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RCM MODELER

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THIS MONTH'S COVER
features 5 year old Joe Mitchell holding dad's 10¼ lb. Dalotel. Powered by O.S. 1.2 4-stroke with JR radio and spring air retracts. Semi-kit available from Columbia Model Crafts. Photo taken at Lake Elkhorn in Columbia, Maryland by Ed Mitchell.

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From the Shop

RCM STAFF

Want an opportunity to win an Enya engine? For details, see the ad elsewhere in this issue. Arrangements have been made with Altech Marketing, the importer and distributor of Enya Model Engines in the U.S., to continue this very popular program through 1984. We are pleased to offer our readers a chance to win an Enya, one of the world's finest engines.

★

Gene Planchak, Downey, California, sent in the following note and photo.

Joe Ward, a good friend of mine who has been into R/C for many years, has found a new use for one of our modeling products. It seems his dog "Lady Bug" (who is getting up in years) has a slipped disc and arthritis. As a result, both of her hind leg's are paralyzed.

So Joe, feeling sorry for the dog, noticed the landing gear on his Tri-Squire and came up with a nifty solution for "Lady Bug's" problem. He used 1/2" foam, some sheet aluminum for the cradle and a leather strap holds the whole thing on. And, it works great.

Joe Ward's solution to help Lady Bug's handicap. See text for explanation.

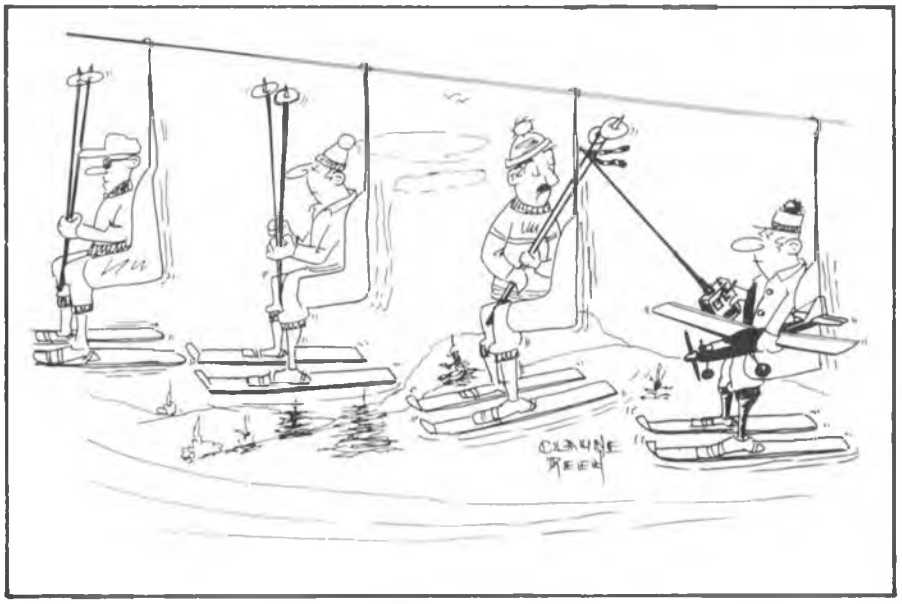
. . . I am s-o-o-o-o confused! . . .

Instead of having to laboriously drag herself, she can now go almost anywhere she wants to. "Lady Bug" is almost as good as new — which is more than I can say for Joe's Tri-Squire.

Remember to keep your batteries charged. See you next month. □

SUNDAY FLIER

Ken Willard



Well, the 1983 Dum-Dum contest, to say the least, was a real winner. More of you entered this time than ever before --- maybe because there are more of you out there doing your thing with R/C. No matter, you really came up with some beauts.

However, it's only fair to tell you that I did it again. First, as I mentioned early this year, I Zapped a couple of servos into permanent immobility; then, during the RCM Trophy races, I outdid myself. Here's what happened.

After five rounds of racing, I was tied for second place. The fifth race was tough, because the wind was light and you really had to use the updraft on the hill carefully. Anyway, I won my race, and was going around to land, when someone called out, "Hey, Ken, great race! How about a victory roll?" So, I turned around, totally forgetting that the lift was virtually nil, rolled over upside down, and promptly did a Split S into the side of the hill as I tried to complete the roll! Dum-dum? You bet. But then, mad at myself for being so stupid, I ran down to get the racer and pulled it out of the bushes. Bushes, hell! It was poison oak! Took me a month to get over the rash! Dum-dum!

So you can easily see why I'm still Chief Dum-dum. But a lot of you came close. Take Bob Demond, from Augusta, Georgia, for example:

When they closed Sky Harbor Airport in Indianapolis, it offered us an excellent flying site. I was flying a Mighty Mambo with an O.S. Max .58 at the time. Only trouble was you had to carry your stuff quite a ways out to the runway, so to make it all in one trip, I simply put the wing on and added two rubber bands just to keep it from falling off on the way out (flight box and transmitter in one hand, Mighty Mambo in the other). By now, you've guessed the rest of this story. Got to the flight line, fired up, took off, and --- say, ***what's that funny noise?*** *Judging from the occasional* ***daylight*** *between the wing and cabin, those two size 64 rubber bands are really earning their keep. Quickly throttled back, landed, and no damage done.*

Bob, I think a lot of us have forgotten to put additional rubber bands on to hold the wing in place. Although you didn't win, you certainly deserve a pat on the back (below the belt, of course) for trying.

I kinda like this next one. It's not unique, but Perry A. Kuznar, up in Eau Claire, Wisconsin, tells it well.

The approach to our field is over a narrow row of medium height evergreen trees. Here I was turning final just beyond the trees. It is at this point that I usually have my throttle pulled back all the way on the stick and must pull back on the throttle trim to get my rpm down lower than my normal idle setting to get the plane down (I have a hard time getting the plane to come down at my normal ground idle setting). So old "Joe Cool" reaches his thumb from the throttle stick to trim and starts pulling it down. My plane started to pitch down a little after my "throttle reduction" so I proceeded to give a little back stick to keep the nose up. Nothing happened! The plane continued to pitch downward and two seconds later — crunch! I couldn't believe it! That's the first time I've ever been shot down. Then I looked at my radio and unbelievingly found out it was I who had shot myself down. I had not pulled down the trim as I had thought but had instead shut off my radio.

In a way, it reminds me of a local modeler who installed retracts and flaps on his latest pride and joy. Took off, flew around, retracted his gear, extended the flaps for a test, and was happy with the way everything worked. It was his first job with all those bells and whistles, as we say. After a nice flight he began his landing pattern, lowered the gear on downwind leg, turned base, then turned final.

"You're gonna overshoot," someone called out.

No problem, Just lower the flaps. Only problem was, his head was up and locked. Instead of reaching for the flap control, he panicked and flipped the gear up! Fortunately, the runoff area beyond the runway was flat, and the resulting belly landing just scraped the bottom of the wing. Not a bad Dum-dum candidate, but he refused to write it up. Y'gotta be careful with those complex transmitters.

Now this next one is almost a winner. George Christensen, of Jonesboro, Tennessee:

I dropped out of modeling when I opted for the corporate ladder but I'm very happy to report that, nearly 30 years later, I'm off that ladder and Scott has me back into the old routine. My first effort was to build Top Flite's 'Hot Kanary,' designed by Scott and Charles Bauer. It was during the construction of that airplane that I committed my 'Dum-dum.' The design features a rather sophisticated (for me) wheel pant system, using molded pant halves, Kraft streamlined wheels and assorted nuts and bolts. The two inner halves require a lot of work; a plywood doubler with a 2-56 bolt and blind nut

for alignment, as well as a slot to accept the 8-32 axle bolt. The outer halves are simply sanded to match their inner mates and set aside for later epoxying. After laboring for hours over the two inner halves, and quite weak from the effort, I was ready to glue the halves together and, yeah, you guessed it. I permanently joined the two inner halves. Upon discovering this when I returned home later that evening, friends had to restrain me from injuring myself in my grief. However, next day I called Scott and he sent me another set of pants and I'm happy to report that I finished the job and am quite proud of my Kanary.

I can see from your picture in RCM, that, like me, you are beyond your teens. I started model building in the thirties when 'kit' was just a nickname for a girl named Katherine and the 'state of the art' in flying models was the Jimmie Allen 'Bluebird.' That airplane would be a classic today and I would be very interested in hearing from any of your readers who might still have a photograph or, better yet, a set of plans. I can vividly recall 'Bluebird' races back in southern Minnesota nearly 50 years ago.

George, at one time or another most modelers have made two left fuselages, or two left wings, so your joining of two inner halves actually is a sort of variation on the theme.

If any of you modelers happen to have a set of plans of the Jimmie Allen "Bluebird" and could send a copy to George at P.O. Box 493, Jonesboro, Tennessee 37659, he would appreciate it very much.

The foregoing letters are only a few of the many that I received. I want to thank all of you for sending in your entries. When you read this last letter, which won first prize, from Edmund G. Leuter, I think you will agree that it is the most unique Dum-dum of them all.

I was getting ready to go out to the local flying field on a picture perfect Saturday. I noticed that I was a bit short on fuel, but then I discovered I had a quart can of K & B 500. I grabbed it and thought that I was set for the day. My plane was a Sig Kadet with ailerons and a Fox .36 R/C.

I put in two very nice flights before all of my fuel was exhausted. I then grabbed the quart of K & B 500 and filled up. Upon firing up the engine, I noticed it wasn't quite running properly. It sounded fat and wouldn't idle right. Thinking the glow plug was at fault, I asked a buddy if he had any spare glow plugs. He said that he had just used his last one on his plane. Fortunately a hobby shop was just a few mintues away and I buzzed over in my car to pick up a couple.

I returned to the field, installed a new plug, fired up only to find that things hadn't changed at all.

I decided to heck with it, I'm going to fly it regardless. Now, the one thing that I would like to say here is that I was a relatively new pilot, having only soloed a month or so before this incident.

I topped off the tank and fired it up again, checking the engine to see it was putting out all it could muster. I pointed the Kadet into the wind and took off. The Kadet staggered into the air. The plane lurched, shimmied, quivered, rattled and shook itself up to the astounding altitude of six feet.

I attempted to turn right. The plane banked to the right and immediately started to lose altitude. I cranked in all of the up elevator I had (I was a new pilot, remember?), and immediately stalled the wing. I was fortunate enough to level the wings just as my only airplane went down in the weeds on one side of the field.

At this time I was firmly convinced that there was something slightly amiss. I have a firm grip of the obvious. I retrieved my undamaged Kadet and tried to figure out what the problem was.

I thought to myself that the engine had run perfectly earlier in the day. Then I switched fuel and the engine went sour. Aha! The fuel!

I opened the can of what was supposed to be brand new K & B 500 fuel. I poured some onto my hand and took a sniff. What I thought was K & B 500 fuel was in reality lacquer thinner. I had actually flown my Kadet on lacquer thinner. And almost made it!

Bob Hughley, Twisp, Washington, built this interesting version of the Ken Willard designed BT-70 (RCM plan #460, May 1971). Bob modified the .15 powered BT-70 by incorporating full span ailerons and tail dragger landing gear with skis. Makes a nice Snowbird.

I borrowed a tankful of real model fuel and my Fox engine ran perfectly. The engine has suffered no permanent damage and lead a normal life. That is, until I flew it and the Kadet into Arco oil storage tank number twenty-two, but that's another story.

Oh, I almost forgot — you're probably wondering how lacquer thinner got into a K & B can. Easy. I had used up the fuel about two weeks before this event. Earlier in the week I had needed some solvent to clean an engine. Now, a good friend of mine owns a body shop. He buys his thinner in fifty-five gallon drums. I brought down the quart can and asked him if he could spare a little thinner. He said no sweat and I filled up the empty K & B can. After I cleaned up the engine, I put the can back on the shelf ***without*** *labeling it. Then came the fateful day when I needed fuel and got thinner.*

So, there is my glorious attempt at fouling things up. I had to wait three years to become a proficient (?) pilot before telling this little story.

Congratulations, Ed (I think).

We had a tough time deciding what your prize should be, Ed. We thought about sending you some fuel, but we were afraid you might put it in your new electric job. So, instead, if you will let Dick Kidd know your preference, he will send you the RCM Anthology Book of your choice. In addition, by arrangement with Top Flite Models, you will be receiving a Headmaster Sport 40 kit for use with your Fox .36. It will fly fine with that engine for power. That is, if you use glow fuel instead of thinner. □

CUNNINGHAM ON R/C

Chuck Cunningham

Featured in the October 1981 issue of R/C Modeler, this Big Bird Two sits in the tranquil surroundings of Lake Powell in Northern Arizona. Powered by an O.S. Max .20, was built by Gary Vegh of Mesa, Arizona. Photo by David W. Vegh.

"My dad says you're the most popular kid on the block!"

As you are reading this, it is winter time in most of the R/C world, not much flying going on, and probably not much building going on either? Why not? As we all know, it's a lot better to build and plan in the winter than to be caught short by not having anything to fly when the flying season starts. Each year I mention this same thought, but each year some new builders and fliers have joined our ranks so for those of you who have read this before, read again --- you might be reminded of something. For those of you who are new to this hobby/sport, pay attention.

Your equipment that is used in R/C is like a living, breathing, thing. It's not like a set of golf clubs or a tennis racket, something inert, that simply lies in wait to be used again. Your R/C equipment is alive. If you don't believe me, try flying with "dead" batteries. The care that you give to your equipment while it is not in use will show up when it's time to get back to the field again. And this also holds true for that other radio set that is resting in that "other" airplane that you don't fly very much. You should charge all of your batteries at least once each month to keep them in good operating condition. You simply cannot keep a battery stuck off in a corner for six or seven months and expect that it will give you good service when you call upon it.

The same is also true for a set of servos. If you have a radio set that is not being used, for whatever reason, give it a little work at least once each month just to flex its muscles so that it won't grow old just sitting around.

Keep a log book, no matter if you have one radio or ten. Set up a simple log book, identify each radio set and battery in the log book, then note the date each time that you take this unit out to fly. When the flying season is over, make sure that each unit in your log book has been "used" at least once each month. By using, I mean charge the batteries overnight, and operate the radio equipment for about five minutes, working the transmitter sticks and servos. **Turn off** all of the switches, and put it back to bed. Make a date entry in your log book, then a month later do it all over again. When you get ready for spring flying you will find that your radios and batteries will be ready to be used again.

Your best bet, though, before the first spring flying session, is to charge each battery pack overnight, then run a full discharge test with an ESV to determine how much battery life is available. If, for the standard receiver and transmitter pack, you get less than one and one half hours, then you may be having some battery problems. Charge and discharge again to see what kind of life your battery possesses. If it does not seem to hold a charge for very long, then your wisest move is to discard that pack and purchase another. It's the best insurance you can buy.

Engines need a dose of tender loving care also. Keep them stored in a clean, dry environment, and keep them well-oiled. The four stroke engines are much more susceptible to moisture problems than are the two stroke engines, due in part to many more moving parts. It is important to run them dry after flying & to keep them clean and well-oiled. What I mean by running them dry is to let the engine run until it has exhausted the fuel in the carburetor when running it for the last time of the day. Do this by pulling the fuel line off of the carburetor and letting the engine burn up all of the fuel in the carburetor. Never leave an engine with fuel still in it. For that matter, never leave a fuel tank with any fuel still in it. Always drain the tank. Unless you have seen what happens, you can't imagine what all that green glop is like that grows in a fuel tank when it is only partially empty. That same glop grows in the engine's carburetor when it still has some fuel in it. No matter what type of engine you are running, a two stroke, a four stroke, or a gas and oil burning engine, it's important to keep each clean, free from moisture and well-oiled.

While we're on the subject of engines, let's talk a little bit about a question that seems to crop up more and more lately. That question is "What engine should I use for what airplane?"

A lot of understanding must go into answering this question. Most kits advertise the engine size range that is

acceptable to the design. An aircraft ad may say .40 to .45 engines. Well, as most of us know, this sizing is based upon the standard two cycle glo engine with lots of power. The questions arise when a modeler is deciding about using a four stroke engine. He wants to know what size engine he should use for what size model. The larger the model, the more that this decision seems to cause a problem. As a simple rule of thumb, assume that the four stroke engine delivers about two thirds to three quarters of the power of an equivalent displacement two cycle engine. Therefore, if the plans or kit calls for a .40 to .45 engine, then consider using a .60 four stroke. If it calls for a .60 two cycle, then use a .75 to .90 four stroke. In the larger models, if the plans call for .90 two cycle, then a 1.20 four stroke will pull well.

Another factor in this equation, however, is how heavy do you normally build a model. Some builders simply build light, while others build heavy as lead. The wing loading of your model has a bearing on the size of engine that you use. As an example, my .40 Turbulent was designed to fly with a .40 to .45 two cycle engine, but lots of builders are putting a .45 four cycle in the nose with great success. Of course, these modelers are building light.

The prop that you turn with a four cycle engine has a lot to do with its ability to haul your aircraft through the air. It has been pretty easy to select a prop for a two cycle engine operating in most normal models; a 10/6 for a .40; a 11/7.5 or a 12/6 for a .60. When you get into the four stroke area, it seems that you have a very wide variety to choose from, and you need to spend some time matching props to the aircraft that you're flying. As an example of this, I heard the other evening from a modeler who had built my .90 Turbulent and had equipped it with a Max .90. After a lot of flying this way, he tried an OS 1.2 four stroke in it and said that the two engines flew the aircraft in a very similar manner, except that the vertical climb-out seemed to be better on the 1.20. I asked him what prop he was using and he said that after trying an 18/6 and a 17/6 he finally settled on a 16/6 as giving the best flying. It's a matter of experimentation.

We are now having some very exciting times in modeling. I don't know if you have realized it or not, but the last five years have probably been the most interesting since the advent of really workable radio equipment back in the early sixties. Today we have such a wide variety to choose from, that it kind of boggles the mind. Pick an area that you're interested in and get busy. If you're moving into larger models, or you want to try a four stroke, then don't let some small problems keep you from the enjoyment of this type of model. If you're simply getting into modeling with the very straightforward method of a mid size model and a .40 engine, then get all of the help that you can from your local hobby shop as well as friends that you make at the flying field. This is a "help each other" hobby. If you're not sure what engine will pull what aircraft, give the matter some study, and then if you still can't come up with the answer, call the manufacturer of the kit. Almost everyone is willing to help. □

RELEASABLE TUBE HOOK

By William L. Bynum

In the Spring of 1981 I was Contest Director for a 2-Meter "Fun Fly" soaring meet in Kansas. As one might imagine, the combination of Kansas weather and a sailplane contest resulted in strong gusty winds and a lot of frustration. Since I normally launched my glider with a power pod, I was somewhat surprised at the height that I could obtain on a small Airtronics' hi-start in the windy conditions. Unfortunately, along with most of the other fliers who were using fixed tow hooks, I had difficulty in getting off of the line at the top and eventually lost most of the altitude.

Since I was being transferred to Belgium, I did not spend a lot of time worrying about the problem. However, Belgium also has its share of wind. A couple of months ago I was complaining about line release when a Canadian flier reached in his tool box, pulled out a small plastic bag containing a British made captured releaseable tow hook and said, in effect, quitcherbitchen and try this.

I was delighted until his next comment, which was, "That will be 3 pounds 60." Not having a mathematical mind, I still was able to compute that that was more than $6.00 U.S. It was then that I remembered that my natural frugal bent (cheap) had prevented me from trying such a U.S. made item before.

Not wanting to appear to be all mouth before an international group of glider nuts, I dutifully paid up, went home and installed the new hook in a Marks' Models' Mirage that was in the final stages of construction.

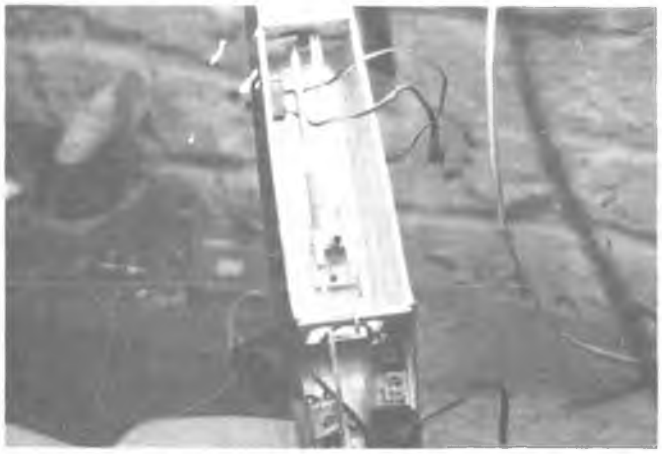
The releaseable hook worked beautifully. Wind no longer drove me into screaming fits. I got off the line when I wanted and where I wanted. I even learned to "S" turn on the line to get even more altitude without a pop-off. More height on launch equalled more time to look for thermals and I began to achieve longer and longer flights.

I started to feel like an accomplished glider guider for the first time and began to think of fine tuning my technique. The first thought was to try different hook locations under different wing loadings and wind conditions. That was when I

The main components. From left to right: 5mm thin wall brass tube with trigger notch; Maple bearing block, upside-down to show the trigger bearing slot; 1/8" ply base plate; 1/16" music wire trigger; tow hook.

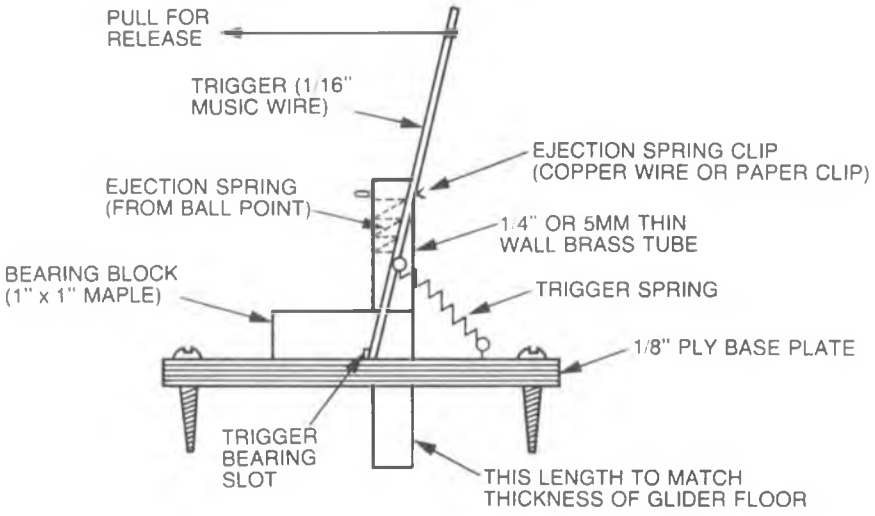
Another view of the components, showing the brass tube super glued into the base plate and the top side of the bearing block.

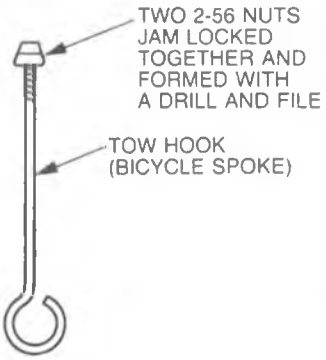
The completed tow hook assembly. From start to finish it normally requires less than 45 minutes to construct this jewel including a couple of tow hooks. Further, it costs less than 30¢!

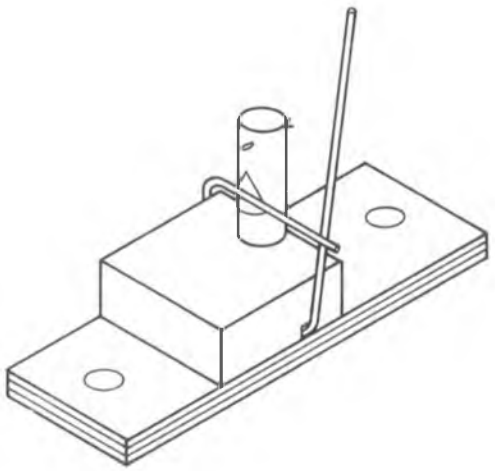


Installed in a glider. This releasable tow hook takes up very little room and functions perfectly once set up properly.

This tow hook requires no major surgery to install or move. The only thing visible is the 5mm hole into which the tow hook is inserted.







remembered the second reason that had prevented me from buying a commercial hook.

The installation of a commercial releaseable tow hook requires that you cut a great awful hole in the belly of your beauty. If you don't get it right or if you want to experiment with the location, you have to extend this hole or cut another. Eeech! There must be a better way.

First stop — data bank — a pile of old magazines and crumbly miscellaneous clippings that had followed me around the world. I read not only the soaring articles but the free flight columns as well. No luck. Every idea that I found either required major surgery for installation or were so complicated that it would require a mechanical engineer to construct and adjust.

There appeared to be no other choice than to develop my own. My criteria were:

1. Installation and adjustment without major surgery.
2. Simple to build.
3. 100% reliable.
4. Inexpensive (dirt cheap).

My experiments to date have met all criteria. The device shown in the drawings and photos requires only a 5 millimeter hole for installation. If you want to move it, another hole is required but a 5 mm hole is easily plugged with a scrap of balsa or even a piece of tape and there is little danger that even 3 or 4 holes of this size will cause any structural weakness. It is also very simple to build and costs about 30 cents.

As for reliability, I have tested it on a vertical pull of 15 pounds and an angled pull, such as applied by a tow line, of 35 pounds with no premature release. The real proof, however, is in the field. To date, I have almost 200 hi-start launches, many in strong winds, without a failure, neither a hang-up nor a pop-off.

I believe the sketch to be self-explanatory but a few hints may be in order. I used 5 mm (about 0.2") thin wall brass tubing because the Belgium hobby shop had it in stock. Quarter inch thin wall brass tubing should work even better.

For my first experiment I used 1/16" brass plate for the base and 1/16" I.D. brass tubing for the release bearing. This worked well but I had some difficulty in keeping everything in line while I silver soldered it all together. For this reason, I prefer the 1/8" ply base plate and the epoxy bearing.

Before you begin assembly, cut the notch in the brass tube with a fine triangular file, bore the holes for the ejection spring pin, and clean the outside of the tubing with fine sandpaper.

To assemble, insert the brass tube through the base plate and temporarily hold or clamp the trigger and bearing block in place against the tube. Move the tube up and down until the trigger fits perfectly into the tube notch. Without moving anything, super glue the brass tube to the base plate.

The rest is simple. Coat the bottom trigger cross bar (the 1/16" music wire part that fits through the bearing block) with Vaseline or goose fat, coat the bottom of the bearing block, to include the trigger bearing slot and the tube support slot, with 5-10 minute epoxy, insert the greased trigger into the bearing slot and clamp the whole mess together as shown in the sketch. After the epoxy starts to set, but before it goes rock hard, wiggle the trigger back and forth to make sure it is not stuck.

Next, the tow ring. Cut a bicycle spoke or a threaded pushrod end about 5/8" longer than the desired length of the finished part. Run a 2-56 nut on to the threaded end about 3/16", put a drop of super glue on the nut and immediately screw another 2-56 nut onto the rod and jam the two nuts together. Chuck the unthreaded end of the rod in a 1/4" drill and turn it on. The cone shaped catch is easily cut to size and formed by holding a fine flat file against the spinning nuts. Check the size of the catch very often against a scrap of tube. The finished size of the catch should be a slightly loose fit in the tube. You will know that you have the correct size when you insert the tow ring into the tube release; the trigger engages and holds it against a steady pull and the ejection spring spits it completely out of the tube when the trigger is activated.

The holding power of the trigger can be adjusted by the size and stretch of the trigger spring. I set my hook up with a fairly weak spring and activate it with a quick blip of full down elevator.

I hope that you will agree with me that this is one of the simplest to construct, and easiest to adjust, releaseable tow hooks that you have ever seen. Good luck and get high. □

AQUA SPORT

ABOUT THE AUTHOR

Mitch Poling has been writing about electric planes since 1974, starting with an R/C conversion of the Mattel Super Star. His main interests in R/C are sport, gliders, water planes, and Stand-Off Scale. Mitch lives in Seattle, Washington, an ideal place for seaplanes and, in addition to his R/C hobby, he is busy raising a brand new daughter, teaching chemistry, learning to fly full scale seaplanes, writing, and enjoying life with his wife, Sandra Smith Poling, M.D.

AQUA SPORT
DESIGNED BY:
Mitch Poling
TYPE AIRCRAFT
Electric or Glow Sport
WINGSPAN
49 Inches
WING CHORD
9⅛ Inches
TOTAL WING AREA
447 Sq. In.
WING LOCATION
High Wing
AIRFOIL
Flat Bottom (11%)
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
3"
O.A. FUSELAGE LENGTH
34"
RADIO COMPARTMENT SIZE
(L) 10" X (W) 2½" X (H) 3½"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
5½"
STABILIZER AREA
97 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7 Inches
VERTICAL FIN WIDTH (incl. rud.)
7" (Avg.)
REC. ENGINE SIZE
Astro 15 Elec.
.10-.15 Glow
FUEL TANK SIZE
4 Oz. Glow
LANDING GEAR
Conventional
W/Wheels or Floats
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., Motor On-Off Or Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa, & Spruce
Empennage ..... Balsa
Wt. Ready To Fly ..... 60-72 Oz.
Wing Loading ..... 20-24 Oz./Sq. Ft.

The Aqua Sport is a lively water plane that is a blast at the lake or pond. It picks up speed quickly and is off in a 50 to 75 foot water run, with a rapid climb rate. The Astro 15 has the power to handle windy days and reasonable wave conditions, plus the ability to take off easily in glass smooth water. I've been flying this plane for three years, including four float plane contests. In all the contests it competed on equal terms with the gas planes and always came out near the middle of the pack. It could do a lot better than that, but the pilot is a definite handicap! Somehow, I always manage to snag a buoy, and I once even hit a tree! Oh well, next year.

It is a delight to do touch and goes (excellent), loops (slow), and rolls (surprisingly quick). Best of all, no neighbors complain about noise, it starts every time, it can start and stop out in the middle of the pond, and always taxies back to shore (the engine doesn't quit!). An extra bonus is the construction; it follows the rule of KISS (keep it simple ---), with a sheet fuselage, sheet floats and tail, and a simple wing with a minimum of parts and no sanding or shaping. This means you are out at the pond having fun in minimum time. So try it, the water's fine!

Wing Construction:

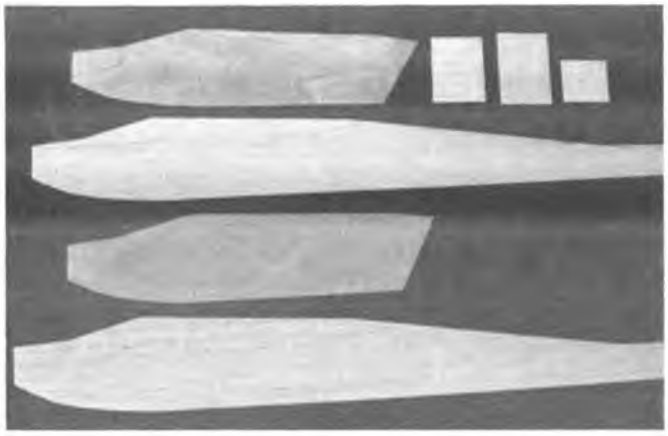
The plans show the 50" wingspan version. I have also flown it with a 62" wingspan; this is exactly the same as the 50" wing, except that two more bays are in each wing panel. If you wish the 62" version, just sketch in the two extra bays and build ahead! I do recommend the 62" size if you wish a slower flying plane or if you are new to float flying, since the handling is more easygoing. The 50" version is quite snappy in its handling, and quicker in the air, which would suit the more advanced flier or the experienced water pilot.

Do pick light balsa for all parts of the plane. A small postal or diet scale works well for weighing balsa (the ones that have grams as well as ounces are the best). My guideline is 1/2 ounce for a 3" x 36" x 1/16" sheet, 3/4" ounces for a 3" x 36" x 3/32" sheet, and 1 ounce for a 3" x 36" x 1/8" sheet. If the scale has grams, this would be 14, 21, and 28 grams.

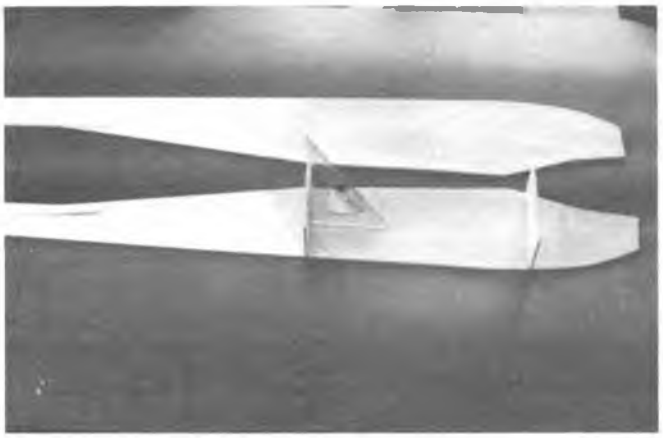
Since the wing ribs are all the same, it saves some time to stack blanks and do them on a jig saw, however, the good old standby, the razor blade, works fine, it just takes longer. The trailing edge is notched to fit the rib ends tightly. This not only makes the wing stronger but makes it easier to build, since the ribs are spaced and jigged at the same time by the trailing edge. The spars are 1/2" x 1/4" spruce. If this size of spruce is not available, the spars can be made by gluing two 1/4" square spruce pieces together, or use basswood. Do not use balsa, unless you like to watch airplane pieces fall out of the sky! All glue in this construction, by the way, is thick cyanoacrylate (thick Hot Stuff, Super Jet, etc.), unless otherwise stated. The leading edges are also spruce. Once the trailing edge, spar and leading edge are glued in, glue on the center rib doubler and the wing tips. Since the left and right wing panels are identical, just put the tips on opposite ends of the panel to get the two wing halves. Install the aluminum tube for the dihedral wire below the spar. This tube is the K & S 12" long, 3/16" internal diameter stock. Use the tube as its own drill by notching one end of it slightly, then bore through the ribs by hand with the tube. Hold a balsa block behind each rib as you do so, to

Build it as an electric or glow powered, wheels or floats. It's a good performer.

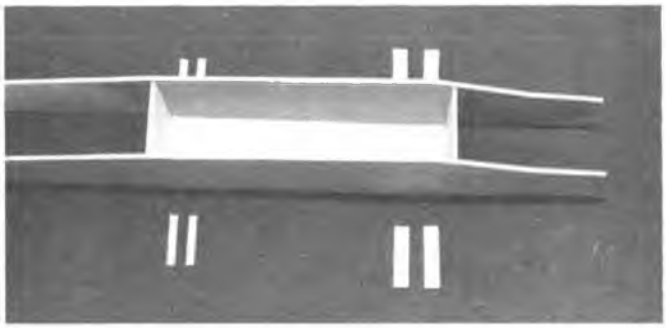
By Mitch Poling



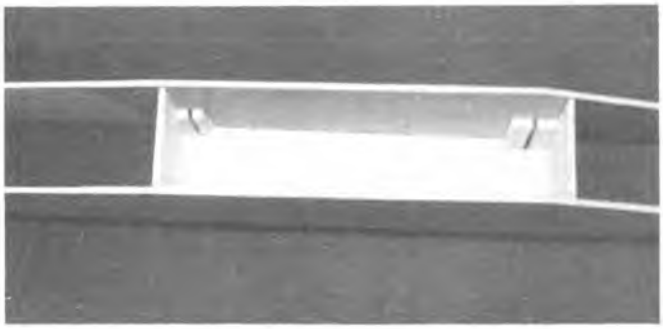
Fuselage sides and parts ready to assemble.



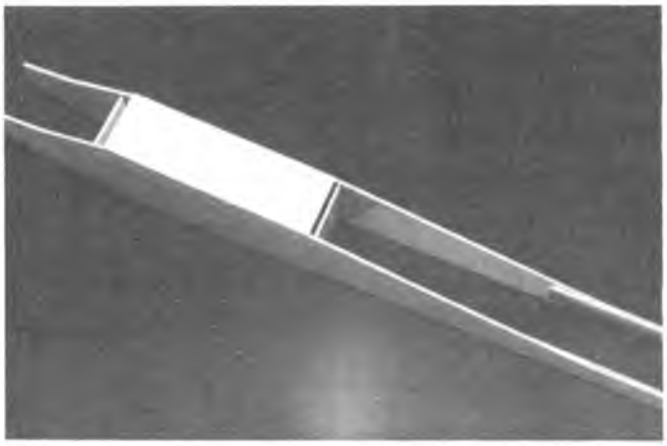
Doublers and bulkheads glued in place with CA. Use triangle for alignment.



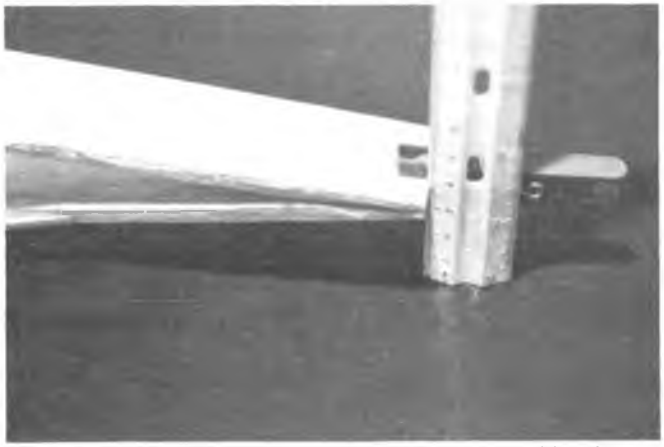
Sides assembled with bottom sheeting in place. L.G. blocks cut and ready to install.



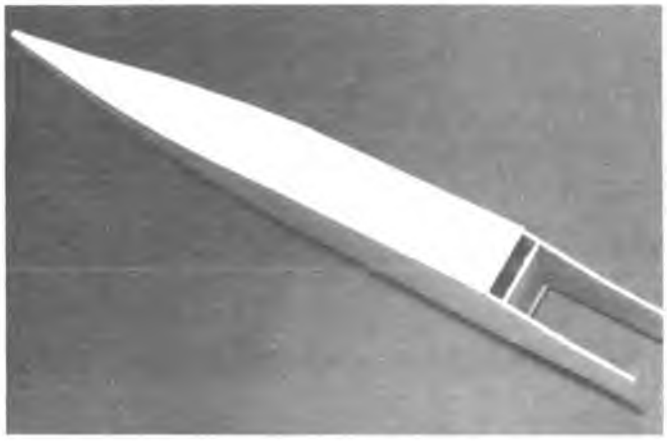
L.G. blocks installed with epoxy or CA.



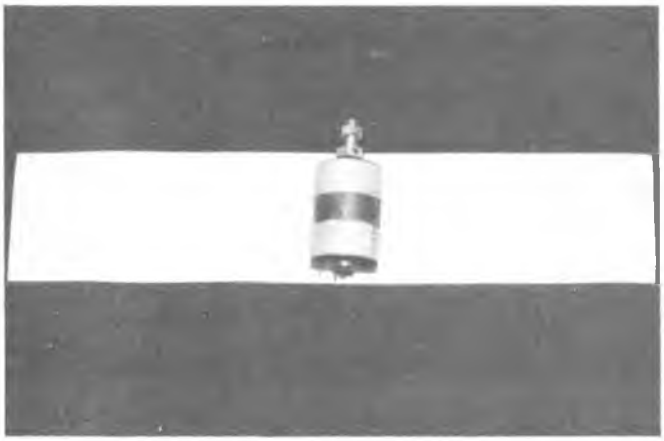
Sheet cabin top to keep alignment square. Hatch will be cut out later.



Glue rear of fuselage together. Check alignment with ruler on table top.



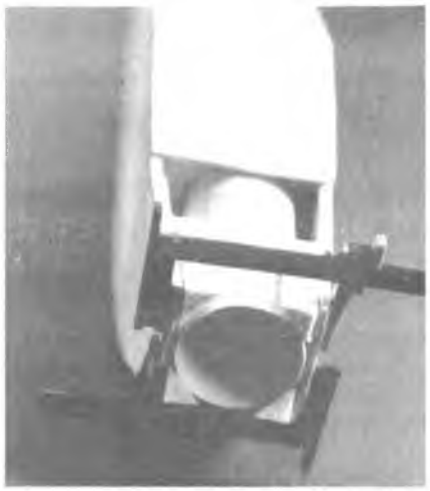
Sheet top and bottom up to front of cabin.



Roll motor tube from file card stock.

Wrap motor tube, using motor as form, several turns using 5-minute epoxy.

Motor tube epoxied to firewall. Tube is offset to give 3° down and 3° right.



Motor tube epoxied in place. 1/2" triangular stock used to fill in around tube.

Top sheeted and corners rounded off to fair nose in.

prevent breakage. Bind the tube to the spar with 3/4" wide nylon tape and Hot Stuff. Three turns of tape is enough, in each rib bay.

Cover the wing with Solarfilm or equivalent, and make the dihedral wire from 3/16" music wire. I recommend using transparent colors for the wings so that water can be spotted if it gets in. Water doesn't cause any problems if it is drained out and left to dry at room temperature. Slip the panels together on the dihedral wire, and tape around the center joint with vinyl tape. Don't worry about gaps at the center, the tape covers them nicely and seals out water.

Put in about 1/4" washout at the trailing edge at the tips by using a MonoKote iron. Twist the wing so that the trailing edge at the tip is 1/4" above the table when the center rib is flat on the table, and use the iron to take out any wrinkles. This should lock in the washout. By the way, there is no need to glue the wing center seam together, and I do not recommend doing so. This way the wing panels can be taken apart easily, an advantage in storing it, traveling, and drying it out if water does get in. "Long time" builders will also notice that there is no center sheeting. This is on purpose — invariably a wing will break at the sheeting, because stress concentrates there; it's better to leave it off.

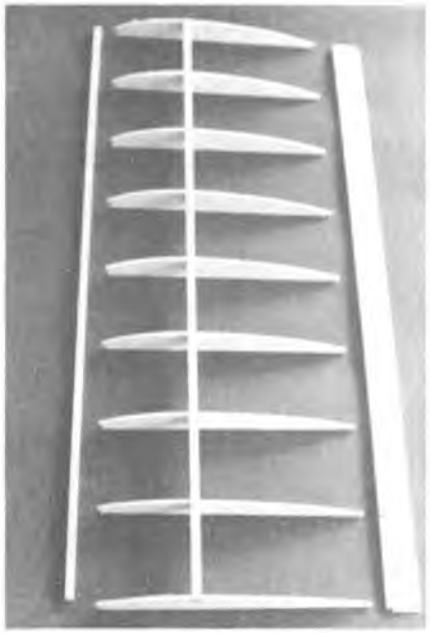
Tail Group:

The rudder and stabilizer are cut from light 1/8" balsa sheet (1 ounce for a 3" x 36" x 1/8" sheet). I make Solarfilm hinges by beveling the hinging edges to 45°, then I cover the elevator and stabilizer in one piece, ditto for the fin and rudder. This makes a strong hinge, with no air gaps. The areas where the fin glues to the stabilizer and the stabilizer to the fuselage are then stripped of film so that 5-minute epoxy will hold firmly. Alternatively, you can make the fin and stabilizer removable, as shown in the plans. This is what I do; it is very handy for travel and repairs if necessary.

Fuselage:

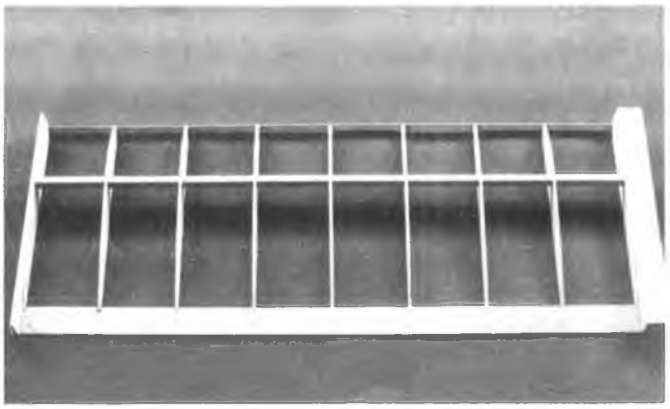
The sides are cut from light 1/8" balsa, and the doublers from 1/64" plywood (1/32" ply, or 1/16" balsa will do if you can't get 1/64" ply). Use scissors to cut the 1/64" ply; it makes the job easy. Lay lines of Hot Stuff on the fuselage where the doublers go (be generous), and press the side and doublers together. Trim any excess with scissors. Glue in F2 and F4, then cover the cabin floor with 3/32" balsa crosswise, between F2 and F4. Glue in the landing gear blocks (leave a 3/16" slot between the front blocks for the slip in wheel landing gear), then cover the cabin top with 3/32" balsa crosswise between F2 to F4. Now you have a rigid, enclosed box, which will ensure that the next step, alignment, will be true. Trim all edges, then use a clothespin to hold the tail end together.

Check whether the fuselage is true (aligned) by laying it on its side on the table, then measure the distance between the table top and the fuselage end. Turn the fuselage on its other side and repeat the measurement. If both measurements are the same, the fuselage is straight and true, and you can Hot Stuff the ends together with the clothespin still in place. Now plank the top and bottom from F4 to the tail.

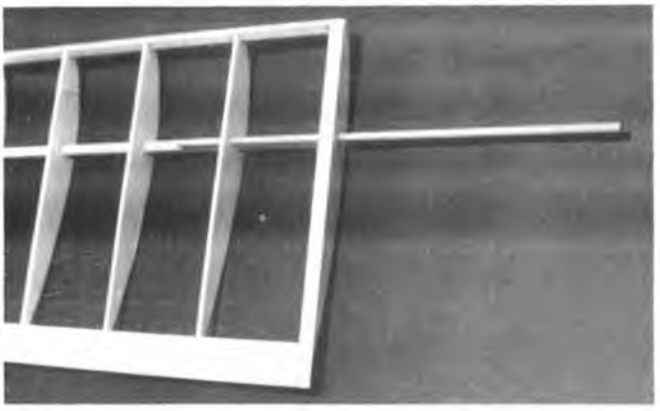


Spruce spar and notched trailing edge make a simple and strong wing.

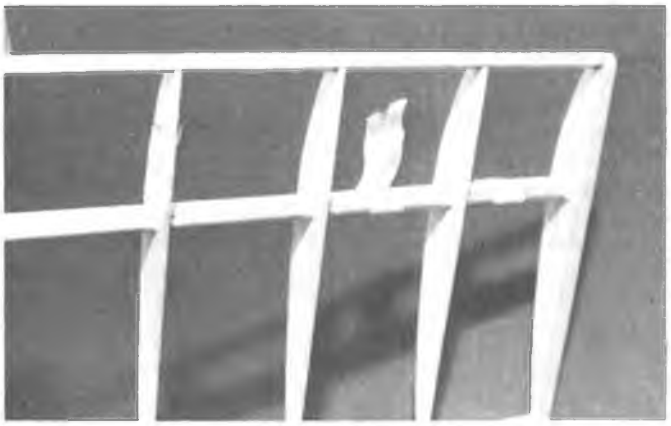
Roll the motor tube from file card, four turns around the motor. Secure the last three turns with 5-minute epoxy. I mix the epoxy directly on the file card, then roll it up, and hold everything in place with masking tape until the epoxy sets. Epoxy the tube to F1 (note the offset), then epoxy F1 in place, using clamps to hold the nose together. Hot Stuff 1/2" triangle stock in the nose around the motor tube, then plank the nose from F2 to the nose tip. Round the nose to match the



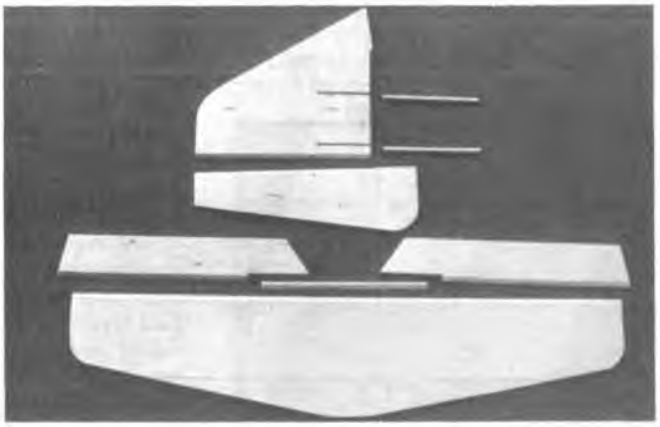
Wing tip 1/8" sheet or block. Center rib doubler from trailing edge stock.



3/16" I.D. aluminum tube, 12" in length, drilled into wing.



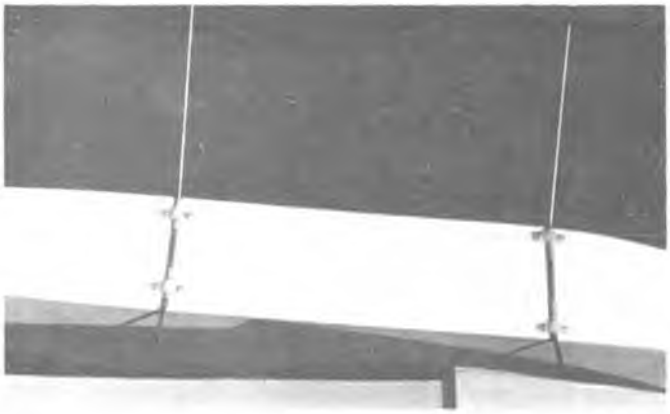
Bind the tubing to spar with nylon tape and CA glue.



Tail pieces ready for installation. Tubing used only if tail is to be removable.

Float pieces with one partially assembled.

Landing gear braces and top sheeting in place.



Float mount straps secured to cabin bottom. No cross struts necessary.

Complete and ready to cover. Wheel option shown. Note hatch opening cut-out under wing.

spinner curve. Paint the fuselage with one coat of Balsarite (Coverite) and cover with Solarfilm. The Balsarite keeps the Solarfilm from wrinkling even if the plane gets wet from a dunking. Strip some Solarfilm away from the cabin top and glue on the 1/4" square rails. Cut out the cabin hatch, 2¼" x 8", and save the cut-out to use as the hatch cover. Install the wing dowels, and that's it!

Floats:

Cut the float sides from 3/32" balsa, and glue in all the formers. Epoxy in the 1/4" thick balsa cross pieces that hold the 1/8" inner diameter Structoplast tubing, then glue in the tubing. Plank the top and bottom with 3/32" balsa crosswise. You do not need to try to chamfer the edges, instead, trim the edges flat with the sides, then sand balsa dust into the gaps and use Hot Stuff to secure the balsa dust as filler. Leave nice sharp edges on the float bottoms for clean breakaway from the water on take-offs. The curve on the front of the floats is fairly sharp, so groove the planking, and lay strips of masking tape over it so it won't crack as you cover the float fronts.

Paint the floats with one coat of Balsarite, then cover with Solarfilm, covering the sides first, then the top and bottom. I cover the bottom in one piece, but the step does take some care, start the covering at the step, then work towards the ends of the float. Seal all edges with Balsarite.

Radio Installation:

I recommend a light radio, servos in the one ounce bracket, and a 250 mah receiver battery. However, I use larger servos (1.25 ounce) and a 500 mah receiver battery, so most radios will do. Use NyRod for the rudder and elevator, since it does a good job of keeping water out of the fuselage. Run the NyRod out the top of the fuselage, just before the stabilizer, for both the rudder and elevator. You must have an on-off control for water taxiing, I use a throttle servo that activates a Cherry Electronics E22 microswitch substituted or the toggle switch that comes with the Astro 15. This switch is secured on the servo by double sided foam tape (servo tape), and the servo arm rides over the lever arm of the switch. This switch requires very little pressure to turn on and does an excellent job. This switch is available from Leisure Electronics (11 Deerspring, Irvine, California 92714). Radio Shack has a similar switch, but it can't handle the current (learned by experience!). All the servos are mounted with double sided foam tape to the cabin sides.

Float Installation:

Plug the landing gear struts into the floats and secure them with Hot Stuff. Mount the struts to the underside of the cabin with landing gear straps. The mounting screws should be routed to go into the blocks in the cabin. Check that the floats are parallel straight ahead, and that the tops are parallel fore and aft. The floats should be slightly negative (pointed down) about 1½° relative to the stabilizer. This is important! It makes the take-offs easy and quick. The step should be at the balance point.

Power Package:

The Astro 15 is recommended for this plane. An optional installation for .10 to .15 glow engines is shown on the plans. If this is done, omit installation of the motor tube, and mount the engine on the front of the nose on a 1/4" plywood firewall.

I have used quite a variety of combinations with the Astro 15. The first Astro 15's had a plain metal front on them, and I found that 9/4 prop was best for them. Next came Astro 15's with a black front, a Top Flite 8/4 is best for these. I have also used an Astro 25 battery pack with the black front Astro 15's, for longer motor runs, using an 8/6 prop. This combination is quite good. Most recently I have been using the Astro Challenger 15 (Cobalt) with 12 sub C cells and an 8/4 prop. This is the best of all for power and duration (from five to eight minutes).

The Challenger and the newest line of 15's have brush holders that project out the back, so they cannot be pushed into the motor tube from the front. Omit the motor tube for this type of motor, and install a 1/8" plywood firewall in the front of the nose. Cut a 5/8" diameter hole in the center to accommodate the front bearing, and drill two holes to match up with the mounting bolt holes in the front of the motor. Cut a 3½" long hatch in the top of the nose so the motor can be installed from behind the firewall. Use 3/16" or 1/4" long bolts to mount the motor to the back of the firewall (longer bolts may strike the armature and damage it). Down and side thrust can be adjusted by shims inside the firewall.

Wheel Option:

The wheel option is a plug-in landing gear; for this, you do have to cut a slot in the bottom of the cabin. When you are using floats, this can be covered with tape. Be sure to use glass fiber tape as shown on the plans so that the landing gear will not spread on hard landings — this can crack the cabin sides. No problem with the float version, there it is better for the gear to spread on a hard landing, as it works as a shock absorber, so no cross struts are used.

Dunkings:

There is sure to be some dunkings in the life of any float plane, and since water is much softer than land, there usually is no damage. However, you do want to be sure that everything gets dried out. Remove the motor, its battery, and the radio equipment, and remove all the plastic cases, then let it all dry at room temperature for a day or so. I mount the servos well away from the cabin floor, so usually they do not get wet and I leave them in place. I do leave the cabin open so that any water that got in there will evaporate. After all is dry, check the servos to be sure the foam tape didn't loosen. Then go fly! I have dunked many times, with no damage to either the radio or the Astro 15. I fly only from fresh water, all bets are off if you wish to fly from salt water; I wouldn't recommend it.

Flying:

At last, the fun part! The plane should balance at the balance point; in fact, I usually fly a little nose heavy, it helps on stability. The flying weights vary from 3¾ lbs., with the regular Astro 15 to 4½ lbs., with the Astro 15 with the Astro 25 battery. Since there are no cooling vents (to keep water out), leave the battery cases off, and after every two flights, check the temperature of the motor and battery. If they are hot to the touch, let them cool off. Body temperature is just right, the batteries work best at that temperature. The first flight of the day will be shorter and not as peppy, since the batteries do need to warm up some. For your first flights, pick a day when the winds are 5 mph or less, and wave height is less than four inches. Take off into the wind, let it get up onto the step by itself and, once it has flying speed, give it a blip of up elevator to break it loose, then back to neutral. Let it fly level for a count of four to let it build up flying speed, then let it climb out. If there are waves, chop, or wind, the plane can easily jump into the air before it has full flying speed and, in this case, hold it level, using down if necessary, until it is safely "at speed." It is better to wind up skipping and doing a few hops than the alternative, which is a stall and dive, which always gives a dunking. Down elevator is your friend, up elevator can bite, in those first few seconds. Once you have mastered the take-off on calm water, go ahead and try it in more wind. If the waves are high enough to occasionally break over the floats, and the propeller occasionally hits a wave, the conditions are rough enough that take-offs will be quite hard to do. Wait until you are expert for that. One big no-no is cross wind take-offs. Right at lift-off, ten times out of ten, the wing will flip up on the upwind side, and over it goes! In conditions like that, a downwind take-off can be done if an upwind

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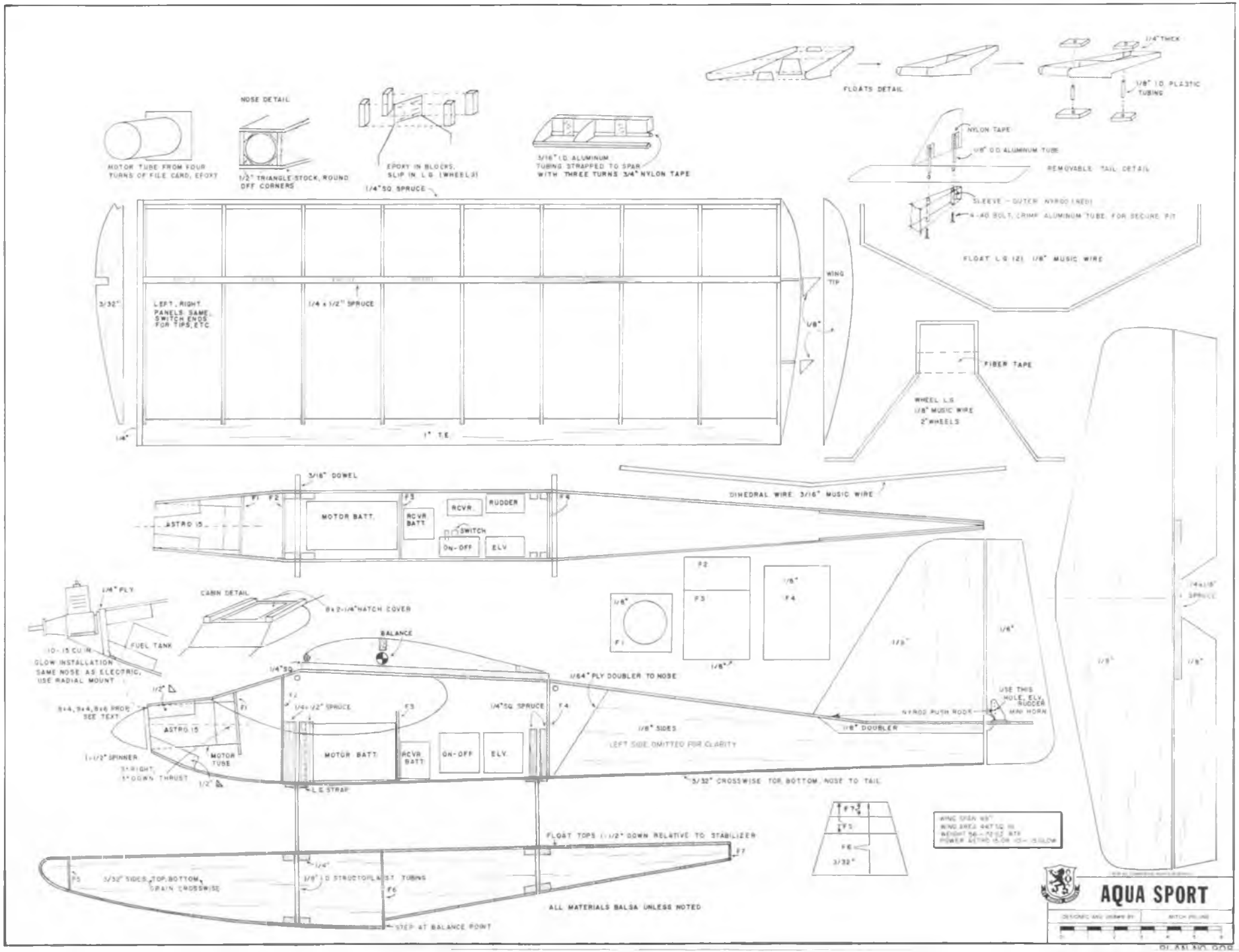
FULL SIZE PLANS AVAILABLE — SEE PAGE 160



FLYING LOWE

Don Lowe

Seventy top fliers from twenty-eight nations gathered in Pensacola, Florida, on October 10-15, 1983, to participate in the 13th World Championships for R/C aerobatics. They came from Asia, Europe, Australia, South America and elsewhere to pit their skills against the best the world has to offer.

After four days of intensive competition, the champion is still Hanno Prettner; flying an aircraft so different that it makes one wonder how important the aircraft design is in the scheme of things. One would have to conclude that, although only one can be the champion, everyone who participated is a winner for the experience. The World Championships is the epitome of achievement for those who flew, regardless of final placing. For me, it was a memorable, rewarding experience to again meet with old friends from around the world — and to make new friends — this to me is the true meaning of it all.

This will be the last competition in which the standard "non-turnaround" pattern will be flown. In 1985 the new, and somewhat controversial, Aresti style aerobatics will test the skills of national champions. Probably the most popular topic of conversation, outside the ever present noise requirement, concerned aircraft design for the new schedule. There was evidence here and there of possible design trends in that direction — such as Hanno's "Calypso" and Jan Van Brek's Saito 4-cycle powered semi-scale design. Jan's and Hanno's aircraft certainly created the most interest due to their departure from the norm. Interestingly, Jan's 4-cycle engine noise tested around 102 D.B. which is louder than many of the "noisy" 2-cycle engines. It sounded quieter

(L) Hans Prettner and (seated) the 1983 World Champion Hanno Prettner with Calypso, Hanno's "no frills" winning airplane.

USA won the Team Championship honors. (L to R): Steve Helms, Tony Frackowiak, and Dave Brown.

A bright new star from West Germany, taking second place, is Bertram Lossen.

Wolfgang Matt with his old faithful Arrow, took 5th place.

From Japan came Y. Akiba with his beautiful Cosmos to finish 6th.

due to the much lower prop frequency. While on this subject, I might comment that **no** contestant failed the noise test although it was checked every flight. Most fliers had conquered this problem through prop selection and operation at reduced rpms. Most seemed to not suffer from loss of thrust although their was evidence here and there that more thrust would have been a big help. Many were using the variable pitch props although the previous leaders in the area, Hanno and Wolfgang Matt, had selected fixed pitch props. From my own observation, most who were using variable pitch did not gain anything thereby — in fact, poor technique certainly hurt some fliers. It is certainly obvious that variable pitch is not required to win since the top five fliers did not use it.

Hanno's aircraft was very simple. It had an exposed pipe and a two wheel retractable gear plus a 12", 9" pitch fixed prop. Hanno told me that this large prop diameter, coupled with the new aircraft design, gave him the same vertical down velocity that he had with his "Magic" and reversible pitch prop! One would have to say that his new design is, as he calls it, a "180°" change in design philosophy from his Magic. His contention is that complication and cost is a deterrent to interest in pattern flying in Europe. So he is trying to lead a new trend.

Some of the "complicated and sophisticated" designs flew very well in the hands of perennial leaders such as Ivan Kristensen, Canada; Steve Helms, USA; and newcomer Bertram Lossen, FRG. It will be interesting to see if these designs do well with the new pattern.

To me, the most beautiful airplane design at the competition was the "Cosmos" as flown by Steve Helms, Akiba (Japan) and several others. I would also feel that this design would be very competitive in "turnaround"

Dad, Gale Helms, and Steve Helms with Steve's Cosmos. 7th place.

From Canada is Jacques Gagnon with his Phoenix.

since it has a generous wing as long as weight is kept down.

Flying at this World Championships was of generally high quality as would be expected from the best. No perfection was seen nor was expected. There was also ample evidence of significent differences in skills between the nations and even between individuals from the same nation. The most consistently high skills were shown by the USA team which placed 3rd, 7th, and 8th to win the team championships. Right behind them came our Japanese friends who placed 6th, 9th, and 10th. In watching the Japanese team members fly, I was impressed by their great similiarity in style and capability, evidence of much team effort. Of course, the USA always has many highly skilled fliers who could make our team. This makes the USA the most difficult nation in which to achieve a place on the team! Probably two of the brightest lights on the pattern horizon as newcomers was Bertram Lossen from FRG and our own Tony Frackowiak. Lossen placed 2nd and Tony placed 8th. Most of the rest in the top grouping were the same as before. It's apparent that the very best fliers turn out to be an individual thing — a combination of natural skills, desire and circumstances that makes a person a consistent winner such as a Prettner, a Matt, a Kristensen, and a Brown. Nationality has little to do with one becoming a champion with the possible exception of the super competitive USA. Wolfgang Matt has been twice World Champion and he hails from the very small nation Liechtenstein — in fact, the country is so small that it fields a team of only two — Wolfgang and his brother Norbert!

The competition was held at one of the several Navy flying facilities in the Pensacola area, Bronson Field.

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Jan Van Beeks from the Netherlands flew this interesting aircraft powered by a Saito FA-120 4 stroker.

Emil Giezandanner from Switzerland with his Scorpion. His brother Bruno was World Champion twice.

TERRIER

Want a super performance aircraft with a .25, then this is it.
By Alan L. Clark

The Terrier is the third in a series of designs which have been refined to get the best possible combination of performance from a standard .25 engine. Refinements were made that improved both in-flight handling and aerobatic capability as well as lowering the stall speed and greatly improving ground handling.

If, like me, you have enjoyed the economy, responsiveness, and small field capability of the 1/2A ships, but like the easy starting, easily throttled engines and large size of the .40 to .60 ships, then the Terrier is what you have been searching for. The Terrier is the size of most .40 and some .60 aircraft, but uses a standard, economical .25 engine. I used the O.S. .25 (non-Schnuerle) on my Terrier because it idles very slow and will run about eleven minutes on four ounces of 10% nitro fuel.

Even though the Terrier is large (58" span, 550 square inches area), it weighs only 55 ounces resulting in a 14.4 oz./ft^2 wing loading. This gets rid of the "powered bomb" characteristic which many aircraft have and allows short take-offs, slow landings, and slow, graceful aerobatic maneuvers which can all be flown directly in front of you.

ABOUT THE AUTHOR

The author, Alan L. Clark, is a private pilot with single engine and glider ratings and has previously owned a Cherokee II sailplane and 1/3 share in a 1946 BC-12D Taylorcraft. He has logged over 40 actual hours of aerobatics in a Cessna Aerobat, Bellanca Citabria, Bellanca Decathlon, and Starduster Too. He has been modeling since the age of 7 and began flying R/C in 1971 with an Ace rudder-only system in a Midwest Whiz Kid. Alan began designing R/C models in 1972 and has since designed many power and sailplane models including the "Yellowjacket" 1/2A pylon racer published in the September 1977 "Model Airplane News". He received an Aerospace Engineering degree from Iowa State University in 1974 and presently works for the Army Civil Service as the lead Reliability Engineer in the Hellfire Missile Project Office, U.S. Army Missile Command in Huntsville, Alabama. He was married to his wife, Kimberly, in 1978 and they now have two boys aged 4 months and 2½ years. Alan's present modeling interests include 1/2A pylon racing, sailplanes, sport flying, scale, and helicopters.

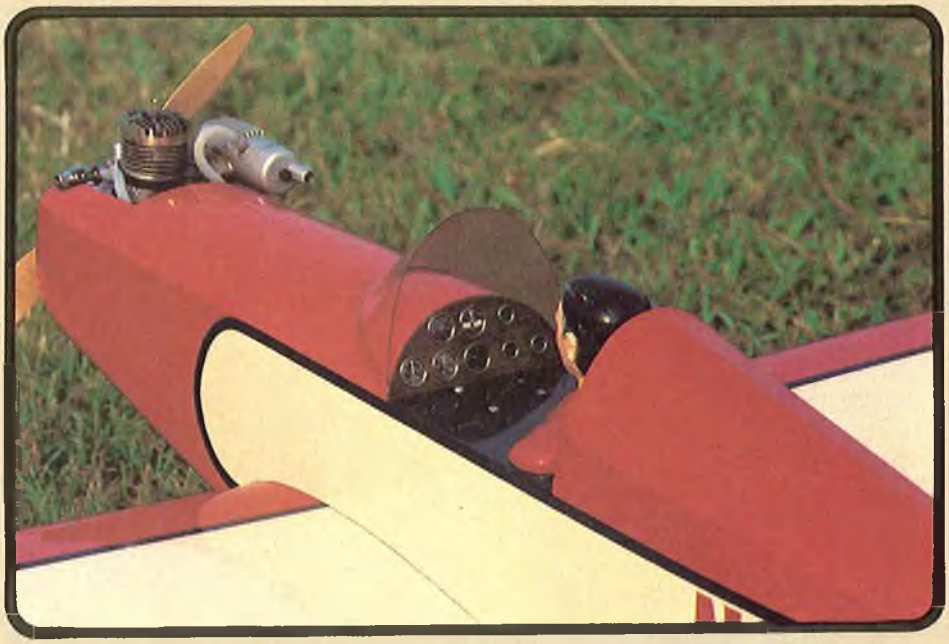
Due to the extra drag of the large, scale-size fuselage with open cockpit (actually the entire model is about 1/6 scale of a full size aircraft), the level flight speed does not get out of hand and, when flying aerobatics, the speed builds slowly when the nose is down.

The real key to the excellent performance of the Terrier on a .25 engine is the airfoil. After much experimentation on various models, a modified NACA 2415 airfoil was selected. This airfoil exhibits a very smooth lift to drag curve (with no drag bucket) which provides very predictable handling in pitch at all speeds. With this airfoil, little down elevator is required to fly inverted, outside maneuvers are easily accomplished, and the sink rate on final approach is much less than the sink rate of a symmetrical airfoil. The airfoil was modified by reducing the leading edge radius 40% and re-contouring the first 15% of the top and bottom surfaces. This modification results in cleaner snaps and spins: entries are easy and the maneuvers are easily stopped when the controls are released. Even with this modification the airfoil exhibits outstanding low-speed stall characteristics. The Terrier can be dragged in tail-low and actually

landed tail-wheel first without dropping a wing (this is helped in part by not running the ailerons all the way to the tips, thereby avoiding premature tip stall by a lowered aileron). Head high passes (even inverted) can be flown extremely slow at about one third throttle with the nose high without fear of tip stalling. In addition to its other benefits, the modified NACA 2415 is a 15% thick section allowing a very strong, light wing to be built. Also the extra drag (due to being thicker than usual) helps keep the level flight speed from getting out of the fun-to-fly regime.

By combining the modified NACA 2415 airfoil with a large 58" wingspan and a fairly high aspect ratio of 6:1, excellent climb and glide performance are obtained. The large span gives a low span loading (weight/span) which results in a low sink rate in the glide since sink rate is proportional to the square of span loading. The relatively high aspect ratio gives a reduction in induced drag which requires less horsepower for a given rate of climb as well as increasing the glide ratio.

The ground handling of the Terrier is better than any other taildragger I have seen, and is better than many tricycle gear aircraft due to the very wide spacing of the main wheels and their being located fairly close to the C.G. It is literally impossible to drag a wing tip while taxiing no matter what the wind condition. Landings, either wheel or 3-point attitude, are very easily accomplished, even in high crosswinds. I have flown regularly in crosswinds high enough to prevent me from taxiing to the pits due to the wind blowing the tail of the plane around so that the nose was into the wind, even while holding full opposite rudder! The flared attitude of the Terrier also



TERRIER

Designed By:
Al Clark
TYPE AIRCRAFT
High Performance Sport
WINGSPAN
58 Inches
WING CHORD
9½ Inch
TOTAL WING AREA
550 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
NACA 2415 Mod.
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1 Inch
O.A. FUSELAGE LENGTH
41"
RADIO COMPARTMENT SIZE
(L) 9½" (W) 3½" (H) 2½"
STABILIZER SPAN
19 Inches
STABILIZER CHORD (incl. elev.)
5¾ Inch
STABILIZER AREA
110 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN WIDTH (incl. rud.)
6" (Avg.)
REC. ENGINE SIZE
.25-.35 Cu. In.
FUEL TANK SIZE
4-6 Oz.
LANDING GEAR
Conventional
REC. NO. CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
BASIC MATERIALS USED

Fuselage	Balsa, Spruce, Ply
Wing	Balsa, Spruce, Ply
Empennage	Balsa
Wt. Ready To Fly	**55 Oz.**
Wing Loading	**14.4 Oz./Sq. Ft.**

Terrier Materials List

1/16" ply, 1.5" x 12", 1 req'd — rib doublers
3/32" ply, 1" x 2.5", 1 req'd — tailwheel bracket mount
1/8" ply, 6" x 12", 1 req'd — landing gear mounts, cockpit floor, F2, F2A, T2
3/16" ply, 4.25" x 4", 1 req'd — firewall, wing mount
3/32" x 3/16" x 36" spruce, 4 req'd — turtledeck stringers
1/4" sq. x 36" spruce, 5 req'd — spar caps, pushrods, servo rails
1/4" dia. dowel, 2" req'd — front wing hold-down
1/4" sq. x 36" balsa, 2 req'd — leading edges, T1, T4, T5 crosspieces
1/4" triangular x 36" balsa, 1 req'd — fuselage and gear mount reinforcement
1.25" T.E. stock, 5" req'd — nose blocks
3/4" x 3" x 6" soft balsa, 1 req'd — nose blocks
1/2" x 3/4" x 7" soft balsa, 1 req'd — tail section fairing blocks
1/2" x 1.5" x 20" soft balsa, 1 req'd — wing tips
1/16" x 3" x 36" medium balsa, 9 req'd — ribs, capstrips, D-tube shtg, center section shtg, T.E. shtg, fuselage doublers, T3 and F3 doublers
3/32" x 3" x 24" medium-hard balsa, 1 req'd — fuselage bottom, spar webs
1/8" x 3" x 36" balsa, 3 medium, 1 hard req'd — ribs, front turtledeck fuselage sides, stabilizer mount doublers, spar webs, T1, T3, T4, T5, F3
3/16" x 3" x 36" medium balsa, 2 req'd — empennage, T6
3/16" x 1" x 29" medium balsa, 1 req'd — trailing edge cap
1/2" x 3" x 36" medium balsa, 1 req'd — trailing edge/aileron stock

Hardware:
1/16" dia. x 36" music wire, 1 req'd — tailgear and pushrods
3/32" dia. music wire, 16" req'd — aileron torque rods
1/8" dia. music wire, 26" req'd — landing gear and elevator horn
1/8" O.D. brass tube, 7" req'd — aileron torque rod bearings
4-40 bolt with blind nut, 4 req'd — engine mount to firewall
Du-Bro #111 threaded coupler, 4 req'd — aileron, rudder, elevator pushrod ends
Du-Bro #109 kwik link clevis, 2 req'd — rudder and elevator pushrods
Goldberg #247 aileron pushrod, 2 req'd — aileron hookup
Rocket City #5 aileron link, 2 req'd — aileron hookup
Du-Bro #165 flex cable, 1 req'd — throttle hookup
Goldberg #215 short control horn, 2 req'd — rudder, elevator
Du-Bro #158 landing gear straps, 1 set req'd — landing gear mounting
1/16" wheel collar, 1 req'd — tailgear
1/8" wheel collar, 4 req'd — maingear
Du-Bro 2.75" wheel, 2 req'd — main wheels
Perfect 1.25" balloon wheel, 1 req'd — tailwheel
Goldberg tailwheel bracket, 1 req'd — tailwheel assy. mounting
Rocket City nylon hinge material, 1 pack req'd — aileron, rudder, elevator hinges
1/4"-20 nylon bolt, 2 req'd — wing hold-down
Goldberg 2.5" wide nylon tape, 22" req'd — wing center reinforcement
.030 clear plastic sheet, 3" x 8" req'd — windshield
Engine Mount to suit engine used, 1 req'd
4 or 6 oz. slant style fuel tank, 1 req'd
MonoKote, 2 rolls req'd
Williams Brothers 2⅝" pilot, 1 req'd
Tatone Instruments - 1/2" size, 1 set req'd
Epoxy clear and/or color dope for fuelproofing
RTV for wing-to-fuselage seal

happens to be the 3-point attitude, making you look like an expert on every landing. As with any taildragger, always hold full up elevator when taxiing.

Take-offs are easy — just gentle rudder input to steer, hold about 1/3 back stick and the Terrier will do a beautiful, smooth take-off every time. If you like the hot dog type, just let the tail come up, steer with the rudder until you are really moving, then haul the stick back and you are off! Remember, on this kind of climb-out to hold some right rudder — you will need it!

Aerobatic maneuvers of all kinds can be done with the Terrier. It will do the usual loops, rolls, spins, snap rolls, and hammerheads with ease and, with a little practice on your piloting technique, you will be doing 4-point rolls, tail slides, double snap rolls, snap on top of loops, square loops, and many others. Due to the Terrier's slow flying speed and low stall speed, you will be able to do all these maneuvers right in front of you! No more far away turnarounds setting up for the next maneuver. In addition to these maneuvers, you will be pleased to discover that the Terrier will also do a lot of outside maneuvers. Outside loops, outside snap rolls, outside loops with outside snaps, and inverted spins are all easily done with the Terrier. Spins and snaps, both inside and outside, can be stopped very easily merely by releasing the controls. Low and slow flying is easy, using a nose high attitude and 1/4 to 1/3 throttle! Slips, a difficult maneuver for many R/C aircraft, are also easily done with the Terrier simply by applying full rudder and then the appropriate amount of opposite aileron; altitude can be lost quickly and easily on final approach using this maneuver.

Keep in mind that all the above described maneuvers are done using a non-Schnuerle O.S. .25 in Huntsville, Alabama, which is about 700 feet MSL. For you folks at higher elevations, a Schnuerle .25 would be advisable, or maybe even a regular .35. I am sure that some of you out there would even think of installing a .40 but, please, not on this airplane! However, one type of .40 engine which would work great on the Terrier would be one of the .40 4-strokes. These are economical and the fantastic, quiet, scale-like sound would complement the scale-like looks of the Terrier. Two of the Terriers built in our club, the Rocket City Radio Controllers, are using 4-strokes — one an O.S. .40 and the other a Saito .45. I recommend that for 4-strokes you make a new firewall and move it back 3/4" and then lengthen the nose blocks to suit your engine. Even with the heavier engine weight, balance should be no problem, as I had all my radio gear located well-forward using the O.S. .25.

Structurally, the Terrier is lightweight, strong, and simple (I like easy to build structures), and with a little care in wood selection you should have no trouble coming out at around 55 oz. (using a relatively small radio, O.S. .25, and MonoKote finish). Almost anyone should be able to build the Terrier in a minimum amount of time using fast curing epoxies and cyanoacrylates. Even a beginner, with a little help, should be able to duplicate this model. As always, making a "kit" of parts first makes things easier later, so study the plans, cut out the parts for your "kit," and let's start building!

CONSTRUCTION

Fin And Rudder:

This is simple, so we will do it first to get into the swing of things. Shape the fin to the outline shown on the plans. The fin should be made from fairly hard balsa while the rudder should be made from medium density balsa. Add the cross-grain pieces to the top and bottom of the rudder using 5-minute epoxy and then cut the slots for the nylon hinges. Next, install the short piece of inner NyRod with nylon tape and cyanoacrylate to the bottom of the rudder. This engages the tailwheel wire and allows steering without any binding as well as being very strong. Round the edges of the fin and rudder and finish sanding overall with 320 or 400 paper.

The Terrier in its natural environment. Large diameter wheels permit operation from grass.

The author/designer preparing for another flight at Madison County Skypark near Huntsville, Alabama.

Stabilizer And Elevator:

These are built similar to the rudder. Use medium density balsa here. Glue on the cross-grain pieces to the ends of the stabilizer and the two elevator panels with 5-minute epoxy. Shape these pieces according to the plan and then install the 1/8" music wire elevator joiner. The best way to do this is to cut the slots into the elevator panels and then glue in the joiner using 5-minute epoxy with the elevator panels pinned down against the stabilizer (with waxpaper between the stabilizer and elevators). This will insure a good fit with no twist in the elevator panels. Do not be tempted to replace the 1/8" music wire joiner with one of smaller diameter because these elevator panels are quite large and can cause a smaller diameter joiner to twist which will cause your loops to lose track as well as affecting snap-roll performance. After everything is glued, cut the hinge slots and then round all edges. Finish sanding overall with 320 or 400 paper. One final point concerning the empennage — do not omit the cross-grain pieces. They are necessary to keep the tail surfaces stiff while under flight loads and also from warping due to covering shrinkage.

The Terrier on take-off.

Nice view of the Terrier on a fly-by.

Wing:

All balsa wood in the wings should be fairly light except for the spar webs, which should be hard balsa. The first things to build are the landing gear mounting blocks (using 5-minute epoxy) as detailed on the plans. Then epoxy the 1/16" plywood doublers on ribs W3 and W4 for each wing; make sure these are on the correct side of their respective ribs. Next, cut the slot into both W1 ribs for the 1/4" diameter hold-down dowel. Now we are ready to start construction.

Pin down the lower trailing edge sheet and draw a reference line 3/16" from the rear edge; this line is where the back end of the ribs should be. Use pieces of left over 1/4" square spruce spar stock as shims under the lower spar (about four shims will do). Lay

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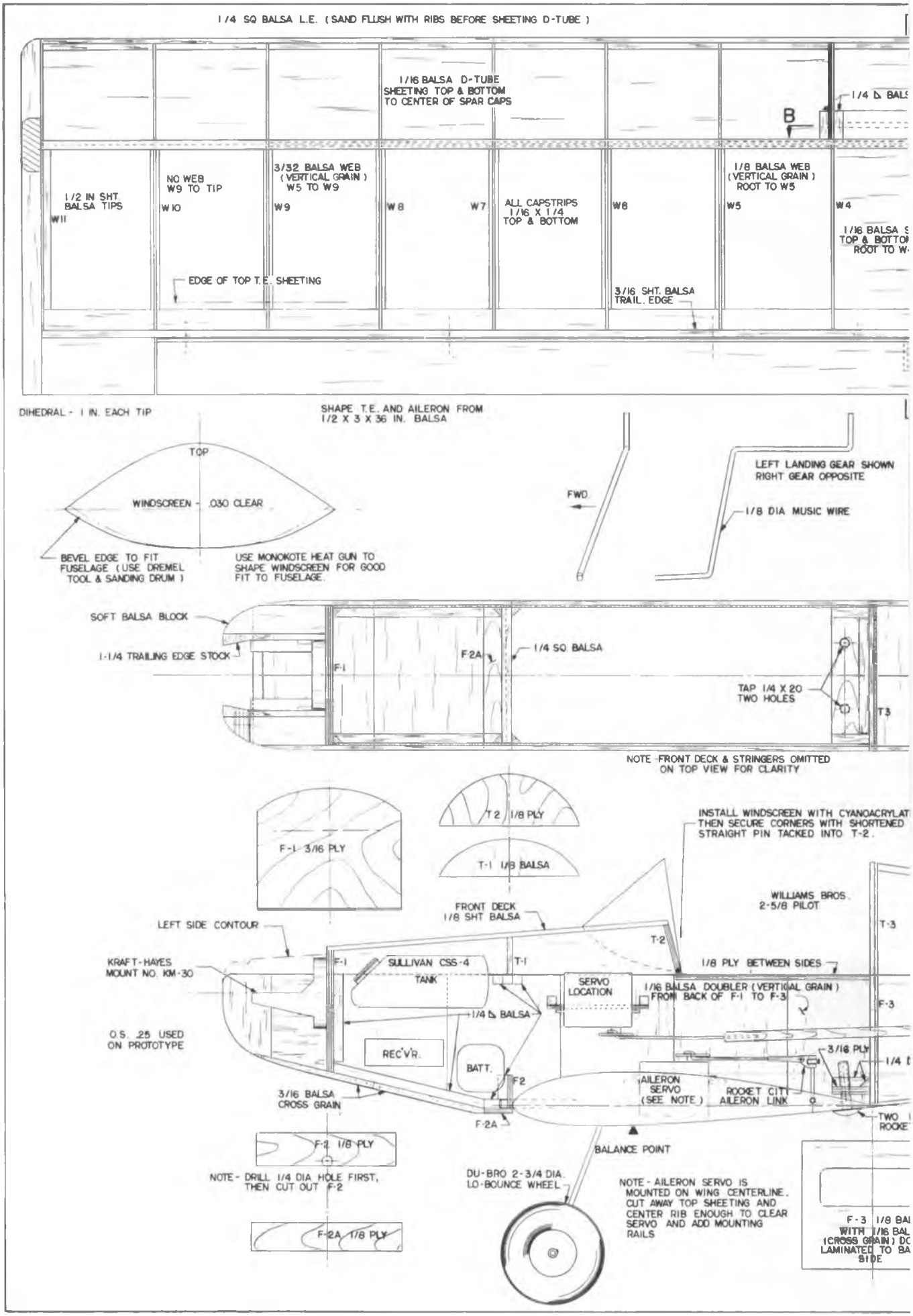
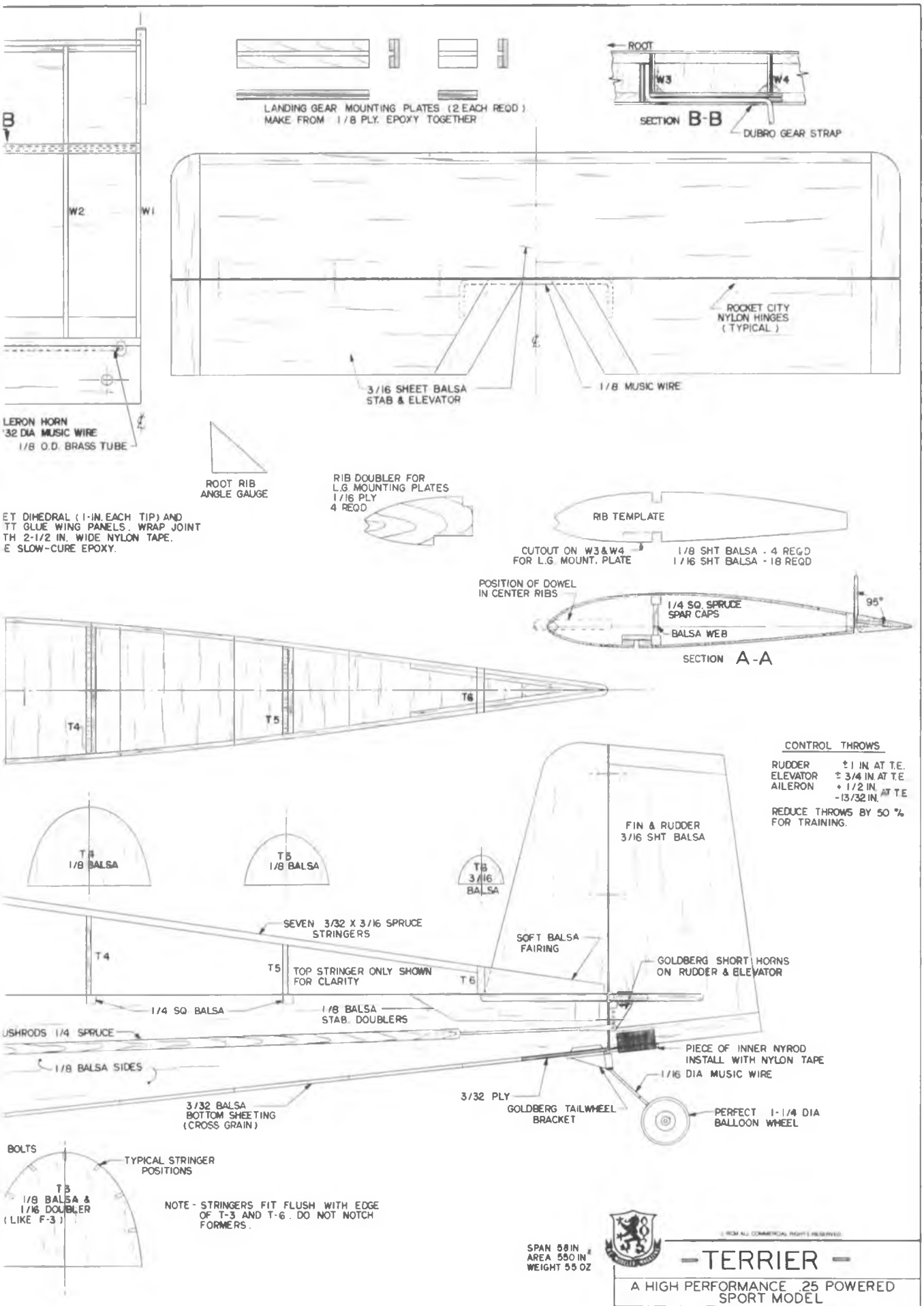
A walnut panel with Tatone 1/2" and 5/16" instruments dress up the cockpit. A Williams Brothers 2⅝" Sportsman Pilot completes the realism.

An O.S. .25 with a Rev-Up 9/4 prop and Harry Higley safety prop nut handle the propulsion duties.


1/4 SQ BALSA L.E. (SAND FLUSH WITH RIBS BEFORE SHEETING D-TUBE)
1/16 BALSA D-TUBE SHEETING TOP & BOTTOM TO CENTER OF SPAR CAPS
1/4 SQ BALSA
B
1/2 IN SHT. BALSA TIPS
W11
NO WEB W9 TO TIP
W10
3/32 BALSA WEB (VERTICAL GRAIN) W5 TO W9
W9
W8
W7
ALL CAPSTRIPS 1/16 X 1/4 TOP & BOTTOM
W6
1/8 BALSA WEB (VERTICAL GRAIN) ROOT TO W5
W5
W4
1/16 BALSA S TOP & BOTTO ROOT TO W
EDGE OF TOP T.E. SHEETING
3/16 SHT. BALSA TRAIL. EDGE
DIHEDRAL - 1 IN. EACH TIP
SHAPE T.E. AND AILERON FROM 1/2 X 3 X 36 IN. BALSA
TOP
WINDSCREEN - .030 CLEAR
BEVEL EDGE TO FIT FUSELAGE (USE DREMEL TOOL & SANDING DRUM)
USE MONOKOTE HEAT GUN TO SHAPE WINDSCREEN FOR GOOD FIT TO FUSELAGE.
FWD.
LEFT LANDING GEAR SHOWN RIGHT GEAR OPPOSITE
1/8 DIA MUSIC WIRE
SOFT BALSA BLOCK
1-1/4 TRAILING EDGE STOCK
F-1
F-2A
1/4 SQ BALSA
TAP 1/4 X 20 TWO HOLES
T-3
NOTE - FRONT DECK & STRINGERS OMITTED ON TOP VIEW FOR CLARITY
F-1 3/16 PLY
T-2 1/8 PLY
T-1 1/8 BALSA
INSTALL WINDSCREEN WITH CYANOACRYLAT THEN SECURE CORNERS WITH SHORTENED STRAIGHT PIN TACKED INTO T-2.
WILLIAMS BROS. 2-5/8 PILOT
FRONT DECK 1/8 SHT BALSA
LEFT SIDE CONTOUR
T-2
T-3
KRAFT-HAYES MOUNT NO. KM-30
F-1
SULLIVAN CSS-4
T-1
1/8 PLY BETWEEN SIDES
TANK
SERVO LOCATION
1/16 BALSA DOUBLER (VERTICAL GRAIN) FROM BACK OF F-1 TO F-3
F-3
1/4 SQ BALSA
O.S. .25 USED ON PROTOTYPE
REC'V'R.
BATT.
F2
3/16 PLY
1/4 SQ
AILERON SERVO (SEE NOTE)
ROCKET CITY AILERON LINK
TWO ROCKE
3/16 BALSA CROSS GRAIN
F-2A
F-2 1/8 PLY
BALANCE POINT
NOTE - DRILL 1/4 DIA HOLE FIRST, THEN CUT OUT F-2
DU-BRO 2-3/4 DIA. LO-BOUNCE WHEEL
NOTE - AILERON SERVO IS MOUNTED ON WING CENTERLINE. CUT AWAY TOP SHEETING AND CENTER RIB ENOUGH TO CLEAR SERVO AND ADD MOUNTING RAILS
F-2A 1/8 PLY
F-3 1/8 BA WITH 1/16 BAL (CROSS GRAIN) DO LAMINATED TO BA SIDE



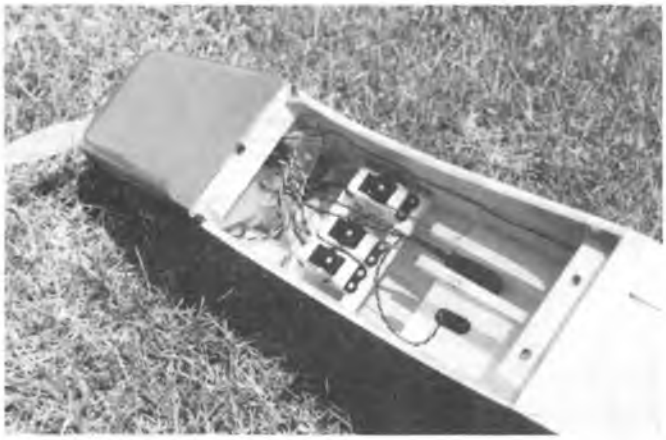
SPAN 58 IN.
AREA 550 IN.²
WEIGHT 55 OZ

— TERRIER —

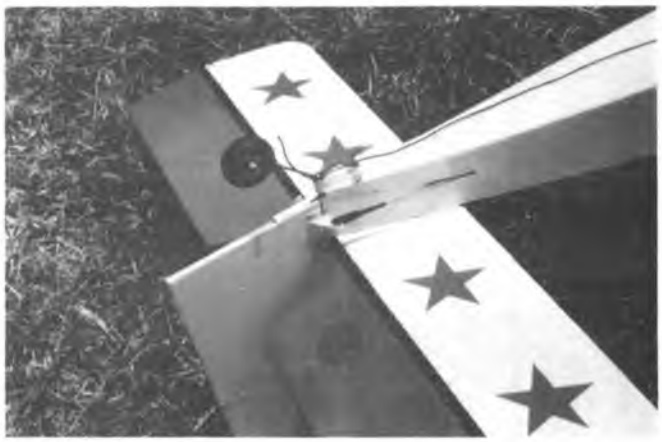
A HIGH PERFORMANCE .25 POWERED SPORT MODEL

DESIGNED & DRAWN BY	INKED BY
A. Cisek	Gregory L. Storer

PLAN NO. 909



Servo and pushrod installation are shown. Note switch and charging jack mounted in cockpit floor.



Tail wheel and rudder control arrangement can be seen in this photo.

the lower spar on the shims in its proper position and proceed to glue ribs W1 through W11 to the trailing edge and lower spar cap with Zap (or whatever cyanoacrylate you prefer). Do not forget to use the root rib dihedral angle gauge to get W1 glued at the proper angle. Next, glue in the spar webs with Zap, making sure to note the different thickness where shown on the plans. After gluing the webs check the top spar for a proper fit (sand the tops of the webs as necessary) and glue into place (use epoxy for this step to compensate for any gaps between webs and spar).

Now is the time to fit the 3/16" balsa trailing edge by beveling the lower edge with sandpaper for a good fit. Refer to the plans for the proper bevel and placement. After a good fit is achieved, Zap the trailing edge on and then install the top trailing edge sheet. Next, Zap the 1/4" square balsa leading edge into place and we are ready to install the landing gear mounting blocks.

First, remove the wing panel from the building board. Carefully study the proper position of the landing gear mounting blocks. Install the blocks with 5-minute epoxy, making sure to glue the long block to the lower spar cap as well as to the ribs. Epoxy in the three 1/4'' triangular balsa reinforcements and the gear mount is completed.

Aileron control installation is straight forward.

Sheeting the D-tube is next. Before this step, the 1/4" square balsa leading edge must be sanded flush with the nose of the ribs on top and bottom (see wing cross section on plans). I used a razor plane followed up by a 10" to 12" long sanding bar for this step. After the leading edge has been trimmed, install the lower 1/16" balsa D-tube sheet using Zap. (When selecting D-tube sheeting, use the lightest wood for the bottom sheet). Remember the sheeting only covers half the spar cap as shown on the plans.

Before sheeting the top of the D-tube, locate the slot in the lower landing gear mounting block by running a 1/8" diameter drill through the vertical gear mounting block. Now cut out the lower 1/16" balsa sheet where the landing gear wire goes and you are ready to install the top D-tube sheet.

Pin the wing down securely on the building board with the 1/4" square shims under the lower spar. Assuming you have a flat building board we are now ready to install the top D-tube sheet. A good way to do this is as follows:

(1) Put Titebond on the edges of rib W2 through W10.

(2) Zap the back edge of the 1/16" balsa sheet to the top spar cap.

(3) Pull the sheet down snugly over rib W6 and Zap to the leading edge at this point.

(4) Continue to pull the sheet down over each rib and Zap to the leading edge, working your way out to the root and tip (W5, W7 then W4, W8, etc.).

(5) Zap the sheet along the edge of W1 and W11 and then remove the wing from the board.

(6) Finish Zapping the sheet along the leading edge between all the ribs and the D-tube is complete with no pins required! At this time install the top and bottom 1/16" balsa sheeting from W1 to W4 and Zap the 1/4" wide capstrips to all the ribs.

The trailing edge stock should be cut from medium density 1/2" sheet balsa stock. I made mine from one sheet of 1/2" x 3" x 36" stock by cutting the sheet down the middle and using a razor plane and sandpaper to get the final shape. Some fellows have used a table saw and others a bandsaw to shape these pieces. Whatever works for you, be my guest. However, do not do any shaping on the front edge of the trailing edge stock at this point. After tapering the trailing edge stock per the plans, cut it into the two short pieces and the one long (aileron) piece for each wing as shown on the plans. Now go ahead and shape the front edge of the ailerons per the plans.

Bend up the aileron horns from 3/32" diameter music wire and don't forget to slide on the 1/8" O.D. brass

Terrier starting an outside loop.

tube before bending! Also, you need one left and one right horn. While you are at it, bend up one left and one right landing gear from 1/8" diameter music wire. I use a couple pair of Vise-Grips for these bending operations. You fellows with a bench vise will have an easier time of it.

Next, slot the inboard trailing edge piece for the aileron horn assembly and make some clearance for the horn to move fore and aft. Now, using 5-minute epoxy, carefully install the horn assembly into the trailing edge and glue the whole thing to the back of the wing checking to see that the proper airfoil shape is maintained. Also, at this time, glue on the outboard trailing edge piece using the aileron as a guide for proper positioning. While these are curing, drill the hole and make the slot in the aileron to fit the horn.

Sand the entire wing panel with medium grit sandpaper and then glue on and shape wing tip. Finish sanding the wing panel with 320 or 400 paper.

For the right wing panel use a little cooking oil on the plans to make them transparent and build on the opposite side. Repeat all the steps described to build the left panel. After both panels are complete, check their fit to make sure you have 2" total dihedral (1" under each tip). Sand the roots, if necessary, then epoxy the two panels together being careful not to get any twist. After the joint cures, use slow-cure epoxy to install the 2.5" wide nylon tape reinforcement around (top and bottom) the center joint. The 1/4" hold-down dowel will be installed later after match-drilling to F2.

Fuselage:

Glue the 1/16" balsa cross grain doublers to the fuselage sides using contact cement. Then Zap on the 1/4" balsa triangular pieces and 1/8" balsa stab doublers. Next, Zap F1 and F3 to the right fuselage side using a square to make sure they are perpendicular. Now turn both sides upside down on your building surface with F1 hanging over the edge and Zap F1 and F3 to the left side. Using 5-minute epoxy, install F2, F2A, and the 3/16" plywood wing mount. Next, set the wing into its proper position and drill the 1/4" hole into the wing using the hole in F2 as a guide (I sharpen the end of a 12" piece of 1/4" O.D. brass tube and use it as a drill bit). Also at this time, using 5-minute epoxy, install the 3/16" balsa cross grain sheeting on the bottom front of the fuselage and remove the wing.

Turn the fuselage over and install the 1/4" balsa triangular pieces at F2 and at the 3/16" plywood wing mount. Then glue in the plywood cockpit floor between the fuselage sides with Zap. Using 5-minute epoxy, install the 1/4" square balsa piece and triangular pieces under T1. Next, taper the aft ends of the 1/8" balsa stab doublers so the sides can be pulled together at the tail.

Mark the center of F1 and F3 with a pencil. Now draw a straight line across your building surface. Set the fuselage on the surface upside down again with F1 hanging over the edge and with the pencil marks over the line on the building surface; pin the fuselage down in this position. Now pull the sides together over the pencil line at the tail and glue together with 5-minute epoxy, making sure they are not twisted. After the epoxy cures, install the 3/32" balsa cross grain sheeting on the fuselage bottom aft of the wing with Zap. Also, use 5-minute epoxy and install the 3/32" plywood tailwheel bracket mount.

Remove the fuselage from the board and install the 1/4" square balsa pieces under T4 and T5 with 5-minute epoxy. Now, using Zap, install formers T1-T6 as shown on the plans. Next, glue in the top center 3/32" x 3/16" spruce turtleback stringer with 5-minute epoxy and then install three more on either side, spacing them as shown on the plans.

Make the front turtledeck cover by edge gluing two 3" wide pieces of 1/8" balsa. Cut the sheet slightly oversize and then carefully trim and/or sand the edges for a good fit. Install with Zap and use micro-balloons and Zap to fill any small gaps at the edges. Glue the soft balsa blocks and 1¼" T.E. stock pieces into the nose with 5-minute epoxy as shown on the plans. Note that the left and right nose blocks are different. Also, at this time, install the 1/4" hold-down dowel into the wing, using epoxy. After curing, place the wing on the fuselage, check alignment, and drill and tap the holes for the 1/4-20 bolts. Carve the nose to the shape shown on the plans and sand the fuselage overall with medium grit paper. Finish sand with 320 or 400 paper. Also, at this time, cut the soft balsa fairing blocks aft of T6 and sand to shape.

Cover and Finish:

I prefer MonoKote for its light weight and quick application. Before covering you should apply two coats of Hobbypoxy clear dope or equivalent, to the nose area and around the area where the wing rests; this is for fuelproofing. Then cover each assembly (wing, fuselage, tail) individually with your choice of colors. After covering is complete, glue on the tail and fairing blocks using 5-minute epoxy. Remember to cut away the MonoKote at the glue joints. Refer to the plans for the installation of the windshield. Don't omit the cut-off straight pins at the lower corners as these add a lot of strength in holding the windshield on. Run a piece of 1/4" wide striping tape around the windshield/fuselage joint to simulate a canopy frame.

Install the landing gear and tailwheel hardware and make sure main wheels are lined up properly (no camber or toe-in). Then install the throttle cable and housing, engine mount, fuel tank, engine and muffler, and prop. At this time verify that the wing incidence is correct (0 degrees) and then cover the center section of the wing with several strips of MonoKote backing (the clear stuff you remove before use). Now apply RTV to the fuselage opening and install the wing, tightening the nylon bolts snugly. After the RTV has cured, remove the wing and trim off the excess RTV with a sharp razor blade. You now have a perfect seal against fuel and oil.

The pilot I used was a Williams Brothers 2⅝" Sportsman figure painted with PLA enamel (the kind used for plastic display models) which is completely fuelproof. Credit for the painting of the pilot goes to my wife, Kim, who did a much better job than I could have done! The pilot is installed with RTV and, in addition, has two #3

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General view of flightline — 81 pilots, 110 airplanes.

WORLD ENGINES/HAMILTON HAWKS 4-STROKE ENGINE RALLY

Oct 1-2, 1983

By Jerry Smith

The World Engines/Hamilton Hawks 4-Stroke Engine Rally was a smashing success! I know because I spent two beautiful days gawking, photographing, flying, and talking with many pilots and friends. To my knowledge this is the first 4-stroke rally ever held east of the Mississippi, and the first major event of any kind for the hosting Hamilton Hawks, a club in its 6th year of operation.

The Hawks flying site is located in Joyce Park, Hamilton, Ohio. In order to get to the flying field it is necessary to drive down a narrow road, through the woods next to the big Miami River. Signs on the trees kept us busy reading the funny slogans, like: Hawks Safari Tour, or The Big Miami River, don't fly over it or crash into it! (The fish are complaining.)

Contest Director Dick Nutting kept things moving on the mike. With 5-7 airplanes in the air at one time it was difficult, sometimes, to keep out of the other guys way. A great variety of

(L to R): Hawks secretary, Ben Brackett, John Maloney and C.D. Dick Nutting discuss prize winners.

Proctor Nieuport 28 by Bob Bell. O.S. FS 120.

Joe David and Tiger Shark Saito .45, 60" wing, 5½ lbs. Future RCM construction article.

Bob Karlson, Wilmington, Delaware, F4F Wildcat, retracts. O.S. FS 120, 13½ lbs. Looked absolutely real in flight.

Beautiful Emeraud by Dick Konkle, Atlanta, Georgia. Kavan twin, C & H Ignition, 1/3 scale.

Duane Campbell and 40% Pober Pixey. Pilots choice trophy.

Under the cowl of Duane's Pixey is a gleaming Kavan Twin. Looks real, huh?

Bebe Jodel B9-30% scale, O.S. FS 120 Twin by Dick Konkle, Atlanta, Georgia.

Stomp FB4V, 1/4 scale, O.S. FS 120 Twin, by Ron Taylor, Carroll, Ohio.

GMP Cricket, O.S. FS 40, stock except for rotor gear ratio, by Duane Stevens, Cincinnati, Ohio.

Bob Neitske, Elkhart, Indiana, and Super Buccaneer.

Andrea Kavan, daughter of Franz Kavan, on a foggy Sunday morning.

aircraft were spread out along the flight line. And, all had one thing in common — a 4-cycle engine. Quiet was the word of the day. Not spending much time around 4-strokers, I was amazed at the low sound level, especially with the large number of planes in the air. I went away with the feeling that I could still hear.

The registration fee for both days was $5.00. Mighty reasonable considering John Maloney of World Engines, sponsored the event with over $5,000.00 in prizes, which consisted mainly of engines and trophies. Events in the contest were Pilots Choice: best aircraft in the rally selected by ballot of the registered pilots. Simplified Stand-Off Scale, Timed Flight, Phantom Judges: based

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SOARING

Al Doig

Spectator area — Visalia, California, Fall Soaring Fesitval.

Hey gang, I'd like to tell you about a contest I attended in October of last year. I keep saying that I don't report on contests and then go ahead and do it. Anyway — the reason for this report is that this one is so well-done and so much fun it might serve as a model for other clubs to follow. This yearly bash is sponsored by the Portuguese Air Force, otherwise known as the Central Valley Radio Controllers. This quiet, unassuming group of farm folk reside in Visalia, California, which is a small town just north of Pixley, on Highway 99.

The CVRC have their own field which is quite large and planted in grass. There are permanent winch pads and spectator and stand-by areas are roped off. RV parking has been permitted on the field for out-of-towners. Watering and mowing equipment keeps the grass green and trimmed.

This event gets bigger each year, with 135 entries in 1983; 121 fliers posted scores. In addition to trophies for the top ten places, team trophies were awarded for the top four man team. Team competition has become as keen as individual effort. The C.D. Dell Henry, issued this challenge. "California is offering a challenge to any state that sends a four man team for the four man team trophy. We feel we are the greatest and we're more than anxious to prove the fact!" The only out of state team responding to the challenge was a crack team from the Northwest Soaring Society from Oregon and Washington. They placed 8th.

The events were an AMA Task 4, Cumulative Duration (Add-Em-Up); one set on Saturday and one on Sunday. Landing was onto a scale runway, but of different dimensions than AMA. There were 50, 75, 100, 75, 50 point segments. The 100 pointer was 4 feet deep and gave most fliers fits due to slippery grass and poor depth perception. All launching was done with just two winches and at no time did I see anyone waiting for a winch. The secret — two Davey Systems Retrieval Systems. These worked flawlessly both days. It was the first time most fliers had launched using a retrieval system.

In past years a Saturday night banquet was held, probably attended by not more than half the contestants. This year a catered barbecue of fried chicken served on the field attracted almost all the contestants and their families. This type of get-together really makes a flying meet. No one has to go home, or to the motel to shower and dress for a more formal meal. The fact that entertainment was provided by belly dancers had little to do with the large turnout.

Transmitter impound — Fall Soaring Festival.

Scale landing area — Fall Soaring Festival. Dave Johnson, Portland, Oregon, landing. Dave was 3rd.

Erik Eiche, Vancouver, B.C. Sagitta 900 with differential air brakes.

Dennis Brandt, Southern California flier with new sleek design. Scaled up from his 2-meter design. Eppler 207, 12 oz./sq. ft. Spoilers about 60% back on wing. Do not change pitch when raised.

Mark Smith of Mark's models with a new friend. Will be kitted.

Mark Smith's new model features slick blade type spoiler.

I guess I ought to tell you who won. Tom Copp of the Fresno Soaring Society copped first; Fred Weaver, who I think was flying under the CVRC banner, was second; third was Dave Johnson of Portland, Oregon, and the Northwest Soaring Society. The winning team was the Silverado Soaring Society. With most of the top fliers on the West Coast present, you can imagine the competition was keen. Mark Smith, who was 7th in the 1983 World Championships, finished with 98% of the winner's score, and was 11th. With 87%, I was way up the ladder, right?, wrong; I was awarded 67th. Oh well, it was fun.

A couple of side observations: Right in the middle of California Gas Bag country, in floater type weather, the winner, Tom Copp flew a stock straight wing Sagitta 600 with ailerons, rudder, elevator, and flaps. Third place Dave Johnson flew an aileron/flap Camano 100. You're going to see more aileron ships in the winner's circle. A second point of interest was the distribution of radios, 66% were Futaba, 19% Airtronics, 7% Kraft, with all others adding up to the remaining 8%.

Next year's bash will be held October 6, and 7, 1984, so out of state teams should start honing their weapons.

★

I'm sure you were all awake last year when I told you about Erik Eiche of Vancouver B.C. winning the big Northwest Soaring Society Championship with his Gentle Lady (February '83 issue). Erik has an interesting philosophy of sailplane design. He puts all his design effort into perfecting the last ten seconds of flight. Last year's Gentle Lady had spoilers which, when actuated, raised and lowered differentially with rudder action giving enhanced yawing action and better final landing control. In 1983, Erik, flew a stock Sagitta 900 with a not-so-stock spoiler/airbrake system. Besides upper and lower spoilers, Erik's Sagitta has airbrakes that look like ailerons. When the airbrakes are raised, the are worked in a differential fashion simultaneously with the rudder, thereby enhancing the yaw. The upper and lower spoilers are on the same channel as the airbrakes and come up with the airbrakes but are not additionally moved by the rudder. Mr. Eiche says of the system: "It is ideal for very slow landing approach during the last 10 seconds. The ship sinks out without a tendency to dive or to stall. Find the right amount of throw through experimenting, and tip stalls are virtually eliminated. Did the system work for Mr. Eiche in 1983? Not too badly. In the 1983 NWSS Championship Erik was 2nd after the day and a half elimination. At this point each contestant has the opportunity to fly one of his previous rounds over. The top 10 then have a fly-off for placings. Erik stuck with his original scores and in the fly-off earned 4th place, behind Bob Dodgson, Dave Johnson, and Tom Neilson. For proper proportions contact Erik Eiche, 6080 Tranquille Place, Richmond, B.C. Canada V7C 2T1.

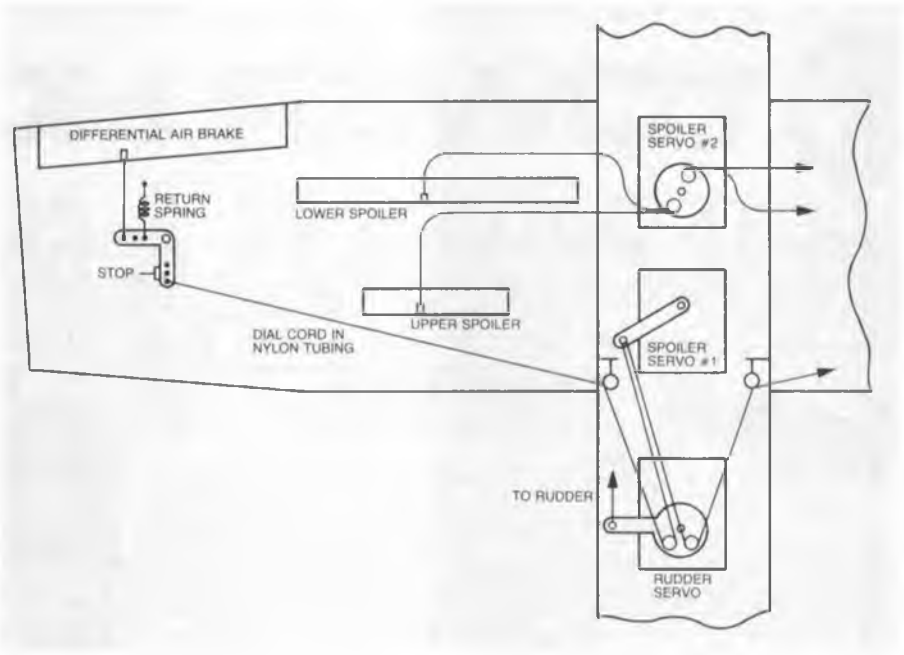

Fig. 1: Erik Eiche's differential air brake.

★

I know that a number of you guys out there are into aerobatic slope flying. One of the multitude of areas in which I have no expertise is aerobatics. Whilst browsing through some old issues of the "Journal of the Torrey Pines Gulls," I ran across some interesting observations by Ken Banks on aerobatic design that may also be interesting to the thermal designer.

"One factor in aerobatic glider design is that it is desirable that rudder deflection yield ***only*** *yaw (no roll) when rudder is used in stall turns and in the knife edge position (as in 4-point rolls). Because there is some dihedral, this seems at first, unlikely. However, the rudder by itself generates a small rolling moment opposite to the sense of rudder deflection, because most of the rudder is above the roll axis. For instance, right rudder causes a leftward force at the top of the vertical fin, giving a small rolling moment to the left. The height of the fin can be adjusted so that this exactly cancels the rolling moment to the right generated by yaw and dihedral, with the net result of no roll response at all. This design aspect is very empirical; it is a question of clipping off the top of the fin and rudder, or adding to it until the desired behavior is achieved.*

The pure-yaw response is important in stall turns and in the knife-edge position and should be tested there rather than in slow level flight. In slow level flight, because of the angle of attack, the tail is effectively lowered, and a rudder which gives pure yaw response during the above maneuvers will sometimes give a slight rolling response in level flight.

An unfortunate aspect of a rudder which gives pure-yaw response is that it is not much help in getting the airplane down if the aileron servo quits!

The Long-Tail Straight Roller — Aileron differential is of limited use in controlling adverse yaw in aerobatic gliders because its effect is reversed when inverted (more accurately, when the aircraft is experiencing negative g's). The same problem occurs with coupled rudder. In consequence, fully aerobatic gliders rely simply on a long tail moment arm and a good-sized vertical stab to limit adverse yaw. In this case a certain amount of adverse yaw is accepted, both upright and inverted, which is inferior to proper pilot coordination of rudder and aileron, but is much easier for the pilot.

The Vertical Tail Volume Coefficient, (discussed in the September '83 column) can be used as a measure of the ability of the fin to counter adverse yaw. Aerobatic gliders might have tail volume coefficients of from 0.035 to 0.058, while rudder/elevator gliders use values between 0.020 and 0.026. At the higher values and with little or no dihedral, there is a lack of spiral stability under some conditions, and a small amount

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GIVE IT A WHIRL

John Gorham

Visit To Japan

Japan is subarashii (Japanese for outstanding!). Just got back from a delightful two week visit to that beautiful country. The purpose of the visit was three-fold: to visit the Tokyo Trade Show, which is the equivalent of our "Toledo"; to attend and report on the Japanese Helicopter Nationals; and to take a couple of weeks vacation on which to celebrate my honeymoon. We had a wonderful time, visited and stayed in Tokyo, Kyoto, and Fukuyama, as well as getting around and about the major cities.

Trade Show

The Japanese hold two trade shows each year. This would be a luxury for American hobby manufacturers who expect to attend a minimum of five or six shows each year. Our shows are located much further away from each other geographically, too, such as Seattle in January, New York in February and Toledo in April! In any event, the first Japanese show of the year is held in Osaka during May, and the Tokyo show is usually held during October. It's been two years since I visited the Osaka trade show and this was my first visit to the Tokyo one. The Tokyo show is held in one of the convention rooms of the Trade Center in the Sunshine City complex, which also contains the Sunshine Prince hotel. This is very convenient since most of the overseas visitors stayed in the Sunshine Prince hotel and were able to walk under cover, through the shopping mall, to the trade show. Also, because of the shopping mall, there were many fine restaurants close to the show.

There was not too much new shown this year in helicopters. "KKK"

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A beautiful "A" star using TSK components.

Contestant test hovers while waiting his turn.

Five judges are used in Japanese finals.

Site No. 2 was busy for both days.

Hirobo Corvettes and Kalt Jet Rangers predominated.

1981 and 1982 National Champ, Suwabe with his new machine.

Nearly all transmitters were in a carrying case.

1984 Hirobo rotor head with individually flapping blades.

Tokyo's model stores had plenty of heli parts.

Two KKK Robinsons on display.

showed their new "Robinson R22HP" model. This helicopter is imported into the USA by Dave Robertson of C.M.I. One of its features, apart from high quality construction, is a unique flybar-less head design. Dave flew this model at our Merced Fly-In and it seemed to perform well. I'm sure we'll see several of them around in the USA in the near future. The "Kalt" booth showed their fine range of "Baron" models, including the new "Baron 60 Blackhead" which was flown so well by Yoshiaki Nagatsuka at our own 1983 AMA Nationals. The "Kalt" helicopter range is imported into the USA by Circus Hobbies, Las Vegas. Kalt also showed some new fiberglass rotor blades which are as yet unpriced. Later, we hope to get more information on these blades and will give you a report.

The "Hirobo" booth was busy and bright, as usual. "Hirobo" helicopters are imported into the USA by "GMP." "Hirobo" showed many of their super scale ships, including their large Iroquois which was beautifully finished and also a 90 powered Bell 47-G which is utilized as a camera ship. Their new "Falcon 888" was also shown. The basic features of this model are already incorporated into the GMP "Competitor," which is a joint USA/Japanese venture with the "Hirobo" company. Another new "40" powered smaller heli, also a joint venture, is soon to be announced and it will be on display at "Toledo" this year. "Hirobo" also showed a new rotor head which is a similar design to the one used on their well-known "SST" mechanism but, in addition to having a simple see-saw damped action on the main blades, it also incorporates individual flapping of each blade. Each flapping hinge also had adjustable damping. I've not yet tried this head but I understand that its flight performance is really quite remarkable.

The radio manufacturers, of course, all showed their latest models and this year all three were showing helicopter radios. At last, it seems, the radio manufacturers have discovered that we exist and the "big three": "JR," "Sanwa" and "Futaba" are all producing some beautiful equipment for us to either look at longingly or buy. From all accounts, "Futaba's" new "PCM" system seems as though it will really help solve our radio interference problems. "Sanwa," which is marketed in the USA as "Airtronics," also has their own version of pulse modulation and, of course, "JR" is still maintaining and improving its range of radios for the helicopter enthusiast. The "KO" booth showed a new radio soon to be announced and also, of course, the familiar Kraft/KO gyro which so many of us now use in our helicopters. During the show we kept bumping into many familiar Europeans and Americans who were at the show for much the same reason that we were. These included Paul Bender of Hobby Shack, Hans Graupner of Graupner, Harry Wolfe of Robbe, Clive Coote of RipMax Models in England, Bill Selzer of Cox Hobbies, Ron Gilman, new President of Circus Hobbies, and many others. Clive told me that his father, Max Coote, recently passed away. This was quite a loss to the modeling fraternity since Max Coote was one of the early pioneers in modeling in England and built up from scratch a large modeling supply organization known as RipMax, which

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Intermediate Class — ***Competitor*** 1st, 3rd, 4th
Novice Class — ***Competitor*** 2nd, 4th
F.A.I. Class — ***Competitor*** 2nd, 3rd

1983 CANADIAN NATIONALS

Competitor — 1st F.A.I. (Expert Class)
Competitor — 1st Novice Class

1983 EAST COAST HELICOPTER CHAMPIONSHIPS

Expert Class — ***Competitor*** 1st, 2nd
Novice Class — ***Competitor*** 1st, 2nd, 4th

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17 year old Tom Dalusio flew his ***Competitor*** to 1st place — Expert, Senior and 2nd place — F.A.I. Open.

Robert Gorham flew ***Competitor*** to become U.S. National Champion.

Ralph Geese won 1st place — Intermediate with ***Competitor***.

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1983 Japanese Helicopter Nationals

Although I have watched video tapes of the Japanese pilots flying their R/C helicopters on previous occasions and participated in fun-flys on previous visits to Japan, this is the first major contest that I have attended. For your interest I have several general observations about the way it differs from American contests. First and foremost, the Japanese Nationals are held in a location which is almost impossible to find even by the locals, let alone by a visitor. One has to drive many miles out of Tokyo, making many "hidden" turns off the main highway, "bumping" the last two to three miles over very rough dirt roads and finally arriving at a clearing between some corn fields. That's where the Nationals are held! The facilities on the field were very minimal, two small outhouses and the organizing club bus. That's about it. The only other comfort you could find was your own car (thank goodness we had one!). I must say, however, some nice box lunches appeared around midday and my wife and I were invited to participate. What we would have done for food other than this would be hard to say. Apart from the very frugal amenities, however, the rest of the activities were just like any other Nationals in any country. The pilots were capable, enthusiastic and friendly, the organization was superbly carried out, all scoring was done on a computer and print-outs were available of the progress of the flying and scoring almost whenever requested. The man in charge of the computer was obviously also a programmer since the print-outs included a nice computer generated picture of a helicopter.

The Japanese Nationals are run a little differently from the AMA Nats in this country. For a start, the contestants are selected from regional eliminating contests. There are four regions, each one choosing a number of fliers depending upon its size and population. The final result is 37 fliers chosen from the regional eliminations and the three top fliers of the previous year. The contest is for only one class and that is to the "FAI F3C" rules. Flying is conducted on two separate sites, spaced about 1/4 mile apart. Frequency control is handled by having good communication on "walkie talkies" between the two sites. There seemed to be no problems so their system obviously works. Another difference is something which we could well copy over here and that is that when one flier is near

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the end of his round the next contestant is permitted to run up and test hover at a specific hover circle located a reasonable distance from the main contestant's landing circle. This activity is coordinated by one of the officials and things are kept moving fast using this technique.

Every contest we attend always has surprises. The 1983 Japanese Nationals were no exception and the surprise this time concerned the 1981/82 champion, Suwabe. Suwabe was hoping to make this his third consecutive year of winning, which would have been the first time this had been achieved. But to tell the story properly you should know that Suwabe lives in Fukuyama, which is about 400 miles from Tokyo. A few days before the Nationals he crashed his Hirobo "SST Corvette" and — this must be familiar to many of us — Suwabe promptly embarked on building two (Note: **two**) new machines to fly at the Nationals. The ones that he decided to build were the as yet unannounced Hirobo new "Corvette." I was in Fukuyama the **day before** the Nationals to visit with Suwabe and I found him still painting his fuselages prior to putting in his radio. This was just 15 hours before the Nationals were due to start! Well, just like any modeler all over the world would, Suwabe worked very hard to finish his models in time and he and his modeler friends then drove non-stop through the night for over 400 miles to arrive at the Nats — just 20 minutes too late! Suwabe's entry was thus disallowed and, as a result, the 1981/82 champion sat through two days watching the other guys fly. I'm sure there were many of us there who had a lot of sympathy for young Suwabe. The models which he would have flown are one of the most advanced — and beautiful, that I have ever seen.

As stated earlier, the Nationals are run to only one set of rules and one class only is flown, the "FAI F3C."

TABLE 1 — FAI F3C CONTEST RULES

Maneuver	K Factor
Hovering "M" *	6
Tail-In 360 Degree *	6
Horizontal "8" *	8
Top Hat	8
Double Pirouette	8
Nose-In 360 Degree	9
Shovel	9
Pilot Promenade	8
"4" Point Pirouette	9
Stall Turn	6
Loop	8
Split "S"	8
Immelman	8
Observation	10
Roll	9
Belgian Stall Turn	9
540 Degree Stall Turn	8
Autorotation	9
Rectangular Approach +	6
Landing *	6

*** mandatory plus 4 selected optional**
\+ Not used in Japanese Nationals

These rules have been described in a previous "Give It A Whirl," but I have included the list of maneuvers above for your convenience.

Each flier must fly the four mandatory maneuvers and then select four from the rest. Each round is scored by five judges who, as you can see in the photographs, sit and watch very attentively for hours on end just like any five judges anywhere in the world. Like we do, the Japanese try to fly at least 3 rounds, with the aggregate of the best two rounds forming the final contest score. Out of the 40 machines entered, 38 were scale (Jet Rangers) or semi-scale such as the Hirobo "SST Corvette." This one difference from our machines was quite remarkable and you'll see from the photographs the startling appearance of all those fine scale machines lined up. Roughly half the machines were Hirobo and half were Kalt. Some of the contest machines were fitted with parts by the "TSK" company which makes accessory or add-on parts of super high quality for up-grading your helicopter if that's what you want to do. The quality of construction and finish of all the entries was very high and it seems that another difference in Japan is that the contest fliers' machines are all of the highest grade and appearance available, whereas in the United States, of course, we still fly basic "pod and boom" kit models and haven't yet reached the situation of having to up-grade too much in order to win. Next year, maybe?

Another obvious difference in their Nationals was that the caller was not just a helper who announced each intended maneuver loudly to the judges. The Japanese flier and his helper were undoubtedly a closely-knit team with the helper acting more the role of a manager and the flier that of a pilot only. The helper was constantly busy keeping out of the way of the pilot but providing advice from time to time. He also scheduled the maneuvers and then announcing them to the judges using an electronic hand-held megaphone.

Well, the competition was like all competitions — tense at times — and I watched every flight of the first two rounds which were completed on the first day. Despite the beautiful weather on the first day, on the second day it rained for the first time in our visit to Japan. It really rained hard so we didn't even try to attend on the second day, thinking that there would probably be no flying, and how would you get there anyway over two miles of muddy roads? It seems that the pilots turned-up, took a vote, and decided that the third round must be flown.

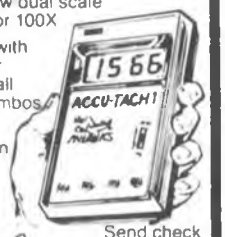


TABLE 2 — 1983 JAPAN R/C HELICOPTER CHAMPIONSHIP RESULTS

Place	Flier	1R	2R	3R	Total
1	S. Taya	1484.0	1602.5	----	3086.5
2	S. Ishikawa	1532.0	1445.5	----	2977.5
3	W. Sakaguchi	1365.0	1604.5	----	2969.5
4	K. Takayanagi	1406.0	1461.0	----	2867.0
5	A. Nagase	1358.5	1393.5	1403.8	2797.3
6	Y. Kubo	1264.0	1472.5	1310.7	2783.2
7	S. Yamamoto	1380.5	1351.5	1368.4	2748.9
8	M. Shimizu	1346.0	1395.0	1310.5	2741.0
9	T. Miki	1293.5	1407.0	1214.1	2700.5
10	T. Ikeda	1450.0	219.0	1239.0	2689.0

Those in a good position, that is to say with two good rounds, obviously held-off their time and let the others "have a go at it." The top 10 places are shown mainly for the purpose of letting you see the points which the entrants scored. (See Table 2.)

The winner was S. Taya flying a Jet Ranger with Kalt/TSK mechanism. Another observation about the differences in style between the Japanese and American fliers was that the Japanese flew more slowly and concentrated on precision of the hovering and slow forward flight maneuvers. I saw very few loops and rolls. Could U.S. fliers beat them? Well, it's hard to compare because we fly AMA rules and they fly FAI (now this is going to change). Having seen both the top United States and Japanese Nationals fliers during 1983, I'd say that American fliers have adequate flying ability and machines to hold our own well. We just need to get practicing flying R/C helicopters in the FAI style. I also had the pleasure of watching Ewald Heim, the European champion, fly his "Star Ranger" this year. In light of all this, my guess is that the first FAI/World Championships in 1985 will be very exciting and the results very close. Just keep practicing FAI maneuvers, fellows!

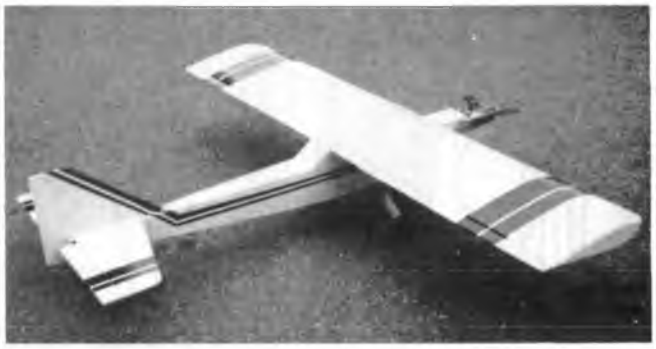
I thoroughly enjoyed this visit to the Nationals and got to know many of the fliers and club officials very well. I was made an honorary member of the "Tokyo 15 RC Club," which helped to run the competition. Most important, however, having described to him our recent "Fun-Fli" meeting in Merced in 1983 (see GIAW, January 1984). I got an assurance from Suwabe that he would be prepared to come to the USA and attend a similar fly-in we hold in 1984. I believe that Ewald Heim could also be persuaded to come over from Germany so it's my firm intention, during the summer or fall of 1984, to have another Fly-In in California. Maybe Merced, maybe another site, but it will be conducted in a similar manner to 1983's meet. In other words, an un-contest during which we can all share each other's views, try each other's machines, and watch in awe as some of the world's best fliers put on a show for us. Watch this column for an early announcement of when and where this will be. Last year it was 94 helicopters; this year, who knows?

Well, next month we'll get back to some more technical discussion. Until then, keep 'em whirling. □

Apologies to Tom Hall with his beautiful Jet Ranger shown in the February RCM, page 140. We called him Tom Bigeley by mistake.

RCM PRODUCT REVIEW

Craft Air
MYSTIQUE



SPECIFICATIONS

Name	MYSTIQUE
Aircraft Type	Trainer
Manufactured By	Craft Air 20115 Nordhoff St. Chatsworth, California 91311
Mfg. Suggested Retail Price	$69.95
Available From	Retail Outlets
Wingspan	57½ Inches
Wing Chord	10¾ Inches
Total Wing Area	616 Sq. In.
Fuselage Length	50 Inches
Stabilizer Span	21½ Inches
Total Stab Area	91½ Sq. In.
Recommended Engine Range	.40-.50
Recommend Fuel Tank Size	10 Oz.
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa & Poplar
Wing	Balsa, Bass
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Futaba 7FGK
Engine Make & Displacement	Super Tigre .46
Tank Size Used	8 Oz.
Weight, Ready to Fly	84 Oz.
Wing Loading	19.6 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Top quality materials (except main gear); amount of hardware, strength of model.

WE DIDN'T LIKE THE:
Needs stronger main gear, would prefer 3/32 wing sheeting.

If you are puzzled by weaving take-offs, erratic flight, and/or bouncy landings, then perhaps the new Craft Air Mystique will "take the mystery out of flying." That is the suggestion on the colorful label which adorns the box containing the .40 size trainer kit.

The 43¼" x 5¾" x 3" box is stuffed with materials which includes an excellent hardware package. Items that appeared were such things as a fiber filled nylon engine mount, pushrods, threaded rods, plus the usual hardware found in most kits.

The kit contains no die-cut parts as machine cut wood is used. All wood was of excellent quality and the little parts were bagged.

Construction:

The plans are one sheet (35" x 53"), contain eight construction photos, and the instructions. It is advised to cut the instructions apart and assemble into a little booklet.

The fuselage has 1/8" poplar sides, 1/8" poplar and balsa bottom, and a 1/4" balsa top block. Combine these materials with plenty of 1/4" triangle reinforcement and the result is a very strong box fuselage.

The tail surfaces are all 1/4" balsa and fit together perfectly. Balsa of 1/4" thickness is only slightly heavier than the often used 3/16" and provides extra material for hinging.

The wing had 3/32" ribs anchored by two 1/4" x 3/8" bass spars and spaced by 1/8" balsa shear webs. These materials are all a little stronger than what would often be in a .40 size kit. The wing sheeting was all 1/16" balsa while we would have preferred 3/32". Once the wing was covered, the strength of the sheeted areas on the wing increased. This reviewer did manage to stick his finger through the sheeting on two occasions while sanding the wing.

The entire airframe assembles very quickly as it was ready to cover in four days of spare time effort. Parts fit is excellent, a tribute to Craft Air's accurate machine cutting.

Instructions are very well-written and include useful information on installing hinges using toothpicks as pins. The quality of instructional material helps make this a true trainer kit.

Covering:

After a dip in the can of Balsarite, the airframe was covered entirely in white World Tex. This imported iron-on fabric is very easy to apply and is only slightly more expensive than the mylar type coverings. Formula U Polar White was sprayed over the whole plane followed by Formula U trim in Bright Red and Midnight Blue.

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ENGINE CLINIC

Clarence Lee

Product and engine reviews the past few months have gotten us behind in answering reader's letters. In fact, elsewhere in the magazine you will find a review of the new Saito FA-120 four stroke engine that I decided to run as a separate review rather than in the Engine Clinic column in order to cover more of the letters this month.

Our first letter this month comes from Bob Davis, the diesel conversion man. In previous columns I have answered many diesel related questions from readers. Many have wanted to know if converting their Rossi, Webra, or OPS pattern engine to diesel would give them more power. Some of the nine to ten pound ships being a little marginal in power. I have always stated that converting to diesel operation would allow the engine to turn a larger diameter or higher pitch propeller at lower rpm but not to expect more power if continuing to use an 11/7 or 11/7½ type prop. I have also pointed out that going to a larger prop size would be more beneficial to the scale type, etc., aircraft. This definition of power being a two headed monster. It all depends on the aircraft and application involved. At any rate, I believe Bob has taken exception to some of my previous replies to readers in regards to dieselizing engines for pattern aircraft. Here is what he has to say.

Dear Clarence,

As you know I stay pretty quiet, busily developing diesel conversions and now our new CO_2 conversion kit (photo enclosed with specs). The basis of this letter is your response to Thomas DiLibero, August '83. Regarding one, power of diesel vs. glow and, two, the application of usable power. Reference: your review in '82 on dieselized K & B 21. Your test indicated the dieselized engine turned a 10/6 as fast as the same engine on glow turned a 9/6. Since a 10/6 could not be considered to be violently over-propping the 21 it would certainly increase the performance of an R/C pattern ship. If a 9/7 was chosen rather than the 10/6, a substantial increase in speed would occur. If, additionally, a Graupner quiet pipe, which has a broad range, is employed, the ability to tune the timing of the diesel to the pipe would further boost usable performance. I'm sure most modelers would agree that flying straight and fast is of no benefit in pattern other than for its aesthetics, if that's what turns you on, or for the momentum created allowing you to get through maneuvers.

A diesel puts out what might be called raw power — similar to what modelers are now experiencing with some chain saw engines. The new turnaround pattern cannot be achieved on a 60 swinging an 11/7 at 13,000 rpm. It can, however, be achieved on a dieselized 60 turning a 14/8 or 15 x 6, or even a 16/6 on which it puts out at a constant 7,500 rpm. Reference: Al Alman, Big Bird, June '82, Model Builder.

In regard to whether diesels are fast, one need only review numerous articles; columns, M.A.N. '81, by Bill Camphill, Delta manufacturing, K & B 21 dieselized wins races when running against 25% nitro cars, and turns up 28,000 + rpm in the straight aways, or in John Oian's, champion race boat driver, successfully competed with K & B 6.5's and 7.5 outboards on diesel; reference: column '82 M.A.N. Last, but certainly not least, is the suggested diesel formula mentioned in your article. This could have been a suitable formula in the 40's, 50's, and 60's and is still usable on old diesels, and many current foreign sport diesels, non R/C type. The amount of oil is far too much and, if used on a throttle equipped diesel, will lead to momentary excessive hydraulics as the engine changes from idle to full power. The running dynamics of a modern R/C dieselized engine led us to develop far less oily mixtures. We currently manufacture four formulas: 1/2A to .10, standard, ABC/90, and formula T, to allow for the characteristics from 1/2A all the way up to dieselized twin Tartins.

In regard to amyl nitrate formulas. This material is a cetane booster, meaning it speeds up the burn thus allowing a faster liberation of energy at a lower compression setting, thus dramatically increasing power and providing adequate temperatures to maintain smooth running and idle performance. A model diesel can idle slower than a glow or even an ignition engine.

Feedback from modelers since 1976 has allowed us to refine these diesel fuel formulas.

Note: One of the most powerful conversions in the 60 class we've run to date is the Fox Eagle III. If you would like a conversion for it I would be glad to send it. I have always been a great admirer of Duke, as I'm sure you have been. I've sold a large number of these conversions and modelers have been dramatically impressed with the performance.

Sincerely yours,
Bob

Dear Clarence,

An acquaintance of mine recently purchased a mint "Anderson Spitfire" 65, 6100 series ignition engine. The former owner didn't relate the history of this engine but sold it for quite a bit of money. We are curious about this engine and would like any info you could give us. Thanks.

Yours,
Mike Dickinson
Woodland, Washington

The Anderson Spitfire was designed and manufactured by Mel Anderson here in Los Angeles from 1947 up until 1949 when manufacture was discontinued and Mel concentrated on a series of 1/2A type engines. The engine was a real quality product but did not become a "favorite" among the U-control pattern fliers due to its size and weight. An earlier design of Mel's — the Super Cyclone, designed prior to WW II while Mel was an employee of Aircraft Industries who manufactured the Baby Cyclone and Super Cyclone engines (the Baby Cyclone designed by the late Bill Atwood), always seemed to be the more popular engine due to the same power output but being smaller in size and lighter in weight.

In the early 50's Mel's company filed bankruptcy and K & B purchased the assets. Johnny Brodbeck, Jr., who was still in high school at the time, and well-known U-control speed flier Lew Mahieu, who originated Supersonic fuels, assembled Anderson Spitfire engines and some were sold at that time. K & B later traded the Anderson tooling, dies, and remaining parts to Lew for rights to his Supersonic Fuels. Lew later sold the Anderson project to a gentleman named McCord and McCord continued to produce the engine through about 1958 in both spark ignition and glow versions as well as an R/C version.

McCord later sold the Anderson project to a man whose name I do not know and he, in turn, sold the project to Ralph Mroch in Denver, Colorado (REMCO). Ralph also acquired the remaining tooling and parts for the Super Cyclone engine and sold REMCO Super Cyclones and Anderson Spitfires for many years. More recently Ralph sold the Super Cyclone and Anderson Spitfire tooling to Karl Carlson of Replica Engines in San Jose, California. So you can see, the Anderson engine has been through many hands over the years.

The engine was made in both ringed and lapped piston versions as well as in .61 and .65 cu. in. displacements. How many engines were manufactured over the years I have no idea but I should guess many tens of thousands.

After going bankrupt, Mel Anderson went to work for Henry Engineering (Veco) and designed their 100 series Veco .19, .29, and .35. Mel and Gil Henry, who owned Henry Engineering, later had a series of disagreements and Mel left the company. It was at this time that I became Veco's design consultant. As far as I know Mel Anderson is still alive and living here in the Los Angeles area, but well along in years now.

Dear Mr. Lee,

This letter is written in response to Mr. Ferber's letter in the January issue of RCM which asked for an effective method of muffling our model engines while being run in the garage. The method I use is very inexpensive, very quiet, and has an added benefit to quiet operation. I slip a 2' length of "Tygon" tubing over the outlet of the engine muffler and put the other end of the tubing in a bucket of water. With the size engines I run (.15's) about 6" of water above the tubing outlet is sufficient to break up the exhaust flow into separate bubbles. I would guess that with .60's you would need your water deeper than 6". This results in very quiet operation with just the prop blast and water gurgles to listen to. The added benefit to this method of muffling is that you don't have castor oil blown all over your garage walls and floor! It all stays in your water bucket which you can pour out where you want to.

I have applied this method of muffling to one of my models and have a question about its operation. I have a Dumas Windy air boat with an O.S.-10 FSR. I epoxied a short length of 3/8" copper tubing through the top and bottom of the hull and then connected the tubing to the engine muffler with about a 6" length of flexible "Tygon" tubing. This may not look very good but it sure makes the boat run quieter and also keeps the exhaust oil from coating the rear of the boat. I also opened up the discharge area of the O.S. muffler as much as I could. My question is this: While running the engine in the backyard I pinched down on the flexible tubing leading from the muffler, just to see how the engine would react to an increase in back pressure. To my surprise the engine speed increased! I don't own a tach but would estimate the speed increase to be 700-900 rpm. It was **very** *noticeable. I repeated the same test both with and without muffler pressure run to the tank and with different props. Each time the speed would peak just before I*

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pinched the flexible tubing almost completely closed. In order to keep the rpm increase permanently, I put my Vise-Grips on the 3/8" copper tubing and, with the engine at full throttle, began crimping the tube closed. When the rpm reached the same peak as before, I quit crimping. To check this I would pinch the flexible tubing to see if any more speed increase could be achieved with further restriction. This I know sounds crazy but it sure worked. I use Sig — 10% fuel, Fox idle bar plug, Master Airscrew 7/4 prop, and the engine is about 9 months old with about 1½ gallons of fuel use. I would appreciate your comments on speed increase with increased backpressure as well as the water muffler.

Sincerely,
Ron Kilman
Ada, Oklahoma

The old bucket of water trick for muffling an engine is one that I imagine many fellows, including myself, have tried over the years. Although it may work on the smaller displacement engines, I never found it that useful with the .45 cu. in. and larger size engines. The tubing leading to the water bucket handled most of the quieting effect. The water bucket does trap the oil and goop but did not seem to do much for the smoke and fumes. They still will bubble off the top. In fact, I always experienced more smoke in general due to the water bucket not being behind the prop blast to be blown away. You do not realize how much exhaust is coming out of these engines until you isolate the outlet away from the prop blast.

As far as an rpm gain by pinching the exhaust tubing — you were evidently creating a tuning effect similar to a mini-pipe. There is also the possibility that the particular engine was pumping excess fuel out the exhaust and, by creating some back pressure, more of the incoming fuel mixture was being retained in the engine. Quite often you will experience this type of thing --- that is, a little back pressure actually increasing the power of the engine. Many times a little short 2" header pipe on an engine will give a 200-300 rpm increase.

Dear Mr. Lee,

I have an Enya .35-V model 5225. The threads in the cylinder for one of the six head bolts are stripped. The hole looks too close to the cylinder sleeve to tap it for a larger diameter bolt.

What can I do?

Thanks for all the good information that I get every month from your column.

Sincerely yours,
Bob Lyons
Easley, South Carolina

You do not have much choice Bob. Drill and tap the case for longer head screws. If that doesn't work, the case will have to be replaced. Possibly a Heli-coil could be used, but if there is not enough material for a larger diameter bolt then you could not use a Heli-coil.

Dear Clarence;

Is Fox Lustrox good for breaking in an engine?

Earl Shuholm
San Francisco, California

A dab or two of Fox Lustrox down the intake will help seat the ring in a ringed engine a little quicker and loosen up the piston in a lapped iron piston/sleeve assembly. However, you do not want to get carried away and try to use Lustrox or any polishing agent to eliminate the break-in period. Bear in mind that while you are loosening up the tight spots or parts you are also loosening the properly fit parts as well. Lustrox is very fine and actually does not have much of a wearing effect. It is more of a polishing agent. In fact, that is what it is originally intended for — polishing eye glasses. Never use Lustrox, or any lapping agent, in an ABC engine as

you will lose the piston/sleeve fit. Which brings us to our next letter.

Dear Clarence,

Many thanks for your column over the years. By following your advice about using good fuel and plugs and not using a starter I've had five years of trouble-free flying.

I learned to fly with a Merco 29 and 35 and broke the spray-bars off close to the carb. I repaired them but never had success with those engines until I was able to buy new spray-bars.

The trouble apparently was that the needles were not centering in the spray-bars so that after a lot of trouble starting the engine, any movement of the off-center needle would either close the hole or cause excess richness. After losing most of the 1977 season I switched to Enya's and have had trouble free flying since.

Now a question if I may. I bought a 25 ABC Fuji and couldn't get it started; it is extremely "sticky" at T.D.C. I found later that someone else had ran 8 tanks though it very rich.

I'm not overly concerned about using this engine but at the same time I would hate to see it completely wasted, so could I do anything such as polishing the top 1/16" of the piston? The engine feels quite normal so I expect after a normal ABC run-in, the engine should be okay.

Thanks for your remarks about the Merco 61 (December '82 RCM). I shall be putting one in a Lazy Ace in the spring and will now make up a fuel with Baker's AA.

Happy New Year,
Ron Ashton
Toronto, Ont. Canada

ABC engines are supposed to be a little tight at the top to allow for differential expansions rates of the piston and sleeve. The hotter the engine gets, the more the sleeve expands eliminating any seizing or sticking-up tendency. This is one of the main advantages of an ABC piston/sleeve assembly. If properly fit, the lapped piston also gives a better compression seal than a ringed engine and the aluminum piston is considerably lighter than a lapped iron piston. The higher the nitro content of the fuel to be used in the engine the tighter an ABC piston/sleeve should be fit. At operating temperature, the correct running fit is achieved. Naturally, if the piston fit is so tight you can hardly turn the engine over by hand and you are using only 15% nitro, it should be loosened up until just a slight "grab" is noticed. I would look for some other cause for the engine not starting. Try using a little larger prop with more flywheel action and an electric starter to start the engine the first few times. I am not that familiar with the Fuji and do not know if it is sleeve bearing or ball bearing. If sleeve bearing, be sure the crankshaft does not hit the back plate when pushing rearward with the prop installed. And, also, if the engine has an aluminum prop drive washer you do not want it to run against the aluminum case. A thin steel thrust washer should be installed between the two aluminum parts. With eight tanks of fuel already through the engine an electric starter should not be necessary but it will help until you find the correct needle setting for starting, etc.

Dear Mr. Lee,

I just purchased a Schluter Heli-Boy helicopter with an O.S. Max .61 FSR-H engine. Before I install the engine in the craft, I want to break-in the engine properly and I have a few questions for which I would appreciate your answers.

1. What is the proper break-in procedure for this engine?

2. What size prop do you recommend for me to use?

3. What kind of fuel should I use to break it in and what fuel should I use for flying? (% nitro and castor or synthetic?)

Since engines are rather expensive, I want my engines to last as long as they were designed to. Thank you very much for your valuable time.

Sincerely,
David J. Warheit
Freeport, Pennsylvania

The best method of breaking in a new engine intended for use in a helicopter would be to give it some time in a conventional aircraft first. If you are strictly a helicopter flier then it would be a good idea to give the engine some bench runs to loosen it up.

If you do have a conventional aircraft, give the engine half a dozen rich flights. First flight very rich, second flight a click or two leaner, etc. By the sixth or seventh flight you want to be running the engine in a slightly rich two cycle. There is no need to overdo the extra rich running as it only increases the carbon and varnish formation. The engine should be okay to install in your helicopter then. However, remember it is still not fully broken-in so keep it on the rich side for the first gallon of fuel.

If you have to go with the bench running, run five or six tanks of fuel through the engine with the engine running very rich. Occasionally lean the mixture in, then richen right back up again. Keep repeating this procedure. When the engine will hold a slightly rich two cycle without showing signs of getting hot, it is okay to install in your helicopter.

For a prop, use either an 11/7 or 11/7½ prop—Rev-Up, Zinger, etc. Use the same fuel for break-in that you intend running in the helicopter, 5%-15% nitro is plenty. Helicopters run hot so a fuel with a little castor oil is helpful. Straight castor makes a lot of residue on the aircraft so I prefer a synthetic/castor mix. Or, if you use a synthetic oil mix, add an ounce of castor to a gallon. □

When writing to RCM send a SASE for prompt reply.

SCALE VIEWS

Col. John deVries

Heresy, sheer heresy, I tell you! That's what we're going to talk about this month. I'm going to suggest that people break some rules that go way back to the first time a pioneering modeler stuck some electronics in a scale model and interfered successfully with its flight path. So --- let's get on with this nefarious business!

Our first suggestion is that the R/C beginner's **first** model be a **scale** model. A special scale model, to be sure, but something that **really** looks like an airplane. We've all seen thousands of those slab-sided high wing monoplanes with tricycle gears out at the flying field. "Trainers" they call them. **But,** there are many, many kits for scale models that are as easy to build and as easy to fly as the traditional R/C training models. A Cub, a Vagabond, an Aeronca --- all have the same aerodynamic set-up as the usual trainer, with the slight disadvantage that they're tail-draggers. If you insist on three-wheelers, there's the Tri-Pacers and Ercoupes (which flew in full sized form with **no rudder pedals!**). The pure and unadulterated R/C trainers **do** have one advantage --- the instruction books that come with the **kits** are, usually, pretty comprehensive. However, the R/C beginner with any initiative at all will find almost as good instructional material within the confines of the better **scale kits.**

Continuing this heresy a step further, why couldn't a beginner's first R/C model be a B-I-G scale model? A well-designed "biggie" poses few, if any, construction difficulties beyond their smaller brethren --- particularly if the modeler has at hand a book like Dick Phillips' "Big Is Beautiful" or Bob Beckman's "Building and Flying Giant Scale Radio Control Aircraft." The big advantage of starting "big" is that the models fly so gracefully and well. One of the biggest problems that the beginning modeler faces is that the bird gets ahead of him in flight. With the "giants," that's not usually the case!

As with any heresy, we've got to talk about the costs. In the case of the scale trainer of comparable size to purpose designed models, there isn't much, if any, cost difference. Kit cost is the only consideration because engine, radio and the host of bits and pieces needed to complete the model would be about the same. Of course, "going B-I-G" will be more expensive --- perhaps $100 to $150 more. But, in either case, we'd have a model that not

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Laird Solution, in the foreground, together with the Laird Super Solution --- both powered by .60's. Props shown are 12 inchers --- to give an idea of model size. Scale is 2.25" = 1 ft. Upper wings span 47 inches.

Man! This is what it's all about! Jim MacDonald's Vickers "Jockey" in full scale flight. Webra .91 moves this 1/5 scale model that weighs in at 12 pounds. Jim says that he intends to "clean up his construction drawings and make them available to other modelers." We'll keep you advised!

Jim MacDonald's excellent rendition of the Vickers Model 151 "Jockey," a 1932 one-off British interceptor. Big model, with a 78" span, 13" chord. A winner at the Riverside, California, 4-stroke contest and it qualified designer MacDonald for the Masters!

Chuck Fleenor's line-up of scale weathervanes. Fokker D-VII, Beech Staggerwing, Piper Cub, and stainless steel Beech Bonanza. Other aircraft to be duplicated --- check Chuck's address in the column.

only is a trainer, but a **scale** ship, as well.

Heads are shaking and tchers are "tsking" --- but, we're **not** talking Mustangs and Spitfires as first models. Or, even as second models! We're just suggesting that there are some scale models that build and fly as easily for the beginner as some of the kits with the word, "Trainer" emblazoned across the box.

Our second heresy has to do with R/C radios and how they're installed. Howcum, when we buy a new duper-super radio for our R/C scale model, are all of the servos the **same** size? After all, who needs 39 inch-ounces of push to operate the **throttle** of **any** R/C engine? From the tiniest exhaust throttled .049 to the heftiest of Quadras, Kioritz's and Kawasaki's the throttles can be handled by the most miniscule of servos!

In the same vein, why do we insist on sticking the throttle servo somewhere back in the fuselage, aft of the fuel tank. We end up with some strange and wonderful pushrods and flexible wire connections, just snaking the "push" **around** fuel containers. And the model ends up with lead in the nose, because it's tail heavy! Why not just mount a tiny servo on the aft side of the firewall and use a flexible servo extension cord, back to the receiver? We could certainly use the weight up forward.

B-24 Stafford kit built by Al Schwartz, St Paul, Minnesota, placed 3rd in the Twin Cities Meet in Jordan, Minnesota, August '83. Al Schwartz on the left assistant, Dick Steine, right. Ship flew beautifully, claims that he has rolled the model. Photo by Steve Kanyusik.

Why don't we do it? Vibration, you say! Horsefeathers, say I. Would you believe that there has never been a scientific analysis of R/C servos when it comes to their tolerance of vibration. Unlike military equip — that's expected to perform in a vibration environment, R/C equipment hasn't been subjected to "jiggle tables" where the frequency and amplitude of vibration can be induced and the effects measured --- and suitable mounts designed to eliminate it! Oh, we've seen what vibration can do to

the tender gear trains and motors in our servos when "ole debbil" vibration works them over. But, except for good and logical explanations of **how** to mount servos in trays and other vibration isolating installations, we can't **predict** with any degree of accuracy **when** and **how** the "vibes" will affect our servos!

With these factors in mind, I decided to ask **the** expert on tiny servos, **Bill Cannon,** what would happen if we perched a tiny servo on the aft side of the firewall to run the throttle of our birds. The following is a direct quote from his response.

"Dear John --- Your note was most welcome, and I agree completely with your views on utilizing our Micro Servos as universal throttle servos. When mounted in aileron trays, even on the firewall, they should serve extremely well for this purpose!" Bill also added a P.S. "These servos are available with several types of plugs --- per our brochure."

A week or so after getting Bill's letter, he sent another, amplifying his remarks. "Our standard CE-9 servos all have adjustable centering and should work on systems having 1.3 to 1.7 ms (millisecond) centers. It is a very simple matter to add one resistor and make the servos adaptable to practically any system using a total throw of 1 millisecond or less." He added, "Compatible systems would have to have decoder outputs of (a) positive nature fitting the above specs." Which are **most** radios available today!

In light of what Bill Cannon says, I'm going to give it a practical test --- and stick one of his servos in an aileron-type servo tray, on the aft side of the firewall of the next three scale models I design and build! We'll keep you informed as to what happens to both servos and models. In the meantime, I kind of wish that someone would conduct some **scientific** vibration testing of models, servos and servo mounts. Maybe they could tell us **where** the vibration is greatest, **what** kind of vibration will "do our radios in" and, beyond current practice, **how** we can cope with it --- to **really** protect our scale model investments.

Still talking heresy! Would you believe that there's a book on the market that claims that there's no such thing as **accurate** scale drawings? Or, that two **giants** in scale have been tossing verbal brickbats at one another, each claiming the most accurate model in the history of the world of a particular type? Or, that the efforts of a couple of well-respected draftsmen are nothing but "artistic renderings" of airplane three-views? To which we might respond --- "So!"

And add the word, "what!"

In the real world of real airplanes, if you take two birds from the same production line, they may fly completely different. Manufacturing tolerances build up for good or evil and you may find a "lemon" or a "peach." Both craft were built in the same jigs, from the same blueprints and yet they may be as different as night and day. The same thing should be of consideration when it comes to scale models. There are good drawings and bad drawings and they **will** make a difference if they're used to develop scale models. But, unless you go around with a micrometer in your hands, there **are** drawings that are suitable for the production of mighty accurate scale models. As far as who does the most accurate job of reproducing real airplanes, the only response is to examine the claims, examine the models and then examine the real airplane, if one is handy. **Then,** make up your own mind. Finally, sometimes models built from a set of so-called "artistic renderings" may more truly represent the prototype than birds built from "factory drawings." We've seen some pretty sharp models based on the drawings in Profile publications, given a skillful designer and builder. Just as we've seen super models based on Wylam or Neito's best. Our heresy? Saying that an accurate, satisfying scale model can be built, with available drawings and without having the designer of the real bird peering over your shoulder!

"And, now," as Monty Python is wont to say, "for something completely different." If you need a **very** realistic Wright "Cyclone" engine for the nose of your 1" = 1' scale ship, hang on for a little while. Seems that Monogram Models, Inc., will be reissuing their super accurate Cyclone in kit form. If it follows the original issue, it'll contain eight full cylinders --- the ninth is a cut-away to show piston motion. It has such neat features as a flexible ignition harness and tiny sparkplugs. Of course, we'll probably drop off the scale accessory section so we can stick our glow plug engines in back but modification will be relatively easy. To give you an idea of the little Cyclone's size, it's about 4" in diameter --- bigger than the now available O.S. Wankel engine! Gonna get a bunch --- and try one ahead of the Wankel!

For the scale R/C modeler who has everything --- and **really** wants to know which way the wind is blowing --- we now have scale weather vanes! They're made, on a custom order basis, by Chuck Fleenor (SR 1252 R, 84 Pine Lane, Woodland Park, Colorado

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80863) from 18 gauge steel (24 gauge stainless for the Beech Bonanza). The wingspans are all 24" for the Fokker D7, Staggerwing Beech, Piper Cub and the aforementioned Bonanza. The paint jobs are enamel and each "vane" has a Teflon pivot bushing that fits a 3/4" pipe. Chuck has borrowed a set of Ford Trimotor drawings from me as well as some Stearman three-views --- so check with him if you're interested in a distinctive weather vane --- they're winners at the Colorado State Fair!

Those of you who have followed our "every other month" efforts in this space are aware of our fascination with the new 4-cycle engines for scale models. Took the new O.S. 40 four-banger out of the box, bolted it to the old Tatone test stand, stuck some two year old Cool Power in the tank. Hitched up the plug battery and gave 'er a flip. Scared the devil out of myself --- it started on the first flip! First time that's **ever** happened to me! Shook me so much that I caught my left thumb in the prop! Wrapped a rag around that sucker and proceeded to start and stop the engine for the rest of the afternoon. When my arm got tired from flipping, I broke out the old Sullivan starter. And therein lies a problem! The electric starter made as much noise as the idling engine --- so I couldn't tell, for sure, if the O.S. had started! And the recommended 11/5 prop almost blew the collecting bag off of the nearby power mower! One flip starts, very quiet operation, lots of moving air --- four cycles are **the** thing for scale. Might say that 4-cycles are in my blood --- and vise versa!

While we're on the subject, it may be of interest to you to know that John Tatone has marketed an aluminum engine mount for the Enya 90 four banger. Best part of the whole exercise is that the mount is **drilled** and **tapped** to fit the Enya. Slip the engine in place and tighten up the four socket-head bolts that come with the mount --- sanitary! Gonna use mine in a quarter-scale model of the Pacific C-1 racer that I've designed. For you aero historians, the C-1 is the Otto Timm designed racer that beat Waldo Waterman's "Gosling" parasol in the 1921 Curtis Cup Race for OX5-powered aircraft. It's a shoulder winged bird with good scale R/C moments --- and a big radiator up front to hide the Enya.

As I write this column, there's a little man looking over my shoulder! He's a 1/3 scale civilian pilot and his right hand is clutched --- ready to hold the stick in a scale R/C model. His "maker" is William M. Hawke (7148 Lasting Light Way, Columbia, Maryland 21045) who plans a 1/4 scale and other smaller versions, including WW II Navy pilots. A full figure, Mr. Hawke's "pilots" are assembled using the popular CA "fast glues" and can be painted with water based Polly-S™ paints for a very realistic appearance. **Very** life-like, Mr. Hawke's pilot figures are "dressed" in simple shirt and slacks and, thus, lend themselves to clothing mods with a minimum of effort. The 1/3rd scale pilot weighs a featherweight 15 oz. on the old postage scale. I'm going to use a Hawke figure in the Pacific C-1 discussed above --- with added helmet and goggles, to represent the C-1's pilot, Rogers.

New Hobbypoxy Colors

Hobbypoxy continues its presentation of mixing formulas for authentic scale colors with these German Luftwaffe colors for day fighters in operation from 1940 to 1945.

For the period 1940-1944, Messerschmitt Bf109-F and Bf109-G models, and Focke Wulf FW190-A models, had a factory applied "splinter" camouflage pattern on upper surfaces using 74 Gray Green and 75 Gray Violet, with undersurfaces and sides of fuselage painted 76 Light Blue. On Bf109s the fuselage mottle pattern was done in 02 RLM Gray, 70 Black Green, and 74 Gray Green, while on FW190s, the mottle was a combination of 02 RLM Gray and 74 Gray Green. (Formulas for 02 RLM Gray and 70 Black Green were published earlier.)

In 1944-1945, factory finishes switched to a "defensive" camouflage scheme of 82 Dark Green and 75 Gray Violet, with 76 Light Blue on undersurfaces and fuselage sides. Bf109-G and Bf109-K models, and FW190-D models, were finished in this scheme. Mottle on Bf109s was still 02/70/74, while FW190-D mottle was changed to 82 Dark Green and/or 75 Gray Violet.

It must be noted that field-applied modifications were made to suit local conditions. We are presenting only factory standard colors. Here are the formulas:

Gray Green 74 — Six parts H81 Black; two parts H70 Gray; one part H33 Stinson Green; one part H47 Bright Yellow.

Gray Violet 75 — Two parts H81 Black; one part H70 Gray; one part H65 Bright Red; one part H10 White.

Light Blue 76 — To a half pint of H10 White add: three teaspoons H70 Gray; two teaspoons H26 Light Blue; two teaspoons H81 Black; two teaspoons H33 Stinson Green.

Dark Green 82 — Four parts H81 Black; four parts H33 Stinson Green; three parts H65 Bright Red; two parts H49 Cub Yellow.

(Be sure to mix the above formulas 1:1 with H05 Flat Hardener for an authentic matte finish.)

The reference used for these colors is "The Official Monogram Painting Guide To German Aircraft 1935-1945," published by Monogram Aviation Publications, 625 Edgebrook Drive, Boylston, Massachusetts 01505.

A closing note to those of you, like Jim MacDonald of Davis, California, and Bob Bailey of the Boeing Hawks R/C Club, who have been kind enough to send us photos of scale models for publication in the magazine. We really appreciate the effort required to send the black and whites. One caution, however! Please caption the photos by typing or writing the info on a bit of paper and then tape the caption bits to the back of the appropriate print. Many of you have been using marker pens on the naked rear of the prints and it either bleeds through the photo on the other side or transfers to the print directly behind it in your letters. When it does, the photos can't be used — with writing all over 'em. Thanks a bunch — and keep 'em coming because we all want to see **your** scale R/C models!

□

RADIO SPECTRUM

Jim Oddino

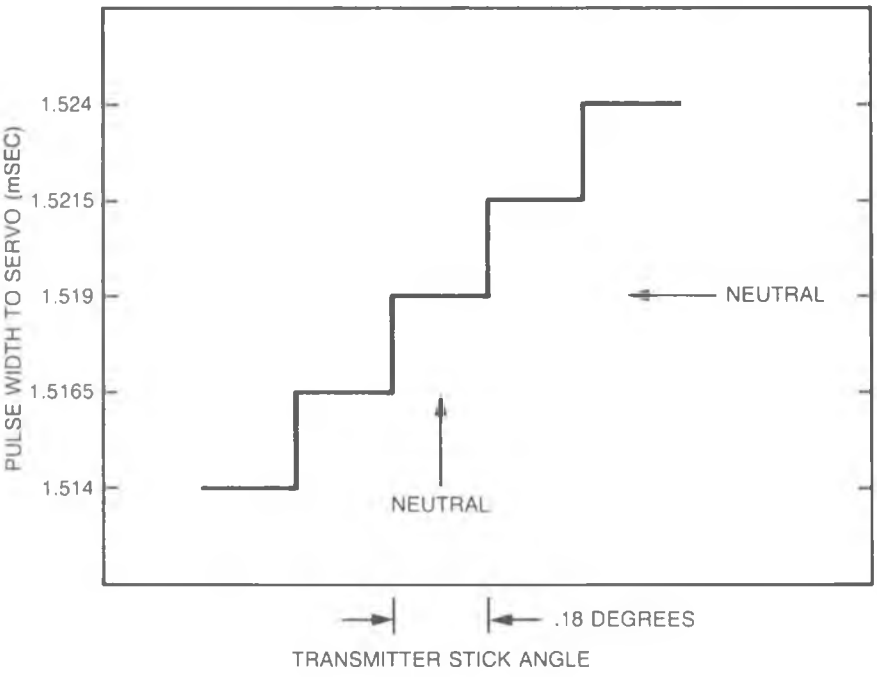


FIGURE 1

Futaba PCM System

Well, I finally got my hands on a Futaba PCM system. We had seen it at Toledo and were impressed by its looks and performance, as best it could be determined by operating it at a trade show. I, for one, was dying to see what made it tick.

We spent a lot of time discussing PCM in the October issue and spent a little time dwelling on the short-comings of the German Microprop PCM system, namely the lack of resolution. A PCM system is a true digital system and, therefore, the control signals are quantized; that is, divided into discreet steps. The Microprop system provided for 256 such steps in each channel, which resulted in servo movement in .5 degree steps. In October I said I thought we would like .1 degree steps to be as good as the present PPM systems but, after checking out the Futaba, I'm not so sure they have to be that fine. The thing that made me decide this is the fact that when I was trying to figure out the Futaba code, I was trying to move the stick so the encoder would change in one step increments. I found that I could not reliably move the stick and hold it at the new position long enough to see what the encoder was doing. I finally wired in a ten turn pot in order to step through the full range of the encoder. What I found was that I would have had to move the transmitter stick something like .18 degrees and then hold it so it didn't change by ± .09 degrees. I'm afraid I'm not that steady.

The bottom line is that the Futaba System of encoding results in the servos moving in .25 degree steps, which is twice as good as the Microprop and which is good enough. They have also put a mod in the S130 servos so that you don't see the steps. Saying that .25 degree steps is good enough may be an understatement. Smaller steps may not be as good from a jitter standpoint. What is impressive about the Futaba is that there is no servo jitter. You never hear the servos buzzing. If you look at the pulse to the servo on a scope you find it returns to neutral perfectly every time. Not to less than a microsecond but to less than a tenth of a microsecond. (I'm not sure how "perfect." I looked on a scale that was 1 microsecond per centimeter and could not detect a difference.) The reason for the "perfect" return to neutral is the quantization we talked about. See Figure 1.

As long as the input is in a certain range (± .09 degrees) the encoder will send out the number or word corresponding to neutral and the decoder will always translate that word to the same pulse width (1.519 ms), and its accuracy is strictly a function of the clock in the receiver. So what we have is a trade off between resolution and repeatability of neutral and I think Futaba has the right combination.

Of course, you could have better resolution and still have the good neutral but it would require more accurate analog circuits in front of the encoder. Until someone does better I'd say Futaba has the best combination right now. The servos will move as smoothly as I can move and they return to neutral to an accuracy determined by the gear train (< ± .1°). Of course, to realize this accuracy, the pots and gimbals and analog circuits must be very good too. If the gimbal doesn't bring the control

pot back to the same position, or if the pot is not good, all the electronics in the world won't get you back to an accurate neutral. Why do I put such a premium on stable neutrals? Well, one point of reference is a comparison of the reed systems of the 1950's with the early proportional systems. I had a Space Control proportional system but still had trouble beating guys with reed systems in my early contest days. The reason was that I was always trimming. They (the reed guys) in effect had a three step digital system with the two end points and neutral very well-defined. The proportional system was subject to drifts with voltage, temperature and humidity. A more recent experience also made me appreciate solid neutrals.

I was trying to set up a new Phoenix 8 and found I was constantly trimming the ailerons. I measured how well the pulse width was coming back to neutral and found a 13μsec. variation, equivalent to about two or three clicks of trim on the JR transmitter. Cleaning the pot fixed the problem but, the point is, you need consistent neutrals if you are going to fly well and try to be competitive.

I should point out that great resolution is really only needed on aileron, elevator and rudder. Most manufacturers are putting detents on throttle and the aux. channels so that the resolution is determined by the number of clicks in the mechanical device on the input. It is silly to waste bandwidth by having more resolution in those channels. I suspect in future systems all channels will not be implemented the same. The three channels mentioned above will have resolution equivalent to 8 or more bits and will be updated more often than the other channels. The landing gear channel is a good example of overkill. For successful operation, we really only need one bit which could be transmitted as little as once per second. Throttle and the aux. channels would need something in-between and I'm guessing 6 bits would be enough. That would provide for 64 steps on throttle, flaps, mixture, etc., which ought to be plenty. (The Futaba aux. channels have 30 detents and the throttle 20.)

What about frame rate on the Futaba? To tell the truth, I'm not sure how often **new** information is sent to the servos. The servos get a pulse every 19 milliseconds but the receiver gets new information only every 38 milliseconds. But that is not the end. I ran a test to try and find out if possibly you need two frames of good info before you send a new pulse width to the servo. I put a switch on the transmitter so I could put in a step command and then measured the time from when I threw the switch until the servo motor got a pulse. I found that this varied and averaged about 50 milliseconds. This seemed to back up my premise that you needed two good frames. Then, if you threw the switch just before that particular channel was being transmitted, the servo would receive a pulse in just over 38 milliseconds; and, if you threw it just after, you would get the pulse in just under 76 milliseconds. This theory was shot down by the fact that once in many tries I would get a pulse to the servo in less than 38 milliseconds. So, I'm not sure how it works, but the conclusion I came to was that the average update lag is about 50 milliseconds which is equivalent to a 20 Hz frame rate in our current systems. Kind of slow by our old standards but I can't detect any adverse effects. I also don't understand the Futaba ad which claims "up to 10 commands a second." Sure looks like 20 to me.

I'm not sure anyone is interested in the details of the encoding / decoding scheme but I'm hoping someone out there can tell me why Futaba did what they did. The code may have some great features that I don't recognize.

First of all, let's define a frame as

the period in which no code is repeated. This period is about 76 milliseconds. A sync word is sent followed by the words commanding aileron, elevator, throttle and rudder. This is followed by a word that is a function of all four of those channel commands and is probably some kind of parity check. Then channels 5, 6, 7, and 8 are sent, followed by another word that is a function of those four channels. This all took 38 milliseconds. The whole process is then repeated but with a different sync word and a different code for each command. So the information is sent out every 38 msec but the frame is 76 msec. This made me suspect you needed the two words for each channel in each frame to correlate before you sent a command to the servo.

Next, let's talk about the number of increments that we divide our range into or, put another way, how many bits is our resolution. I'll give you the bottom line first and then try to explain. Channel 8 can be set to any of 456 positions which is something greater than 8 bits (256 positions) and less than 9 bits (512 positions). (This assumes you don't have detents on the input pot position.) What kind of "word" gives something in between 8 and 9 bits?

Typical words in the Futaba system look like Figure 2.

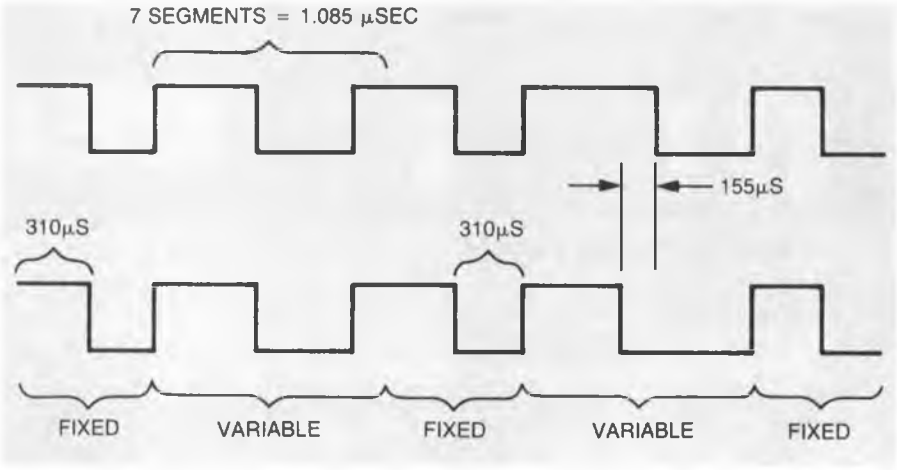
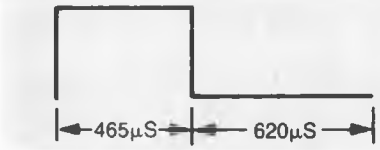


FIGURE 2

The first thing we see is a fixed waveform between words and in the middle. This is probably used in the decoder for an accurate bit sync. The rest of the word is made up of what I call a prefix and a suffix. The prefix in the words shown above look like this:

And the suffix in the second word looks like:



Notice there are 7 segments each 155µsec. long that can be either a one or a zero. We also notice that a mark or a space can never be less than 310µsec.

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Given those rules I figure you can have 26 possibilities in each (the prefix and suffix), but Futaba only uses 24 of them in the suffix and fewer in the prefix. If they used all 24 in both they would have 576 positions which is better than 9 bit resolution. Why they don't use them all I don't know. By the way the two words I've shown are for two adjacent steps corresponding to .9965 msec and .999 msec. There doesn't seem to be any logic to the sequence, but it looks like a code designed to have lots of changes from ones to zeros which means equal time on the two frequencies in a frequency modulation system. I'm hoping someone out there can shed some more light on the merits of this code based on my simple description. I guess most of you could care less and are wondering how well it all works. I have to say that I am very impressed.

The useful resolution is .25 degrees, with a range of 106 degrees of total servo travel. The system centers to less than .2 degrees, and the servos don't buzz.

The system looks like it would be totally immune to noise that we seem to have trouble with in some installations such as long aileron cables, gyros, electric landing gear, etc.

It also looks like it should reject interference better than most systems. I was able to test it with both AM and FM transmitters on the same frequency. It looked like it worked all of the time as long as I was closer to the receiver than the jammer. It was amazing to see it work with a totally distorted signal coming out of the receiver when I had a jammer turned on. And once again, if the jammer did get to it, it still didn't glitch, it just held the last good information.

Now, some may be saying that is a step backward remembering the early days of digital proportional. They may be right; we'll have to wait and see. However, I suspect our present systems miss lots of pulses and we never know it. We sure know when we get something we didn't send though.

I recently talked to Dr. Robert Suding who has been working on a digital encoder. He mentioned he had built a circuit to count missing pulses. The guys back East have been testing 900 MHz systems for the AMA and thought everything was great until they found that they were missing up to 10% of the pulses during a typical flight. The point is, it is better to miss information than to respond to bad information.

I've breadboarded a circuit to monitor missing pulses which we'll publish in a future article. The concept for those who might want to get started early is shown in Figure 3.

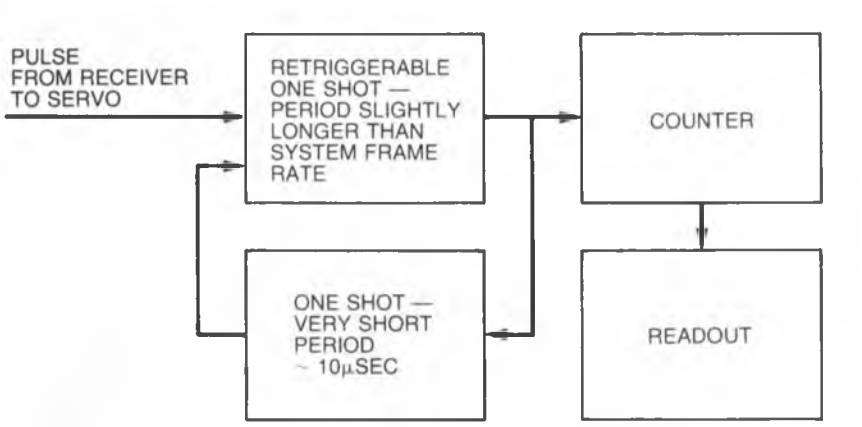

FIGURE 3

As long as you get a pulse out of the decoder every frame, you will not get a pulse out of the retriggerable one shot. If you miss one, it will be registered in the counter and retrigger the first one shot via the second. In this way, if you missed two consecutive pulses, you would register two counts in the counter. Of course you'll never measure a missing pulse on a PCM because the receiver will put out a pulse even if it doesn't receive a signal from the transmitter. I'm dying to see how well the other systems do. Please send in any data you might collect.

I think we'll knock this off for now but I'm sure we'll be talking about the Futaba PCM a lot more in future columns.

Simple Cycler

We received a new product from RAM (RAdio controlled Models) which might interest quite a few people. It is called a Simpler Cycler. What it is, is a battery discharger (basically a resistor) with a sensing circuit that sets off a beeper when the critical voltage has been reached. It is not automatic in that it doesn't stop discharging. You must disconnect it when you hear the beeper. It doesn't switch to charge — you must connect your own charger. It doesn't measure time — you must look at your watch. In spite of all it doesn't do, it is a very handy accessory especially when used with an expanded scale voltmeter. Quite often I will check my battery's discharge curve by connecting my ESV and then taking a voltage reading periodically. More than once I have been distracted and forgotten to disconnect the ESV and discharged the battery too far. If I had the Simple Cycler wired in, in parallel, it would have said wake up you fool and disconnect me. You would want to disconnect the load resistor in either the ESV or the Simple Cycler if you do this. The reason it is called "simple" is because it really is when compared to a full bore battery cycler like the Ace

Digipace. I'm sure there are some of you who view the Digipace as an expensive way to go, and yet can see that the Simple Cycler is better than a resistor and voltmeter that you are liable to forget.

Whistles And Bells

I've received a few letters responding to my question regarding the type of features that modelers are interested in, on their R/C systems. Most agree that dual rates and servo reversing are a must, but there is a surprising number who want mixing, for V tails and flying wing type things, and aileron/rudder coupling. I also think roll buttons and snap buttons are becoming more popular. Quite a few like the individual end point adjustments and more than one complained because the JR Unlimited didn't have it on throttle. How quickly we become spoiled.

Also popular is the automatic dual rate on rudder; that is, where you have high rate rudder in low throttle for doing spins, stall turns, etc. And low rate when you are in high throttle. I've been using this feature on my JR but I'm not sure it is necessary.

Nobody has commented on adjustable length sticks, rotatable gimbals, adjustable stick tension, detent trims, etc., namely all the mechanical type stuff. I would think people might be more discriminating in this area. I, for one, like the ball type antenna mount on the JR Century VII. Let's hear from you guys, maybe we'll get the perfect radio yet. Stay tuned. □

THE INFAMOUS FIGURE 9

By Bill Lavers

A Humorous Look At Ourselves

The loud speaker blared, "Number 16, you're up next," and when he stepped forward it seemed like the whole crowd was watching him. The club members, all seventy-nine of them. The annual fly-in bunch, from all over the country. The big-name hobby dealers and manufacturers, for the club's first attempt at a trade show. What a moment.

He grabbed the frequency pin, cranked the engine, taxied to the end of the runway, lined up for take-off and away he went. And what a show he put on; his brand new plane flew like nothing before. Chandelles, spins, eight-point rolls; everything was right on the money. For a finale, a high speed pass right down the middle of the runway so everyone could see, and then he pulled it up, up and over. Then it happened --- **The Infamous Figure 9.**

A hush came over the entire field. And then, quietly at first, the people began to talk. But, what could they say? **What can one say** after the mischievous Figure 9 occurs?

From A Figure 9 Pilot's Point Of View

The mathematician: "It worked great at 200 feet. How come, when I enter a loop at 50 feet, I recover at a minus 10?"

The poet: "The goin' up part was great, the comin' down part was the pits. All right, so it don't rhyme — I'm not in the mood."

The stalwart: (One minute after the crash) "Oh well, what will be will be. (Ten minutes after) Will be — my achin' back. I figured that kit was a turkey when I bought it from Rudy for three bucks."

Our new member from Vermont: "Crashed? Yup."

The optomist: "Let's see, the servos are okay. Receiver still works. I can rework the stab, and the fin will glue right back in place. Right wing is a patch job, and I've got some ribs to replace in the left. And --- oh my gawd, where's the intake and the crankshaft and the prop? Anybody seen my - - - -?"

The pessimist: "That it. That does it. I've had it. Now, listen up everybody (as he stands flat-footed on the remains of his plane). This here's what's called an on-the-spot auction. I got one Sig Kadet, one Telemaster, two K & B 40's, two Futabas, and one Kraft that's been slightly jarred. What am I bid for the whole danged lot?"

The middle-of-the-roader: "Every Sunday, I put her down way over there in the grass, or over here in the sand, or way down there in the weeds. Why in tarnation is it, I had to hit smack-dab in the middle of that 20-foot wide mass of concrete we lovingly call a paved runway?"

The alibi artist: "I got hit. I got glitched. Did you see that? I pulled full up and it went straight down. Hey, I'm on 320. Anybody else on 320 get bumped today?"

The serene pilot: 'Hey there, thanks for bringin' her in. I'll give it a look as soon as I get this other one warmed up."

The nervous pilot: "Lookit. Lookit. It crashed. It crashed. I'll be all right as soon as I get these bits and pieces sorted out. Now, tell those Boy Scouts to peep the keople back."

Had one too many: "W-e-l-l I'l-l b-e d-a-n-g-e-d."

Didn't have enough: "I'll get it. Wait just a minute, I'll get it off the runway. First, I got to run back to the car for something."

The horoscope freak: "Yep. The newspaper was right. My horoscope was on target as usual: *Spend part of this day at amusements you enjoy. Keep cheerful at all times.* I'm a Libra, ya' know."

The laid-back pilot: "Look at her there, all quiet and peaceful. No noise, no smell. Just layin' there pretty as a picture. Look at how the sun glints off that there piece of the servo case."

Member from California: "Hey, man, look what we can do here. The left stab is okay, and the right wing is barely scratched. I can glue 'em both together and put a stick fuselage off-center here. Remember how the Germans built that assymetrical job? Man, it'll work. Put that dude on a high-start, and zowie."

Pilot with 19 planes: "Shaw, I hate that. That was a goodun. Flew like a bird. Lemme get another one from the RV. Think I'll try the Ugly Stik or the Fledgling. No, maybe I'll use the Kougar. No, that was the one that crashed. Or was it? Now, wait a minute."

Pilot with only one airplane: "The wheels look OK and the tank survived. Still got my AMA card and my dues are paid up. When did you say the next club auction is coming up?"

Our Alabama pilot: "I'm from Dothan, see, and this is nothin' new to me. Back there, when we pull one like that, we just lean back, take a deep breath, and say --- aw horsefeathers."

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I'M A MODEL AIRPLANE NUT

By Bob Gray

I'm a model airplane nut. My wife says so. My non-flying friends say so. But I think that's harsh terminology. Why can't they say that I'm a craftsman interested in airborne miniatures? Or that I'm designing and building remotely controlled drone vehicles? Or that I'm a frustrated aeronautical engineer who's working at a reduced scale? I don't know. But I do know that if you ask my wife what my hobby is, she'll say, "He's a model airplane nut."

Well, what makes a "model airplane nut?" How can you recognize one? People tell me that it's not difficult. They say that you can smell one before you see him, because he carries the distinctive aromas of such exotic substances as Methyl Ethyl Ketone, or Polyester Resin, or Castor Oil and Methanol. They say you can recognize him by certain words and phrases which slip into his conversation, such as "L/D ratio," or "FAI fuel," or "undercambered airfoil," or "needle valve setting." And he makes weird, esoteric statements, such as, "I designed it as a slope soaring lead sled, but then I added some area and it turned out to be a bitchin' thermal machine." Or, "After I added pressure, that old S.T. would turn a 7/6 wood at 20,000 rpm." Or, "Now that I've got flaps on my Ugly Stick, I can land it backward in a 5 mph wind."

They say that you can recognize him also, by his reactions to emergencies. For instance, when a power failure occurs, does he worry about the food in the refrigerator spoiling? No, he starts screaming, "How am I gonna charge my nicads for the contest tomorrow?" Or, when a wind storm with 70 mph winds hits the area, is he concerned about the camper trucks that are being blown off the highway, or with the broken tree limbs that are falling on his house? Nope. He just says something like, "I guess I'll have to put the short wing on the Sagitta and put some lead in it." Or when he runs the family bus out of gas, halfway between Tracy and Bakersfield, is he concerned with the fact that he's just stranded his wife and kids in the middle of the desert, without food or water? Nope. He's moaning, "I'm gonna miss the qualifying heats for Formula One."

When a friend tells him that he's just bought a 40 acre ranch near Escondido, does our hero say anything about how nice it must be to be away from the smog and the overcrowding of the city? No, he says, "Hey, that's great. Can I bring my sailplane down next Sunday?" When he plans his vacation, does he consult his wife or kids about where they'd like to go? Hell, no. He just announces, "I'm taking the last two weeks in September. That way, we can catch the WW I Scale Meet at Rhinebeck."

He'll gripe and complain and procrastinate about fixing a catch on a kitchen cupboard, but he'll work until 4 am to get the tail rotor assembly just right on his new whirly-bird. He'll scream like a wounded panther if his wife tries to get him to drive her to the grocery store, but he'll drive 600 miles to get in three flights at a "Fun Fly" in Arizona. He'll raise hell when his wife spends $20.00 for a new pair of shoes, but he'll smuggle a $200.00 engine into the house without the slightest pang of conscience.

He enjoys things that normal people can't understand. He gets all goose-pimply when he hears the unsynchronized beat of twin engines on a scale B-25. He gets a lump in his throat, and his knees get weak, when he throws his brand-new sailplane over the edge of the cliff for the first time, and **it flies, by golly, it flies!** He stands in awe as he looks at his buddy's new Quarter Midget, and he marvels at this 2½ pound chunk of balsa, and polished aluminum, and Super Poxy, which flies over 100 mph, and shows the kind of craftsmanship you'd expect to find in a Stradivarius.

His wife gets exasperated with him once in a while, but she consoles herself with the fact that he's not out chasing loose women, or getting drunk with the boys. She resents playing second fiddle to a model airplane, but she's the one he turns to for solace when he tries a loop with his new Quik-Fly, and it pulls out four feet underground.

He's an engineer, working with an X-Acto blade and a Moto-Tool. He's an artist with hardened epoxy on his shirt front. He's a dreamer with plans for a sailplane that will climb in zero lift. He's an athlete, with his right arm six inches longer than his left, from flinging hand launch gliders. He's a magician who can somehow fit a twelve ounce tank in where there isn't enough room. He's a genius, who can get one of his models to climb more than three miles straight up, and can keep an unpowered model airborne for eleven hours.

He's a thinker; he's a doer; he's a little boy whose toys are more expensive than they used to be.

He's a Model Airplane Nut. □

POWER BOATING

Howard Power

In the last couple of months we have been running the latest marine engine offering from OPS. The OPS 45 appears to be a bored and stroked version of the OPS 40 that was very popular in racing circles several years ago. The OPS 40 dropped from the ranks of competitive engines when the other major manufacturers developed 7.5cc engines. The difference in cubic inches was just too much for the continued use of the OPS 40.

Luckily for the competitive boater, OPS has updated their engine to the class limit, hence the OPS 45. The first photo shows the OPS 45's major components disassembled. The motor has a very strong sandcast case. The case has been trenched so that the stroker crankshaft and rod assembly has sufficient clearance. The case strength of this motor was one of the main reasons for our experimentation with this motor. Sandcast cases have historically proved their superior strength when compared to the die cast cases supplied with many racing engines in this class. Case strength is particularly important in racing marine applications because the front bearing assembly must be restrained solidly with respect to the cylinder and liner assembly or a power loss will occur. If sufficient case strength is not provided for, the motor's lifespan is shortened by the parts working against each other. In many cases we have found that when you "hop up" motors with die cast cases you can actually break the top off the case when the motor is pushed to very high rpm. The OPS has not disappointed us in terms of case strength and in its ability to run at high revs.

The OPS has a typical ABC piston and sleeve set-up with the normal four port liner geometry. The single exhaust port had a total duration measured to be 170 degrees, the boost port total duration was 125 degrees, and the bypass duration was 132 degrees. The tapered liner had a bore of 0.862" and a very good piston-to-linear fit that insures good compression. The stroke of our test motor was measured to be 0.768" and the calculated displacement was found to be 0.448 cubic inches. The

Photo 1: OPS 45 major parts disassembled.

Photo 2: OPS 45 installed in the Marlin hydro.

tubular wrist pin has one end blocked and is restrained in the piston by the normal wire wrist pin clips.

The connecting rod appears to be bar stock and of substantial dimensions. We did not test the motor with the stock rod, however, since one of our usually reliable racing buddies provided us with information that this component was a weak link in the design when pushed to the limit. We do not know from experience that this judgment is true but in an attitude of "It's better to be safe than sorry" we replaced the stock rod with one made by RPM (5070 Golden Drive, San Jose, California 95129). I'm reasonably sure that those of you who run low nitro and don't push the rpm too high will have no trouble with the stock rod. The combustion chamber has a very good fit in the liner. Our motor had a deck clearance of .015" and the combustion chamber volume is sized for high nitro fuel usage.

The front housing and crankshaft assembly is normal racing motor design. Twin ball bearings support the crankshaft which has standard 1/4 x 28 threads. In the past we have had trouble with metal retainer bearings. These metal retainers seem to come apart at high revs and deposit unwanted metal fragments throughout the engine with usually disastrous results. We now make it a practice of using plastic retainer bearings whenever they are available. In the case of the OPS 45, the stock rear bearing was replaced by a new K & B 3.5cc rear bearing. An aluminum flywheel is mounted on the crank using the normal split collet arrangement.

The induction system is disc rotary valve timed. The rotor valve is supported by a brass pin and runs against the aluminum backplate. Two drive slots enable the boater to run the carb position on the top or the bottom of the case. The intake opens at 37 degrees ABDC and closes at 65 degrees ATDC for a total of 208 degrees duration. OPS supplies a bolt on exhaust manifold that is not water cooled. It would have been nice if the length of this manifold was about 1/2" longer so that the silicone pipe coupler has a bit more area to seal. The engine comes complete with pipe, U joint drive system, and a variable intake carburetor. The carb is of simple design and works well enough for most sport applications. Anyone who has been reading this column knows, however, that I consider a more complicated carb design a necessity for racing. We turned down the mounting stem of the M & H carburetor (reviewed in last month's column) so that it fits the rather small intake port on the OPS. We used the 6000L carb bored out to .390" and are very pleased with the resulting operating characteristics.

We tested the motor in our Marlin Hydroplane with excellent results. Photo 2 shows the installation. The motor is one of the best we have tested. It runs great, has good low end torque and consistently turns a 1462 prop in the 24,000 rpm range using 60% nitro fuel. It has not failed in any way and we can recommend its use as we have tested it. The motor is available from your local hobby dealer and is imported by Shamrock Competition Imports (P.O. Box 26247, New Orleans, Louisiana 70126). Get one. You won't be disappointed.

Also on the new product front, I am pleased to announce that Power Products (766 Broadway, Seaside, California 93955) has released a new line of hardware designed specifically for the Marlin outrigger hydro kit discussed in my September '83 column. This hardware is, however, applicable to just about any of the other commercially available hydro designs on the market. The first photo shows the hardware mounted on the rear of the Marlin. This photo and the super pictures of the Marlin in the September column were taken by a fellow modeler and good friend, Merrill O'Grady of Salinas, California. If you've ever tried to take pictures of black objects, you know how good a photographer he is.

What makes this hardware a bit different is that it is molded using a light weight but strong space age glass fiber filled plastic material. This material is a little over 1/3 the weight of aluminum so a significant decrease in boat hardware weight can be realized. In addition, since machining processes are held to a minimum and the cost of the hardware is far below that of machined hardware. Bob Seigelkoff of CB Associates did a great job of making the molds and provided valuable assistance during the design stages of this project.

The next photo shows the adjustable wedge rudder assembly. The mounting bracket is long enough to position the rudder blade behind the propeller for less interference and better turning. Webs stiffen the bracket in torsion and provide a solid mounting system to the transom. A pivot block is slotted so that when the two locking nuts are loosened the rudder blade can be moved forward and aft as well as tipped at any angle. By moving the rudder hinge line angle forward, the nose of the boat can be raised when turning. The nose will drop in the turn if the rudder is kicked

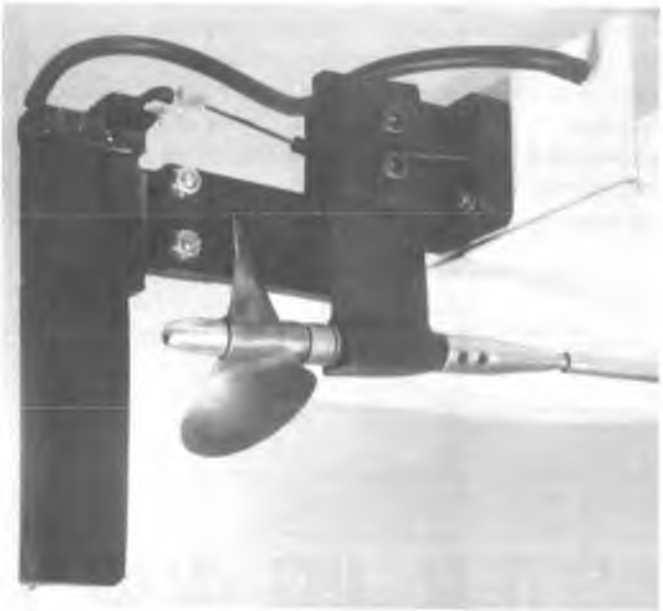

Photo 3: Power Products hardware mounted on the Marlin hydroplane.

Photo 4: Adjustable wedge rudder assembly.

Photo 5: Surface drive transom mounted strut assembly.

back. The entire pivot block is the bearing surface for the rudder pin which keeps the rudder solid. The rudder blade has a wedge profile for developing high turning forces at low deflection angles. Two rudder blade widths are available: 1" wide, and 1¼" wide. The blade has an integral water pickup tube to provide for engine cooling water flow. A control arm is locked to the blade by the pivot pin and can be positioned on either side of the blade. The rudder assembly comes complete with all mounting hardware and lists for $19.95.

This rudder assembly can be used on a multitude of different hulls. We have used it on outriggers, deep vees, and on sport 40 hydros with excellent results. The rudder blade comes out of the package with the water pickup tube projecting from the bottom of the rudder. The tubing should be filed off at a 45 degree angle so that it faces the direction of motion. We have also found that a less draggy configuration results if you cut the tube off flush with the rudder blade bottom. Using a Dremel tool and a small round nosed cylindrical cutter, a flush inlet passage can be easily cut into the blade bottom surface so that the tube "sees" water with forward motion. This configuration also doesn't collect weeds and foreign material if you should ever come into contact with the beach. The water supply silicone tube should be slid onto the brass tube at the top of the blade and "Hot Stuffed" for extra security. Another modification that tends to smooth the cornering of some boats involves rounding off the side view leading edge shape. Trace around a dime placed on the side of the blade so that its curvature is tangent to the leading edge and to the bottom surface. You can easily cut and file this material to any shape desired with only hand tools. The sharp corners on the tip of the wedge should also be removed by

rounding when using this modification. These mods reduce lift produced by the bottom rudder wedge surface.

The component parts of the rudder assembly are available separately. All parts are guaranteed against breakage except those due to crashes. Unlike its bar stock counterparts, the rudder blade can break off if you hit an immovable object. This feature saves ripping out the transom of your boat. The blades, are, however, plenty strong enough to withstand the rigors of heat racing.

The next photo shows the adjustable strut assembly. The strut blade has an airfoil section for low drag. It uses oilite bushings to support the stub shaft assembly shown below the strut. The ferrule, stub shaft, thrust washer and drive dog are standard Octura hardware and are not included in the strut assembly price of $11.98. We lubricate the stub shaft and drive cable with Sta Lube boat trailer wheel bearing waterproof grease. The strut blade is adjustable in depth and in angle and is held tightly by two 10-32 caphead screws and nylon lock nuts. The strut brackets are mounted on the transom and a five degree wedge is supplied to offset propeller thrust when using surface drive propellers. The strut assembly comes with all the necessary mounting bolts and blind nuts. The component parts are available separately. The strut assembly can be mounted on the inside of the hull bottom of sport 40 type hydros. The strut blade slot is lined up with the rear bracket bolt and the strut blade passes through a slot cut in the hull bottom. Once you have found the proper prop depth and angle for your installation, a hole is drilled through the strut blade to match the forward bracket hole. The two bolts will then hold the strut adjustment without rotation.

Also available is a turn fin assembly that includes the bracket, turn fin material and all mounting nuts, bolts, and screws. Photo 2 of our September column shows the assembly and how it is attached to the right sponson of the Marlin. This assembly can be used on any sponson design that has a 45 degree rear surface angle. The turn fin bracket assembly lists for $4.98.

The Marlin hardware package includes the wedge rudder assembly, adjustable strut assembly, turn fin assembly, flex ferrule, drive dog, propeller stub shaft, a 20" length of 3/16 flex cable, brass stuffing box tubing, and complete installation instructions. The complete hardware kit lists for $51.95 and is all you need to get your outrigger hydro hull fitted out. Your local hobby shop can obtain this hardware directly from Power Products at the normal trade discounts. If they don't want to stock these items, the boater can always order direct, but please see your dealer first.

★

Dear Mr. Power,

Included is a money order for one Picco 45 cap saver ring and one carburetor adapter plate to mount on an OS 46VR-M carburetor on my Picco 45. Also, I would like to ask a few questions. But first let me fill you in on my boat. I have a Water Spider 45 for the Picco 45. I will be using a Mac's 7.5cc hydro pipe. I already have an rpm rod and I have a good source for K & B bearings.

After your comparison of fuels at two different races, I really don't know whether to use 15%, 25%, or 40% nitro in this engine. Do you shim the head on your engine? If so, what thickness shim would you recommend for each fuel? Is this a good pipe to use and, if so, what length would be a good starting length depending on fuel? Now for the most important question. What, if any, modifications do you do and/or recommend to exploit the full potential of this engine? I know it's probably a loaded question, but any help you could pass on to me would be greatly appreciated as I am the only one in my area who is going to try the Picco 45. Thanks in advance for lending an ear.

Andre Dube

Nepean, Ontario, Canada

The question of what fuel to use depends upon how fast you want your boat to go. Low nitro fuel is easier on motors and easier on your pocketbook. If you race you probably should use 40% nitro since most people who are competing use this type of fuel. I use a single head shim in my Picco 45 engine. The head clearance should be no less than .010" and no more than .013" for best performance. The head clearance doesn't depend on the nitro percentage you use as long as the motor has sufficient combustion chamber volume. The Picco has plenty of volume at this head clearance setting even for 60% nitro fuel in my experience. The pipe you list is a good pipe to use on this boat and motor combination. The pipe length necessary for best performance is dependent on the type of fuel used and the type of propeller. If you are using 15% nitro fuel I would suggest either an Octura X452 or an Octura 1460 propeller. The pipe should be set at 10" from exhaust port to the maximum diameter section of the pipe. Cut the pipe shorter 1/2" at a time until you get erratic running or the boat won't

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BIG IS BEAUTIFUL

Dick Phillips

I'm just back from the QSAA Rally in Las Vegas and thought I'd pass along at least a few impressions of this long running event. The Seventh Annual was blessed with ideal weather. It was warmer than usual in Nevada at the end of October and we enjoyed daytime temperatures in the 80's with no wind of any consequence. Considering some of the past rallies, this one was a high point for several reasons. As mentioned, the weather was ideal. Attendance and number of models was higher than ever before and, barring some crashes, everything ran very well.

The German team was in evidence again with a 747 in Lufthansa colors. Four propped K & B .61's supplied the power and its performance was impressive. After a few control problems were ironed out (on the ground!) it flew several times to well-deserved applause. The model was a marvel of engineering technique with flaps, spoilers, and most of the wing geometry which makes its full sized counterpart able to both fly at high speed and land at relatively low speeds.

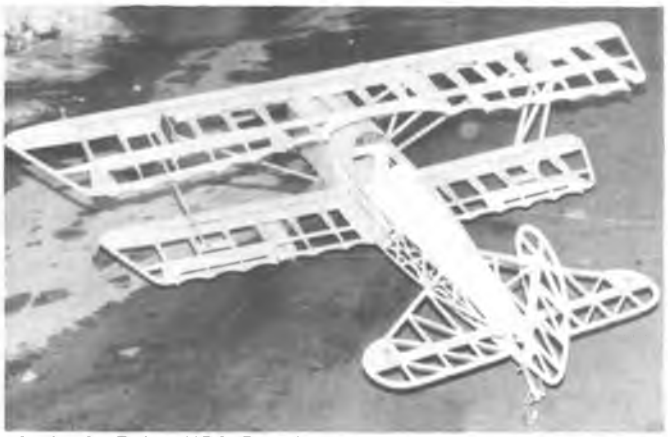
Jorg Vogelsang, also of West Germany, brought another excellent model this year. His past efforts include a radial engined Sopwith Pup, the Manned V-1's of last year, and many examples of the modeler's art. This year he presented us with a Siemans-Schuckert biplane which blew the socks off everyone who saw it fly. It flew extremely well, created a great smoke trail and was pretty obviously being enjoyed by its pilot. I'm not sure the original airplane could do snap rolls, but the model could, and did, repeatedly. It looked like a lot of fun to fly, and the smile on Jorg's face after every flight made it obvious that it was!

Jorg was presented with a trophy at the banquet on Saturday night and, in his remarks on acceptance, said that it was a real delight to come to Las Vegas each year and to be made so welcome by everyone there. To this I can only add that it is a real delight for us to have such fine representatives from overseas coming to join us there. The West German group usually plan their presentation for the following year while at Las Vegas. I don't know what it will be for next year but, on past performance alone, I know it will be something out of the ordinary, it will present a challenge to them, and it will be well-done!

Another model buider who needn't take a back seat to anyone is George Harlan, out of California. George produced an exquisite Monocoupe 90A last year and followed it up with a Dragon Rapide this year. If you don't know the airplane, it's a twin engined biplane, enclosed cabin passenger aircraft out of the 1930's. George's version was used by the English equivalent of the auto clubs here in North America. George's rendering of the subject would have been hard to fault by anyone familiar with the original and it flew very well indeed on a pair of .60's. I suggested to George that he was one of those guys who builds really beautiful hangar queens and then takes them out and flies them. Which he does and they fly as good as they look.

Walt Moucha had his Balsa USA Der Jaeger out on the desert as well and its appeal was considerable in that I have one on the bench at present. Mine's just about ready to cover and I was pleased to see Walt's perform. It's a fine flying bird on the 35 cc Quadra at up to 20 pounds. Not to mention the fact that these tired old eyes of mine won't have any trouble seeing it. It's a bright yellow bird and will stand out against almost any background. It's a good looking, good flying machine and seeing Walt's in the air tweaked my eagerness to see mine fly up a couple of notches.

I would guess that I'm about the least likely candidate to become a Peanut Scaler, but I always make it a point to read Hannan's Hangar by Bill Hannan who writes for Model Builder. Bill has a rather neat way with words and a sense of humor that I suspect is similar to my own. His penchant for really small models (and he is good at it) is well-known, but that doesn't alter my admiration for his writings. He sent along a slim little volume recently that you might like to add to your library. It's called "Scrapbook of Scale, 3-Views and Nostalgia" and includes both 3-views and write-ups on such esoteric airplanes as Cierva, Bucker, Bleriot, Sopwith, Farman, Barnwell and Chauviere, to mention some of them. It's aimed at the Peanut Scale Modeler but there is much of value to anyone who is into Scale Modeling, $8.95 will put it in your



Author's Balsa USA Der Jaeger, ready for covering. Basic construction took two weeks to complete. The fiddly bits about another two weeks. Finished model should weigh under 20 pounds, Quadra 35 cc for power, Airtronics Championship Series with heavy duty servos and 1200 mah pack.

German group's well-executed Boeing 747. Flaps, spoilers both operating. Look at that fantastic gear set-up! Great engineering and comparable workmanship as we have come to expect from them.

Final adjustments to German 747 prior to flight. Despite a few problems, the group worked them out and gave several impressive demonstrations of the big 747's flight capabilities.

Sieman-Schuckert by Jorg Vogelsang of West Germany. Jorg is a perennial attendee at Las Vegas and always brings something outstanding. Model flew beautifully. Prop in photo is for display only.

library. From W.C. Hannan Graphics, P.O. Box A, Escondido, California 92025. Fifty-six pages of good stuff about some interesting and some obscure airplanes.

Have you noticed that when you leave your oversized model sitting for any length of time that you end up with an odd shaped tailwheel? Most of the readily available tailwheels around in the proper sizes were never intended to support our heavier than usual models and they will often go flat on the side that's next to the floor. It's annoying and makes for some funny looking take-offs until they get their shape back. Carl Goldberg Models has some solid wheels just out that should solve the problem. I have a couple of them here and while they are not air filled, they are not hard either. I think they are going to be just the thing to solve that "flat wheel" problem. Carl also has a covering material available called Colortex. Some admirable qualities are claimed for the new material --- good shrinkage, equal in all directions, seams come out almost invisible, low enough heat required for use on foam, airtight and fuelproof when applied, and compatible with most model finishing material. Six colors available now in 27" x 79" rolls at $12.95 are White, Cub Yellow, Medium Blue, Red, Orange and Antique. I've used Carl Goldberg's good things since I was a pup (hasn't everyone) and I don't think I've ever seen anything with his name on it that wasn't as good as it could be made. I'd bet that Colortex will be the same.

I had the chance to talk with Carl and his lovely lady at Las Vegas last year and it's always a delight to be with them. Carl has a quiet manner that belies his vast experience and long involvement in the hobby business. Unlike some who seem to be so busy they don't have time for people, Carl always has a kind word for everyone he meets.

Those of you who are building, or who plan to build, Balsa USA's Der Jaeger may benefit a bit from some of my experiences with the kit. If you are going to use a 35cc Quadra, or any engine of that size, make sure you do some checking with the cowl in place before you mount the engine. I didn't and had to remount it when I found that the cowl would not fit properly with the engine mounted upright. It's necessary to rotate the engine bottom to the left (clockwise, seen from the front) in order to have the carburetor clear the inside of the cowl.

I like to be able to get at things on a model and have made some changes in order to accomplish this as well. I make the built-up and sheeted area under the landing gear blank from soft balsa and mount it in place with screws so as to be able to remove the gear. If you ever have to straighten such a gear, it's a great deal easier to do if you can remove it from the fuselage! Also, the strut attach points which mount under the landing gear (that is between the landing gear and the LG mounting plate) would not be accessible if the gear blank is attached permanently. I have screwed mine into place and once the gear blank is removed as above, the strut attachments can also be removed for either repair or replacement. Not that I plan to damage them, I'm just being

"See, I told you he can fly the crates they come in . . . !"

Jorg readies radio for take-off. Model of WW I machine was more than adequately powered and flew spectacularly. Smoke system on board produced great quantities of long lasting smoke.

Dragon Rapide by George Harlan. Fully detailed model even included a swatch of uniform donated by the original Automobile Association pilot, to clothe model pilot. Much detail was provided to the builder by the British.

prepared for Murphy's Law to step up and bite me on the ankle!

With the Jaeger's fairly long nose moment, and the weight of a Quadra out at the end of it, you will invariably have to add weight in the tail. I have chosen to add some weight to the tail feathers by making the main spars in the stab and elevator out of spruce which will both add some weight and make for a very strong structure. The leading edge of the stab is also spruce and this will make for a tougher leading edge, better able to resist any dings which might be caused in handling the model. Some tail weight will still be required and it's a good idea to provide for some access in the rear of the fuselage in order to be able to add the appropriate weight when it comes time to balance the model.

You may also find that the cowl is a bit long for the standard engine and here you have two ways to correct this. You could elongate the engine mount you are using to gain the extra length required, but this only adds to the balance problem by moving the engine further forward. I changed the prop

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Service dolly provides scale services to exquisitely detailed model. George Harlan's research and attention to detail would be hard to flaw. Great subject presented by an excellent builder. Model flies very well on two .60's.

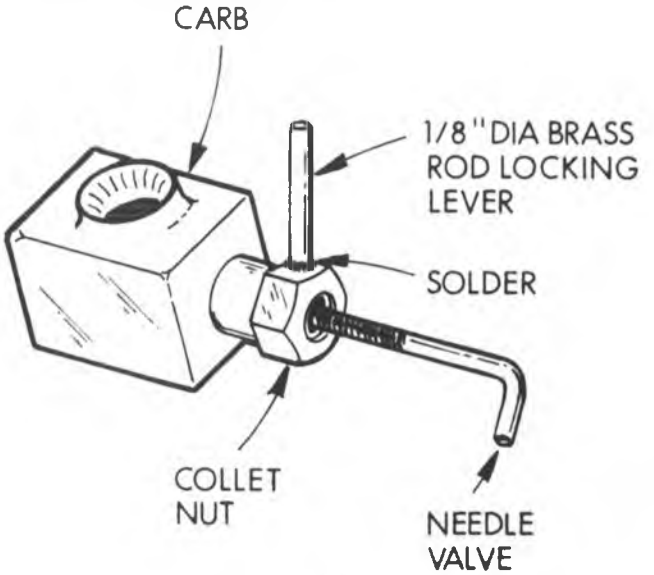
Ron Busch (L) and Walt Moucha prepare Der Jaeger for flight. Model is a bright yellow-orange and can be seen for miles. Not much doubt who Ron is representing. Walt's building and flying abilities well-demonstrated in the Jaeger and its flights.

FOR WHAT IT'S WORTH

Edited By Jerry Smith

To facilitate needle valve adjustments on engines such as the K & B outboards which have a collet/nut arrangement, just silver solder a piece of brass rod to the nut, as shown in the sketch. This rod eliminates the need to fumble with a wrench to lock the needle valve after making an adjustment. The location on the nut for the rod can be determined by tightening the nut and making a mark where it's most convenient for you to use.

Another non-related idea that might be helpful is: When installing or removing numerous screws such as a boat radio box lid, use a hand drill with appropriate tool in the chuck (screwdriver, Allen wrench, Phillips, etc.). It is easy to keep an inexpensive small one in a field box. Thanks to Ed Koporc of Cortland, Ohio.



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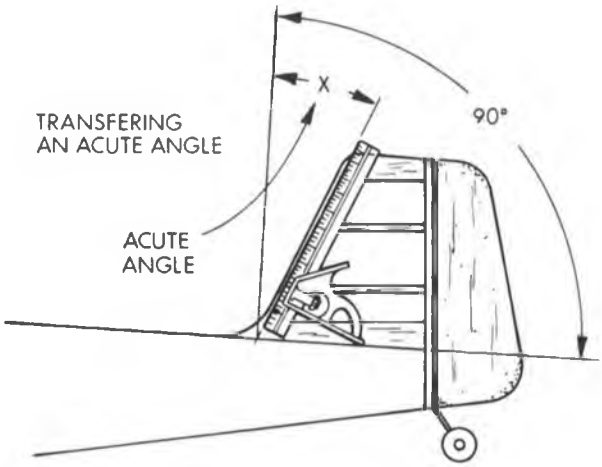
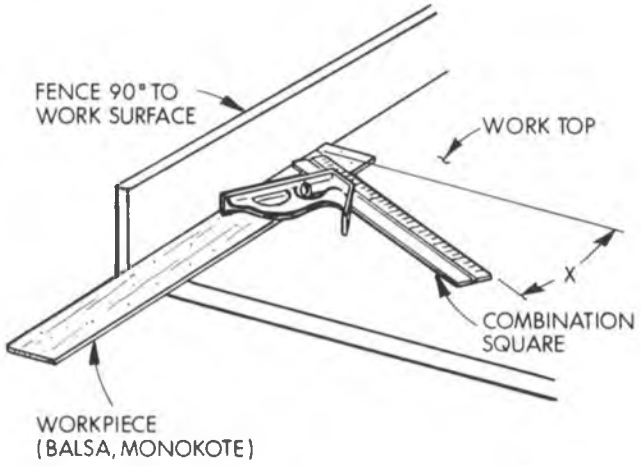
Here's an idea that's great for those who can't find their glo plug wrench mixed in with all the other items in their flight box. It is also a finger saver for starting a stubborn engine. Using an old screwdriver, cut off the shaft leaving it about 4" from the handle to the end. Braze a nut driver, the size of your glo plug, to the end of the screwdriver shaft. Slip a tight fitting piece of rubber hose, found at an auto or plumbing supply store, over this assembly. You are now equipped with a glo plug remover and a chicken stik, all in one, that can be slipped into your back pocket where it is always handy. Thanks to Paul Tussing of Ashville, Ohio.

★

Roberto Cruz of Manila, Philippines, suggests an excellent, fast method for transferring acute angles by the use of a combination square. It is done by resting the square on the surface that is within 90° of the angle to be transferred. Move the blade in or out until it coincides with the angle you wish to transfer. Lock the blade and transfer the angle to the work piece by butting the square against a vertical surface at the edge of the work top. (See sketch.)





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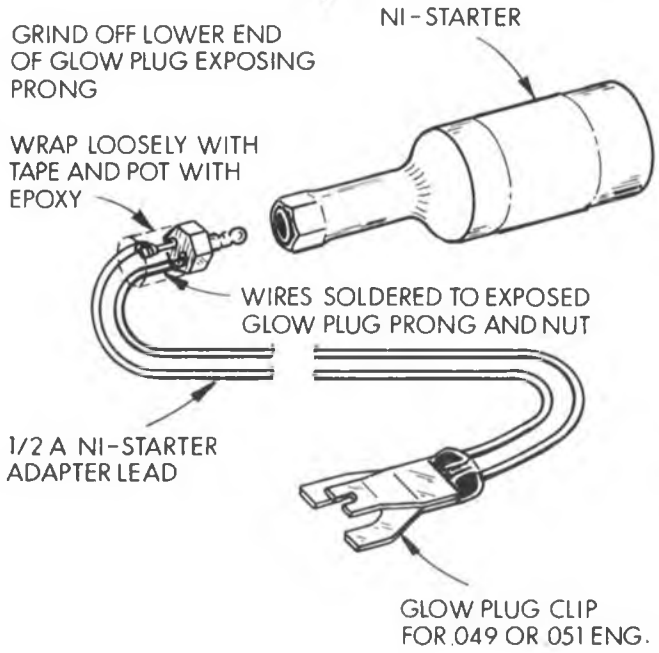
What a beating nose wheels take on the front of a novice controlled trainer writes C.G. Beecher of Winchester, New Hampshire. His trainer suffered greatly from the bent nose gear syndrome after each "landing" of its epoxy-laden seven pound weight. The nose strut was easily and, so far, effectively beefed-up by CA gluing a 3/16" diameter brass wire over the 5/32" diameter strut and drilling out the lower bearing of the bracket to fit. The tube length was sized to allow the 5/32" diameter bored tiller arm to remain in its original position. The effect is to inhibit bending of the strut at the point of exit from the bracket's lower bearing.

★

Have you ever tried to slide a fuel tank that is wrapped with foam rubber into the fuselage of your plane? Sometimes it is not easy. James McCoul of Warren, Michigan, has this suggestion. Try wrapping it with heavy paper to make it slide in easier, then remove the paper, or put the tank that is wrapped with foam rubber into a plastic bag to make it slide into place easier. Also, if the tank leaks, the bag will help to keep the plane dry.

★



An excellent method of using one's Ni-starter for both large R/C glow plug engines and 1/2A glow plug engines is shown in the sketch. Grind the threaded portion of a burned out glow plug down to the hexagon nut, leaving the center prong intact. Connect wires from a 1/2A glow plug clip to the exposed prong and nut by soldering. Then, wrap tape around nut portion of glow plug and fill or pot with epoxy. This creates an extremely strong and trouble-free connection. With this handy adapter one can use his Ni-starter for both engine types. Our thanks to Charles Raff of Trona, California.

★

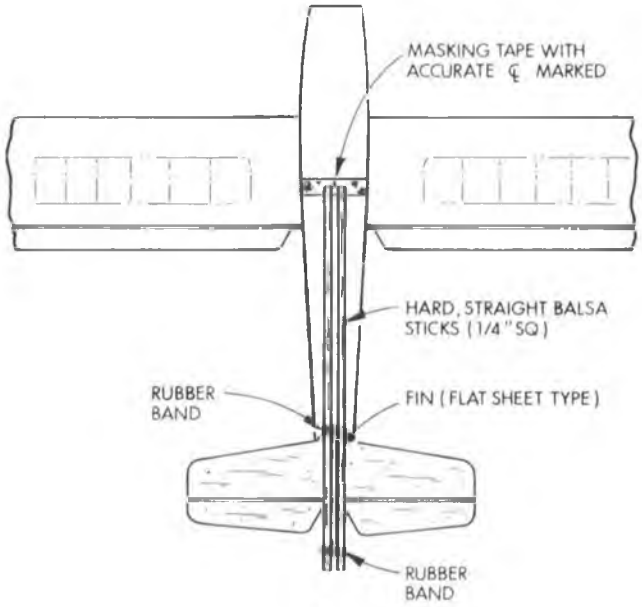
Some of you like to super detail your projects but get thumb cramps from pushing the plunger on the glue syringe when making panel rivets. Richard Banks of Minneapolis, Minnesota, has a great solution --- plastic half-round balls made by Western Trimming Corp., Chatsworth, Texas. These little beauties are available at craft stores everywhere and come in various diameters and colors. They can be used for rivets on both model aircraft and ships. Just apply them with a drop of CA glue. You can't beat the price. 39¢ for 225, and a lot of patience.

★

Stan Zdon of Coon Rapids, Minnesota, has a suggestion that is bound to help some of you. By numbering a servo on both its top surface and its electrical connector, it is easier to determine where each connector attaches to the receiver as opposed to tracing each servo wire through bulkhead and foam cushioning material. Numbering can be done by using small self-stick labels or by applying a small area of white paint that can be written on with a marker or ball point pen.

★

Lenny Keer, Gilcrest, Colorado, solved the following problem: For some of us, attaching the fin to the fuselage is a real hang-up. To accurately position the fin without any incorrect offset, use rubber bands to attach two **straight** balsa sticks together near one end. Slip the fin between the sticks as shown in the sketch. With this method, it is easy to determine alignment. Epoxy the fin in place and adjust for perfect centering before the epoxy cures. Don't forget the vertical alignment as well. *(Ed. Note: If you suspect unwanted offset in the fin on an airplane you are now flying, the above suggestion can be used to check for misalignment.)*



★

Steve Benjamin of Claremont, California, has found a new use for KR-2 Spot Remover. Many of us know what a great absorbent KR-2 Spot Remover is when we run into fuel soaked balsa. One spray of KR-2 serves to lift out any fuel, leaving a white powder when the carrier in the product evaporates. However, this product has another use.

Carry a can in your field box. When you have a minor crash, spray any areas to be glued with the KR-2. When the carrier dries, push the pieces to be glued together and apply Hot Stuff or its equivalent. The white powder serves to absorb any fuel that may have gotten into the area to be repaired. And, it acts like micro-balloon filler when Hot Stuff is applied, leaving a very strong joint.

Send your hints & kinks to R/C Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 — win a free book from RCM's Anthology Library series if your idea is used.

PIT STOP

Gene Husting

The 4th Annual Wiesbaden Grand Prix was held on this beautiful track in Wiesbaden, Germany and was sponsored by McDonalds. Yes, that's the same McDonalds you're thinking of.

Top Qualifier was Ralph Burch Jr. from Denton, Texas. A week earlier Ralph was also Top Qualifier at the World Championships in Carnoux, France, with his Associated RC500 car powered by a Rich Lee K & B engine.

When you do as good a job at tuning your race car as Ralph Burch Sr. does for his son Ralph Jr., then you too can take some time out for ice cream.

The qualifying was covered on the German TV stations, so on Sunday it was standing room only for the paying customers.

1983 Wiesbaden Grand Prix

The week after the World Championships in Carnoux, France, we went to the race in Wiesbaden, West Germany. It's difficult to imagine the difference in these two races. In Carnoux, it was a win at any cost attitude by at least one of the teams there, and a literally do or die effort by some. The contrast in Germany was incredible. The Wiesbaden race was simply a "fun" race, with no great importance on winning, but more to just enjoy the racing. The Germans are a very gracious people and did everything possible to make our stay in Germany an enjoyable one. And that it was!

We had raced on this track four years ago, after the World Championships in Geneva, Switzerland. The Wiesbaden track was brand new at that time and in perfect shape and that race was won by Rick Davis from Detroit. They resurfaced the track for this race and the traction was very good.

We hoped our motor problems that we were having in Carnoux would disappear on this shorter track, but we soon found out it wasn't the length of the Carnoux track that had caused our problems. Arturo Carbonell and Bill Campbell from Delta, had stopped by the Picco factory in Italy after the Carnoux race and showed up in Germany with fresh horsepower. Arturo was flying around the track with these motors. The way we were running, it looked like he could lap us every 5 laps! Needless to say we were getting discouraged. Something had to be done. Rick Davis and I came up with the solution to the problem at the same time. While I was out trying to find some castor oil to add to our fuel, Rick had borrowed some fuel from a German racer, and his car was flying! He was really happy. He immediately told me about it when I came back, so we proceeded to add 4 ounces of castor oil to our gallons of fuel and now all our motors were running okay. The motors weren't as fast as normal, because we had overheated every motor we had in Carnoux, but at least they would now run at about 90% of their potential, which was about twice as fast as earlier in the week. We could at least race and have some fun now.

Karlheinz Will was the Race Director. Karlheinz only had one rule — **no protests allowed!** But he didn't even need that rule. In every sense of the word, this was a fun race. There was nothing to protest.

The track was open for practice all week, but most of the guys went sightseeing until late in the afternoon and then practiced a couple of hours. I had Re-Pete Fusco running my car, but he didn't get in too much practice, because I was down to my last motor and we had to save it for qualifying and racing. He's such a super driver he doesn't need 1/10 the practice time I do, so it was okay.

There were three qualifying heats on Friday. Each heat was 5 minutes long. Ralph Burch Jr., from Denton, Texas, proved once again he's the fastest in the world as he took Top Qualifying honors with his Associated RC500 powered by a Rich Lee built K & B 21 engine. Ralph was also the Top Qualifier at the World Championships in Carnoux. Closest to Ralph was Rody Roem from Holland with his Serpent car powered by OPS. Rody is also a super driver and finished 3rd in Carnoux, after leading much of the race. Tomorrow would be two more rounds of qualifying and then the Mains.

Sunday was two more rounds of qualifying. Ralph Burch had gotten a Picco motor from Arturo and it looked like he might be able to set a faster time with it, but the rod broke. Joe Sullivan also put a Picco motor in his car and he was looking very good. Sunday turned out to be a heat wave in

Rody Roem from Holland, in the center, wins the Grand Prix, with Ralph Burch Jr., on the right, 2nd and Rich Lee taking 3rd.

Germany, with the temperature in the 90's. They were selling food at the track and one of the stands had California ice cream. They sold out a number of times.

"B" Main

Although Rick Davis won this race before, this time he got in a qualifying heat where none of the slower cars would let him by. He ended up in the "B" main, but he won it rather easily and should have been in the "A" Main. Gersoe from Germany was 2nd and Joe Sullivan from Texas drove one of his best races ever to take 3rd.

"B" MAIN RESULTS

1 Rick Davis — USA
2 F. Gersoe
3 Joe Sullivan — USA
4 F. Cromberge
5 B. Schneider
6 S. Veronesi
7 Bill Campbell — USA
8 Chuck Moon — USA
9 P. Knebel
10 Curtis Husting — USA

"A" Main

Time for the "A" Main. It was standing room only with paying spectators standing around the track. The drivers were introduced to the crowd. The cars were lined up and the one hour race was underway. Ralph Burch Jr. jumped in the lead, but he was closely followed by Rody Roem. Gil Losi Jr., Rich Lee and Re-Pete Fusco were having a close race for 3rd.

Ralph continued to lead for 10 minutes, but at both of the pit stops Rody was in and out of the pits faster than Ralph. Ralph wasn't slow, but the Serpent team had developed a quick fill gun that literally dumped the fuel in the tank. Rody was gaining about 2 seconds on every pit stop. And there would be about 11 pit stops, which added up to about 22 seconds or a lap and a quarter on the track. Ralph was faster on the track than Rody, but not fast enough to pull out over a lap lead.

Meanwhile, Rich Lee won the battle for 3rd place, with Gil Losi Jr. settling into 4th and Re-Pete Fusco holding on to 5th. Arturo seemed to be having all kinds of problems. He had a head on crash with Chuck Wiggins, and it wasn't Chuck's fault. The kind of problems Art was having looked more like radio problems. He was never in the race. Chuck Wiggins was actually

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1983 WIESBADEN GRAND PRIX RESULTS

Name	Country	Car	Motor
1 Rody Roem	Holland	Serpent	OPS
2 Ralph Burch Jr.	USA	Associated	Lee K & B
3 Rich Lee	USA	Associated	Lee K & B
4 Gil Losi Jr.	USA	Associated	Paris K & B
5 Re-Pete Fusco	USA	Associated	Lee K & B
6 Arturo Carbonell	USA	Delta	Picco
7 Chuck Wiggins	USA	Delta	Picco
8 J. Baehr	Germany	Serpent	Picco
9 Ronnie Ton	Holland	Serpent	Picco
10 M. Mielke	Germany	Serpent	OPS

SILENT POWER

Jim Zarembski

Some of Sunday's winners at 1983 KRC Electric Fly. (L to R): Sam Stitzer, Art Cangialusi, Keith Grote, Brad Baylor, Ellis Grumer, Charles Hampton, John Sermos, Bob Peiser. Photo by Herb Dirks.

John Grigg with his Pierce Aero-Gemini, Keller 50/24 with fourteen 1.2 ah cells, 14" Geist yellow folding prop. Photo by Herb Dirks.

This column wraps up the 1983 flying season for Silent Power. The Ohio winter I'm accustomed to puts a real crimp on flying from December to March. What a great year 1983 was! Electric powered models of all shapes and sizes were built and flown all across the country. We now have several well-designed high performance kits available that enable the experienced electric flier, as well as the novice, to have success with minimal effort.

I would guess that the hottest model, in terms of number of kits sold, has been the Leisure Playboy, which is truly a joy to fly. The Electricus, whether built from the Larry Jolly kit or from Model Builder plans, gives the sailplane advocate a truly remarkable thermalling machine. The sport pattern and pylon models are delivering performance that would have been thought to be impossible in 1980. I really can't wait to see what's in store in this year of 1984. Big Brother has been watching, and he's pleased with the progress in Silent Power!

Bob Peiser with his impressive WASP-Astro Cobalt 05, seven 1.2 ah cells, 7/6 prop. Photo by Herb Dirks.

Typical crowd at Electric Fly Clinic. Photo by Herb Dirks.

This month we'll cover the 1983 KRC (Keystone RC Club) Electra Fly with Bob Kopski and John Hickey's assistance. We'll also get a glimpse at the man powered "Kremer Prize" winning aircraft built by Paul MacCready, and review the performance of Keith Shaw's Keller 25 powered pattern ship.

Ellis Grumer gets some help holding his fleet. (L to R): Tracy Keneagy holding Porterfield, Kim Smith with Yardbird, and Kristin Kopski holding Smith Mini Plane. Photo by Herb Dirks.

Austin Gutman's Porterfield. In the background, Herb Dirks and John Hickey strap the wing on Bob Kopski's Playboy for photo session. Photo by Don Keneagy.

KRC Electric Fly

I had planned to attend the 1983 Keystone RC Club's Electric Fly event held just north of Philadelphia, but

1983 KRC Electric Fly — Awards Presented

EVENT	SATURDAY	SUNDAY
Best Looking		
1st	Austin Gutman	Elis Grumer
2nd	Don Srull	Sam Stitzer
3rd	Nelson Whitman	Jim Pentimall
4th	John Grigg	John Sermos
Most Aerobatic		
1st	Bob Peiser	Bob Peiser
2nd	John Grigg	Brad Baylor
3rd	Austin Gutman	Art Cangialusi
4th	Joe Beshar	Charles Hampton
Longest Flight		
1st	Charles Hampton	Brad Baylor
2nd	Ted Davey	Charles Hampton
3rd	John Grigg	Ted Davey
4th	Dave Burt	Brian Bailey
SURPRISE EVENTS		
Smallest Flyable	Charles Hampton	-------
Most Unusual	Nelson Whitman	-------
Best Ground Handling	Austin Gutman	-------
Largest Flyable	-------	Jim Than
Heaviest Flyable	-------	Brian Bailey
Most Active Flier	-------	Keith Grote

couldn't because of business travel problems. Bob Kopski sent me the following report and a nice assortment of photographs of the third annual affair.

Dear Jim,

I'm writing in behalf of John Hickey and myself to update you on happenings around here, especially with respect to the recent Electric Fly.

Saturday was a day of record-setting heat and very high winds. We had trouble keeping the canopies connected to the ground! Several planes got blown over on the ground and damaged, including my J-3. Despite this onslaught, everyone seemed to be having a great time! True, there could have been more flying, and that part was disappointing, but all I saw was enthusiastic faces.

We had attendance from nine states and Canada, up from last year. Visitors brought with them a wide range of Electrics, and, in general, the quality and craftsmanship was outstanding. There was a definite increase in the use of speed reducers and cobalts. There was one cobalt 05 powered WASP with very impressive performance all weekend long, but generally attendees flew sport, scale,

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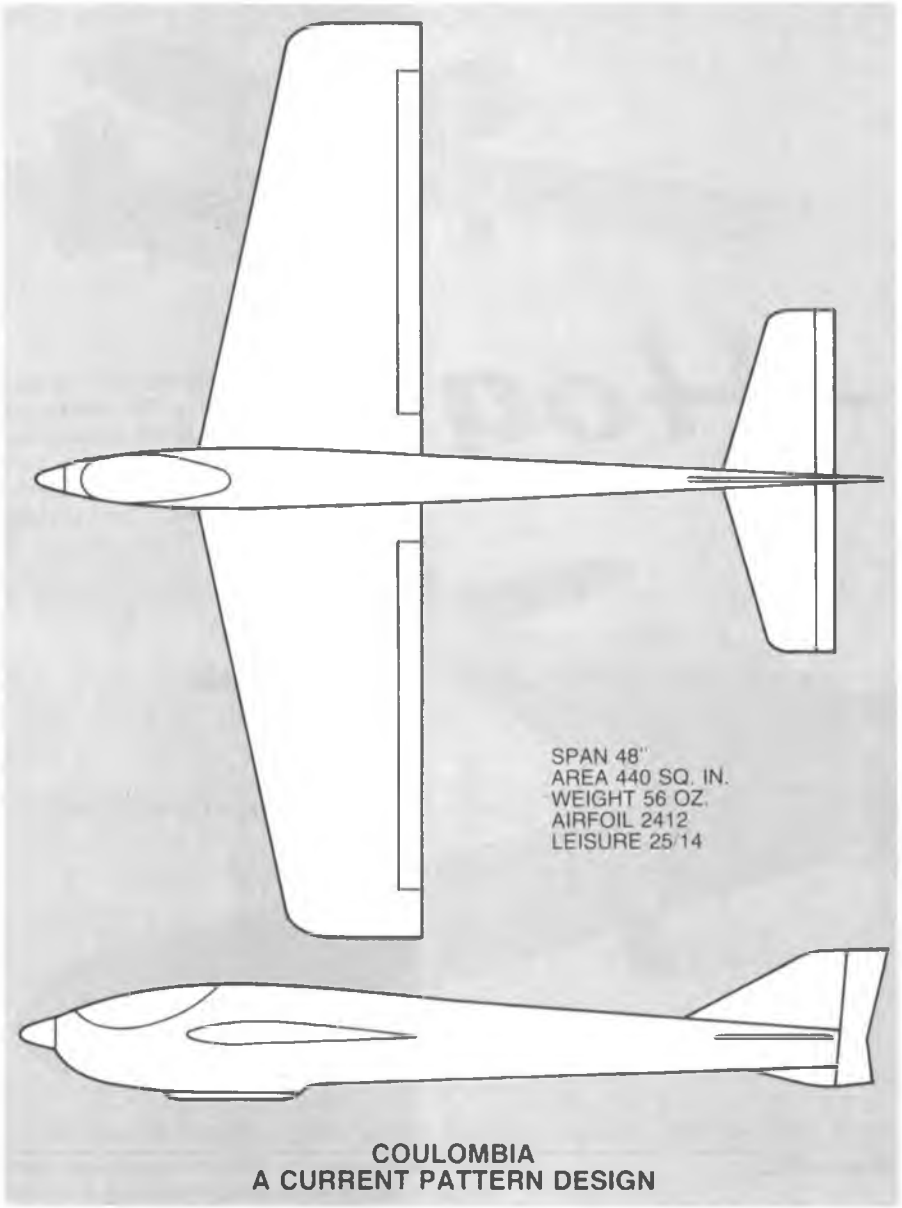

COULOMBIA
A CURRENT PATTERN DESIGN

Keith Shaw with Coulombia. (See text for details.)

OT and glider.

As in previous years, Saturday and Sunday were independent days --- some folks came for one day, some for both. John and Mrs. Grigg, our AMA President and First Lady, were the first visitors to show up on the field Saturday morning. They drove all night and caught us setting up the flight line. They stayed most of the day and then rejoined us later that evening at the social.

We had our customary awards for Best Looking, Longest Flight Time, and Most Aerobatic to fourth place each day. And there were some surprise events, too. Each day saw three or four door prize drawings --- a sizeable one at that, for we had over $500.00 worth of top notch Electric merchandise to give away. The raffle is an important part of the annual activity because that's how we are able to keep growing each year. As in the past, we received considerable support from the hobby industry --- KRC sincerely appreciates this because, as a small club, we would be incapable of such an undertaking "single handed."

And, speaking of growing, participation was up 27% over last year despite the severe weather. There were many new faces in the crowd, and many familiar ones. Spectators were estimated at over 500 for the weekend. Some folks will probably find themselves in a new film the AMA is making --- the cinematographer on the task was present Sunday trying to construct an Electric segment for the scheduled '84 release. Fortunately, Sunday's weather was not as severe as Saturday's.

Early planning for this year's event had only tentative plans for a Saturday night Social. Final decision to have one was made several months ago, and it looks like another Electric Fly tradition has been established. KRC is very anxious to accommodate our guests, and this activity seems to be very popular with everyone. We had plenty of refreshments provided by the KRC ladies, and more door prizes for our guests. John Grigg was kind enough to address the gathering and give us the AMA perspective on Electric.

Another well-established tradition --- the Electric Fly Clinic --- was again swamped with keen interest. Heinz Koerner and his team were busy essentially full time both days. As part of this activity, we again held informal seminars each day; these drew more attention for a longer period of time both days than ever before. There's no question, the interest is there.

This year something new has appeared at the Electric Fly --- follow-up mail from attendees

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When writing to RCM for answers to your questions, please send a self addressed stamped envelope for a prompt rely.

complimenting us on the affair! I guess we're doing something right.

Plans for next year's event will soon be underway, and we'll keep you posted. In the meantime, I hope the enclosed photos will add to the story of the Fourth Annual KRC Electric Fly, now history!

Regards,
Bob Kopski

Kremer Prize

The Kremer prize was established to promote man powered flight. The reward for being the first to fly a one mile circle in less than three minutes

Dr. MacCready, Parker MacCready, and Herb Semelmeyer admiring Bionic Bat.

was about $30,000. There will be further prizes for those who can reduce the one mile time by at least five percent.

As I understand it, the rules allow the pilot to use his body motion for the ten minutes before the flight to store energy for use while making the record attempt. Parker MacCready used a three pound nickel cadmium battery pack to store electric energy produced when he used his legs to turn a generator for about nine of the ten minutes before the flight. He then had to switch some wire leads and began to pedal while two Astro 40's helped him turn the prop. Bob Boucher of Astro Flight provided a report on this event and sent along several photographs.

Dear Jim,

Well, MacCready has done it again! He just won the latest Kremer prize for the first human-powered plane to complete the one mile circle in less than three minutes. He did it in two minutes and 35 seconds. Martin Calley built the 48 foot span carbon fibre plane, called the Bionic Bat, and did a superb job of design and craftsmanship. The plane weighs only 77 lbs. The ribs are foam,

Bionic Bat on early test flight; a very clean design, used carbon fibre extensively, weighs 60 lbs.

Propeller is concentric about tail boom. Driven by bicycle chain.

with spruce caps and the covering is DuPont mylar. We supplied the generators and motors. The rules allow up to ten minutes of energy storage by the pilot prior to take-off, so we used one Astro Challenger 40 cobalt motor wound as a generator to deliver five amps at 36 volts to a flight battery. Then, the battery would deliver 15 amps for 2½ minutes to the two Astro 40 cobalt motors which, in turn, would help the pilot swing the six foot prop to about 250 rpm. It took about 3/4 hp to fly this bird. The prop was mounted concentrically about the tail boom just aft of the fuselage, rather nifty I'd say. Parker MacCready was the pilot and human Dynamo. He trained about two months to get into top shape. It was kind of a frantic project because we knew of two competitors who were building planes and who might beat us to it. One was a crew from MIT, who were also using batteries and cobalt motors. The other was a crew from Japan, who, rumor has it, was using 15 lbs. of rubber bands. MIT flew two weeks prior to MacCready's flight, but did not fly the course in the three minutes required.

The program was carried out under the auspices of the Royal Aeronautical Society of Great Britain and coordinated in the United States by the National Aeronautic Association. The results are expected to be certified in the near future by these organizations.

As to the airplane name: "Bionic" has come to mean an artificial mechanism incorporated into the operation of a biological structure. Here the battery-motor system augments the pilot's muscles during flight. "Bat" can be considered an abbreviation for battery, and also an appropriate title for a flying mammal, which has angular wings and flies silently around near to the ground in the quiet air at dusk.

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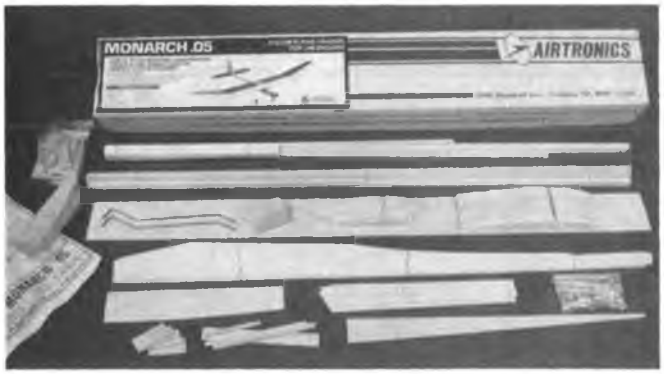
RCM PRODUCT REVIEW

Airtronics MONARCH .05



Over the years we have had the opportunity to build and review a number of Airtronics' kits. The Monarch .05 continues a long legacy of good design and excellent kit manufacturing.

The basic design of the Monarch .05 is taken from the very popular Olympic 650. The basic difference being that the Monarch .05 is designed for a .049 to .051 power plant to be used instead of the high start or slope.

The purpose for using an engine instead of standard sailplane launch method is to allow the beginner or novice pilot the luxury of being able to stay aloft even when the thermal activity is low or non-existent.

However, due to its direct sailplane heritage, the Monarch is right at home in any kind of lift and will provide the new pilot with plenty of flying time to help build those essential skills that are developed only when the pilot has accrued a number of hours at the control stick.

The Monarch comes in a sturdy 37¼" x 5½" x 3" cardboard box. On the front of the box is an excellent color photo of the completed model along with many of the vital statistics. Upon opening the box, you are immediately aware of the high quality and care taken in the manufacturing of this kit. The hardware and many of the components are placed in plastic bags or rubber banded together in groups to help organize and identify specific parts.

Construction:

In addition to the large single set of plans which measure 57" x 35", a 9 page instruction manual is also provided, complete with a number of photographs covering the major steps of construction and the key points.

As with the other Airtronics' kits that we have had the opportunity to build, the quality of the materials used was excellent and the parts fit was very good. Due to its basic design and the quality of finish in the materials (wing ribs all sanded to shape, shaped trailing edge, shaped leading edge, fuselage and bulkheads cut to size and shape), the model builds very quickly and requires a minimum amount of shaping.

The basic construction of the fuselage is lite-ply with balsa wood used for sheeting on the aft section behind the trailing edge of the wing. The technique of assembly insures an accurately aligned fuselage and prevents a twist or bend from being formed during assembly. (**Note:** The cyanoacrylate types of adhesives were used almost exclusively during construction of this model. The few applications where 5-minute epoxy were required, were called out on the plans and in the instruction booklet.)

The wing is constructed directly over the plans and is built in three separate sections. The center section uses a constant chord and the two tip panels are tapered on both the leading and trailing edge. The main spars in both the center section and the tip sections are spruce. (**Note:** The only modification that was made to this kit was the addition of some balsa filler blocks below and above the brass tubes where they are epoxied to the plywood sheer

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SPECIFICATIONS

Name	MONARCH .05
Aircraft Type	Sport-Trainer
Manufactured By	Airtronics 16191 Construction Circle West Irvine, California 92714
Mfg. Suggested Retail Price	$34.95
Available From	Retail Outlets
Wingspan	72 Inches
Wing Chord	10" Cntr. Tips 10"-5½"
Total Wing Area	650 Sq. In.
Fuselage Length	36 Inches
Stabilizer Span	24 Inches
Total Stab Area	126 Sq. In.
Recommended Engine Range	.049-.051
Recommend Fuel Tank Size	Lg. Std. Tank Mount
Recommended No. of Channels	2-3 (Opt. Throt.)
Rec. Control Functions	Rudder & Elev. (Throt.)
Basic Materials Used In Construction:	
Fuselage	Ply, Balsa
Wing	Balsa Spruce
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (9 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Airtronics XL 6
Engine Make & Displacement	Cox .049 Dragonfly
Tank Size Used	Std. as fitted to eng. (Large)
Weight, Ready to Fly	38 Oz.
Wing Loading	8.4 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Plans and instructions, kit packaging, ease of construction, flying.

WE DIDN'T LIKE THE:
No problems.

webs at the dihedral joints. This modification may not have been necessary, but considering the type of use that the model was going to be subjected to, we felt it was best to fill the gap on both the top and bottom rather than rely on surface contact of the epoxy only.)

Both the horizontal and vertical stabilizers are of built-up construction using balsa wood as the prime material with spruce lamination to provide additional strength. This reinforcement provides good amount of additional rigidity to these components.

With all the construction done directly over the plans, and cyanoacrylate adhesives used for nearly all construction, the total construction time was kept to an absolute minimum at somewhere around eight to nine hours, not including covering.

Since we intended to transport this model in a compact car, it was decided to use the method shown on the plans for making the vertical and horizontal stabilizers removable. This, along with the removable wing tip panels and removable landing gear, allows the model to be placed in a very compact area without the worry of some of the major components being broken. This type of disassembly technique allows you the flexibility of taking this model along with you at times when other models would not be allowed due to space required to carry them. Like on vacation!

Covering:

To cover our model, we used metallic blue Super MonoKote for the fuselage and vertical fin as well as for the leading edge of the wing and horizontal stabilizer. The second color used was yellow Super MonoKote for the center bay areas of the wing and horizontal stabilizer. To cut the blue and yellow, we used 1/8" wide red trim tape.

Engine:

After the model was completely covered, the new Cox Dragonfly .049 engine was installed using the larger of the two fuel tank back plates provided with the engine. This larger fuel tank back plate allows the engine to run about 5 minutes on a maximum run. The best engine performance was achieved with a Cox 6/3 gray prop. The throttle was hooked up to a third servo. In hooking up the throttle wire to the exhaust throttle on the engine, a little adjusting must be done. The engine must reach maximum rpm's when the throttle is fully opened and comes back to slow speed when the throttle is fully closed. This adjustment can only be achieved by trial and error with the engine running and requires a few minutes of tinkering to get the proper adjustment.

Radio:

The radio used for our model was the Airtronics XL6 using two of the standard servos and one of the new mini servos. However, nearly any of the smaller servos available today will fit and work quite nicely due to the ample room provided in the radio compartment. The battery pack was placed in the nose as shown on the plans and right behind the battery; the throttle servo was installed sideways in the fuselage. Behind the first bulkhead, the rudder and elevator servos were installed with the receiver mounted behind them. Even with this far forward mounting of the radio equipment, some weight still had to be added to the nose to achieve the correct balance. The C.G. should be located directly on the main wing spar.

Flying:

Flying a Monarch .05 is very much like flying most of the two-meter sailplanes inasmuch that it is very gentle and yet responsive to the controls. With the engine running at maximum rpm, the model can be hand launched with just a gentle shove to insure adequate flying speed. Once under way, it will climb very nicely and requires only the slightest movement of the control sticks to provide a nice turn or to increase or decrease the climb. If there are any thermals in the area during your time of launch, the Monarch will climb extremely well under power and, under this condition, the engine can be brought back to lower power settings if so desired. (**Note:** Too much up elevator will cause the model to just mush around and not climb.) After the engine quits, the flight becomes that of a true sailplane and we have had a number of flights ranging in the area of 15 to 20 minutes.

The true test of a trainer has always been how easy it is to fly for the new pilot. To test this portion of the model, a young friend was selected who had flown several sailplanes under close supervision, but was certainly not ready to be on his own. After the model was trimmed out, the transmitter was turned over to him as soon as the engine had been started. At first, he looked very apprehensive and then said, "Are you sure?" At that point he was told, "That's what it's designed for," and with that, the model was launched into the prevailing wind. Both the model and the new pilot performed beautifully during the first flight and those that followed. The new pilot commented a number of

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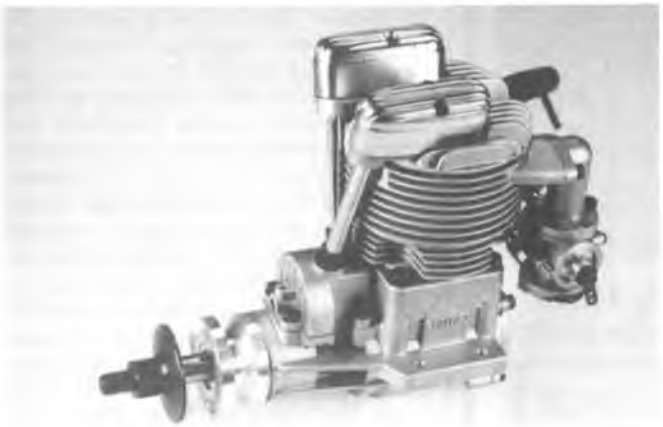

The Saito FA-120 meets the new FAI increased displacement rules for four stroke engines. Clarence likes it.

The disassembled FA-120 reveals high quality machine work and attention to details. Two parts were inadvertently omitted from the photo. Don't write, we know what they are. The other valve and spring are missing.

SAITO FA-120 ENGINE

By Clarence Lee

As many of you probably know by now, especially the competition pattern fliers, the FAI and AMA have approved increasing the allowable maximum engine size for pattern aircraft to 20cc or 1.2 cu. in. for four stroke engines. Due to the lower power output of a four stroke engine, in comparison to an equivalent displacement two stroke engine, this increase in displacement was felt necessary. This rule change, in turn, having been made to promote the use of the four stroke engines which are considerably less noisy than the two stroke engines. Most of your four stroke engines develop approximately two thirds the power of an equivalent displacement two stroke engine. However, this horsepower business is actually a bit misleading in that the four stroke engines develop their power and maximum torque at a lower rpm than a two stroke engine and will swing larger propellers without overheating in the lower rpm ranges. Why it was felt necessary to increase the displacement up to 20cc is a bit of a puzzle to me as 15cc (.90 cu. in.) would seem to have been a more logical limit — especially when the noise factor is a major consideration. A four stroke 1.2 cu. in. engine is not exactly quiet. Although not having the high pitch whine that a two stroke engine does, the 1.2 cu. in. four stroke puts out a pretty good roar.

I believe the first single cylinder four stroke 1.2 cu. in. engine to be offered to the R/C modeler was the Condor 120 made in England by Dennis Allen, who formerly manufactured the Merco engines. The Condor 120 has been followed by the O.S. FS-120 and the Saito FA-120 four stroke engines. The Japanese seem to be right on the ball when it comes to meeting the modelers' needs with new products — especially model engines.

This past month I received one of the new Saito FA-120 four stroke engines from Gen Saito, President of Saito Seisakusho, Ltd., in Japan, for review and evaluation. Incidentally, Gen is the gentleman's name and not a military rank. So as you have probably guessed by now, the topic of this review will be the new Saito FA-120 four stroke engine. This will

Some of the detail features of the Saito FA-120. The unique coned prop washer and locknut with the pinned drive spool firmly secure the propeller. The piston head is relieved for valve clearance. Note the beveled metering recess on the carburetor cap that matches a groove in the end of the rotating barrel.

The FA-120 engine mount with hardware is an accessory item by Saito. The tool set shown on right is included with the engine.

be the third Saito engine we have reviewed. The first was the FA-30 which, at the time, was the smallest four stroke model engine on the market. This was followed by the FA-80 twin which featured an unusual firing order in that one cylinder fired, the crankshaft rotated 180°, and the second cylinder fired, and then the crankshaft rotated another complete revolution and a half where the sequence started again. Both of the previous engines were of exceptionally fine workmanship and quality and the newest FA-120 four stroke single has followed suit. The Saito FA-120 is the first of the 20cc single cylinder four stroke engines to come into my hands, so naturally I was quite anxious to check it out and see how one of the new 1.2 cu. in. four stroke engines would compare with a two stroke .60.

In my opinion the overall appearance of the engine is quite nice and very similar to the other single cylinder four stroke engines in the Saito line. The size, however, will dispel any thought one might have of pulling your present .60 size Rossi, OPS, Webra, etc., out of your present pattern aircraft and installing the 1.2 cu. in. four stroke engine.

The engine is a 1.2 cu. in. engine and the size is proportionate to the displacement. If the engine is used in a pattern type aircraft, a new aircraft would have to be built to accommodate the engine. The power range and appropriate propeller sizes would also dictate this. Do not expect to see a four stroke engine turning an 11/7 or 11/7½ propeller in the 14,000-15,000 rpm range. An aircraft will have to be designed to take advantage of the larger diameter, slower rpm propellers. In the case of the Saito FA-120, something like a 15/8 or 16/6. More on propellers and rpm later.

Although the new 1.2 cu. in. four stroke engines will not adapt too well to present day pattern aircraft, they could well fit in very nicely with ships designed for the Aresti style or turnaround pattern flying. Instead of the screaming pattern ships we are familiar with now that require horizon to horizon to complete three rolls, four points, etc., the four stroke engines will be at their best in ships flying at slower speeds with lots of power in the vertical maneuvers. The four stroke engines should be at their best with the Aresti style maneuvers. I imagine in the next two or three years we will see a whole new concept in pattern type aircraft. That could be quite refreshing as I gave up pattern flying myself many years ago because I got tired of the same old thing. It is rather ironic that this is the concept that my old friend Phil Kraft had

many years ago with his first Quik-Fly aircraft — slower flying, constant speed aircraft that could perform the pattern right in front of the judges.

Saito lists the bore and stroke of the FA-120 at 32mm (1.260") and 24.8mm (.976") respectively. Many times the actual bore and stroke will vary from the manufacturer's claims. This was not true with the Saito — both the bore and stroke were exactly as specified giving a displacement of 19.95cc or 1.217 cu. in. Due to the large bore and shorter stroke, this engine would be considered of overbore design. Since the engine is intended for lower rpm running with large propellers, you would normally expect the bore/stroke ratio to be closer to "square." However, I imagine Saito opted for the larger bore in order to accommodate larger valves hoping to gain more power through better breathing. The two valves being approximately 9/32" in diameter.

The actual checked weight of the engine with exhaust extension was 33½ ounces. As a comparison, an OPS .60 weighs just about 19 ounces and the muffled tuned pipe and header another 7 ounces for a total of 26 ounces. The increased weight of the Saito will dictate shorter nose moments and longer tail moments to offset the additional weight; that, or a lot of nose lightener in the tail. The noise level of the 1.2 cu. in. engine will also require the use of a muffler increasing the overall weight. A muffler was not supplied with the Saito although the exhaust pipe/extension itself does have a slight quieting effect. Actually, I would not consider this weight to be excessive when compared to the size, rugged construction, and power of the engine. This engine actually comes close to some of the 2 cu. in. chain saw/leaf blower type engines in regards to power.

Construction features include a two piece pressure die cast aluminum crankcase/cylinder assembly with the cylinder and head being a one piece unit. If you strip out a glow plug hole you will have to replace the whole upper cylinder. The aluminum cylinder bore has been hard chrome plated with no separate steel liner being used. Whether this is really a desirable feature or not I would be hesitant to say, but it does promote better cooling and a savings in weight. Saito refers to the engine as being of AAC design, meaning an aluminum piston running in a chrome plated aluminum cylinder. Previous Saito engines have used this type of combination but the FA-120 has been modified to also use a single expansion

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type ring as well. The piston is not a lapped fit as in a true AAC or ABC design.

To my knowledge, Saito was the first four stroke engine manufacturer to use a simplified valve drive mechanism using a spur gear mounted on the crankshaft to drive a spur gear on the camshaft, in turn, operating the related cam followers, pushrods and valves. Other four stroke engine manufacturers usually use a valve operating mechanism mounted on the rear of the crankcase and driven by a crank pin extension. A few, including O.S., have been changing their designs to be similar to Saito's with the valve mechanism on the front of the engine and driven by a crankshaft gear.

The camshaft itself is parallel to the crankshaft and runs on phosphur bronze bushings; basically the same as your automobile engine. However, your automobile engine has the crankshaft gear and camshaft gear connected by a timing chain whereas the Saito crankshaft and camshaft gears are directly meshed. To me, this is about the simplest way of achieving the job with a minimum of parts required. The pushrods are enclosed within steel tubes and the rocker arms in cast aluminum housings. The complete valve assembly being removable from the cylinder/head casting. One piece phosphur bronze valve guides and seats are apparently cast or pressed into the cylinder casting. Phosphur bronze is one of the toughest and longest wearing of the bronze material.

Saito refers to the combustion chamber shape as "hemi" or hemispherical, but there has been some modification to the true "hemi" shape. The actual shape is a bit difficult to describe but visualize a shallow hemispherical shape that has had about one quarter of each side filled in forming a flat surface with only the center section retaining the hemi shape. The two outer flat sections having a squish action effect. The intake and exhaust valves are set at an inclined angle and operate in the center hemi section. The glow plug is located between and to the side of the two valves. The full stroke compression ratio figured out to be just about 7.9-1. The actual combustion chamber volume, when filled with SAE 10 weight oil to the bottom of the glow plug hole, is 2.9cc. This, added to the 19.95 cylinder displacement and divided by 2.9, gives the 7.9-1 ratio. This bit of information is for those who may have wondered how compression ratio is computed.

The piston is machined from a die cast high silicon aluminum casting and uses one very thin .0385" (approx. 1mm) ring. As can be seen in the accompanying photographs, the top of the piston has a slightly different treatment. There is a narrow .045" ring or band around the top edge with the main piston top being .010" below this. Initially you would think that this was an attempt to lower the compression ratio slightly. However, this would not explain the reason for the narrow raised band. Being too narrow to have a "squish" action I do not really know the purpose. The portion of the piston from the piston ring up is of smaller diameter than the portion from the piston ring down which is standard procedure to allow for expansion of the piston top. The extra height provided by the narrow band would not contribute to piston support. Two notches are cut into the piston head to provide clearance for the valves. The engine had a fantastic idle so I am not sure if the piston shape in conjunction with the head shape are contributing factors or not. Possibly they are. More on the idle later.

The hardened .275" diameter tubular wrist pin is retained in the piston by wire clips at either end. The connecting rod is an aluminum forging and has phosphur bronze bushings at both the crankpin and wrist pin ends. The wrist pin bosses in the piston are not bushed. This is generally not necessary with high silicon aluminum pistons.

The one piece crankshaft is made of hardened steel and rides in two ball bearings. The rear bearing has an o.d. of 30mm (1.181") and i.d. of 17mm (.669"). The front bearing has an o.d. of 26mm (1.024") and i.d. of 10mm (.393"). The front bearing is of the double shielded type keeping foreign matter out of the bearing and crankcase. Keyed to the crankshaft is the spur gear that, in turn, drives the valve mechanism. The propeller drive spool attaches to the crankshaft by a tapered collet which is becoming pretty much standard practice by the majority of model engine manufacturers. The propeller drive spool has two .120" (3mm) steel pins pressed into the face to grip the propeller. A slightly different feature in the way of a prop nut that I liked was the use of a tapered and slotted rear half that mated with a taper in the front prop washer. Tightening the prop nut locks it onto the crankshaft. Who would have thought that the ordinary prop nut could be improved upon in design? Very clever, these Japanese.

The FA-120 is equipped with a new type of Saito carburetor that incorporates a fuel metering system a bit different than that used by other manufacturers. A brass end plate attached to the side of the cast aluminum housing is the mount for the needle valve and fuel inlet. The inside face of the end plate has a circular groove that gradually reduces in depth. The maximum depth end being in line with a hole leading to the fuel inlet. The aluminum throttle barrel has a groove or channel on its outer face running from a center hole that feeds fuel to the venturi jet to the outer edge. This groove, in turn, aligns with the spiral groove in the end plate. Rotation of the barrel allows this groove to follow the spiral groove in the end plate. As the depth of the spiral groove varies, so does the amount of fuel being fed to the fuel jet in the venturi. Idle mixture strength can be varied by rotation of the brass end plate. This portion of the carburetor seems to work exceptionally well. However, to fine tune the idle mixture, an air bleed is also incorporated. Air bleeds work on the principle of reducing fuel draw ability at the fuel jet — not a desirable feature. Most present day carburetor designs have gotten away from using the air bleed by using various methods of fuel metering which still retains high fuel draw ability. The air bleed can cause starting problems unless you are aware of its presence and how it functions.

It is normal procedure to start an engine — especially an engine of this size — at partial throttle. At partial throttle the air bleed is open, which results in very little fuel being pulled to the engine by choking, for which, incidentally, Saito provides a slide type choking device on the carburetor. When starting the engine it is necessary to open the throttle to full open position to close the air bleed so that choking will pull fuel from the fuel tank. With the air bleed open you can choke all day without getting much fuel to the engine. The inverted carburetor position on four stroke engines does not help matters since much of the fuel runs back out of the carburetor. Then, to compound the situation, four stroke engines like to start "wet." So choking of the engine with the carburetor barrel at full throttle is an absolute necessity with a carburetor using an air bleed idle mixture adjustment. With sufficient fuel in the engine you now reduce the throttle position to partially open. This partially open position seems to be somewhat critical on the Saito. Correct starting position is just slightly above idle speed. Any farther than this and the engine has a tendency to start up and die. Fuel in the fuel line can be seen reverse flowing, or going back to the fuel tank. This is evidently caused by blow back through the carburetor. By having the carburetor barrel just slightly open, this problem seems to be eliminated. It is hard to say if it is valve timing, carburetor design, or a combination of both causing this situation. Strangely enough, once the engine is running, the exceptional idle and smooth acceleration makes you wonder why starting should be critical.

So hand starting can be a bit tricky unless you follow the starting procedure outlined above, which is

also in the Saito instruction sheet. The main thing to remember is full throttle for choking and slightly above idle speed for starting. As with all other four stroke engines I have run, with the exception of the HP-21 which does not have poppet valves, the backwards flip starting method works best. Flipping backwards causes the engine to kick and take off running in the proper direction. Frankly, I prefer an electric starter that makes starting a lot simpler. With an engine of this size, however, a 24 volt starter or an automobile battery for your 12 volt starter is required. A motorcycle battery or Ni-cad pack with your 12 volt starter will not hack it.

Once the engine is running, the carburetor works faultlessly. One other complaint I do have, however, is the lack of an idle speed adjustment screw. This being left up to the throttle position on the transmitter. I realize that it is common practice to allow the throttle barrel to close with the idle speed controlled at the transmitter. Trim in turn being used for engine cut off. However, a lot of idle problems and dying of the engine on final approach are caused by fellows setting the idle speed by ear which is usually too low. I much prefer a positive stop on the carburetor. Servos also have been known to overshoot or not always return to the same end travel position as battery voltage drops. This, in turn, also effects the idle speed. This can all be eliminated with a positive stop idle speed screw.

Also supplied with the carburetor is a venturi throat restrictor that Saito recommends using in conjunction with the larger propeller sizes to aid fuel draw. All of my tests were performed without the venturi restrictor.

Okay, so how does the engine perform? The engine was given an

initial thirty minute break-in consisting of short three to four minute runs at partial throttle with a cooling period in-between for the first fifteen minutes. For the remaining fifteen minutes the engine was run at partial throttle, alternating with periods of full throttle running. At the end of the thirty minute break-in period the engine would hold a steady leaned-in mixture setting without any tendency towards slowing or overheating. However, I would not consider the engine to be fully broken-in. This would probably require at least another hour or two of air time. Actually this bench break-in is not required and was only done for this test purpose. If you intend to fly the engine in an aircraft, the break-in should be done in the air.

Being a new engine, I used Jim Morgan's Cool Power 15% nitro fuel undiluted. Although I have always been under the impression in the past that Cool Power fuel contained 22% synthetic oil, Jim recently told me that the actual oil content is 17%. Jim feels that the superiority of his lubricant package allows him to use 17% lubricants. I would like to mention here that Saito recommends using castor oil based fuel in the engine. I should imagine this would be due to the rust problem associated with many of the synthetic oils. This problem is even magnified in a four stroke engine due to the lower end receiving its lubrication from fuel leakage and piston blow-by past the piston and ring. Even when pulling the fuel line and letting a four stroke engine run out dry, a considerable amount of fuel residue is left in the crankcase, not to mention the rocker boxes, etc. The use of a castor based fuel, or combination synthetic/castor based fuel, would be recommended for any four stroke engine. I have never experienced any rust problem with Cool Power so I opted to go with it. As the engine was to be disassembled for pictures following the testing, rust was not a concern here.

Rpm figures obtained were as follows: 14/8 Zinger, 9,700; 15/8 Zinger, 8,400; 16/8 Top Flite (I couldn't find a Zinger in this size locally at the time of the testing), 7,800. And, with an 18/6 Zinger, 6,650. Since the manufacturer recommends 10,000 rpm as the engines maximum rpm limit, the 15/8 would seem like the appropriate propeller for the engine. Allowing for unloading in the air, the engine would be operating just under the 10,000 rpm range. The 15/8 would be best for pattern type aircraft. For a slower flying scale type I should imagine a 16/6 would be a better choice.

I would like to mention here that many modelers are trying to get more rpm from their four stroke engines than they should, both by running them too lean and by running smaller diameter/pitch propellers. This is something you do not want to do. The lean mixture causes overheating and the small propellers causes over-revving of the engine. You never want to let a four stroke engine with poppet valves over-rev. When a four stroke engine turns much over 10,000-11,000 rpm the valves start to float. That is, the valves stay partially open. The valve springs cannot return the valves to their seats fast enough before the pushrods start to open them again. Stronger springs help but, in turn, cause more wear to the valve train and internal drag in the engine. If the valves are open as the piston reaches the top of its stroke, the piston can hit a valve causing considerable damage. This is evidently why Saito has valve reliefs cut into the top of their piston. So do not try to operate a four stroke engine with poppet valves above the maximum rpm limit recommended by the manufacturer.

Saito lists the practical idle speed of the engine as 1,600 rpm. Having run quite a few four stroke engines, now I was a bit skeptical as to whether this low figure could actually be obtained. Was I in for a surprise! The engine would hold a smooth, steady, 1,400 rpm idle with the starting battery disconnected. Even after a five minute idle period at this speed, acceleration was very good with a bare minimum of hesitation. With the starting battery connected, the engine would hold 1,200 and could even be gotten as low as 1,000 but at this speed the idle got rough. Raising back to 1,200 would smooth it right out. This was easily done without the engine dying, having to be restarted, etc. When you consider that at 1,200 rpm you are hearing only 600 firing impulses, it is even more impressive. For practical purposes, however, I would go with the 1,600 or even a 1,800 rpm idle for a safety margin. I tried several different makes of glow plugs and the engine was not critical to plugs. However, the plug supplied with the engine (Saito P-3) did have the best idle with no tendency to detonate at high speed even with the 18/6 propeller. When the mixture was leaned too far the engine just started running rough and would die. No detonation knock was observed. Some four stroke engines will really "rattle" when too lean. Evidently the combustion chamber shape and piston shape plays a large part here.

During the course of the testing, a fuel consumption check was made. With the 15/8 prop the engine would run just about one minute on one ounce of fuel. This is better than most of your high performance Schnuerle port .60's will do.

Saito really goes all out in supplying maintenance accessories with the engine. Supplied with the engine were two large single end wrenches for tightening the prop nut and exhaust pipe nut, a spanner wrench, screwdriver, and gap gauge for adjusting the valve clearance, and extension wires for the needle valve and choke plate. Also available is an aluminum motor mount drilled and tapped for the engine. The latter is an optional accessory.

Another accessory item available from Saito is a miniature automotive type fuel filter. This has a machined aluminum body, fine wire mesh filter, and a glass bowl so that you can visually see any foreign matter that has accumulated. A knurled retaining collar holds the glass bowl to the body and can be removed for cleaning. A neat little item.

In summing up, I would say that the Saito FA-120 is an exceptionally well-designed and manufactured engine with particular attention paid to many small details. I was quite impressed with the power as the engine would turn the larger size propellers within a few hundred rpm of some of the 2 cu. in. chain saw engines. And the idle was the lowest I have ever achieved with a glow plug engine. □

MINI AMERICA'S CUP
NEWPORT, R.I. 1983

"BUDDY BLACK CAPTURES MINI-AMERICA'S CUP FOR UNITED STATES

By Richard H. Palmer

The closest seven race finish ever, saw Buddy Black bring the coveted Mini-America's Cup back to the United States. Less than 3 seconds and 24 inches separated the two boats at the finish line, with England overlapping the U.S. when they crossed.

Final Awards (L to R): Mayor Paul L. Gaines, Buddy Black — USA winner, John Cleave — English loser, Rich Palmer — organiser.

When writing to RCM for answers to your questions, please send a self addressed stamped envelope for a prompt reply.

PRIMARY FLIGHT TRAINING COURSE FOR CLUBS

Part II

By Don Sobbe

The function of this manual is to provide an organized and progressive series of lessons that will not only assist you in teaching your students to fly, but to fly safely with a basic understanding of their equipment and its limitations. Your function, as an instructor, is to teach this material to the student, monitor his understanding and performance of it, and develop the skills and abilities he will need to fly safely.

Teaching is basically the communication of information. Teaching a skill, such as R/C flying, is a process of building confidence. The lessons are set up so that the student can gain insight and understanding in easy steps that will help build his confidence in his ability so that by the time he is ready to solo, it will be just another flight in the course and you will both be confident of the outcome. Keep in mind that no two people learn at the same rate, and even fast learners have days when nothing goes right. Don't push. If a student is having trouble in one area, go on to something else and come back to the problem area another time. Quite often it helps to review a lesson that the student is familiar with and able to do well. This gets his mind off the trouble spot and restores his confidence.

Each of the lessons is organized into four phases: (1) Purpose, (2) Objectives (3) Elements and (4) Evaluation. This format will enable you to easily monitor the student's progress. The last page of the student's manual contains a log which you should fill out, along with comments and recommendations. In this way, the next instructor will know which lesson the student is working on and what areas need review. No time will be wasted and no part of the course missed. If the student's progress permits, several lessons can be combined in one session. The elements section of each lesson contains an outline of the

minimum knowledge and performance requirements for the lesson. Instructors should make an effort to expand on the elements of each lesson to insure that the student gains the best possible understanding of the lesson objectives.

As an instructor, you have accepted a responsibility to every club member to teach your students to become responsible and safe pilots who we can all be proud of and enjoy as fellow club members. If you ignore this responsibility, you will produce pilots who will be hazards to themselves, you and everyone else.

"In the beginning the student knows nothing. After several lessons he is an expert and from then on he knows less and less."

Graffiti in flight school john.

Lesson 1 — Aircraft Familiarization

Purpose:

To teach the student how to properly pre-flight his model.

Objective:

At the completion of the lesson the student should be able to inspect his model and identify any deficiencies that could cause a malfunction or safety hazard. He should also be able to start and adjust the engine.

Elements:

1. Inspection of the aircraft structure and C.G.
2. Inspection of the radio installation.
3. Inspection of all linkages and control surfaces, including controls for proper throw, direction and freedom of movement.
4. Engine and fuel system installation and security, including props.
5. Instructor's demonstration of safe engine starting procedure and engine adjustment.
6. Student starts and adjusts the engine.
7. Instructor teaches the student how to identify rich and lean engine settings.

Evaluation:

Student should be able to perform lesson objectives. This lesson should be reviewed at the start of all following lessons.

Lesson 2 — Radio And Field Procedures

Purpose:

To teach the student how to use the radio at the field.

Objectives:

To make the student aware of the necessity for frequency control, self-disciplined use of the radio, and safe operation of his model at the field.

Elements:

1. The need for frequency control.
2. Frequency flags.
3. Impound and the frequency poll.
4. Conducting a range check.
5. Abnormal operation of the radio and interference.
6. Batteries: a. charging; b. checking; c. life.
7. Servos-operating and load limits.
8. Pit area.
9. Engine operation in the pits.
10. Taxiing on the field.
11. Use of, and operation on, the runway.
12. Flight box and boundaries.
13. Other traffic and right of way on the field.
14. Restricted air space (pits and parking lot).

Evaluation:

Student should meet the requirements of the lesson objectives and understand and practice all of the lesson elements. Lesson two should be reviewed at the start of all following lessons.

Lesson 3 — Flight Familiarization

Purpose:

To introduce the student to controlling the model in flight.

Objectives:

To allow the student to become familiar with the model's controls and their use in flight.

Elements:

1. Instructor flies and lands the student's model to evaluate its performance and airworthiness. **Note:** This flight should be conducted in a safe and conservative manner. The model will most likely be the student's first R/C model and his confidence in your ability as a pilot and his own ability as a modeler will be reinforced if he sees his model make a successful flight. Be careful not to do anything during this flight that might undermine the student's feeling of accomplishment.
2. On the ground, familiarize the student with the controls and what kind of reactions he can expect from them. Example: Explain the necessity for holding a little up elevator during turns to prevent the model from diving. Keep it simple!
3. Explain the procedures you will use to give the transmitter to the student and take it from him during the flight.
4. Explain what you would like him to do. Example: "Just get familiar with the controls and don't worry about losing control. That's why I'm here."
5. With the model trimmed in level flight and a **reasonable** airspeed, allow the student to fly it. Whenever possible, verbally correct his control inputs rather than doing it yourself. Don't let the student get nervous. If you see this happening, take the controls and let him relax.

Evaluation:

The lesson is complete when the instructor has determined that the student is able to determine and execute proper control inputs to achieve a desired change in the model's attitude. Example: The model dives and the student uses up elevator to stop the dive. Proficiency and accurate control are not criteria at this point.

Lesson 4 — Flight Maneuvers

Purpose:

To acquaint the student with the basic flight maneuvers.

Objective:

To teach the student to properly control the model during basic maneuvering.

Elements:

1. Level flight and trim.
2. Banked turns.
3. Straight climbs.
4. Climbing turns.
5. Gliding.
6. Disorientation. **Note:** An explanation of disorientation and the use of trim should precede this lesson. The five maneuvers should be taught in the order listed, if possible.

Evaluation:

The lesson is complete when the student can perform the maneuvers without assistance from the instructor. Each maneuver should be done with a reasonable degree of accuracy. Example: turns should be fairly smooth and altitude maintained fairly well.

Lesson 5 — Accuracy Maneuvers

Purpose:

To teach the student to perform the five basic maneuvers to a standard that will develop proficiency in their execution.

Objective:

To develop the skill and ability of the student to control the model in a specific manner.

Elements:

1. Level flight, maintaining heading and altitude.
2. Level flight at reduced power, maintaining heading, altitude and trim.
3. Left and right turns to specific headings.
4. Climbing turns to specific headings.
5. Power off (idle) glides that require the student to maneuver the model to a specific area and approximate altitude. Example: Have the student close the throttle over the east end of the field at 200 feet and glide to the west end arriving at an altitude of about 100 feet. **Note:** Keep in mind that the objective is to develop skill and ability **and** an awareness of the model's position relative to directions and altitude. Don't insist on mechanical precision. Review disorientation with the student if

necessary.
Evaluation:
The lesson is complete when the student can maneuver the model at the instructor's direction and can demonstrate an ability to control the model in an accurate manner.

Lesson 6 — Orientation Maneuvers
Purpose:
To develop the judgment, skill and ability necessary for the student to make his first landing.
Objective:
To teach the student to control the model regardless of its heading or direction relative to himself.
Elements:
1. Figure 8 — the student must fly a Figure 8 pattern consisting of two 360 degree turns, one left and one right. The student must place the maneuver in front of himself at a safe distance and altitude.
2. The student must fly a rectangular pattern at a safe altitude, with the upwind leg crossing the landing area. **Note:** The instructor will designate the size, altitude, and distance of both maneuvers.
Evaluation:
The lesson is complete when the student can fly the Figure 8 without experiencing disorientation and can fly both right and left rectangular patterns consistently and accurately.

Lesson 7 — Stalls
Purpose:
To develop the student's understanding of stalls, their cause and avoidance.
Objective:
To teach the student to recognize and recover from stalls.
Elements:
1. Pre-flight discussion of stalls. What causes them and how to recover.
2. Practice of stalls by the student with power and without power.
3. Stalls in turns. (Take-off, departure stalls.) **Note:** Take-off and departure stalls are almost impossible to set up with most trainers, but do occur in more advanced models. Therefore, it is recommended that power be reduced to about 1/3 throttle, and a steep climbing turn be entered. The stall entry will look similar to a spin entry with the model rolling toward the high wing. During this lesson it should be emphasized to the student that a stall can occur at any airspeed and is a function of angle or attack.
Evaluation:
The lesson is complete when the student understands the cause of stalls and has demonstrated the lesson elements and proper recovery.

Lesson 8 — Take-off
Purpose:
To teach the student how to make a normal take-off.
Objective:
To teach the student how to control the model during the take-off.
Elements:
1. Discussion of the effects of torque during take-off and initial climb.
2. Use of the rudder.
3. Use of throttle.
4. Student makes a normal take-off **into** the wind.
Evaluation:
The lesson is complete when the student has successfully taken off and established a normal climb with adequate airspeed. He must also demonstrate adequate directional control during the take-off.

Lesson 9 — Approaches to Landing
Purpose:
To prepare the student for his first landing.
Objective:
To develop the student's ability to visualize and perform a stable and controlled approach to landing.
Elements:
1. Review of Lesson 6.
2. Discussion of proper landing techniques.
3. Student flies a rectangular pattern as in Lesson 6, but reduces power and establishes a normal glide on the base leg and continues the approch until over the end of the runway, at which point he is to add power and go around. The minimum altitude at the end of the maneuver should be no less than 20 feet.
4. As the student becomes comfortable with the maneuver, the altitude should be lowered until the instructor is confident that the model can glide to the runway with the power off (idle).
5. Landing. At this point the instructor will tell the student to continue the approach and land. **Note:** The chances of a successful landing will be increased if the instructor reminds the student to keep the power at idle. It may be necessary to talk the student through the flare and touchdown.
Evaluation:
The lesson is complete and the student can advance to supervised solo flight after the student has successfully landed the model several times and is comfortable with the maneuver.

Lesson 10 — Solo Flight
Purpose:
Confidence building exercise.
Objective:
The student is to perform a solo flight demonstrating the knowledge and skill objectives of the previous nine lessons to the instructor.
Elements:
1. Pre-flight discussion to answer questions and resolve any problems that concern the student about the lesson.
2. Student performs a flight, under the instructor's supervision, starting with a thorough pre-flight and ending with the transmitter back at impound.
3. Instructor monitors student's performance, but assists only when necessary.
Evaluation:
The lesson is complete and the student signed off for solo flight **only** after he has demonstrated a practical knowledge of all course objectives **and** has observed all safety and field operating rules, and has successfully flown his model unassisted.

Lesson 11 — Emergency Procedures
Purpose:
To prepare the student for the unexpected.
Objective:
To acquaint the student with safe procedures to be used in emergencies.
Elements:
1. Discussion of possible in-flight problems and how to deal with them.
2. Unusual attitude training (optional): a. Loops; b. Rolls.
3. Student performs a dead stick landing.
4. Cross wind take-offs and landings (optional).
Evaluation:
The elements of this lesson are only suggestions and there is no minimum performance requirement. The objective is to provide the student with insights that will assist him in safely dealing with the unexpected. Experience will teach him the rest.
"If the student doesn't learn, the instructor hasn't taught." □

HOT PILOTS FLY AT '83 SAM CHAMPS

By Bill Laskar

The 1983 SAM Champs have flown by, but old timers --- and a surprising number of youngsters --- will be talking about them for a long time. It was the largest number of old time airplane builders to meet in one place at one time since the meets were first held way back in 1966.

For those of you who don't know what SAM means, let me explain. It stands for the Society of Antique Modelers. The word "antique" refers to the type of **airplane** --- one that was designed or kitted before Dec. 31, 1942 --- not to the **modelers,** who range in age from 14 to 82. At last count, there were 1606 members, including 90 in Great Britain and 60 in Australia.

This year's Champs --- means the same things as NATS --- was sponsored by SAM Chapter 1 in Denver and was held in July in La Junta --- population 10,000, altitude 4300 MSL. La Junta, which means "junction" in Spanish, is a quiet, friendly little town located in southeastern Colorado.

Large numbers of airplanes are not new to the natives of La Junta. It was the site of a B-25 training base during World War II. The base is gone now, but there is a small airstrip just north of town that is still in use. The contest site was located a safe distance away from the active runway. Bare of trees, water, and other creature comforts, the windswept, desert grass-clumped prairie was tolerable for hand-launched planes but too rough for ground take-off, so the city paved two 50 by 50 foot ramps. They were smooth but hot.

Really hot --- the daytime temperatures ranged from 103° to 108° in the shade. But there was no shade (except man-made) so a more realistic temperature reading on the flight line was closer to 115°. If you flew, you immediately qualified as a **hot pilot.**

Motor homes with Honda trail bikes attached for chasing free flights, cars with coffin-like trailers for hauling models, campers, and just plain pickups were parked side by side along a dusty road. Awnings and tents were erected, and state flags flew from some of the shelters. A command post under an Army surplus tent was set up in the middle of the flight line, with the free flighters at one end and the RC'ers at the other.

Jim Thomas, Contest Manager; and Jim Whelan, free flight CD, were aided by an assortment of volunteers who did everything from sorting out registrations to telling people where the restrooms were located. They were busy people.

The RC'ers, down at the other end of the field, were under the direction of Woody Woodman from New Jersey, R/C Contest Director. Woody, with a build like a Pittsburgh Steeler linebacker and a voice like a Marine drill sergeant, is a very patient and friendly man, but he ran the R/C events in a no-nonsense manner, and there were few arguments. Wife Evelyn helped with the chores, as did Chuck Brannon and Dorothy and Mike Granieri, SAM President.

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Genial Joe Bashar with original plane first flown at 1940 Nats. Entered in 1/2A Texaco R/C assist.

Don Bekins, R/C Grand Champion, having his Goldberg Gas Bird weighed by R/C C.D. Woody Woodman. Note O.S. .60 4-stroke engine.

Richard Williams gets his O.S. .60 4-stroke powered Flamingo fueled by Chuck Brannon. Rick was 2nd in Texaco event.

Cliff Betz and wife Anne brought his McCoy 29 ignition powered Brooklyn Dodger R/C from New Orleans, Louisiana.

George Laskar and Bob Higging tweek the O.S. .60 4-stroke in a Dallaire.

The renown Chet Lanzo launches his Forster 29 ignition Lanzo Bomber.

Mary Banaszak shows off Ralph Schellenbaum's immaculate Torp 29 ignition powered Brooklyn Dodger.

The contest was a four day event and began on Monday, July 18, with a MECA Collecto, which means model engine swap meet. It was held in a large room in the local junior college, where tables were heaped with glorious delights --- rare "few of a kind" engines, "difficult to find" replacement parts, spark plugs, tanks, and ignition parts. For about $200 you could pick up a brand new, custom built, gold plated reproduction of the famed Ohlsson 60, or you might find a genuine vintage Ohlsson 23 for $50. You could even get a 1980s CDI "state of the art" ignition conversion for your new old-fashioned glo engine.

That busy day ended with the annual Bean Feed. Lots of hamburgers, cold draft beer, hot coffee, friendly conversation, and, oh yes --- beans.

Now for the kind of flying that goes on at this kind of event. Basically, the name of the game is endurance --- long flights. Get up as high as you can as fast as you can, but still abide by the rules. Well, you can live with rules. You can fine-tune your engine and trim your plane and perfect your flying technique. But there's one thing you can't control --- air currents. Winning times go to those who find the thermals and stay in them. Alas! The air at La Junta could best be described as all sink and no lift. Or so it seemed to most contestants.

The magnitude of this kind of contest is almost overwhelming. For example, there were 29 different events, including those for cabin, pylon, electric, compressed air, rubber power, glo, ignition, diesel, hand launched glider, and on and on. All of these events had to be flown off in three days. Sounds like a lot of time, but a lot of flying had to be crammed into the morning hours because the scorching heat made afternoon flying almost unbearable.

But it was almost like a time warp to look up and see frail rubber powered cabin planes with huge props slowly turning against the wind. Or majestic silk and doped free flight planes from the past, flashing the colors of the rainbow as they flew between you and the sun. Exhaust smells and sounds took you back to simpler times, when your only worries were school grades and your Model A. There were planes named Buzzard Bombshell, Zipper, Clipper, Playboy, and Flamingo. And engines with names like Golden Bee, Super Cyclone, Atom, and Torpedo. It was great!

I would have liked to have watched all of the flying events, but that was impossible, so I spent most of my time with the RC'ers. Rather than try to give a "flight by flight" account of the week's action, I will pass along some observations, impressions, and highlights of the activities.

First off, in spite of the heat, rough terrain, and uncooperative air, all the people there seemed to be enjoying themselves. They wore everything from skimpy bathing suits to floppy jump suits with club insignia emblazoned across the front and back. Intelligent folk, very few went bareheaded. Most wore variations of straw hats, baseball caps, and even Bedouin-like kaffiyehs to protect against the brutal sun.

Groups gathered under tents to drink Gatorade and swap stories and ideas. One pilot told about the fuel he uses. It's blended by a friend on the West Coast who works out of a basement laboratory, where he brews up a mixture that has to ferment for two weeks in a cool, dark place before it can be used. Tom McCoy brought down the good humored wrath of his buddies by disclosing closely guarded secrets on how to improve the performance of a tired Super Cyclone. And Gerald Martin blamed his poor flight times on the heavy grasshoppers that boarded his plane

Tom McCoy preparing to launch his Lanzo Bomber.

Buzz Averill getting a few more R's from the Super Tigre 29 in his Goldberg Clipper.

and changed the wing loading. Believe it or not!

The first official flight began on Tuesday at precisely 8 a.m. when Sal Taibi, a true pioneer from the early days, launched a Playboy cabin free flight.

The contest was on, and it was time to observe the flying and talk to some of the piolts. Like Joe Bashar, an old-timer from way back, who was flying the original 1/2A that he designed and built in 1940. The plane was beginning to show its age (Joe looked great), but the wing pylon, covered with nylon from a stocking pilfered from his mother's stocking drawer, was still intact.

John Bortnak from Calgary, Alberta, is a prolific builder --- he has built 22 planes since March and entered several of them in the Champs --- and a dedicated and skillful flier. He's determined too --- in just one day he walked nearly 15 miles across the burning sands around La Junta to recover his errant airplanes. It paid off. He won a handful of trophies, including a first place for hand-launched gliders.

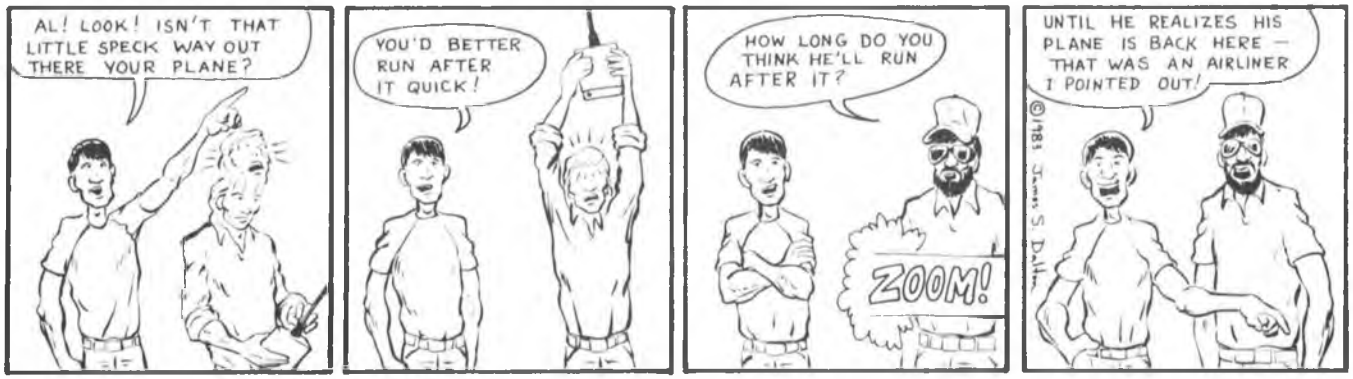
Another pioneer, Chet Lanzo, a genial soft-spoken gentleman from Ohio, who designed winning gas models in the '30s, was there with a collection of his still-winning designs. Chet designed one of the first successful radio controlled planes and won first place with it in the 1937 NATS.

I talked with an old-timer who worked for Bell Labs 50 years ago. He designed an R/C system using a telephone dial (now there's company loyalty) for a controller --- dial 1 for left, 2 for right, 3 for up, and so on. Now there was a challenge! Unfortunately, he ran out of planes and ideas before he could perfect the system.

I'll mention Sal Taibi again. Sal was a household name among modelers the world over back in the pre-war years, and he's still building and flying winning planes. In fact, one of his free flight planes flew so well it went out of sight. It might still be up

Chet Lanzo released Ralph Turner's K & B 40 powered MG-2 for another take-off.

FLYIN' FOOLS by Jim Dalton



there somewhere.

Just a few more names --- Ken Hinton and his wife Doris brought over a boat load of free flight scale models from East Anglia, England. Ken has attended four SAM Champs in the States. Jim Adams, editor of *SAM Speaks* --- the official publication of the Society --- chased his scale Fokker D-8 free flight for four miles to retrieve it. He won a first place trophy for his efforts --- for the plane, not for chasing it.

John Pond, that peripatetic secretary-treasurer of SAM, was busy on the flight line with his gigantic scaled-up Comet Zipper. And Dee Mathews, part-time plane designer and photographer and full-time dentist, was busy taking photographs for AMA.

There were interesting bits of action away from the flight line too. Free flighters riding bouncing trail bikes, trying to steer with one hand and clutch the airplane with the other. Bill Burleson running and leaping wildly into the air, trying to grab a loose wing which had been sucked up into the vortex of a swirling dust devil. Another dust devil victim, a bright orange Super Buccaneer, hung twisted and bent from an awning brace.

The final R/C event of the meet was the Texaco fly-off. Years ago Texaco Oil sponsored the event, hence the name. Fuel quantity is limited, flight time unlimited, high time wins. But, at La Junta, the flight time was limited to a max of 30 minutes, necessary because the high flight line temperatures were beginning to take their toll on pilots and timers.

Five people maxed 30 minutes: Gerald Martin, R. Williams, J. Kyncy, J. Percy, and Don Bekins, who won with a Gas Bird powered by an O.S. .60 4-cycle. His winning time in the fly-off was roughly 10.5 minutes, not very spectacular for a bird capable of hour-long flights. Blame it on the bad air. All sink.

The climax of the whole affair was the Thursday evening Victory Banquet, where 300 pounds of beef, 90 pounds of beans, and 80 gallons of beer and coffee (mostly beer) was consumed. There were the usual introduction and speeches — mercifully short — and a table full of trophy awards --- 200 of them! Don Bekins from Marine City, California, won the big one — the All Events Trophy — for the highest total points.

And to cap the very pleasant evening, Spencer Burtis, editor of the La Junta *Tribune Democrat*, promised to run a list of all the lost planes (free flights --- blame it on the wind) and the addresses of their owners.

A nice gesture. And a nice ending to a very interesting event. □

leave the batteries on charge indefinitely, being ready to fly anytime you want. If you have large packs or SR batteries, the charge rates are programmable up to 120 ma. LED's monitor proper operation.

The Chargemaster could be the only charger you'll ever need: 34K55 Ace Chargemaster kit, $36.95; 34K55C Ace Chargemaster ASBLD, $46.95. From Ace R/C, Inc., Box 511 Higginsville, Missouri 64037, (816) 584-7121.

HOBBY LOBBY GRAUPNER THYSSEN II R/C RIVER TOWBOAT

Thyssen II is an exact scale model of the existing river towboat which is powered by the patented Voith-Schneider Propulsion System (not included in kit). The model is 27" long with a beam of 9.9" and was designed from the actual plans of the full scale vessel. The hull, bulkwark, towing (pushing) knees, and super structure are all preformed to make a very good looking model in a relatively short building time. Full size plans and illustrated instructions show detail clearly. Kit contains 228 different items such as: #217-search light, #220-blue lens, #179-rail stanchion, 3-hole. Most of these unique fittings are injection formed plastic or pre-formed in some other way. Extremely detailed deck fittings set worth $59.00 included in price of kit. Hobby Lobby price is $129.00.

Also available, river barge for Thyssen II Towboat, 48" long, 9.9" wide. Thyssen II can push two or three. Price of barge — $47.90, (HLGR2148). From Hobby Lobby International, 1 Franklin Pike Circle, P.O. Box 285, Brentwood, Tennessee 37027. □

MONARCH 05

from page 159/154

times on how smooth the airplane moved and how responsive it was and yet it was extremely forgiving at times when he over-controlled or mentally got behind the model. After making his first unassisted landing, he turned around to us with a big grin and said, "Boy, that's great isn't it!"

After we had completed the basic flight testing of the model, it was decided to see how the model would perform on some of the more advanced maneuvers commonly performed with the higher performance sailplanes of today. The Monarch will perform beautiful loops and can be slow rolled using rudder and elevator. It will even fly inverted for extended periods of time using full down elevator with little tendency to fall off to one side or the other.

Conclusion:

In summing up the Monarch .05, we would have to give it a good rating in all categories. If you are a beginner in R/C, the Monarch .05 should make an excellent first model due to its simple design and rugged durability, in addition to excellent flight performance. So, if you are looking for a first model or perhaps even a model just for a change of pace, the Monarch .05 is an excellent flying aircraft that will provide many hours of enjoyment. □

SILENT POWER

from page 153/143

For information contact Dr. Paul MacCready at AeroVironment, Inc., Pasadena, California, (213) 449-4392 or Kay Morgan at AeroVironment, Inc., Simi Valley, California (805) 581-0601 or (805) 581-2187.

New Products From Astro Flight

Astro Flight has just realeased a new motor to replace the old 05 and 075. The new motor is the size of the old 075 with a new winding and two ball bearings. With six Sanyo cells 1.2AH, it's rated as an 05. With seven cells, it's rated as an 075. The bench test looks pretty good. It does seven minutes with a 7/4 prop with six cells at 11,000 rpm --- perfect for the sport flier.

We are also going to try a new helicopter motor soon. I have one in the lab, and it works very well on the bench. The helicopter motor is designed to operate on a tethered cord on 110 volts AC from the wall. It should make training easy and will permit long hovering flights, which are required to learn this aspect of R/C flying.

Well, that's about it for now.

Bob Boucher
President, Astro Flight

Pattern Flying

Keith Shaw of Ann Arbor, Michigan, began work on an electric powered pattern plane designed for the Keller 25-14 in the spring of 1983. The result is the "Coulombia." This is a "state of the art" aerobatic design which uses the NACA 2412 airfoil. It has a wingspan of 48" and a wing area

of 440 sq. inches. At a flying weight of 56 oz., the wing loading is 18 oz. per square foot. The Keller motor uses 12 Sanyo cells of 1.2 A.H. to turn a 9/7 prop at over 9,000 rpm. With rudder, elevator, aileron, and proportional motor control, virtually all pattern maneuvers are crisp. Keith has demonstrated the ship at a number of Midwest flying events, and has proven in a spectacular way that electric power can provide performance in pattern flight. The flying speed is in the 80 mph range, but Keith uses a Jomar SC-2 speed control to carefully optimize flight time by reducing the rpm on the downward leg of a loop, etc. The flight time is about 6½ minutes. The amazing statistic about this craft is that the RTF weight without radio and flight system is a mere 14 oz. Unfortunately, Keith does **not** have a set of plans for the model. He draws the patterns for parts on cardboard, and uses them as guides for cutting. Hopefully, we'll convince Keith to publish this beauty.

Tidbits

Astro Flight Micro Switch #4032 — $5.00

I've been using the Astro Flight #4032 Micro Switch on most of my ships this summer. This heavy duty unit is pre-wired with a male and female small molex connector and is servo taped to the side of the motor control servo. Full motor control turns on the micro switch and when you pull back on the power, the micro switch is wired to short the motor and stop the prop. This is especially helpful in sailplanes, and small pattern/pylon aircraft without landing gear. You can turn the motor on and off until the prop stops horizontally so as not to break your propeller. In addition, the glide of any model is superior with a stopped prop versus a free rotating prop.

Until next time, good flying. □

PIT STOP

from page 135/134

driving very well.

At the 3rd pit stop Ralph and Rody came in together, but Rody was out first. Rody continued to make time in the pits. This is when Ralph decided to gamble. He actually didn't have much choice. At the 1/2 hour mark Rody pulled into the pits and made a tire change. So did Rich Lee. Ralph decided to try and make the whole race on one set of rear tires. It was a good try, but it didn't work. Ralph gained about 15 seconds on Rody's tire change, but with the new tires Rody was going faster. The opposite was happening with Ralph. As the tires wore down, Ralph was going slower. As a matter of fact, Rich Lee was now going as fast as Ralph. Ralph didn't have to worry about Rody anymore. Now he had to worry about Rich.

As it ended, Rody won quite easily. Ralph was literally driving on the wheels at the end, but he did manage to stay ahead of Rich. It was quite an exciting race for the spectators and it was certainly a **fun** race for us. □

BIG IS BEAUTIFUL

from page 128/126

adapter to gain the necessary length. I had a longer prop adapter (3/8" longer) made up by a modeling machinist friend here. There are several good adapters available in a variety of sizes and many of them advertise in these pages. I don't doubt you could have one made up inexpensively by one of these suppliers, to do what I did for my Jaeger.

I can't recall having been as enthused about a model as this one for some time. It's a bit out of the ordinary, its moments are good (with the possible exception of the long nose) and, at a finished weight of around 20 pounds, it should be a really exceptional flying machine. The span of 80" is reasonable for transport, assembly requires the insertion of a dozen bolts which can be done in about ten minutes, so assembly is not a lengthy task. I'm really looking forward to flying mine, especially after having seen Walt Moucha fly his at both Ida Grove and Las Vegas.

A couple of friends of mine and I are trying a bit of an experiment and we'd like some input from you. We are going to be making a video tape of my well-known envelope covering method. This tape will show, in detail, the covering of the Jaeger with my Dacron sleeve method, including the ABS turtledeck. We'll cover everything, right from taking the measurements to final shrinking in place. We'd like to know what you think of the idea. Would you like to see a series of video tapes on the construction of large models? What kinds of things would be of value to you in such a series of tapes? Would you prefer to buy or rent such material, if available, and what do you feel would be a reasonable cost? The tapes are being done in a professional studio with professional gear and will be with sound and color. Your comments to me c/o RCM or to 9 Geneva Cr., St. Albert, Alberta, Canada, T8N 0Z3, will be appreciated.

See you next month . . . □

POWER BOATING

from page 118/114

turn the propeller at launch. I would guess that 9½" will yield best performance but only testing will answer your question. If you use 40% nitro you can try Octura X455 or 1462 propellers. Start with a 9½" pipe length and experiment to get the best results.

I do not recommend any timing modifications for the Picco 45 in your application. My columns in RCM dated August 1982, May 1983, and June 1983, outline all the modifications I use in my engine. Look these columns up to get the details. To summarize the following things are recommended to improve performance.

(1) Replace carb, use Rossi 65, OS7F or Martin carb with .390" throat.

(2) Modify backplate so that the drum rotor runs in a bronze bushing. This modification is for increased lifetime at rpm greater than 23,000.

(3) Replace rod with one that has a bronze upper bushing.

(4) Replace the rear ball bearing with a bearing that has a plastic retainer (K & B 3.5 bearing).

(5) Fit a cap saver ring to keep the head button tightly sealed. This may not be necessary if you use low nitro fuel.

These mods have really helped my engines. I hope you have similar results.

Well, that about does it for another month. Send your questions, comments and great ideas, etc., to the address at the end of this column. If you desire and answer before magazine publication, enclose a self-addressed stamped envelope so I may answer your letter by return mail. Howard Power, Hobbies Unlimited, 766 Broadway, Seaside, California 93955, (408) 394-1200. □

INFAMOUS FIGURE 9

from page 104

The macho pilot: "Well, you win some and you lose some. After all, if you're in this business you got to fly, fly, fly, and take what comes.

Tell you what. Think I'll b-build me a stagger-wing B-Beech. That Beech, that b-b boo-hoo hoo-hoo."

As The Other Club Members Viewed It

Club president: "Wouldn't you know it? All year long they leave their club T-shirts hangin' in the closet. And I'm the one that told 'em they couldn't fly if they didn't wear the T-shirt. Now, look at him, standin' over that re-kit job. Ain't no doubt as to who he belongs to."

Instructor: "After all those hours I put in with you? And, that was a year ago. I told you, and told you, and told you — when it's going away, back is up. When it's comin' towards you, back is up. Going that way, back is up. Goin' this way --- aw, what's the use."

Vice president: "Who, me? For the newspaper? Well now, I was over here drinkin' a, uh, coke, and I really didn't see it, but I'll say this, and I want it clearly understood. You can't tell what's gunna happen when you invite pilots from all over the country. Why, some of those yo-yos from the Midwest ain't flyin' with a full deck. I saw one of 'em --- what? It was? One of our club members?"

Club secretary: "Haven't we got an award for a thing like that? If we don't, we'll make one. How about 4 plus 5 award? Wait'll next meeting, we'll get him nominated all right."

Treasurer: "I'll tell you what, when it all sinks in, he's going to start doing some arithmetic. I'd better get those dues from him right now."

Safety officer: "I didn't see it. **Who** did **what**?"

Meeting program director: "Scratch one 'show and tell.' Who else can we get for the next meeting?"

Newsletter editor: "Listen to this. How does this sound for a start? Floyd Fender, local dentist and long-standing member of the club, broke new ground today."

Club historian: "Hey, wait a minute. Don't pick it up yet. I wanna get a picture. Get that nosewheel and firewall and the rest of that stuff and put it over here in the same pile. Now, lay that MonoKote back so we can see the battery pack and receiver. OK, now you — hey pilot — you squat right down behind the wreck. That's it, just a little to your left now. OK, now smile."

The know-it-all: "I knew it. I knew he'd end up in crash city one of these days. I tell ya', you just can't trust 'em, those waddyacullum, mode one pilots. Why, I was watching him the other day, and you know what? He pulled back elevator and his engine came near to a dead idle."

to page 195

INFAMOUS FIGURE 9

from page 193/104

Pilot's best friend: "Don't sweat it pal. You know, we all do that once in awhile. It happens to the best of us, especially when the plane is out of line like an old Hong Kong fish boat."

Another buddy: "Ole buddy, I hate to bring this up but, after all, those were my retracts on that plane. Now, if you could see your way clear, say by the end of the month to . . ."

Old-timer: "Slow down son, take it easy. I've been through this type of thing before. Tell you what you ought to do. You know what they say about fallin' off a horse? You gotta get right back on and ride. So, you just get your frequency pin, take that other plane you got there, that quarter-scale watchamacallit with the Kavan Continental, and you get out there and fly. Now, boy!"

As the Hobby Market Saw It

Designer of the crashed aircraft: "Strictly pilot error. You see, if you take Guisseppe's equation, and consider the span-wise loading . . ."

Designer of the crashed engine: "Five years in design, two years in prototype production, it hits the market and --- zip."

Radio manufacturer (responding to the irate pilot of the crashed aircraft): "Well, you can take your airplane and do the same thing, buddy."

The local hobby dealer: "Hey friend, that's a darned shame. But, actually you're lucky. Starting next Saturday, we've got Hot Stuff on sale."

Finally, From The Pilot's Faithful Family

His three-year old son: "Do it again, Daddy, do it again."

Grandpa: "You call that a hobby? Back in my day, we got the same results, only we did it a lot simpler. Ya see, we'd find us a good piece of soft pine, and then sharpen up the old knife, and then we'd set in the old porch rocker and . . ."

Wife: "Now, tell me again about that new camera I've wanted so bad."

Sixteen-year old daughter: "I could just die. Father makes me come out here every year to watch, and now he does this. Everybody's staring at him. I wish I could crawl in a hole. Mom, can I have the car keys?"

Six-year old son (with a tear in his eye): "Daddy, it's all right. Everything will be all right. Honest. I'll help you build a new one."

-- And now, dear reader, you have heard what the others say. What will **you** say if your plane flies the **Infamous Figure 9?** □

MYSTIQUE

from page 72

Engine:

A Supertigre .46 was chosen as the power source. With its stock muffler it is a quiet engine with sufficient power to haul this trainer upwards. A Sullivan 8 ounce tank fit into its compartment.

Radio:

Four channels of a Futaba 7 FGK provided the electronic link to the Mystique. There is plenty of fuselage room so installation is the normal three servos abreast set up.

Flying:

Three ounces of insurance (lead) was added to the nose and it was test flight time. There was certainly no mystery to flying the Mystique as it flew just like a .40 size trainer should — predictable and stable. With its symmetrical wing, it doesn't exhibit any of the trim variations that flat bottom wings are prone to. The landing gear (main) proved to be a little weaker than a .40 trainer should have. The installation of a cross wire took care of the tendency to bounce.

Conclusion:

The Craft Air Mystique meets its claims of being an easy to build and fly trainer. With its wood quality and hardware package, it becomes a recommended choice for anyone looking for a kit of this type. □

SOARING

from page 49/48

of opposite aileron must be held in low-speed high bank-angle turns. Once the pilot becomes accustomed to this technique it causes no difficulty. The improvement in rolling performance is well-worth it. I prefer some dihedral, even if it is only 1° per panel. The straight line stability and "grooving" in maneuvers suffers if there is none at all.

The tail moment will have to be fairly long to keep the vertical tail from being awkward in size. The limit on tail length is primarily one of appearance. One negative characteristic of these configurations, especially at the long tail extreme, is a tendency to a form of 'Dutch Roll' in turbulence. The tail wags back and forth and damping is not rapid. In power R/C aircraft this used to be called Quick-Fli wiggle, I believe. This behavior can be both confused and aggravated by rudder flutter."

★

Well, that's all we have room for this month. Next month we will conclude this sermon on aerobatic sailplanes with an interesting dissertation on mass distribution and its effect on flight characteristics. Get your tickets early, the hall will be crowded.

Catch you next month, all being well. Howzat! □

Cliff Tacie and prize winning Clipped Wing Cub. Cliff hails from Mt. Clemens, Michigan.

maneuver, best save, worst crash, and most realistic flight. Draw Poker and Spot Landing.

Some of the notables attending the rally were: Hazel and Maxey Hester of Sig; Beverly Goad of Indy R/C; Don Belote of the Toledo Weak Signals; and, from Bavaria, Germany, Franz Kavan, daughter Andrea and Helmut Dressendoerfer. Helmut did some fancy demo flying with his mighty Kavan powered Cap 20. On one occasion, during a low inverted pass, his horizontal stab hit a tree limb. He rolled it out just in time to land on the runway. The Kavan FK50 twin has exceptional power.

4-STROKE ENGINE RALLY

from page 45/44

on the evaluation of a corps of unannounced judges, prizes were awarded to the most spectacular

Ken Miller, Toledo Ohio, and 1937 Ohlsson Pacemaker-Enya .40, 5 lbs.

It was a gorgeous two days of relaxed, quiet flying. The attendance turnout was fantastic. Even the weather gods smiled down. Will it happen again next year? You bet! The Hawks and John Maloney will do it again!

Winners:

Pilots Choice

1. Duane Campbell — Wapakoneta, Ohio — 40% Pober Pixey.
2. Bob Karlson — Wilmington, Del. — F4F Wildcat.
3. Jerry Gardner — Fort Smith, Ark. — Cessna 310.

Best Save

1. Maxey Hester — Montezuma, Iowa.

Most Realistic Flight

1. Cliff Tacie — Mt. Clemens, Michigan.

Most Spectacular Maneuver

1. Bob Karlson — Wilmington, Del.

Worst Crash

1. John Cameron.

Timed Flight

1. Steve Jones — Kokomo, Indiana.

2. Norm Peters — Cicero, Indiana.

Spot Landing

1. Steve Ragsdale — Brownsburg, Indiana.

2. Vic Scott — Speedway, Indiana.

Draw Poker

1. Steve Ragsdale — Brownsburg, Indiana.

2. Steve Jones — Kokomo, Indiana.

Stand-Off Scale

1. Bob Karlson — Wilmington, Del.

2. Duane Cambell — Wapakoneta, Ohio. □

from page 43/36

screws installed from inside the fuselage into a piece of 1/8" plywood which I installed inside the pilot when I glued him together.

I used balsa wood stained with walnut stain for the instrument panel, and the instruments are made by Tatone. I also stained the former directly behind the pilot's head with walnut stain. Interestingly, everyone thinks I have used real walnut! (I fuelproofed the panel and former with clear Hobbypoxy.)

Set Up and Flying:

If you use a standard O.S. .25 engine you will need to keep your radio gear well-forward. My receiver and battery are under the fuel tank and the servos are in the forward part of the radio compartment. No weight was required to obtain the proper C.G. I used 1/4" square spruce for pushrods, but the NyRod type will work equally as well.

After all your gear is installed including landing gear, pilot, prop, etc., check the C.G. Move the radio gear or add weight to get the C.G. location shown on the plans. Control throws should be as close as possible to those shown on the plans for optimum aerobatic performance. If you are inexperienced, or aren't inclined towards wild aerobatics, then reduce the throws shown by 40% to 50%. The best prop is a 9/4 for the standard O.S. .25. The Rev-Up or Zinger props seem to work best. For the .40 4-stroke engines, diameters of 11"-12" and pitches of 6"-7" will put you in the ballpark.

As far as flying is concerned, the Terrier is very docile and quite easy to handle. When flying very slow it is advisable to use rudder along with ailerons to counteract the adverse yaw from the ailerons. (This results from the high drag of the wing with the down aileron, which causes the plane to turn opposite the direction you want to go. Its effect is more pronounced at slower airspeeds.) Take-offs are done by applying full throttle, holding about 1/3 up elevator, and steering with rudder as needed. Snap rolls are best done using ailerons, rudder, and elevator, although they can be done with only rudder and elevator. Spins look best using only rudder and elevator (and low throttle, of course), but can be done faster using ailerons, rudder, and elevator. Also, remember that when flying upside down and doing inverted maneuvers, your stall speed is higher than it would be if you were flying upright. Landings can be either three-point or wheel landings — both are easy to do. I won't go into aerobatic maneuvers since these were described in detail in the first part of the article. If you intend to fly off grass, I suggest you go to 3½" Trexler Air Wheels and a Schnuerle .25.

After a few hours time with the Terrier, I think you will find that it is one of the most fun to fly aircraft you have ever flown; I know that I have. If you have comments or questions, feel free to write me in care of RCM (please send an S.A.S.E.) Have fun! □

plus the best single finals flight with eight judges used. Placements did shuffle a bit, however, after the finals with Brown moving from 4th to 3rd, Matt moving from 6th to 5th, Kristensen moving from 3rd to 4th, Akiba moving from 7th to 6th, and Helms moving from 5th to 7th.

Placements are shown in Table A.

TABLE A

Prelim	Final	Final Score %
Prettner	Prettner	100%
Lossen	Lossen	97.33%
Kristensen	Brown	96.54%
D. Brown	Kristensen	96.13%
Helms	Matt	94.93%
Matt	Akiba	93.17
Akiba	Helms	92.79%

The competition would not have been possible without the considerable volunteer help — most notable was Ron Chidgey whose brainstorm spawned the Pensacola event. Contest Director Ray Fritz, together with his assistant Tony Stillman, plus the many volunteer workers did a fine job to assure a happy occasion for all. □

FLYING LOWE

from page 35/33

The local modelers are certainly blessed with many choices of flying sites. Weather was outstanding the week before the contest — but then a stationary front moved in to threaten flying schedule and to put a damper on things. In spite of low clouds and rain on occasion, flying was completed on schedule with every competitor getting his four preliminary, and the seven finalist two additional rounds. Final placings were established by the addition of the best preliminary round in front of each of two sets of judges

AQUA SPORT

from page 29/24

take-off is not convenient. It takes a longer take-off run, but it beats getting wet in a cross wind attempt.

Taxiing is done with lots of rudder and on-off blasts of the motor. I have used a water rudder, but the extra drag is too much on take-off, and the water rudder is of use only at slow speeds anyhow. If the wind is too stiff to use the air rudder and the plane insists on weather vaning (points into the wind), just turn off the motor and let it sail into shore. It takes longer, but it works just fine. The real ones have to do that occasionally too.

If you use the wheel option, take off from pavement, not grass, or, alternatively, hand launch. Both versions do nice rolls, especially to the right; just pull the stick back into the right corner, and watch out! Loops require a little dive to build up speed, then lots of up elevator. The float version tries to roll out at the top of a loop due to the weight of the floats, so be quick on the rudder, or you will get the world's largest barrel roll! Touch and goes on water are a blast, and really pretty to see. Turn off the motor, come in fairly fast, skip (no power), then as the plane comes up on the skip, turn on the motor and go. You can do that all day! Nothing beats a float plane for fun --- let's go! □