend right aileron tab down .050 inches and left tab up .070 inches.</p>
<p>4. Spiral dive to the left. (Model raises its right wing—pilot's right—and finally crashes to the left.)</p>	<p>1. Hold model at arm's length. Close one eye and see if the wings are warped. The left wing should have about .070 inches wash-in. If not enough wash-in, breathe on it and twist leading edge higher.</p> <p>2. Bend rear of rudder or tab about .050 inches to the right.</p> <p>3. Bend the trailing edge of the stab or elevator up about .050 inches.</p> <p>4. Add about 1/2 a pea of modeling clay to the tail.</p> <p>5. Bend left aileron tab down .050 inches and right tab up .070 inches.</p>
<p>5. Model refuses to fly left, even though you try everything.</p>	<p>1. Go with the flow. Fly right. Why fight it? You may have built it as a RH model without knowing it.</p>
<p>6. The model flies great until it runs out of power, then it dives, stalls, or goes straight.</p>	<p>1. Remember that the rubber spinning the prop makes the plane roll left. When the motor runs down, this force is missing. Try adjusting the model so that it glides well, and then play with the prop shaft part of the nose bearing. Twisting it a little right will open up a too-tight left turn, a little left will turn a straight climb into a left circle, etc.</p>



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like it very much on direct drive. Yes, it costs as much as a good four-cycle 40. Of course it does, the quality and time involved in making it is about the same. If you want to save money, buy three of the offroad six packs for the flight battery or, better yet, order from Charlie's or CS for savings. I recommend any plane designed for four-cycle 40s, the Quickie 500 planes, or the Stik-type planes. You should come out about six pounds, this will give you good performance. Be sure not to take shortcuts on wiring, use the Jomar or SR wire, Sermos, spade lug, or Adams connectors, and use double pole toggle switches using poles in parallel if you use a toggle. A 30-

amp plastic fuse is a good idea to protect the throttle and the plane. So there you go, and you can mix it up at the field and nobody will notice your plane is an electric unless you happen to fly alone! As many of us know, life gets better after 40; make it electric! Till next time!

Engines. . . . Continued from page 27

Italian contest and won first place. If you (would) like to get one of these Super Tigres, I'll be glad to swap a brand new one. . . ." The letter came from Guisepe Gottorelli in Italy.

I mounted Evan's G-19 and put on a heavy

Yoshioka 11.3 by 8.2 prop (heaviest I had) and put a leather glove on my right starting hand. In 15 seconds it was running at 7200. 11 7-1/2 Master Aircrow (and no glove) read 7550 rpm, and the engine was a pure delight. I wasn't going to strain this loan anywhere near the rated 15,500. The G-19 has a vertical bypass or transfer port up the left and right side of the cylinder. The exhaust ports are cut into the front and rear of the cylinder. As the exhaust exits the two ports, it is diverted left and right by a cast-in-place divider much like those under the rockets at Cape Kennedy that deflect cooling water and steam out from under the launches. The exhausts come out in front of and behind the transfer ports, yields four exhaust outlets, and this pattern was used on earlier ST engines.

The G-20 and all subsequent engines use today's side exhaust layout for gasses leaving the cylinder. The rear center of the crankcase has a big removable screw to drain out fuel from a severely flooded engine. Cylinder head has four hold-down bolts like today's X-40. The G-19 is delightfully insensitive on compression screw settings. Most diesels start and run within a 90-degree turn of the screw. The engine could have the screw set a half turn either side of optimum with little change. Oddly, the needle valve is *not* ground round; it has 11 flat surfaces that form a point. The prop driver is keyed with a standard square piece of steel to the prop shaft.

The G-19 was made in two versions; type A was diesel, and type B was glow. B was an ounce lighter. Data sheet shows the G-19 produced 45 hp at 15,500 rpm. The following G-20 was rated at 16,500, and the G-21 was rated at 17,500. So you can see Mr. Garafoli was building high-performance engines in the fifties. Some were rated as high as 28,000 rpm back then. It's the Super Tigre G-21 that the Soviets chose to *exactly* copy and sold under the name "Kometa MD-5," and they've also exactly copied other Super Tigres in manufacture but not in excellence of performance.

The first line of the Super Tigre instruction sheets from those days said, "Abbiare la massima cura del motore in Vostro possesso e seguite attentamente i consigli dati, per evitare delusioni e perdite de tempo." It's still good advice today. It means: take care of your engine and follow carefully our suggestions/instructions to avoid disappointments and waste of time.

RATINGS

Design = 9 points. Manufacturing excellence = 10 points (all fits are superb). Performance = 10 points. This was a near-perfect engine in the late 1940s. Today's value = \$60 to \$75. For Evan's G-19 Super Tigre.

Hey Kid! Continued from page 52

thousandths) of an inch thick. This is my idea of a "little." A dime is about .050 inches (a little more), and a nickel is about .075 inches thick (a lot). Of course, you'll be guessing, but at least you'll be in the ball park, instead of just trying to read my mind.

Dives can be fixed by increasing the angle of attack either by bending in some "up"

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elevator, or by breathing heavily on the stabilizer and bending the rear or trailing edge up a little. This is where your ability to tell a dive from the dive after a stall comes into play, because if you try "up" elevator to correct the dive that results from a stall, you'll make the next stall even worse, and get another dive! One of the challenges of flying free-flight is to be able to solve these kinds of problems, and you feel pretty great when you finally have it flying well! Take the trouble-shooting chart with you to the flying field to help you over the rough spots.

If you haven't added the aileron, elevator, and rudder trim tabs, you'll be breathing on balsa and twisting a lot to deflect the air in the right directions. You'll have to check those balsa twists after every flight, though, as balsa has a habit of going back to its original position. Steaming is more permanent.

CHANGING THE CG

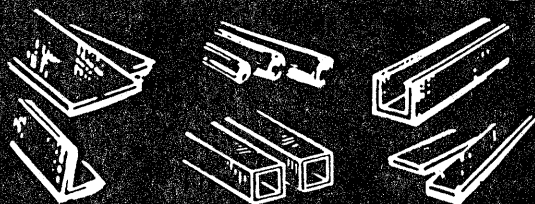
If you built your model and balanced it correctly before adding the wing, no changes in the center of gravity should be necessary. However, sometimes differences in motor weights when you add a longer motor may require a little nose-weight to re-balance the model. Sometimes a model which refuses to climb can be coaxed into doing so by making the tail just a wee bit heavier. Modeling clay is ideal for adding weight, and it does not take much. *Never* add weight to *both* the nose and tail, as that does nothing to adjust the balance but just makes the model heavier. Sometimes adding just a little clay to one wing tip or the other may help a model turn, but this should only be tried after all other methods have failed. Again, adding weight to both wingtips just cancels out the effect you are trying to achieve.

SOME FINAL NOTES

Try not to re-fly bad flights. Do something different on the flight following a bad flight. Oil the propeller bearing every few flights to keep dry plastic from rubbing on dry plastic. The rubber motor gets "tired" when being wound fully and should be changed now and then. If it's nicked or torn, it should be thrown out, but a motor which has gotten stretched will recuperate with a half-hour's rest. Keep rubber in a container that keeps out air and light, both of which ruin rubber. Re-lube the rubber motor when it feels dry. You can run a dry motor, but you will not be able to pack in as many winds, and it will tear easily. The only advantage of a dry motor is that sand does not stick to it as easily! If you get grit all over your motor, change it, or expect it to break soon. It can be washed off and re-lubed if you have water handy. If you get dirt into the nose bearing and the prop feels funny when you turn it, better wash that off with water *without getting any on the wings and tail*. Water is the enemy of sheet balsa, it gives you warps (unless you pin the wet part to a flat board and let it dry for a day or two).

I suggest that you don't risk your life for your model, much as you love it. Running in front of cars when your plane is flying over a street is a maneuver that can land you in the hospital, and climbing trees can have the same result. Throwing things at it to dislodge it is okay, if no one is standing underneath to get beamed by what you threw up

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131	1/4	.60
132	9/32	.65
133	5/16	.70
134	11/32	.80
135	3/8	.90
136	13/32	1.00
137	7/16	1.10
138	15/32	1.20
139	1/2	1.30
140	17/32	1.40
141	9/16	1.50
142	19/32	1.60
143	5/8	1.70
144	21/32	1.80

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231	.016 x 1/2	.35
232	.016 x 1	.50
233	.016 x 3/4	.40
234	.016 x 2	.90
235	.025 x 1/4	.30
236	.025 x 1/2	.40
237	.025 x 1	.70
238	.025 x 3/4	.55
239	.025 x 2	1.30
240	.032 x 1/4	.35
241	.032 x 1/2	.50
242	.032 x 1	.85
243	.032 x 3/4	.65
244	.032 x 2	1.60
245	.064 x 1/4	.60
246	.064 x 1/2	1.00
247	.064 x 3/4	1.25
248	.064 x 1	1.70
249	.064 x 2	3.00

SQUARE BRASS TUBE (12")

149	1/16 Square	.65
150	3/32 Square	.70
151	1/8 Square	.80
152	5/32 Square	.90
153	3/16 Square	1.10
154	7/32 Square	1.20
155	1/4 Square	1.40

BRASS STREAMLINE TUBE (12")

122	Small	.90
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SHEET METAL (4" x 10")

STOCK NO.	SIZE	PRICE EACH
250	.005 Brass	.90
251	.010 Brass	1.25
252	.015 Brass	1.75
253	.032 Brass	3.00
254	.008 Tin	.75
255	.016 Alum.	.80
256	.032 Alum.	1.00
257	.064 Alum.	1.50
258	Asst. Brass	1.50
259	.025 Copper	2.75

BRASS ANGLE (12")

171	1/8 x 1/8	.55
172	5/32 x 5/32	.65
173	3/16 x 3/16	.55
174	7/32 x 7/32	.60
175	1/4 x 1/4	.65

BRASS CHANNEL (12")

181	1/8	.70
182	5/32	.80
183	3/16	.65
184	7/32	.70
185	1/4	.75

SOLID BRASS ROD (12")

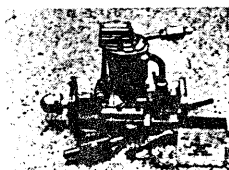
159	.020	.10
160	1/32	.12
161	3/64	.15
162	1/16	.20
163	3/32	.25
164	1/8	.40
165	5/32	.60
166	3/16	.80
167	.114	.40
168	.081	.40
169	.072	.25

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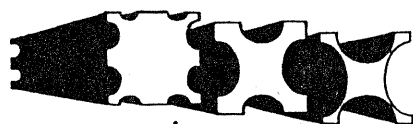
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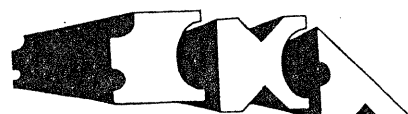
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G.S. 106

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Dick Sarpolus switched to Micafilm because


As he said, "it was easy to apply, very light, and very strong." Dick wrote us saying "I thought the lack of adhesive would be a problem, but it was simple." He used Pearly White & Red Micafilm on the Robin Hood. But for the C/L aerobatic, he used 3/4 ounce clear Micafilm and painted it with dope. "I'll be switching to Micafilm for most projects", he said. "Keep up the good work."

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at it. Some guys use a fish line with a weight on the end to throw over a branch and then yank on the line to shake the model out.

Some of you may wonder why we make our B.A.R.F. fly in circles. After you see it fly, you'll know why. If it went straight, it would leave most flying fields, and certainly would not do well inside a gym! Also, by circling, you can keep it inside a "thermal," or rising bubble of warm air caused by the sun heating the ground. Birds in thermals do not have to move their wings to stay up or climb, as the air around them is going up faster than they are gliding down. Your



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into higher pitch (so you will see more blade when looking at it from the side; more air resistance will make it turn slower). Twisting the blades to low pitch (less air resistance as seen from the side) will make the prop spin faster and give more power, but with a shorter run. This is useful if your 1/16 motor is not quite powerful enough to get you to the ceiling. I have over two-minute flights in regular gyms with *Sleek Streeks* by experimenting with different motors and prop pitches.

Outdoors your flight possibilities are unlimited. Walt Mooney once saw a *Sleek Streek* fly by a glider he was piloting at 7,000 feet! Some people have been known to put their phone number on their models when they start flying that well.

REPAIRS

I hope you don't need any, but it's a good idea to have your tube of glue handy. If your wing or tail parts are cracked, do not smear glue on the top or bottom of the wing. It will warp your model when it dries and shrinks up. Break off the cracked portion and spread cement on the edge where it broke. Do the same for the place it broke away from, wiping off the excess after you put it back together. The only glue which remains should be what is in the joint.

If the fuselage snaps, generally just gluing the parts back together is not strong enough. Gluing a sliver of balsa or toothpick on each side and wrapping the lot with thread and rubbing glue into the thread will help, but adds weight. Sometimes you can just make an overlap joint by putting one part over the other for a little ways, gluing and thread wrapping. Crude, but it may last until you get home to fix it right.

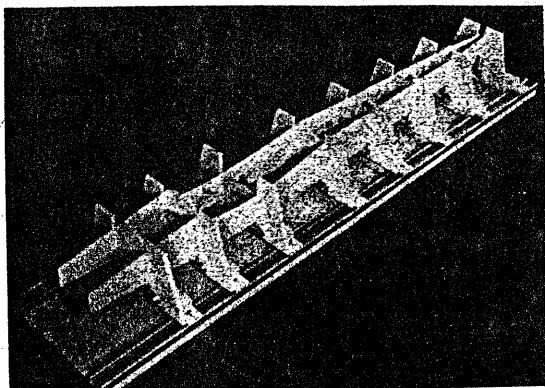
Next month we are going to begin what is called "stick and tissue" building, with a model called the *Peck R.O.G.* You might want to pick up a couple before then. You might also want to see if you can find a building board that you can easily shove pins into. Celotex wallboard is ideal (1/2-inch thick), but it comes in four-by-eight-foot sheets. Maybe you can go in on a sheet with a couple of friends. You can cut it up with a pocket knife right there at the lumber yard so it will fit in the family car. A really flat side of cardboard box (the double-thickness ones are great if you can find one)

model can do the same thing. Losing your first model up and out of sight can be a real thrill!

INDOOR FLYING

If you will be flying in a gym, you might want to spend some time with sandpaper making your model as light as possible, or even making a new one out of lighter balsa from your hobby dealer (Sig "very light" contest balsa is good). If your model is light enough, you will be able to use lighter rubber, such as 1/16-inch instead of 3/32-inch. If you use heavier rubber, you can cut its power down to get long runs by making longer loops, by twisting the prop blades

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is the next-best thing. You'll need some pins also, the kind they call "silk pins" at a sewing counter do nicely. Until next month, happy landings!

A special order sheet of all the materials we will be using in this beginners' series is available from Peck Polymers/Beginners, P. O. Box 2498, La Mesa, California 92044; phone, (619)448-1818. They stock Sleek Streeks, rubber, cement, winders, kits, and materials. A large self-addressed, stamped envelope will get you the special price list for this series.

R/C Soaring. . Continued from page 43

success of the Goldberg Electra, Airtronics has decided to go the idea one better. The Eclipse will be a six- or seven-cell model with gear drive (as opposed to the Electra's direct drive). The motors will be similar in design (i.e., Mabuchi 540/550 types), but the addition of a gear box will make the Eclipse's climb-outs, much less lethargic than DD types.

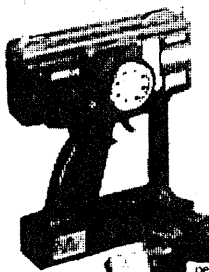
Stylistically, the Eclipse is a little reminiscent of the Olympic 650 with a few significant changes. Although the wing is a three-panel job like the little Oly, it has a bit more area (660) and a 76-inch span. The wing has tapered tip panels and straight trailing edges. The horizontal stab is, I believe, bigger than the Oly's, and it has a different shape (as does the vertical). The overall length of the plane from spinner to rudder is 42.75 inches. Ready to fly, the Eclipse weighs 37 ounces with three small servos and a seven-cell, 800-mAh power pack.

The kit will come in two versions: a deluxe version with motor, 3:1 gearbox, folding prop, spinner, and switch harness; and a standard kit without these items. Both will have the same complete hardware packages for the plane (i.e., pushrods, horns, etc.).

Structurally the Eclipse will be very Oly-like with an open structure wing with plug-in tip panels. The spar in the main panels will be 1/4-square spruce spar caps with I-beam shear webbing, and the tip panels will be 1/8 by 1/4 spruce webbed out four rib bays. Plans will indicate built-in washout for tip-stall-resistant flying.

The first kit run is tentatively planned for

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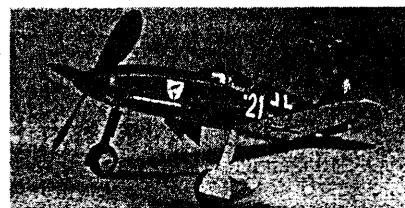
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this February. Likewise look for this design at upcoming trade shows.

With these two "earthshaking" (a common Southern California saying these days) discoveries behind us, let's move on.

Ian Douglas and Glen Clifton of the SWSA and ISS clubs of Southern California flew a sharp little two-meter design called the "Donzel" (in medieval times this was the knight's assistant who helped him put on armor and get on his horse). Its main claim to fame is the rather unusual choice of airfoils, namely the Selig 3010 which was



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designed to be a hand-launch glider section for use at very low Reynolds numbers (see August 1985 column for details). Ian is very happy with this Selig airfoil and has used it several times with success on small gliders.

Ian flew the Donzel to the highest place for a two-meter class ship. In the overall standings he was 18th.

The Donzel was designed for guys of both above-mentioned clubs who had flown Gnome 2-meters and had possibly crunched to death their fuselages. The Gnome 2M wing will fit right on this



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