Filling the pacifier fuel system with syringe is George Sugiuchi, who appears in all the pictures taken by Tom. The Burrito Brother/Maverick ancestry is quite evident in the design. The laminated curved wing tips add a touch of class, Tom thinks (they are aesthetic), and really don't take long to make, especially with modern modeling adhesives. Pictures indicate the compactness of this .09 aircraft.

If you want a top performing model that fits easily in a small car—but a ship that the bigger A jobs can't bully—then, instead of a ½A you should go this .09 route. This ship, an entirely new design, was developed out of the ½A Maverick.

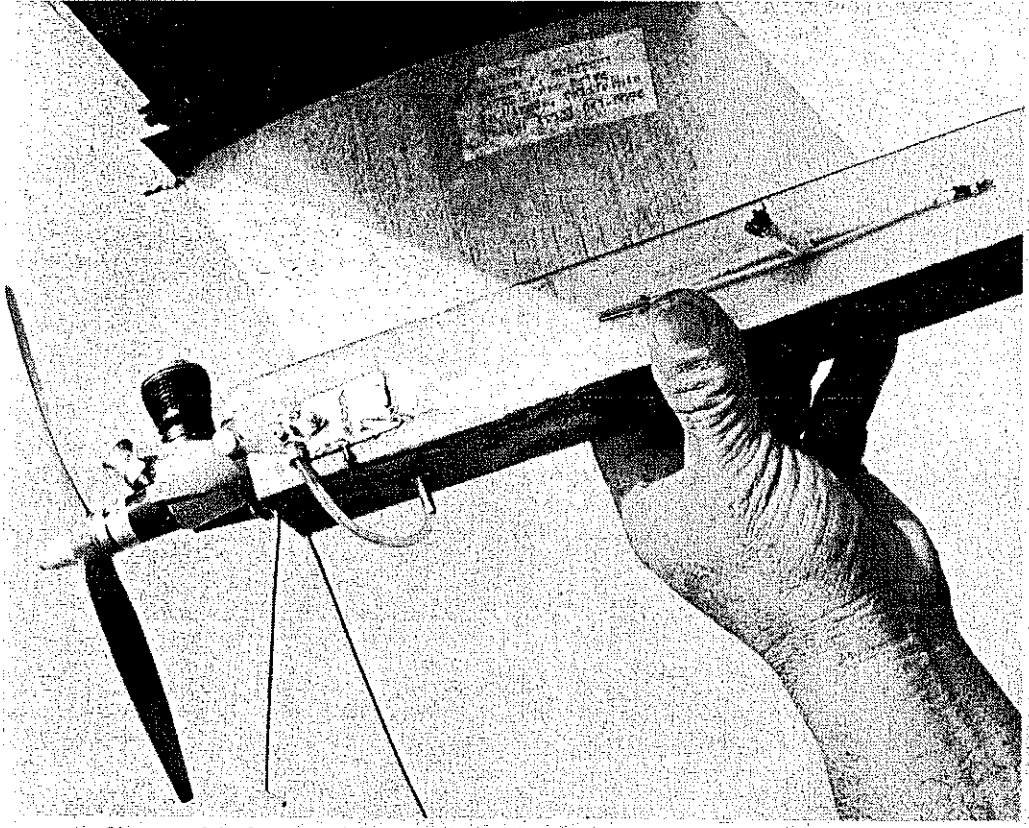
MANTO

Tom Hutchinson

Editor's Note: We are pleased and proud to publish this excellent free flight. Its story began in 1972-'73 when these pictures and plans were prepared—and a special challenge led to its publication. After reading his introduction you'll agree that Tom made all his points. What he goes on to say about construction and flight adjustments belong in any pro free-flighter's scrap book.

THIS article is dedicated to George Sugiuichi, one of those rare trusting souls with a spirit of adventure that every free flight designer dreams about. George built one of my ½A Maverick designs and really liked the way it flew, but had trouble winning with it in Class A because of its small size. All the ships that kept beating him were larger .19-powered models like my Flying Burrito Brother. The Maverick more than held its own against ships its own size, but these bigger bullies took advantage of the laws of nature and outclassed any ½A flying against them. (The smaller ½A model also had a visibility problem, since it tended to get lost easily, both in the air and on the ground.)

The obvious solution was, if you can't beat them, join them by building a top-of-the-line Class A ship, but George usually went to contests in a small car. He phoned me one day and asked what I thought about the performance capability of an .09-powered Class A model, since he hadn't seen many of them around. The more I thought about George's idea, the more it made sense to me. A Cox TD .09 has one of the highest power-to-weight ratios of any engine currently available. It hadn't been too widely



Close-up of the front end showing the Cox TD .09 installed in its Kraft/Hayes mount. Plans show DT snuffer tube hole, details evident in this pic. Twin-legged gear provides soft landings.

used because you can't readily switch engines and fly two classes with the same model. But a model built strictly for Class A competition with this engine would be more potent than a ½A because of its larger size and higher power. You'd also have a model that didn't take up very much more room in the car than a typical ½A.

Since George liked the way the Maverick flew, we decided that the new design would be based on its proportions as much as possible. I made some quick calculations and phoned back the dimensions to George. The next day, he showed up with a complete set of working drawings for my approval. Within two weeks, he had the first prototype completed and ready for test flights. I missed witnessing the initial test flights, but George reported back with enthusiasm the day after. The ship had flown right off the board, with the same good flight characteristics of the ½A. He also mentioned that he was starting another one right away, as a backup model in Class A.

Bob Ohly accompanied George to this first testing session and subsequent ones. He wanted to build one of these models, too, so he asked George to borrow his set of working drawings. While he had them, he decided to make up a set of inked plans from them. After seeing them, George and I thought we might have come up with a design worth publishing. We knew we had a good-flying airplane, a distinctive concept, a well-drawn set of plans and an experienced author to write the text. The name came easily enough: "Manito" is East LA Spanish for "little brother," which we felt was appropriate, considering its Burrito Brother/Maverick ancestry.

I took some photos of George at a Lake Elsinore flying session, then sat down at my typewriter in the spring of 1973 to prepare the article. I had the rough draft half-completed when I came back from spring vacation, only to learn the shocking news that George had died of a sudden heart attack while I was away. Since he had provided so much of the inspiration for the project, I just put away the plans, photos and rough draft. After getting married, starting a new career in teaching and moving several times, I'd almost forgotten about the Manito until last fall. That's when your editor wondered in print if there were any good free flight designs suitable for publication that weren't "just another look-alike ½A." His words jogged my memory, so I went up into the attic and pulled out the Manito plans to see if it would meet his stringent requirements.

After six years, the Manito still looked like a good idea. Flying fields, engine runs and automobiles have all shrunk in size, so a compact Class A model with better-than-½A performance should still be attractive to most fliers. Your editor agreed, and so the Manito will finally appear in print just as George, Bob and I envisioned it.

The Manito was originally designed around the Cox TD .09, but there are alternative power choices. Any plain-bearing .15, like the OS Max or Enya, would provide comparable performance, but would weigh about an ounce or so more. The design would probably be able to handle the power of a ball-bearing .15 like the ST G15, but the extra engine weight would probably cause the glide to suffer. With an .09 or .15 engine, total weight of the model shouldn't exceed 12 oz. (George's models weighed about 10 oz. with a TD .09.)

Posed during an early morn testing session at Lake Elsinore, George demonstrates the proper position for the hand-launching mode. Tom says this pressure system (pacifier) is simplest, light and consistent. On his model (not shown) Tom lets tank hang out—won't soak inside of fuselage if it breaks.

Construction

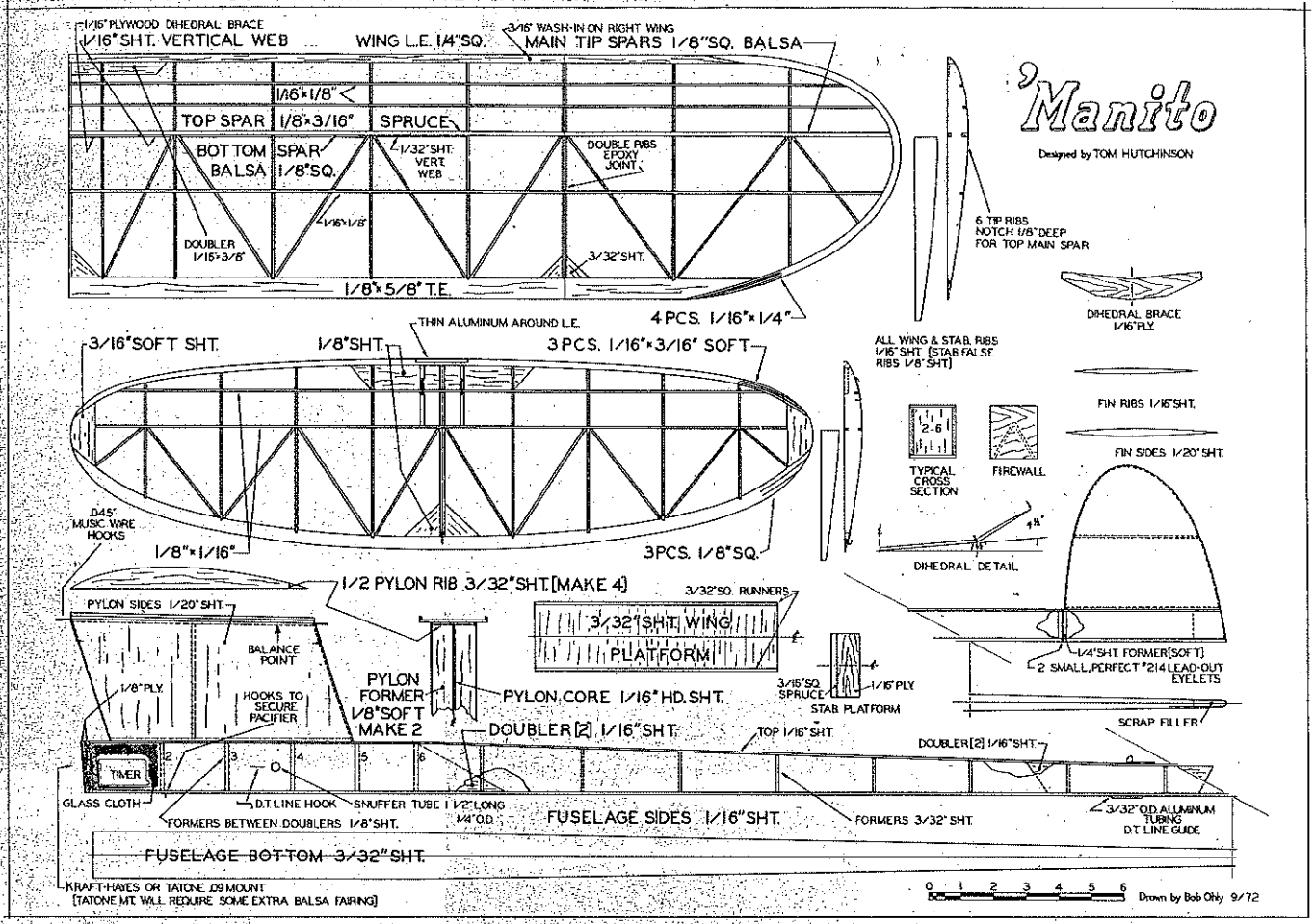
The model will go together much more quickly if all parts are cut out in advance, like a kit. For parts where only one or two pieces of the same shape are needed, trace the outline out on drafting vellum, then stick to the balsa with a removable rubber spray cement like 3M Spra-Mount. The ribs can be cut out individually using a plywood template, but greater uniformity will occur if you stack-cut them on a Dremel jigsaw or bandsaw. Cut out the required number of rib blanks to length from balsa sheet at least

George adjusts engine on his Manito—in approved manner, we add. Both George and Tom use squeeze-off timers for simplicity of operation. With flood-off timer excess fuel dumps so that its weight is not carried during glide.

1½ inches wide. Stick on a tracing of the rib pattern to the top sheet, then pin the whole stack together by running pins from both top and bottom. When cutting the ribs out, run the stack through the saw from the same direction for both the upper and lower surfaces. Cut the spar notches on the saw, while still stacked together. Sand the entire unit smooth, leaving the trailing edge portions of the ribs slightly oversize to allow for sanding to final contour later.

Wing Construction: Start the wings by laminating the curved tip pieces together. Best way is to cut out a form from scrap ¼ inch balsa (a cheaper substitute is corrugated cardboard) to the inside outline of the wing tips. Strip some ¼ in. wide strips from soft 1/16 sheet. They should be slightly over length, about 18 inches. Bend four of these strips around the form, holding them against the form with pins. Now use Hot Stuff to bond the laminations together. It might be wise to wax the outside edge of the form with a crayon to prevent sticking. Repeat for other tips. Now you can pin the leading and trailing edges down over the plan, and splice in the curved tips.

Be sure the right wing has sufficient wash-in. Block up the leading edge at the dihedral joint with a piece of 3/16 balsa. About halfway out to



dihedral joint, block up the leading edge with a piece of 3/32 balsa. The left wing center panel and both tip panels are built flat on board.

Cut the diagonal ribs a little oversize in thickness, to allow final sanding to contour after building. Cut the spar slots in the diagonal ribs after assembly, with a sharp razor blade and metal straightedge, using the slots in the straight ribs as a guide.

Use 5-minute epoxy for gluing the dihedral joints. It doesn't warp, fills in gaps and dries fast enough so that both center and tip joints can be made in one night. Sanding in the dihedral angles is made easier if the top spars in the tips are not installed until after the tip dihedral joint is set.

The center brace is a full-depth piece of 1/16 ply. After the center joint has been made, slot the center three ribs with two hacksaw blades taped together and the brace will easily slip in place. You can now install the spar webbing, with grain vertical. This step will provide a large part of the wing's bending stiffness, so don't omit it!

Stabilizer: This model has a long tail moment arm, so it's very necessary to keep stabilizer weight to a minimum. Laminate the leading and trailing edges from soft balsa strips in a manner similar to wing tips, except that no forms are required. Just set a row of pins along the inside outline, add the strips and outer layer of pins, then bond together with Hot Stuff.

Cut down the tip stab ribs from full-size center ribs. Place the rib over the spar, then cut off to proper length at leading and trailing edges. Use your rib template to trim to the right depth, cutting off the top side only.

Covering: Cover the wing and stabilizer so they can be allowed to cure while the fuselage is being built. Japanese tissue is the best covering material for a light model, although 00 Silkspan would also be suitable. Don't use the plastic films, since they are too flexible and heavy.

Don't skimp on your finish. Too little finish will result in a model which becomes fuel-soaked

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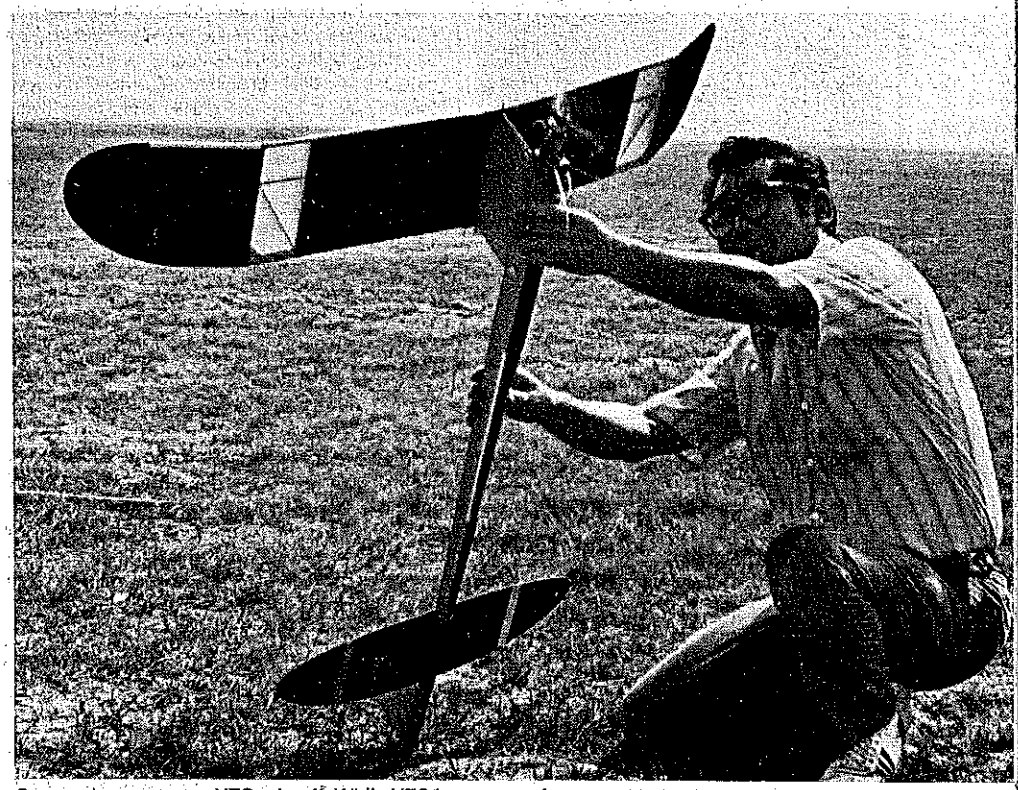

George demonstrates VTO takeoff. While VTO is not part of present AMA rules, most California contests still allow it. Lighter-colored panels of tissue separating the darker-colored bottom panels make for good contrast and visibility. A design of many years standing, Manito has planform that is dateless. Ship is state of the art, but old timers will sense familiar things.

the time consuming way to do it, but it sure looks the best. Add the balsa gun fairings and then water shrink the entire covered plane. I like to "shrink in" my wing washout rather than build it in. I used about ⅛ inch of washout at each wing tip.

Dope the plane with two coats of thinned dope, preferably nitrate, to which you have added an appropriate amount of plasticizer. The cowl section, as mentioned before, is not covered, but is filled in with several coats of dope and talcum powder followed by sanding. Take your time here because the cowl must look like metal rather than "grainy" balsa, if you really want a nifty-looking Fiat. After clear doping, select your favorite Fiat color scheme. I chose the sand and spinach effect with a yellow cowling and light grey undersurfaces.

I used Floquil Model Railroad paints thinned with very thin nitrate dope and sprayed on with an airbrush. After adding all the colors, details such as panel lines can be added with a soft grey pencil and "fixed" with a coat of clear nitrate sprayed on. My Fiat was built with the gear "up." I simulated the gear doors and wheels with bond paper glued in place with rubber cement. The numbers were cut from either black or red tissue and doped on. Next, add a pilot carved from foam and machine guns made from balsa or aluminum tube stack.

Trimming and Flying: I used a 9½-in. Peck-Polymers plastic prop and a large Peck-Polymers bearing with 5° of down thrust. The finished weight of my Fiat without rubber was about 70 grams (slightly over 2 oz.) and about 95 grams with rubber. I used 4 strands (2 loops) of FAI 3/16" rubber. The total length of rubber was about 15-17 feet! Tie the rubber with a good knot, lube it with Dow 33 or Sig Rubber Lube and proceed to "braid" the motor. Do this by having your buddy hold the knotted end of the motor while you put in about 17 winder turns with a 16:1 winder. Now, grab the knotted end from your buddy, while still holding onto the other end, and place both ends over your index finger. Pull out the now 4-stranded motor several times until it looks nicely "braided."

Install the motor in the plane and test glide over tall grass. When the glide is reasonable, try a few winds and launch the plane slightly nose down. If everything is still OK, try about 30 winder turns. My Fiat flies in a large left circle with a left glide. When properly trimmed, it will fly in a slightly nose-up attitude and glide very well with the braided motor. I fly for fun with about 100 winder turns (1600 total turns) and get 45 seconds or more duration. I go for broke with 130-plus turns—except you can't get that many turns in with a 16:1 winder. The motor is too strong. My plane flew for 1:53 to beat Mike Midkiff's super Hellcat at the F.A.C. Nats and I needed to use a 5:1 winder to get over 2000 total turns in it. Good luck with yours! Now I think I'll try one of Bill Winter's Grumman bipes!

(Editor: The "old timer" thinks his Curtiss SOC-3 biplane has the most potential for a bipe—also from MAN, gosh knows when.)

Manito/Hutchinson

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quickly, with a short useful lifetime. Use about three coats of nitrate dope with a clear epoxy final coat. Give a couple of extra coats to the front portion of the stab, since most of the exhaust residue seems to collect there.

Fuselage: Use a metal straightedge to cut out the sides, then add nose and tail doublers. Draw the top view out on a piece of 3/32 sheet, but don't cut it out yet. Pin this bottom to your building board, and glue in formers. (Hot Stuff works well for fuselage construction.) Add the sides, checking carefully for alignment. Sand fuselage assembly, then add the top.

Build the pylon by gluing pylon core to bottom ribs. Add formers, checking that core is truly vertical. Add the tip ribs, then sand and cover with 1/20 sheet.

The fin is built in the same way, but no central core is needed. Cut out two sides to the outline shown, then glue the fin ribs to one side with Hot Stuff. Sand so no rib edges stick out, then glue on other side.

I recommend an epoxy finish like Hobbypoxy on the fuselage. High-nitro fuels will destroy any other finish in a very short time. Cover the fuselage with tissue, using nitrate dope for better epoxy adhesion. Apply a couple of coats of nitrate (lacquer) sanding sealer, then two coats of colored epoxy (add an additional coat of epoxy at front end). Wet sand the first coat with #400 wet-or-dry sandpaper, and the final coat with #600. Rub out with Dupont white polishing compound.

Assemble the complete model and move the pylon until the ship balances where indicated, or very slightly forward, then epoxy in place.

Flying: Don't be in too much of a hurry to get out to the flying field. Assemble the model and check thoroughly for proper balance and the correct warps. The CG should be where shown on plans. If it balances tail-heavy, move the engine forward by inserting additional plywood spacers between the firewall and the engine mount. The engine should point straight ahead, or slightly left.

Hand glide the model to be sure there's no stalling or diving tendency. Correct by shimming the front or back of stab with pieces of thin ply. There should be a definite glide circle to right. Run the engine a few times to familiarize yourself with the pacifier fuel system and to make sure the engine cutoff works.

For the first flight, try a 5-second run with the prop on backwards and the engine running full bore. This probably won't tell you much, but it should get rid of first flight jitters. If the model does anything but climb straight out at a shallow angle, you may have problems. A sharp turn may mean that you have a misaligned rudder or bent fuselage. A steep climb at this stage means you have too much incidence.

From now on, all flights will be made at full power with the prop in the proper direction. Reason for this is that a hot free-flight pattern depends on being trimmed for one certain speed. The various adjustments you make are all delicately balanced to work against each other properly at your maximum climb speed. If you try to work your way up gradually in power, you'll find yourself undoing the low speed adjustments as you go along.

So bite the bullet, and try a full-power test fight with about a 3-second engine run. The model should climb straight out at a steep angle. Adjust thrust offset to correct any turning tendencies right at launch. Remove incidence if the model shows any looping tendency on this short a run. If it has a shallow climb angle, or the nose begins to tuck under, add incidence by shimming rear of stab. When you get it going straight out with no looping tendencies on this 3-second run, increase the engine run in 2-second increments.

If the model tends to go left on longer engine runs, add right rudder tab. Use pieces of 1/16 x ¼ balsa cut to a trailing edge section and glued to

the appropriate side of the rudder. Vary the length to get more or less tab effect. The thick, built-up rudder section makes the model fairly insensitive to rudder tab adjustments, which makes it easy to fine-tune the pattern to your liking.

The trim method I use is similar to that used on FAI Power models to obtain a right/right pattern, but without the complication of auto-surfaces. Thrust adjustments are most effective at low speeds (the first few seconds after launch). The wing wash-in gives you a left roll tendency during the right climb. Rudder tab is used to correct the later stages of the power pattern. You'll probably end up with a slight amount of left thrust, plus some right rudder tab (if warps are correct).

The power pattern you want to get should be a straight climb for about three seconds, gradually changing into a right climb, making about one complete turn in nine seconds. If the model goes "round and round," making too many turns, take out incidence to straighten out and speed up the climb. If the model climbs too straight up and tends to go left at the end of the power pattern, add more right tab. If it stalls and doesn't recover quickly when the engine cuts, add more incidence.

When the power pattern is set, check the glide again. Add weight to the rear of the fuselage until the model stalls slightly in the glide, then remove a bit. When you've achieved the desired power pattern, don't tilt the stab to change the glide circle, since that will affect the incident setting and maybe mess up your carefully-trimmed power pattern. Instead, add shims to the wing rails and tilt the wing. The glide circle should give about one complete circle in 40 seconds in calm weather. Tighten this to about 30 seconds if the wind comes up.

When writing advertisers, mention that you read about them in Model Aviation

CL Scale/Gretz

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quality of the lumber obtained can vary enormously. Densities can vary from four pounds to 20 pounds per cubic foot. Eight- to 12-pound balsa is considered medium, or average, weight. Six pound or less is considered "contest" grade. Logically, one should select the lightest, softest grades for the lightly stressed parts of the structure (block wing tips, sheet tail surfaces, etc.) and the heavier, hard grades for wing spars and fuselage longerons.

Grain direction is an important consideration, primarily in the selection of sheet balsa. The way the grain runs through the sheet largely controls its rigidity or flexibility. For example, if the sheet is cut from the log so that the tree's annular rings run across the thickness of the sheet (A-grain, tangent cut), then the sheet will be fairly flexible, edge to edge. In fact, after soaking in water some tangent-cut sheets can be completely rolled into a tube shape without splitting. If, on the other hand, the sheet is cut with the annular rings running through the thickness of the sheet (C-grain, quarter grain), the sheet will be very rigid edge to edge and cannot be bent without splitting. A sheet is called "random cut" or B-grain when the grain direction is less clearly defined, and this sheet will have intermediate properties between A and C grain. The accompanying chart illustrates the three basic grain types for sheet balsa and lists the most appropriate uses for each.

Remember, when selecting sheet balsa, grain direction and weight should be unrelated considerations. You can find light or heavy A-grain, light or heavy B-grain, and light or heavy C-grain. Grain direction controls the stiffness, not the weight!

Mike Gretz, Box 162, Montezuma, IA 50171.

RC Old Timers/Mathews

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the Oshkosh "happening" stems from a permanent site which has been constantly improved on a long-term lease agreement, and the absolute assurance of knowing what to expect in motel and meal arrangements before one even arrives. We should perhaps consider the EAA example as we re-evaluate our own annual national "convention."

The Omaha Nats: While the rest of the contestants at the '79 Nats flew at either Lincoln or Mead, Nebraska, we RC Old Timers went to the far west edge of Omaha. Our site was in a City Park overlooking a lake with neatly mowed grass surrounding it in all directions. Truly a lovely site, with the field placed on the crest of a flattened-off hill, and a panoramic view of the surrounding countryside. Although hardly an ideal way to demonstrate our "thing" to the public or to interested contestants in other events, those who attended were rewarded with a lovely day and a friendly group to mingle with.

Although the entry size was rather disappointing, the calibre of competition was high, with several well-developed models and above average times recorded. John Pond and this writer demonstrated the brilliant minds required in writing a column. John launched his Dallaire with the receiver *off* and I locked my keys in the car trunk. Smart! In spite of that, I greatly enjoyed the hospitality extended by the locals, and would gladly fly at their place another time. It was beautiful.

Bill (Berkely Models) Effinger recently related something worth sharing: "The first gas model I built was a scale Buhl Pup, (Editor: It was big, like today's ¼ scalers.) built with removable wings and bracing for easy transportation. I built this model without ever seeing a gas model. Come to think of it, it was likely the first scale gas model. With a six-foot span and a Brown Jr. (#187) it climbed like a rocket, but took 1000 feet to pull out when the engine quit. . . must have traveled at 80 mph. Transportation was a problem as I was under 18 and didn't have a driver's license. Taking a model on the subway to the ferry, to the bus, to the trolley, and finally to the airport was an experience."

Mr. Effinger is recalling 1936 in New York City; he lived in Brooklyn. Who says flying site problems are something new? Somehow those who want to fly models always figure a way.

Fast Richard Runs Behind: We hope to include brief overviews of manufacturers' lines of Old Timer-oriented kits, powerplants, and accessories in future columns. You folks in the business are invited to advise me of what you have. We'll start with Dick Mathis Design Group (formerly M&P), Lone Oak, Texas 75453. "Fast" Richard's kit line includes: Flying Quaker 84", Quaker 54" (reduced size as opposed to the Quaker Flash—see *MA*, 8-78), Dallaire 108" and the Comet Clipper. He has recently returned to S.M.U. to complete his PhD on a teaching fellowship and is running behind on deliveries of the Clipper. Dick advises anyone who has made a deposit that refunds will be made to those who cannot wait for early 1980 delivery. We plan a kit review of this Carl Goldberg classic cabin job soon. It should be a pure delight.

Dick and his vivacious wife, Mary K., are contemplating adding a 900 sq. in. scaled-down Dallaire to their line. We watched several of them perform at Ft. Worth and predict this Dallaire Jr., combined with a 40-size engine, will