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RCM radio control MODELER

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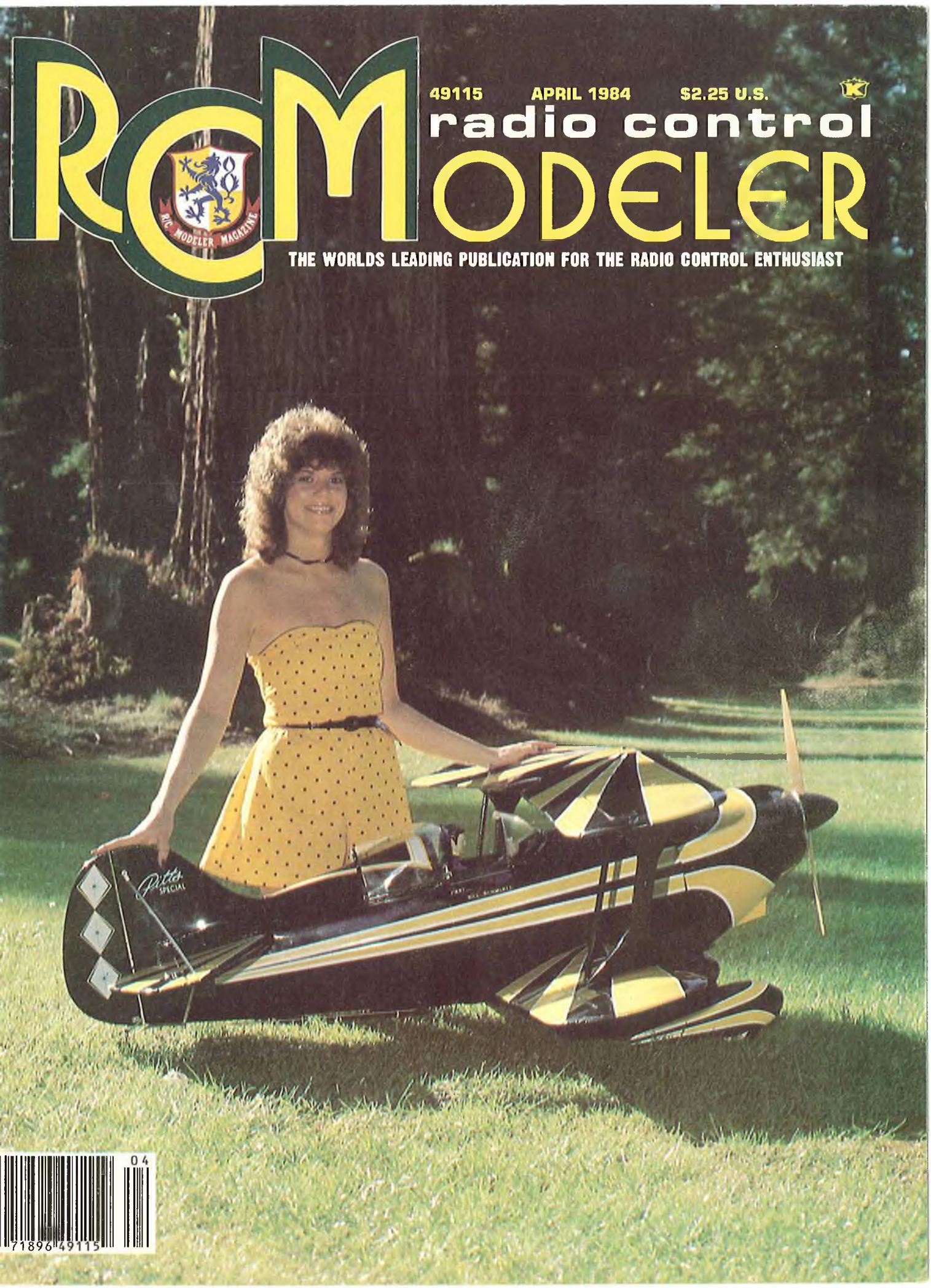

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R/C MODELER

THIS MONTH'S COVER

features a Byron Originals' Pitts S-1 built by Bill Schwartz. Powered by an E & R Revised Quadra, the Pitts utilizes a Futaba 6 channel radio. The model is Debbie Schwartz, Bill's daughter-in-law, a cosmetologist, part-time model and flier too. Photo shot at the Brooktrails Golf Course in Willits, California. Ektachrome transparency by Geron Marcom.

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FROM THE SHOP

RCM Staff

The RCM Incentive Award for the Challenge to the CA Industry has been increased with this 1000 yen note from Bob Smith, Longmont, Colorado.

In answer to our challenge to the CA industry, we received the following:

Dear Editors and RCM Staff,

Having pried my fingers apart for the fifth time this morning after cleaving a clogged CA nozzle, I am compelled to respond to your "From The Shop" column in the December '83 issue of RCM.

Your "challenge" to the CA Industry to come up with a non-clogging nozzle is a stroke of genius and should not be passed off lightly. Few advances in technology would be more welcomed by modelers.

To that end I propose you establish an "RCM Prize" for the company or individual that comes up with the solution. I am enclosing a 1000 Y note (hard to spend in Colorado) to raise the stakes above the 50 Y you offered as a reward. Please let me know when you have a winner as the skin on my fingers is beginning to wear thin!

Bob Smith
Longmont, Colorado

★

We received this interesting approach to learning float flying from Bob Swearingen.

Dear Sirs,

In Minnesota, float flying is great with our ten thousand lakes. I find float flying off of snow is a good way to learn, because it's easier than getting off of water. I find flying off of snow is a good way to find out how the aircraft handles with the added drag.

Once the airplane is trimmed out by snow flying, then it's ready to get its feet wet. Both pictures were taken November 10, 1983, before the lakes froze up.

The aircraft is a Falcon 56 wing, a Kadet body, with B.J. foam floats. B.J. foam floats added very little extra weight, and are the best floats I've ever used. They required a little extra work to cover, but it was worth it.

Yours truly,
Bob Swearingen
St. Paul, Minnesota

★

Original Wright Propeller Donated To Air And Space Museum

An original wooden propeller from the 1903 Wright Flyer was donated to the Smithsonian's National Air and Space Museum as part of the 80th anniversary celebration of man's first flight.

Wilkinson Wright of Dayton, Ohio, a grand nephew of the Wright brothers, presented the propeller to Museum Director Walter J. Boyne on December 15, 1983. The ceremony, open to the general public, took place in the museum's Milestones of Flight gallery under the original 1903 Flyer suspended from the ceiling.

"The design of the propeller," Boyne said, "was one of the greatest achievements of Orville and Wilbur Wright. The brothers, with their outstanding talent, understood the importance of the propeller as a type of rotary wing. With this and other discoveries, they were able to leap three or four giant steps ahead of all contenders, solving problems that had baffled more formally trained men for more than a century."

The result: On December 17, 1903, near Kitty Hawk, North Carolina, Wilbur and Orville Wright made the first controlled, sustained, heavier-than-air flight. In all, four flights were made that day, the longest covering 859 feet in 59 seconds.

After those first flights, a strong gust of wind knocked over the Flyer, and the craft was shipped back to Dayton in pieces. One of the two propellers is now in the collection of the National Park Service. The other was retained by the Wright family.

The two propellers currently on the 1903 Flyer at the Air and Space Museum are replicas of the original propellers prepared by Orville Wright.

The propeller that was donated December 15, measures almost 6 feet in length. It was fashioned by the Wright brothers themselves out of spruce. After Orville's death in 1948, the propeller was transferred to the Wright family as part of the estate and kept in Kettering, Ohio.

The National Air and Space Museum is open to the public seven days a week from 10 a.m. to 5:30 p.m. (Closed December 25.) Admission is free. □

Bob Swearingen, St. Paul, Minnesota, enjoys float flying.

This is the way Bob learned to fly with floats. See text.

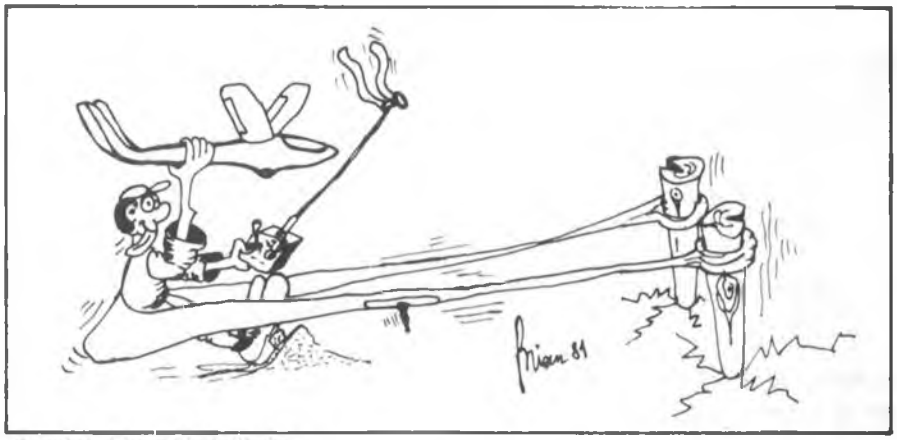
SOARING

Al Doig

Received a letter and pictures from John Dvorak, San Jose, California. John sent a picture of his "Freedom" with the new "Swingee" aileron mechanism. These little rascals change the in-out motion of the pushrod to up and down aileron movement. I've not seen one yet, but John says, "The Swingees have provided good control thus far in my Freedom during fast aerobatic maneuvers."

★

I just talked to Dan Pruss who attended the CIAM meeting in Paris in December. The next World Soaring Championships are now set for Adelaide, Australia, starting either the 6th or 13th of April, 1985. To me, the 6th seems highly unlikely as the 7th is Easter Sunday. I've heard some concern expressed for the attendance at a contest held in Australia. From Europe it is almost exactly on the other side of the world and the air fare is quite expensive. From the U.S. the travel time is about 24 hours and present cost of a tourist ticket is around $2000, though there are pre-purchase plans that reduce the price to $1600. Since the seasons are reversed, the Australian winter corresponds to our summer, making the normal August or September dates rather chancy, weatherwise;



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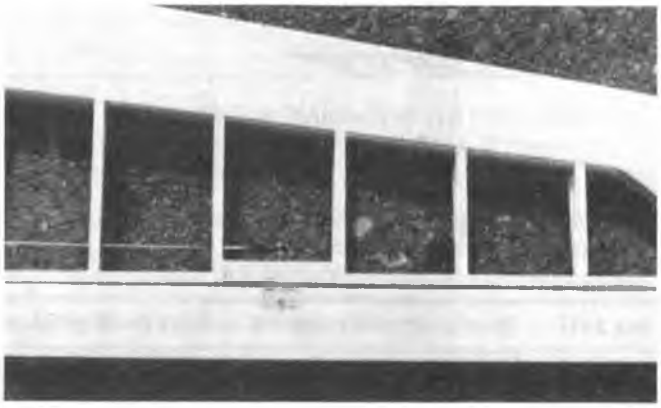
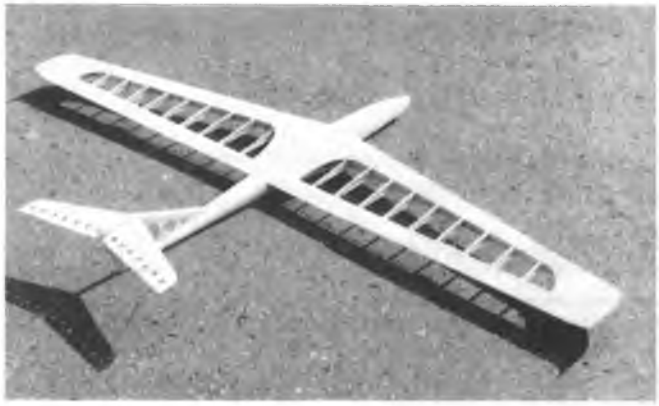
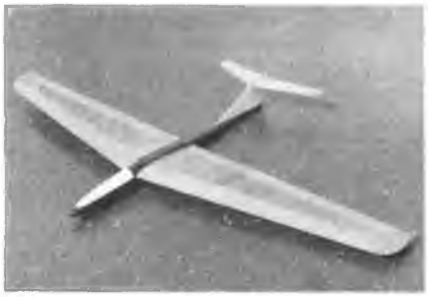


"Swingee" aileron mechanism installed in the wing of John Dvorak's "Freedom" slope soarer.



Uncovered "Freedom" by John Dvorak, San Jose, Calif.



"Freedom" when covered — John Dvorak, San Jose, Calif.

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Did you ever wonder what an English glider pilot's workshop looks like? Here's David Rye's, Somerset, England.

David Rye, Somerset, England, and his "Durex," big eh?

hence, June which is their fall, may be a better selection. A date this early in the year may be inconvenient for some contestants.

However, I personally think the selection of Australia as the site of the 5th R/C World Championships is reasonable. Because of the distance, no one ever wants to go to Australia for a meet, so if the Aussies want to compete, they are the ones who always must travel half way around the world. While some potential competitors may not come for one reason or another, be it financial, political, or what not, I think all serious organizations will find a way to field a team. And, I'm sure those who do attend will find a warm welcome "Down Under."

A couple of problems face the U.S. in its quest for the next World Team Championship. The first one, that of team selection, was outlined in the February issue so I won't dwell further on that problem. The second is financial. If you think the AMA pops for a lush safari to these exotic places, think again. It is my understanding that the AMA pays air fare from New York and sustenance for the period of the contest. Someone else must pay any additional costs such as a practice period before the contest, local transportation, etc. The 1983 U.S. Soaring Team apparently went to England without enough money to pay their way out, thereby creating untold trauma (an unpleasant experience that affects the mind or nerves inducing hysteria or the like).

In discussing the situation, I find that no one had a very clear understanding of his responsibilities. Is the Team Manager solely responsible for collecting and disbursing the funds? What is the financial responsibility of the team members? The support personnel? Who decides what? A set of guidelines in this area is badly needed. If contributions are needed from any of the traveling personnel, or from anyone else, they should be in hand prior to departure. And the estimated money needed on site should be pinned to the shirt of the disbursing officer as he boards the plane. Enough of that — on to the dull stuff!

★

In the last issue I published a few criteria for aerobatic slope glider design which also would be of interest to the thermal sailplane designer. These thoughts were originally published by Ken Banks in the "Journal of the Torrey Pines Gulls" back in 1979. I promised to continue Mr. Banks' thoughts this month with his dissertation on mass distribution, and its effect on flight characteristics. So, here we go; hang on:

In aerobatic aircraft the distribution of masses is an important consideration in performing smooth consecutive rolls. Although these matters are less critical in other types of aircraft, mass distribution can still affect handling. The basic problem is that when rigid bodies rotate, in general the axis of rotation moves about in the body, usually in a fashion that makes the rotation appear "wobbly" and sometimes with the axis of rotation diverging from the orginal axis. However, bodies have three orthagonal principal axes about which they will rotate without wobbling, and if the rotation takes place about an axis close to one of these principal axes, the wobbling and divergence will be lessened. In an aircraft, these axes correspond approximately to the yaw, pitch, and roll axes, and the details of behavior depend on the relative magnitudes of the moments of inertia about these axes. Roughly speaking, the more mass there is farther away

from the axis in question, the greater the moment of inertia. A dumb-bell has a greater moment of inertia about an axis perpendicular to its handle than it does about one through the weights and handle.

The axis with the greatest moment of inertia is the yaw axis (both the wing and fuselage have masses at a distance from this axis). Motion about this axis corresponds to a flat spin. Without aerodynamic forces, motion about this axis is stable in the sense that small deviations of the axis of rotation from the principal axis do not cause the axis of rotation to move farther away from the principal axis, (there is no divergence) although there can be some wobbling. It is well-known that recovery from flat spins is difficult, and this stability is one of the reasons.

On the other two axes, the motion about the one with the ***least*** *moment of inertia is also stable, while motion about the one with the intermediate moment of inertia is unstable in the sense that if the axis of rotation deviates from this principal axis, the axis tends, without further influence, to deviate farther and farther away (although aerodynamic forces may limit how far it deviates). These other two axes correspond roughly to the pitch axis and the roll axis. The moment of inertia about the roll axis will be larger than that about the pitch axis for aircraft with long span, heavy wings, and short fuselages, making these aircraft less capable of smooth consecutive rolls. (Aerodynamic forces — from the tail — prevent the roll from diverging completely.) Going too far in the other direction is not desirable either, as it could introduce difficulty in pitch maneuvers, and the proper balance in moments of inertia here is really an empirical question, beyond knowing that a short-tail, long-span aircraft is not likely to perform consecutive straight rolls well.*

Regardless of the relative magnitudes of the moments of inertia, the difficulties (wobbling and divergence) discussed above will be lessened if the roll axis corresponds as closely as possible to the associated principal axis of the aircraft. The location of the principal axis is determined by the location of masses in the aircraft and, roughly speaking, can be considered a line through the major masses in the fuselage. The masses which need to be considered are the radio (especially the battery), the nose weight, any ballast, the wing and the tail. Now consider the not-uncommon shoulder wing configuration, with a stylish drooped nose and a flying stab mounted part way up the vertical fin.

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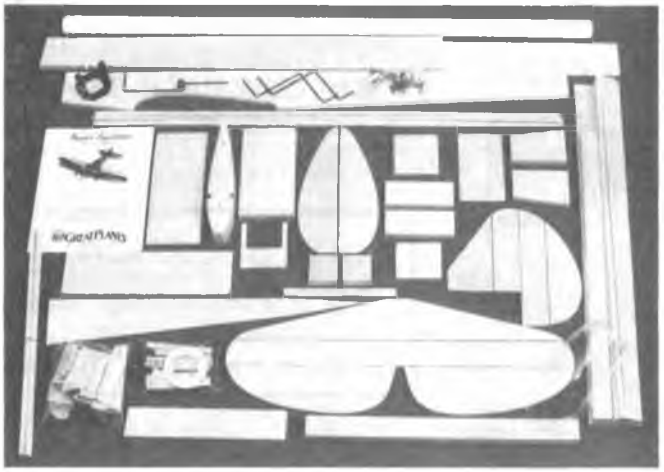
RCM PRODUCT REVIEW

Great Planes Model Mfg.
SUPER SPORTSTER 60



SPECIFICATIONS

Name	SUPER SPORTSTER 60
Aircraft Type	Sport low wing
Manufactured By	Great Planes Model Mfg. Co. P.O. Box 721 Urbana, Illinois 61801
Mfg. Suggested Retail Price	$86.95
Available From	Retail Outlets
Wingspan	61½ Inches
Wing Chord	11 Inches
Total Wing Area	675 Square Inches
Fuselage Length	48 Inches
Stabilizer Span	23½ Inches
Total Stab Area	82½ Sq. In.
Mfg. Rec. Engine Range	.45-.61
Recommended Fuel Tank Size	12 Oz.
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage:	Balsa, Ply
Wing:	Balsa, Ply
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (23 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Futaba FP-6FGK FM
Engine Make & Displacement	H.B. .61 PDP
Tank Size Used	12 Oz.
Weight, Ready to Fly	116 Oz.
Wing Loading	24.7 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Excellent instruction manual, wood quality, wheel pants, performance.

WE DIDN'T LIKE THE:
No faults.

Great Planes Model Manufacturing has increased the size of the previously released Super Sportster 40 to give birth to its big brother, the Super Sportster 60. This sport model offers pleasing lines and the unusual choice of either a tail dragger or a tricycle gear configuration. The box, measuring 48½" x 7" x 3" is fully packed with wood and accessories. Nothing gets damaged in shipping because there isn't any room for anything to move about. Hardware is bagged separately, as are the small wood parts. A pair of heavy plastic wheel pants are included in another bag.

Construction:

The 38" by 53" plans show only one wing panel, which is the first one to build. The other wing panel is then built upside down over the plans. Be certain to think while doing this, particularly in regards to the placement of the landing gear blocks. It would be embarrassing, not to mention aerodynamically unwise, to wind up with one landing gear on top and one landing gear on the bottom of the wing.

The 22 page instruction manual is very well-done and contains many clarifying photographs. All parts were of excellent quality and the fit of the machined parts was perfect.

The tail section is all solid balsa with the fin and rudder being 1/2" balsa and the stabilizer and elevator being 3/8" balsa. The thickness of the stab and elevator allowed use of the Robart hinges, but use only the type with the steel pin.

The initial step in building the wing is to decide which configuration you prefer and cut the landing gear block notches accordingly. Everything else is what you would expect from a kit with a wood, built-up wing. The spars are a very healthy 3/8" x 1/2" balsa with accurately cut notches to locate the ribs. An appreciated feature of the wing was the wedge rib used to butt glue the two panels together. Instead of setting the root ribs at an angle, they are installed upright and the wedge sets the dihedral when it is glued to one end of the panel.

The fuselage is a very solid structure with all balsa except for two ply bulkheads. Following the illustrated steps in the manual leads to quick construction of the fuselage. Carve a little on the front end and upper front area and it's ready for covering. The turtledeck is formed with 1/4" sq. balsa stringers from the rear of the cockpit to the front of the fin. Replacing these with equally sized spruce might be a consideration.

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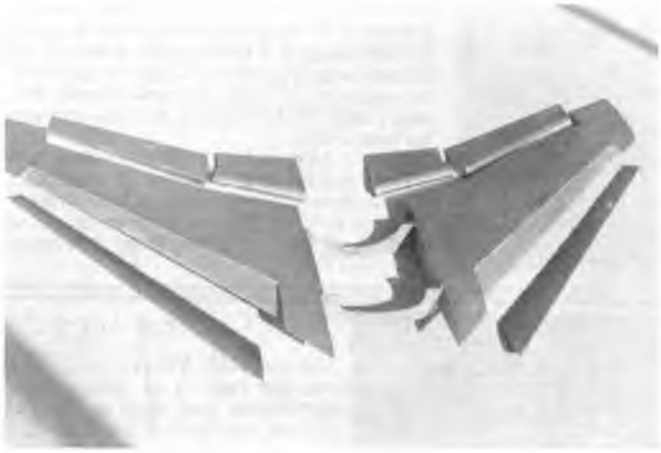
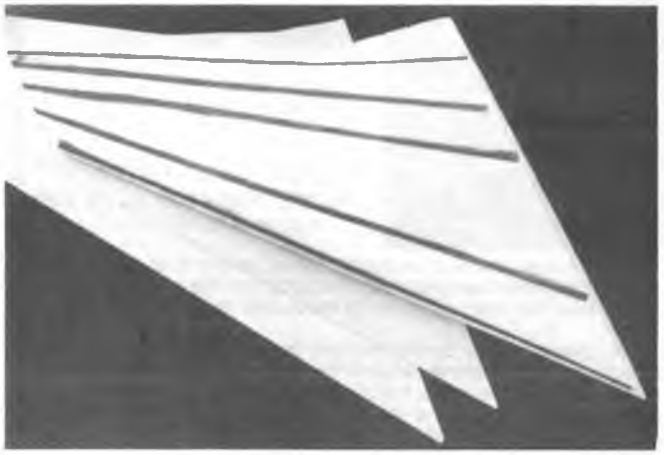
SCALE VIEWS

Col. Art Johnson



When you cut a thin foam wing up into this many pieces, ordinary construction techniques will not hack it.



Strips of carbon fiber tape from Dave Brown Products are squeegeed to foam using Hobbypoxy 2. Take care when you separate the tape into thinner strips and brush thinned epoxy from center out.

Jets Are Different:

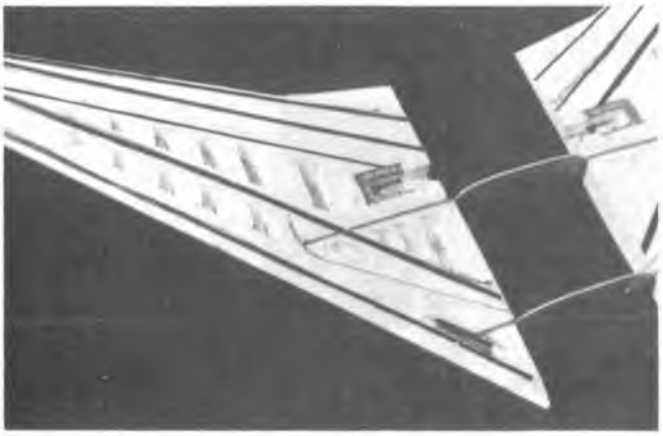
About a year ago in an article on flight realism of prop type aircraft, I mentioned that most of the information presented would not apply to jet aircraft. In fact, the operation of jet engines and aircraft is so different that about the only part of the article applying to both is the basic calculation of model speed as compared to the full size counterpart. Your model should still fly at the same speed as the original divided by the scale, if it is going to look right to the flight judges.

Thanks to the efforts of companies like Jet Hangar Hobbies and Byron Originals, models of jet aircraft powered by ducted fan engines can do a pretty good job of simulating jet flight. Kits from these companies have put jet type models in the hands of the average scale modeler and we are seeing more of the jets at contests and at Sunday flying sessions. The large turnout of jet models in the Sportsman Sportscale class at the '83 National Championships gives evidence that they can be handled by other than the experts. In fact, I would say that some of these jets can be flown by just about any modeler competent to fly a sport plane like the Sig Kougar. The ducted fan systems used to provide the push for these models can hardly be described as jet engines; nevertheless, anyone who has seen Tom Cook's twin fan engined F-4 fly, knows that this type model can very closely simulate the flight of the big fighter.

So what is different about jets that can help a scale modeler fly in a more realistic manner? A number of things but the most apparent is speed. Anyone who has seen jet and prop fighters perform at an airshow knows that the jets have a far greater range of speed from landing speed to flat out. A good WW II fighter might touch down at 85 mph and hit a max cruise of 330 mph at sea level for a speed range of about 245 mph. A Navy A-4 Skyhawk, which is not a fighter but a subsonic attack bomber, might range from 150 mph to .9 mach or 685 mph at sea level, a spread of 535 mph. A supersonic fighter can hit around 1.2 mach or 915 mph at sea level for a variation of 765 mph or more than three times the speed range of the WW II fighter. When we divide these speeds by the scale of a typical ducted fan model of a jet fighter, we come up with model speeds that are well within the capabilities of current fan power plants. For example — a 1/8 scale model of a subsonic fighter (F-86 typical) should touch down at just under 20 mph and top out at around 85 mph. A supersonic fighter at 1/8 scale like the F-16 Falcon could get up to 114 mph simulating a mach 1.2 low level supersonic pass but it would not be a very realistic maneuver. Low level supersonic flight is prohibited in this country over populated areas. Even the supersonic F-16's of the USAF Thunderbird team perform their shows at subsonic speeds to avoid possible damage claims from sonic booms, and the Navy Blue Angels A-4's cannot go supersonic.

The higher speed range of jets makes it easier to fly models built to a smaller scale. A 1/8th scale model of a WW II fighter should never fly over 50 mph while that is the right model speed for a 1/8 scale jet entering initial for the landing pattern. Only the smaller models of jet aircraft are likely to fly too fast for realism while this is a common problem with models of WW II aircraft built to less than 1/6 scale.

Engine operation for jets is also a lot different from that of piston engined aircraft. The five minute full power limit for most prop fighters does not apply. Jet engines can be operated for extended periods at full throttle even with the addition of afterburner on top of 100 percent power. The modeler can forget about pulling the throttle back to simulate the full scale plane. I doubt if a flight judge watching a full size jet has any idea what percent power the pilot is using. He certainly cannot tell from the sound — well — maybe it would be hard to miss the afterburner! Jet engines are throttled back to save fuel and at the rate fuel goes through



You need the tape on both sides to do any good. Spars are laminated from lite-ply, carbon tape or magnalite and 1/64 ply. Super strong and light.

The business end of Tom Cook's 1983 National Champion Sportscale model of the F-4 Phantom. Tail cone opens to release drag chute — afterburner nozzle in full power open position.

most model fan engines, the jet model jockey might want to throttle back for the same reason.

The high speed of jets has led to the development of a large variety of lift and drag augmentation devices to permit the clean birds to slow up and land in a reasonable length of runway. Duplicating some of these functions for the ultimate in realism on a model of a jet can be a challenge. On the piston engined aircraft you did not have to worry about installing speed brakes, leading edge slats, flying stabilators, drag chutes or afterburner eyelids that change shape in flight. Enough mechanical options to use up the channels on our best R/C transmitters and some of these are not really options, they are essential if the model is to look and fly right.

Retract gear and flaps are pretty standard on most jets and some even have tailskids just like an old Fokker. The difference is that they retract and are there only to save the tail section in a nose high landing. The thin wings on jets cause all kinds of problems in the design of retract gears. Some go into the wing but more retract into the fuselage. They may retract forward, backward or sideways and one or more gears may rotate as they go up. Did you know that the main gear on the A-4 Skyhawk rotate as they go up just like the gear on a P-40 or an F4U Corsair? The nose gear does the same on the F-86 and all three gears rotate as they retract on the F-16. Enough problems to drive a modeler nuts if he is looking for top scale points.

As scale modelers build more realistic jets, they may want to look at possible changes to the AMA competition rules. Right now, ducted fan models are recognized as different only by the rule that exempts them from using mufflers. This rule is probably not needed any longer as the muffled tuned pipe has become almost universal for the fan engines. The rule that allows changes to the business end of prop engined models between static and flight judging does not help the modeler of jet aircraft. Maybe we should allow the scale jet builder to change the business end of his model under the same principle? For example, an afterburner cone with the eyelids closed might be used for static judging and later changed to one with the eyelids in the take-off power position for flight. (I suspect that it will be some time before anyone figures out a way to burn raw fuel in the tail pipe and operate the eyelids in the air to simulate operation of a real afterburning jet engine.) A change of this kind in the rules would serve the same purpose as changing the prop for flying on a piston engine model, i.e., it would make the available power more efficient. At the same time it would improve model appearance in both the static and flight modes.

We may want to change other rules in the interest of safety. An AMA prop nut would not make sense on a jet model but there are other pointed objects sticking out of some jets that could be a hazard. The pitot tubes on many jets are real spears. When reproduced in metal as they normally are, these long tubes could inflict a serious wound even if the model only hits someone while taxiing. Perhaps we should allow or require such items

Jets have rivets too! This is blow and go end of full size F-86F — subsonic fighter without afterburner.

to be removed for flight. They are usually of small diameter and difficult to see in flight so their absence would not appreciably affect scale appearance.

So far we have talked about the flight operation differences between jets and prop aircraft. Anyone who has built a model of a jet knows that construction techniques are also a little different. Weight is far more critical in a jet model than in a prop engine powered model. Anything that will increase strength while reducing weight is worth trying. I mentioned the new carbon graphite fiber materials in a previous article and have since used them in several models. The photos with this article

Larry Epifanio added dihedral to the tail of his F-86 from the Byron kit to match the F-86F configuration. Like most military aircraft, there were many different models of the F-86.

Velcro straps make installation and removal of saddle tanks in a ducted fan model easy. Straps go around tank and are glued to fuselage side. Vibration proof but easy to separate.

show one way to greatly increase the strength of a very thin foam wing without adding much weight. In this case, the Dave Brown type graphite fiber tape was epoxied to the foam in locations where it would improve the bending resistance of the wing, slats, flaps, and ailerons. Thin Magnalite material was epoxied between strips of 1/16" and 1/8" balsa to add strength and ding resistance to the leading and trailing edges. In addition, the spars connecting the wings were made by laminating lite-ply carbon fiber tape and 1/64" ply with Hobbypoxy 2. The result is a very strong, rigid, but still lightweight, spar. For many years I was of the opinion that a built-up balsa wing would always be lighter than the same wing built with foam core. Now I am not so sure. With the new materials, a foam wing can be made strong and light and there is no doubt that it is easier to build. With graphite fiber reinforcement, the foam wings can really be tough.

Fuel capacity is always a problem with the voracious appetite of the ducted fan engines. Many scale models of jet aircraft use more than one tank to provide sufficient capacity without using up all the space in the fuselage. Installing these tanks so they can be removed for checking is not easy but recently Larry Epifanio, one of our local scale jet enthusiasts, put me onto a great idea. The tanks are installed with strips of Velcro wrapped around the tank and epoxied to the fuselage along part of the strip. The Velcro ends are wrapped over to lock them where they can be pulled off to release the tank for removal. They hold the tank firmly under vibration and still permit instant access. One

inch wide Velcro can be purchased at most cloth or sewing shops for about a buck a foot so the cost is reasonable. A piece of foam attached to the back of the tank with servo tape will further insure against slipping within the Velcro straps.

New Scale Rules for '84-'85:

The new AMA rule books should be out by the time you read this. You will not see many changes that affect R/C Scale competition. There were not many changes proposed for the last rules change cycle and only five of these were approved that will apply to scale events. None of these involve major changes to the scale events as flown for the last two years. Several of the changes clarify points that were in the rules but glossed over to some extent. For example, judges must pay more attention to the list of parts not built by the competitor. This was required last year but now you will lose all craftsmanship points unless the list is in your presentation.

Another change was made to tighten judges interpretation of landing downgrades. For many years we have known that we were operating scale models from runways that, in many cases, were too short to realistically land some of our models. In other words, the models were scale but the runway was not. In some cases the scale factor was so far off that the model should have been downgraded for realism if it did land and stop in the unscale length available. Now judges must take this factor into consideration and not penalize a pilot for what happens when he runs off the end of a non-scale runway.

I was a little surprised to find that during the rules cycle deliberations of the contest boards over the last two years that no one had submitted a proposal to increase the weight of models allowed to compete in the Giant Scale event. Apparently none of the competitors who submit proposals for change saw a need for an increase. For the next two years the maximum weight allowed for Giant Scale competition will remain at the current 40 pounds. Maybe this weight limit is not too restrictive as all of the many Giant Scale models flying successfully at the last National Championships weighed in under 40 pounds. In any event, this will not prevent anyone from flying his 40 to 55 pound Giant Scale model at an AMA sanctioned fun-fly, but if your model does not fit within the limits for the AMA competition event you want to enter, better build one that does or put your oar in during the next rules change cycle.

On the rules change proposals, I noted that the proposal to award bonus points for a scratch-built model was not passed by the board. I think I know what the author of this proposal had in mind but if static judges pay attention to the list of parts not built by the modeler, the "do it yourself" modeler should make out okay in the craftsmanship area. That is the purpose of the rule that requires a modeler to state the fact that he built his model using a fiberglass fuselage from some other craftsman's mold. If static judges are on the ball, there should be no need for bonus points to reward the builder who did it all himself as compared with the builder who's model reflects the outline and surface detail craftsmanship of some other guy who produced the original mold. Aside from that, however, the term "scratch-built" is another of the most misused words in the scale modeler's vocabulary. More than almost any other term in common use, it can mean different things to different people. "Scratch-built" should not be confused with the term "original design" as it was used to identify modelers eligible for bonus points when the Sportscale rules were first published. At that time an "original design" defined an original drawing of a scale model produced by the builder who then built his model from his own design. The term "scratch-built" has generally been applied to a model built from someone else's drawing, either from a published plan or from a kit, with the modeler building with materials he obtained from the hobby supplier rather than from a kit. Unfortunately there are all degrees of scratch-built, varying from those who claim it is scratch-built when the punk or hardwood from the kit was replaced by wood from the hobby shop, to those who actually build everything themselves from a published plan and even modify the plan to some extent. With the term encompassing all degrees of craftsmanship, it becomes a useless word to a static judge so the contest board has wisely decided to stick with the more positive description of what the builder did not do rather than what he did. Just make sure that the right list is in your presentation when you get ready for the contest season. A zero for craftsmanship could ruin your whole day.

Transmitter For Scale?:

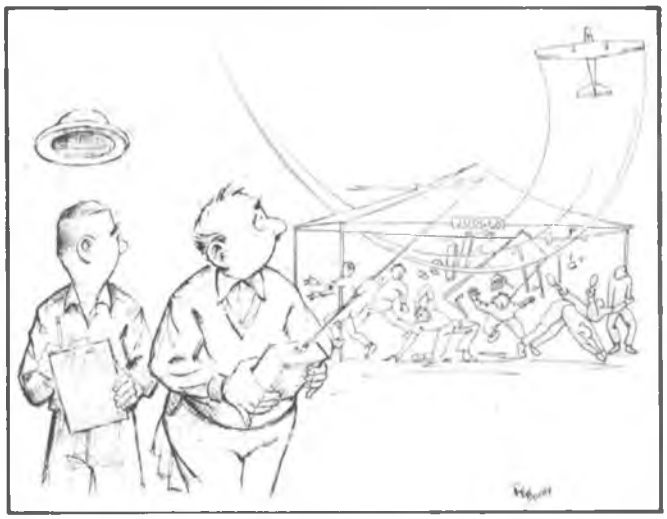
Futaba does not list it this way but their new PCM 8SGA system certainly has all the channel selectors and switches in the right place for scale flying. This is the first new transmitter that I have seen with all the auxiliary switches at the top and at the sides on top where you can operate them with a finger without removing your thumbs from the sticks. The set-up is perfect for pickling the bombs or tanks off at low altitude or hitting the drag chute release on landing. So far I have handled the Futaba PCM only in the dealer's shop, but even in this hands-on examination it looked as though it would be a good choice for the more complex scale aircraft. The servos have plenty of torque even for big birds and the adjustment and mixing features seem almost unlimited. If the new Futaba works as well as it looks it should be a great radio for serious scale modelers.

See you in Toledo? □

CUNNINGHAM ON R/C

Chuck Cunningham

From Norwich, New York, David Crouch, John Wright, and Jim Wright shown with their RCM Big Bird Too's (RCM plan #849). Jim still has a few things to do to complete his.



"Ah . . . what did you call that one?"

Son of a gun. Here it is coming into spring, and all of those good intentions that you had have almost evaporated — haven't they? I know that I haven't built nearly as many models, or drawn as many plans, or researched as many scale aircraft, as I had planned to do this winter. I'll bet that you haven't either. There is still a little time before this year's flying season really gets into full swing, so why not do a few of those projects as in anything else, getting started is the biggest hurdle.

Let's take a look at some of the projects that you might be considering. First, how about that new model you were going to build. Did you buy a kit and then stuff it under the bed until you got time to start it? I've wondered for years just how many model kits are purchased and never built. One heck of a lot. Why not drag that kit from under the bed, dust it off, and build it? Have your ideas changed on what you want to fly? Is that the reason that this kit remains unbuilt? Okay, stuff it back under the bed again, and go get started on the project that you **really** want to build, but better hurry up, flying time is almost here.

How can you avoid this pitfall of not getting started on things that you really want to do? Well, it beats the heck out of me, too. My list of projects gets longer and longer, yet I can't seem to chip away at the list the way that I used to do.

In the meantime, how about that bird that you were flying last fall? Did you care for it and its radio and engine over the winter, or did you stick it up on a rack to wait for spring. It's a good idea to check everything over now before the first day of flying. Even if you're a reasonably careful modeler and flier, now is the time to check out your equipment to see if it is working right. I've mentioned so many times before about keeping your batteries in good shape that I won't go into that again, except to mention that if you use a 12 volt battery to power a fuel pump, light a glo plug and, perhaps, charge your radio batteries, it also needs tender loving care to face the spring in tip top condition. Check the fluid level in the battery and keep it well-charged all winter. Some of the small chargers can be left connected to the 12 volt wet cell batteries all of the time, keeping them on a trickle charge. Good for the battery and good for the pocketbook.

Check over the airframe of your favorite model. Are the tail feathers still firmly glued in place? Are the control horns well-anchored, or have they worked a bit loose? Are the hinges well-seated, not sloppy and loose? Does the covering need reshrinking? Pushrods still in good shape? How about the front end of your bird? Engine mounts still in good shape, or do they need cleaning and regluing? Is the firewall loose? Is the landing gear system still firmly attached to the rest of the structure? Does the throttle barrel in the carburetor work well, or is it stuck with old caster oil? How about the path that the throttle pushrod takes? Is it clear, or is it fouled up with old oil? You get the idea --- take a little time to check over your model to see if it's really ready to take to the sky again. Hey, how about your tool box? Is it in shape for spring, or do you need to consider repainting it or building a new one?

Getting back to unfinished, or never started, projects --- if you want to build a new model, or perhaps a new kind of model, make a mental resolution now to get started on it this week. Why not today?

Are you a bit tired of what you have been doing in R/C and looking for something different? Then change it. There are more chances for fun in this great hobby/sport than it is possible to explore. If you have been spending a couple of years flying a "Stick" type model, learning the ins and outs of that type of flying, and you're getting just a bit bored with this, why not try an old timer type model with a four stroke engine. You can have so many really enjoyable hours of flying this combination that you will wonder just why you waited to try it. Using a four stroke engine keeps the noise level down and will allow you to fly in locations that might not otherwise be available. Flying an old timer type aircraft, soaring about the sky, picking up thermals, shooting touch and goes, in general just enjoying the beauty of flight is really a great way to spend a nice spring afternoon or evening.

Keep in mind that you need to build this type of aircraft light, yet strong. You need to do a bit of extra bracing in the fuselage structure to take care of some of the bumps and bruises that the wind may give to the aircraft when it is landing. There are not very many old timer kits available on the hobby shop shelves, but if you will study the ads in this magazine you will find

some of these kits are available from mail order sources. When using a four stroke engine, again, keep in mind that the current crop of four stroke engines put out about two thirds of the usable power of the current crop of two stroke engines. If it takes a .40 engine to fly an old timer, then plan on using a .60 four stroke. As an example, my trusty, rusty, old Powerhouse normally flies with an O.S. .40 in the nose. When I put floats on it I replaced the .40 with an old and very reliable Enya .60 II. Now it's going to have an O.S. .60 four stroke in it for relaxing springtime flying.

For quite a long time I have been advocating modification of existing kits to arrive at another type, or different looking, aircraft. Many of you have tried this with great success. I have received a number of letters asking questions about changing from a tail dragger to a trike gear, or vice versa. There really isn't any problem in converting either way. If an aircraft is a good flying machine with a wheel in the nose, then it will also be a good flying machine with the wheel located at the tail. You simply need to be careful of the placement of the main supporting gears. We have talked about this in the last couple of months, but it struck me that there is one item that I haven't mentioned lately, and that is the angle of attack of the aircraft at rest. What is the problem with an aircraft at rest? Simply that the aircraft must move from its "at rest" position to a flying mode in the early stages of its taxi run. If it is difficult for the aircraft to align itself in its normal flying position, then it will become somewhat difficult to make a good take-off. Take, for example, an aircraft that is a tail dragger with long main gears, a short coupled fuselage and a short tail wheel support. This aircraft, at rest, is sitting at a very high angle of attack; in other words, the wing of this aircraft is sitting at a very positive angle to the ground. When this model starts its taxi run, the wing almost acts as a massive airbrake. It tends to make the aircraft wallow about, causing the pilot to react with his thumb on the rudder control, attempting to override the wallowing of the aircraft. This leads to much mass confusion, with the result that the aircraft, if it does get airborne, limps into the sky, barely at flying speed, with a snap into the ground lurking at the first turn. Many aircraft can be saved from a too early grave by simply checking the angle of attack. If it is too great (and you can get a pretty good idea of this just by looking at the model) then change it. You can change it by either shortening the main gears, using smaller wheels, or lengthening the wire supporting the tail wheel, or a combination of these. Many a squirrely airplane has been saved by the simple method of reducing the ground angle of attack.

Let's take a look at the trike geared model. Again, its "at rest" position should be studied. Does the wing sit positive to the ground when the model is at rest? Sure, this will make an easier take-off if the wing is positive to the ground --- but how about landing? With a trike gear set-up, and nose high, the aircraft will probably spring back into the air and bounce in for several bumps when landing --- sometime resulting in a snap roll at the end of the landing bounces.

I realize that those of you flying from grass fields need to have the model sitting slightly nose high in order to get off of the ground. In this situation the flier must develop a landing method that brings the model in nose high, much like an airliner, letting the main gears touch down first, followed by the nose gear.

Many modelers who have grown up flying from pavement only and flying only trike geared aircraft have developed a landing technique that is kind of a quick dump at the runway. In this situation the model sits slightly nose down so that when it contacts the runway, it stays glued to it, due to the negative "lift" of the wing. Which brings us back to the second method of setting a trike geared aircraft at rest. That is with the nose low. As we mentioned above, this glues the model to the runway upon landing, but makes for less than pretty take-offs. The result is usually a leap into the air.

A really nice take-off is one that you gently ease off of the ground into a gentle climb, no violent maneuvers, just a nice normal climb-out. To achieve this, set up your trike geared aircraft so that the wing is level with the ground. You can do this quite easily by setting the assembled model on a table, then measure from the table top to the leading and trailing edge of the wing. If the mid point of the leading edge is the same distance from the table as is the mid point on the trailing edge, then the aircraft is setting at zero with the table. If it is higher to the mid point of the leading edge, then the model is sitting positive to the ground. If the trailing edge is higher, then it is sitting negative to the ground. You can adjust this setting by either slipping the nose gear longer or shorter, or by bending the main gears in just a bit. After an aircraft has flown for a while the main gears naturally tend to spread apart, thus making the model squat down on the main gears just a bit more.

While on the subject of landing gears, it is a bit better to rigidly brace the main gears on a tail dragger than it is to let them be sprung as with a rubber band in the middle. The reason for this is that with a sprung type landing gear, when you come in for a landing, the gear flexes and tosses the model back into the air. With a more rigid landing gear, it will still flex some, but will not toss the aircraft back into the air with as much enthusiasm as does the spring loaded gear. As in everything else in R/C, pay attention to the small things and you will have a great deal of enjoyment from this hobby/sport.

Time to once again remind you of the Southwest Jumbo Fly-In to be held at Thunderbird Field, just west of Fort Worth, Texas, July 21 and 22, 1984. As most of you know by now, this is a Fly-In for large models, monoplanes with a wingspan of greater than 80" and bipes with a span greater than 60". This will be the seventh addition of this great show, so make your plans now to spend this weekend with us.□

Professional model, Gina Kelley Thompson, gives us an interesting perspective as to the size of her dad's 9' span "Yardstick."

YARDSTICK

By George Thompson

Photos By Sean Kreck

Introduction

Have you wanted to build a "biggy" but have been turned off by excessive kit prices of $80 to $150, knowing you still had to buy the covering, wheels, landing gear and motor mounts.

Here is a 9 foot span model you can build for $50 complete (not including motor and radio). The trick is making your own kit, stack cut the ribs, splice spars, build up the leading and trailing edge, fabricate the fuselage formers and substitute other material for balsa.

Use free yardsticks for the entire fuselage, wing spars and odds and ends. Use the plain, unvarnished kind; the printing is okay. Yardsticks can be obtained at hardware stores, paint stores, fabric houses, dress shops and sewing centers. Get your wife, girlfriend, mother, etc., to help. You will need approximately 20 yardsticks. Use scrap pieces for gussets, etc. Yardsticks are excellent wood to work with, easy to cut, saw, and sand. They are not prone to splitting, cracking, or breaking.

Use standard building practices throughout, keeping the weight down. Do not add to the plans, the plane is plenty strong enough as drawn. I cannot emphasize the weight factor too much. Use white glue throughout except the high stress areas where the newer 5-minute epoxies are used.

CONSTRUCTION

General construction notes are as follows:

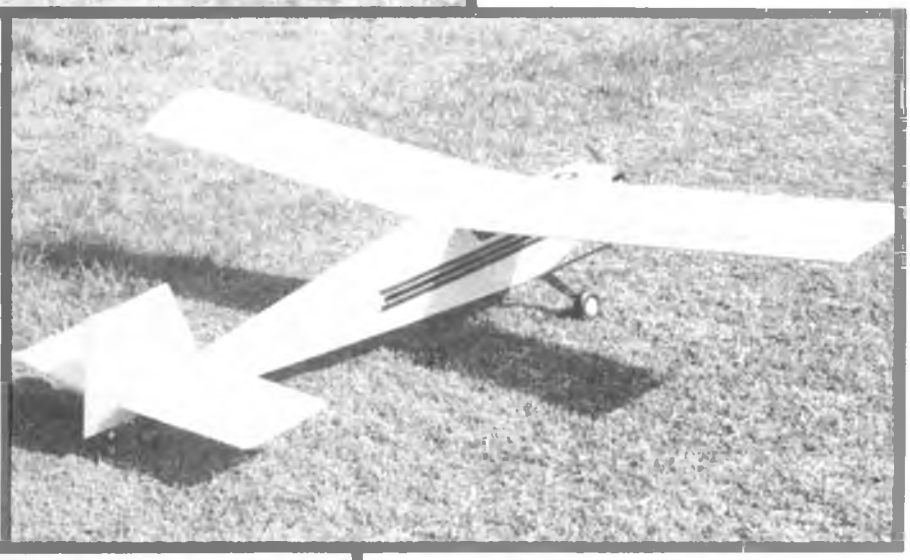
Fuselage:

Lay out and glue two sides as shown. Add splice plates, making sure you have a left and a right hand side. Make formers F3 through F5. Construct the fuselage upside down using a

Check out this 9' span model you can build for $50.00, less engine and radio. A .40 to .61 engine will put it in the air.

straightedge and a right triangle to assure alignment. Double glue the motor area including the firewall and gussets. Install the plywood floor and the landing gear mount. Drill for the blind nuts for mounting the landing gear; drill and tap 1/4-20 two places for the functional struts. Glue in the plywood plate for the tail skid; drill for the wire skid; glue in the balsa plate top rear as a platform stabilizer.

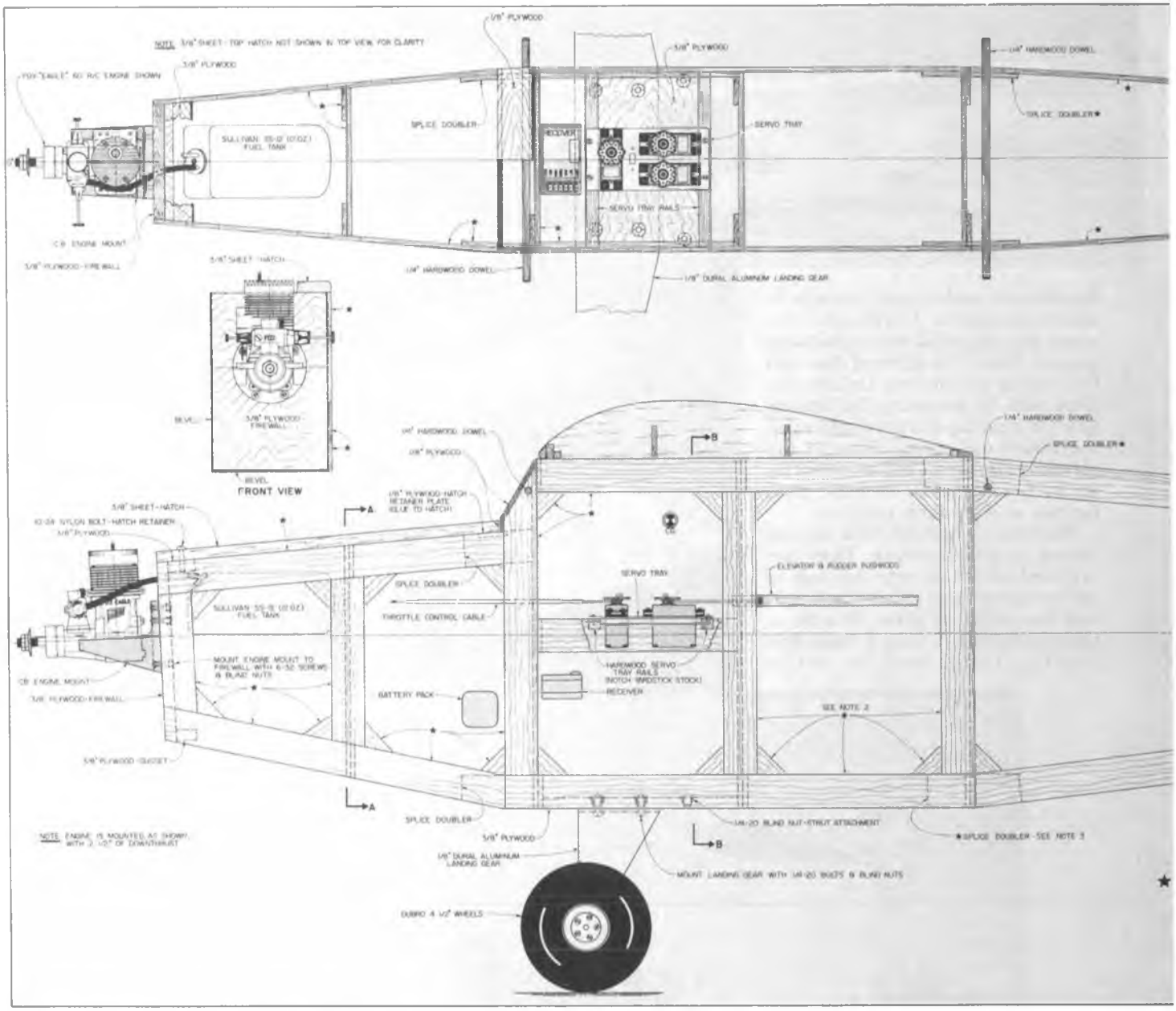
The formers from F5 back are not shown on the drawing. They are installed after the rear tail post is pulled together and glued. The height and the width of these formers is undetermined. Using a long flat sanding block, sand the entire



fuselage to remove burrs, ridges and glue overspill. Do not attempt to remove the printing from the yardsticks.

Wing:

Make a cardboard pattern of the wing rib W-1 without the spar slots. Trace around the pattern with a fine point ballpoint pen on 1/8" x 3" x 36" balsa sheets (you get five ribs per sheet). Cut out the ribs, stack them together and pin and sand to finished shape. Cut the spar slots (four hacksaw blades taped together make the correct width cut). Splice the spars using epoxy glue. Lay on the full size plan. Using white glue and pins, add the ribs. Build up the leading edge, butt splicing 36" balsa strips, staggering the splices. Do the same with the trailing edge. Please note the 1/4" sq. balsa strip used as rib spacer and gussets front and rear. Add wing tip plate and gussets TB-1 and TB-2. The wing half is now finished; do the same for the other half except put the tip plate on the opposite end to make a left and a right half. After sanding and shaping, cut out the center ribs for the DB-1 ply joiner. Block up the tips for 5° dihedral angle each tip (that is .017 per inch per degree or 4.5" per tip). Add the DB-1 plywood joiners using lots of epoxy. Clamp in place. Add 1/4" sq. pieces of balsa to prevent wing hold-down rubbers from crushing covering. Go back and double glue the



Completed fuselage should be covered in clear film to be able to read the names.

Aft end of fuselage showing stabilizer platform.

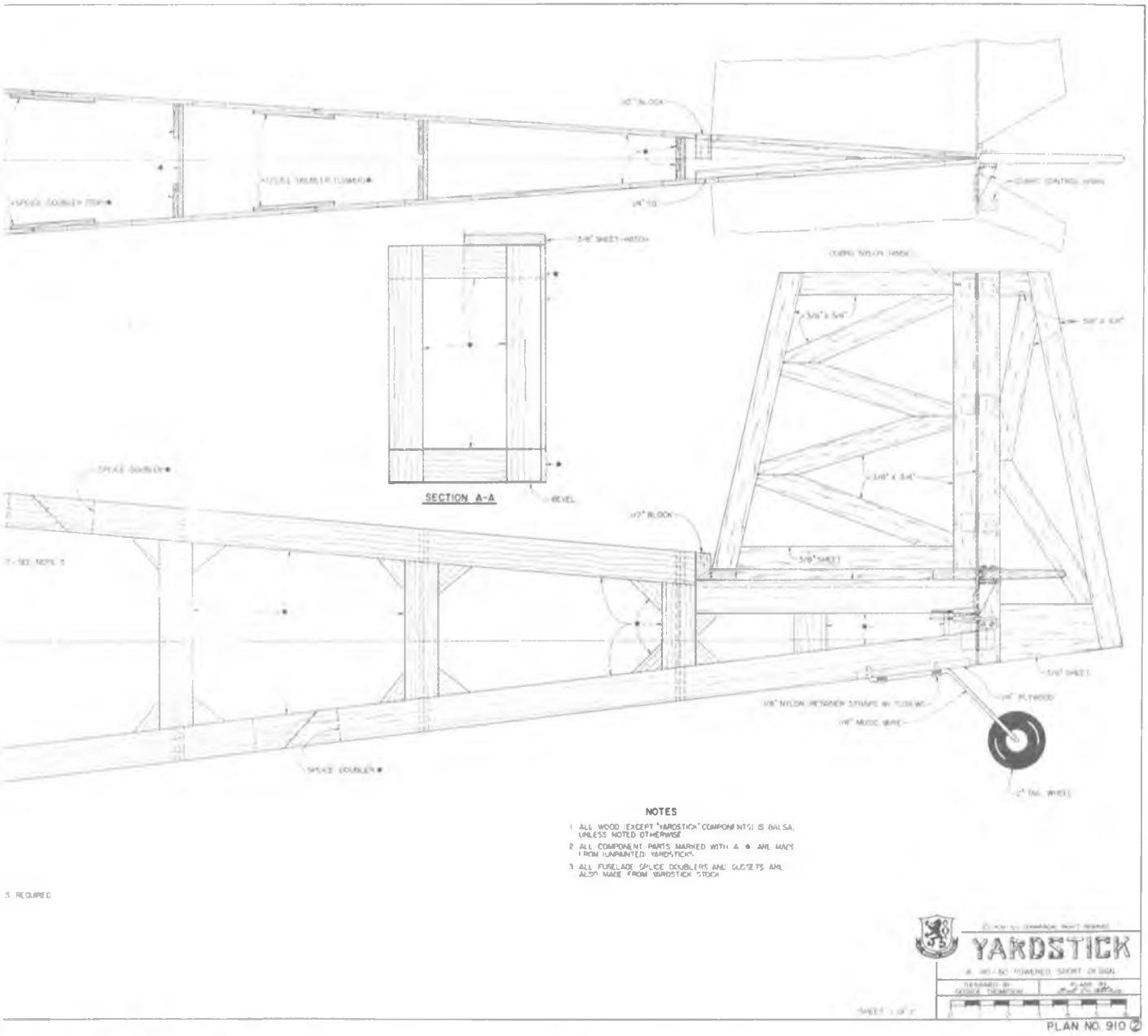
entire structure. Let dry overnight.

Tail Surfaces:

Cut the 3/8" sheets into required strips. On the full size drawing lay out and glue the strips to form the elevator and the rudder. When dry, remove from plan and sand to remove burrs and excess glue. Round the leading edge and the hinged edges and taper the trailing edges. Go back and double glue all joints.

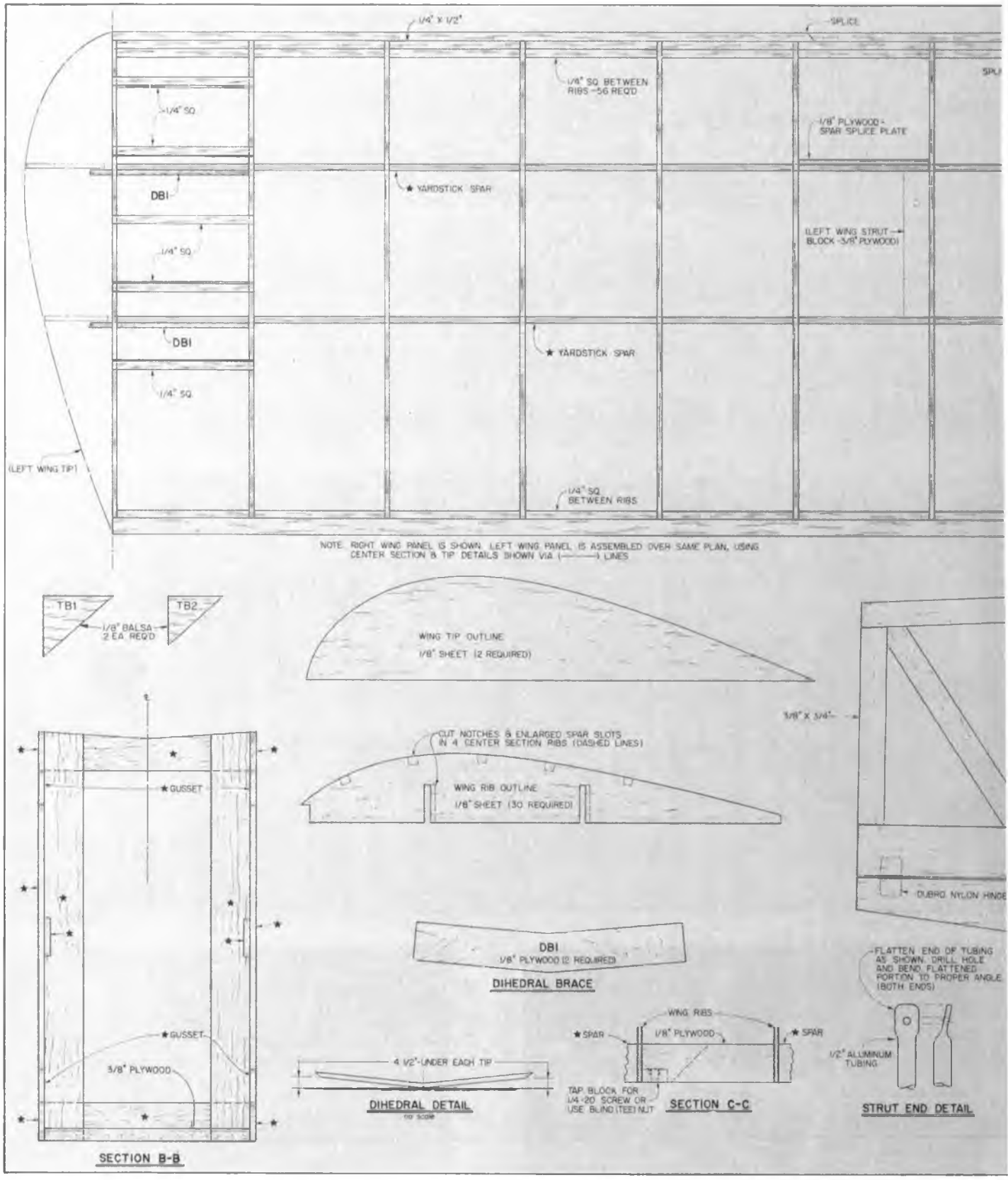
Before covering, check fit the wing and stab. Insert the 1/4" dowels in holes; do not glue; strap on the wing; lay on the stab; sight from front and rear to align stab. At this time make the two functional struts. Flatten one end of a tube for about 1" of its length. Bend to proper angle by trial and error. Drill 5/16" oversize hole in the center of the flattened area. Using 1/4-20 nylon bolts, fasten flattened end to tapped hole in wing. Mark strut tubing where it touches the bottom of the fuselage. Remove and flatten at mark. Cut off excess, leaving 1" of the flattened area to bend. Drill the

FULL SIZE PLANS AVAILABLE — SEE PAGE 176



Fuselage at wing trailing edge showing gussets and cross pieces for radio tray.

Bill of Materials
Fuselage:
Approximately 16 yardsticks
3/8" plywood for firewall, 4" x 6"
1/4" or 3/8" plywood for floor, 6" x 6"
1/8" plywood for windshield, 3" x 7"
1/4" dowel for hold-down, 16" long
1/4" balsa scrap
1/4" plywood scrap
Wing:
(8) 1/8" x 3" x 36" balsa for ribs & tip plates
(6) 1/4" sq. x 36" balsa for leading edge
(9) 1/4" x 1/2" x 36" for leading & trailing edge
(6) Yardsticks for spars
Rudder & Elevator:
(4) 3/8" x 3" x 36" balsa (cut to strip size)
Miscellaneous:
5 — rolls of MonoKote
8 — oz. white glue
1 — oz. epoxy glue
2 — 4½ in. diameter wheels
1 — aluminum landing gear
2 — 3 ft. lengths of 1/2" aluminum tube



second 5/16" oversize hole in the center of the flattened area; check for fit and repeat for other strut.

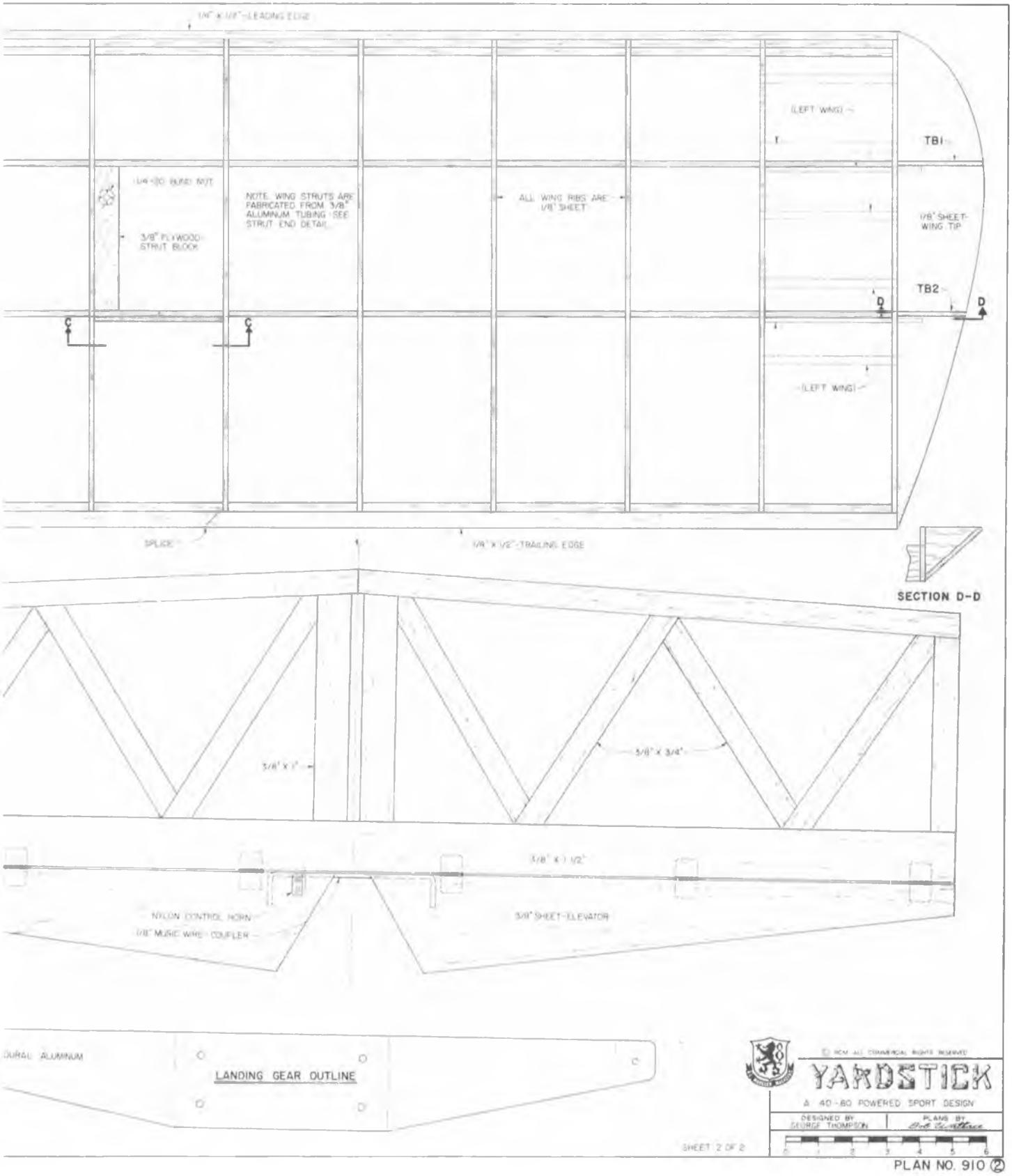
Covering:

Cover with anything you feel most comfortable using — silk, silkspan, bamboo paper, nylon dress backing, or iron-on film. I used silkspan on the first Yardstick and Super MonoKote on the second. It all costs about the same. By the time you have bought silkspan, clear dope, colored dope and trim dope you might as well buy five rolls of Super MonoKote and save a lot of labor. I use different colored vinyl tape for trim, fixing the edges with clear polyurethane spray.

Engine and Radio Installation:

You can power the Yardstick with a sick, tired, old .60 or a good .40. Use

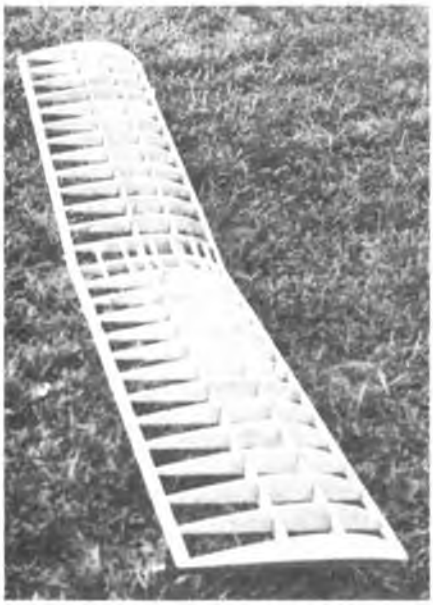
FULL SIZE PLANS AVAILABLE — SEE PAGE 176



any make beam mount that fastens radially to the plywood firewall. Use at least a 10 oz. fuel tank and do not forget to pressurize the tank from the muffler. Any good three channel radio may be used. In my last yardstick model I made a tray using the yardstick scraps. The tray was 1" deep, 3" wide and 11" long. I mounted a standard 3 servo tray, the receiver and the battery back in the noted tray. I installed two transverse pieces of yardstick across the fuselage at F3 and F4 and mounted radio tray on them. I slid the tray back and forth to find the Center of Gravity. I used 3/8" dowels as pushrods for the elevator and rudder, and nyrod for the throttle control.

Flying:

I wont's insult you by presuming to

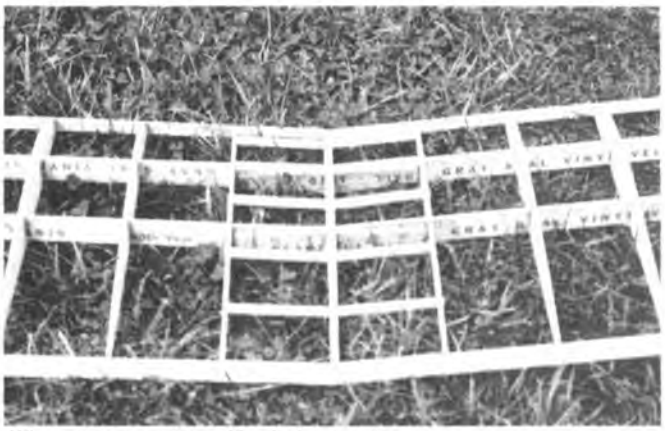


Completed wing ready to cover.

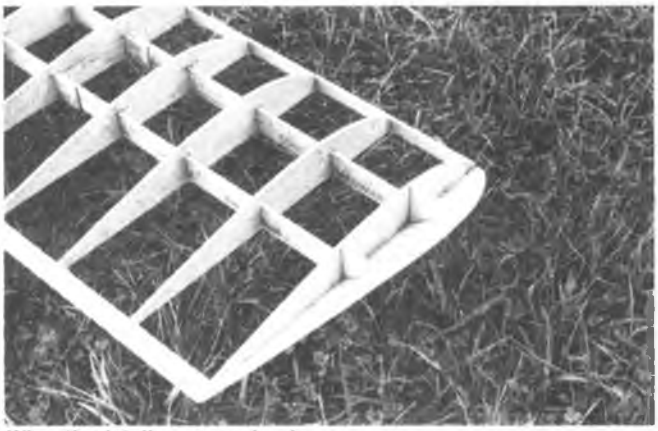
YARDSTICK
Designed By.
George Thompson
TYPE AIRCRAFT
Large Sport
WINGSPAN
108 Inches
WING CHORD
15 Inches
TOTAL WING AREA
1620 Sq. In.
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
4½"
O.A. FUSELAGE LENGTH
81"
RADIO COMPARTMENT SIZE
Ample
STABILIZER SPAN
36 Inches
STABILIZER CHORD (incl. elev.)
10½" (Avg.)
STABILIZER AREA
385 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
10 Inches
VERTICAL FIN WIDTH (Incl. rud.)
11½" (Avg.)
REC. ENGINE SIZE
.40-.61 cu. in.
FUEL TANK SIZE
12 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., Throt.

BASIC MATERIALS USED IN CONSTRUCTION

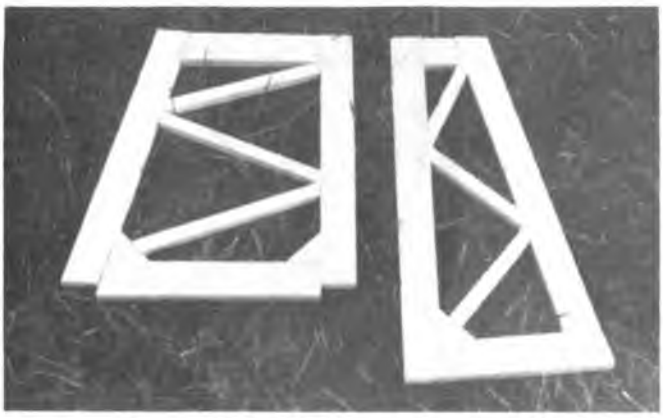
Fuselage	Balsa, Ply, Yardsticks
Wing	Balsa, Ply, Yardsticks
Empennage	Balsa
Wt. Ready To Fly	**120 Oz.**
Wing Loading	**10.7 Oz./Sq. Ft.**



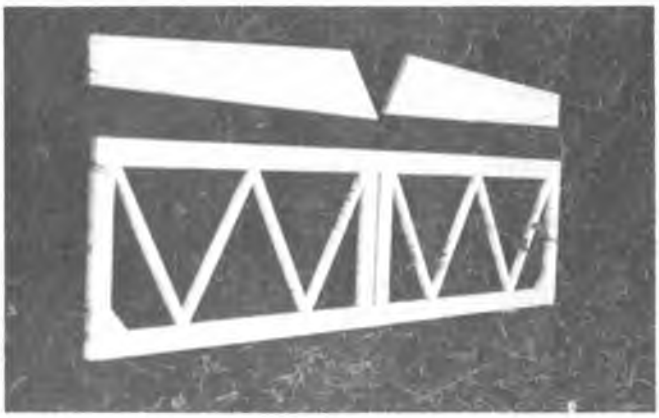
Wing center section dihedral gussets.



Wing tip detail — very simple.



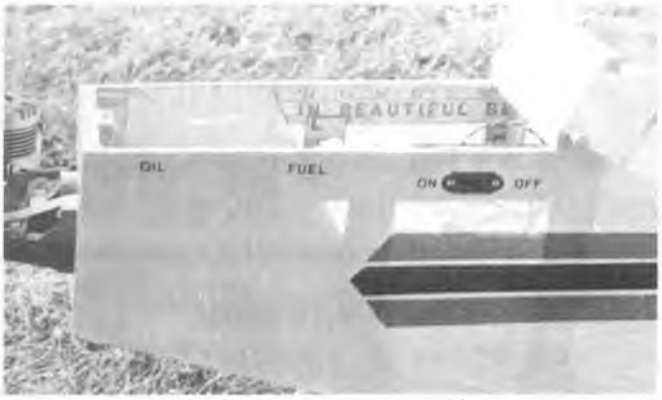
Rudder and fin built from 3/8" balsa.



Elevator and stab built from 3/8" balsa.

tell you how to fly. I'll just tell you about the first flight of the Yardstick. Power was an old Enya .60. The pilot was Mr. Fran Crane of the "Hurricane Hawks" show team of Hamilton, Ohio. After the usual preflight checks, Fran taxied to the head of the runway and took off. That's all I can say, he took off. He said later that at 1/2 throttle it literally leaped into the air in 10 feet. With the .60 for power the model cruises at 1/3 throttle. Loops are really a joy. Fly through them just as you would in a full scale aircraft, chopping the throttle at the top and feeding it back in as you level off. Landings are made with throttle just as you would any real aircraft with a full flare-out just before the wheels touch down. That is really all I can say about it --- try it, fly it and enjoy it yourself. □

Completed airframe — very strong and sturdy, yet lightweight.



Tank compartment with room for most anything you want to put in there.

View of strut attachment and landing gear.

Completed Yardstick eager to get into the air.

RCM PRODUCT REVIEW

E & R Hobbies
DAKOTA HAWK 76

SPECIFICATIONS

Name	DAKOTA HAWK 76
Aircraft Type	Sport
Manufactured By	E & R Hobbies RR 1 Box 40 Edgeley, N. Dakota 58433
Mfg. Suggested Retail Price	$99.95
Accessory Package	$38.95
Available From	Direct from Mfg.
Wingspan	76 Inches
Wing Chord	12½ Inches
Total Wing Area	930 Sq. In.
Fuselage Length	51 Inches
Stabilizer Span	26 Inches
Total Stab Area	156 Sq. In.
Recommended Engine Range	.60 or .61
Recommended Fuel Tank Size	16 Oz.
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Spruce
Wing	Balsa, Ply & Spruce
Tail Surfaces	Balsa, Ply & Spruce
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (17 pages)
Construction Photos	No

RCM PROTOTYPE

Radio Used	Kraft KP7C MK IV
Engine Make & Displacement	Enya .60 Schnuerle
Tank Size Used	16 Oz. Kraft
Weight, Ready to Fly	140 Oz.
Wing Loading	21.6 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Strength and stability of the plane, quality of the materials and ease of construction.

WE DIDN'T LIKE THE:
Tank location at bottom of fuselage.

Minda tired of flying little bitty airplanes? Need something a little bigger? Want something that will handle that new .60 size FSR? How about a plane that doesn't disappear off the end of the runway? This one should fit the bill, do everything you ask, and more.

The amazing thing we found out about the Dakota Hawk 76 is that it will fly a full range of acrobatics then come in and float the full length of the field and drop feather light on the runway. Eight pounds plus and drop like a feather? Yes sir that is right, read on.

Sure it is big — huge is a better word — and structurally as strong as an ox. Throughout the whole plane, if there is any question, a material that will stand the guff and stress is used. For example, in a smaller plane there would be no problem, balsa wood would be used, here it is either spruce or aircraft ply. We were impressed with the heavy duty engine mount included in the kit, it is a work of art. It is rubber shock mounted to the firewall for a minimum of vibration transmitted to the fuselage. The fuselage itself is cavernous; no matter how or where you want to mount your flight pack, there is more than enough room. Yet when she is up there in the blue there is nothing boxy about the way she looks. This is a sleek, trim, plane of which you will be very proud.

Construction:

The plans are large, of course they would have to be large; after all, the fuselage is 51" long, each wing half measures in at 39" with a chord of 12½". Better make sure your working surface can handle 65" x 32" plans.

Also included in the kit is a seventeen page instruction manual that is quite extensive. Generally speaking it has a step-by-step format but, in addition, there are all kinds of building hints interspersed between the steps. We did miss construction photos and the plans could have had more building instructions called out. The instruction manual should have had a paragraph or two of flying information.

To give you an idea of the strength of this giant, the fuselge sides are 3/16" **solid** balsa which is doubled as far back as the trailing edge of the wing with 1/16" aircraft ply. The longerons are 1/4" spruce and all of the pre-cut formers are of 1/8" or 3/32" aircraft ply. The fuselage builds up box style from the nose block to behind the wing, then it tapers to the tail. It really goes together with ease, any intermediate builder would be right at home with it. We were very impressed with the wing hold-down design. Instead of using the dowels at the front and screws at the trailing edge, two 5/8" wide strips of 1/4" aircraft ply are built longitudinally between the formers directly below the wing. Four bolts passing through the wing between the spars are tapped into these huge chunks of plywood. The wing anchor strips build tremendous strength into the center of the fuselage.

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Every hinge line on the whole plane is fabricated from preformed spruce strips spaced with 1/32" ply. There are gaps in the ply and the hinges slip into these gaps. The fabricated hinge blocks are then glued full length to the various hinged surfaces. The rudder, fin and elevator are sheet balsa, the stab is built-up.

The wing builds quite easily, everything fits quite well and no problems were encountered. The normal aileron horns at the center of the wing were replaced with individual aileron servos which are linked directly to the aileron with metal pushrods. This method eliminates linkage slop and the ensuing flutter. There are 3/32" ply pieces set into the top and bottom surfaces of the wing center to prevent the hold-down bolts from crushing the wing. This structure matches the rest of the plane for strength.

As a matter of convenience, we would suggest that the blind mounting nuts in the landing gear block be installed prior to securing the servo tray to the fuselage. It is difficult getting through the tray to insert the nuts.

Covering:

The RCM prototype Dakota Hawk 76 was covered with Top Flite's relatively new colors of MonoKote, Charcoal and Maroon. The trim was Cream MonoKote.

Engine:

The Lord aluminum engine mount included in the kit has rubber vibration dampeners between the mount and the firewall. These dampeners are specifically designed and manufactured for a particular kind of engine. The dampeners included in the accessory package were intended to be used with an O.S. Max .61 engine. If you use the wrong engine with the dampeners, vibration may be increased instead of decreased.

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TWO MUCH IV

Presented here are the final results by the designer to obtain max altitude from a 12 volt winch. Altitude allows a lot of sky searching for thermals.

By Joseph S. Lupton, Jr.

The 2-Meter class of R/C Sailplanes is a very popular event at all of the contests I have attended for the last several years and it has gained in popularity for several good reasons. They are smaller and, therefore, easier to transport. 2-Meter kits are less expensive and require less time to build, therefore, they are a logical choice for a beginning R/C glider flier. This article is presented to provide the sailplane modeler with a design that is easy to fly and yet gives performance that will satisfy those with serious competition in mind.

This model, Two Much, began before I became seriously competition minded, although I had flown in one sailplane contest. I had been flying power models for some time and was getting tired of just more loops, rolls, touch and go landings, and just trying to keep the model in sight. With a fast forty or sixty size model, one does not have time to relax and really enjoy just plain flying (pardon the pun), not to mention the fact that the greasy kid stuff was getting expensive. In any case, I had been flying a Wanderer 99 which is an excellent choice for a first sailplane. It is a good trainer and thermals with the best of them, but it did not have spoilers and did not have the pizzaz I wanted and thought a competition sailplane should have.

I was attending the Roanoke Valley RC Club annual auction in 1981 when a Hobie Hawk fuselage was offered for sale. I could see this as the beginning of something really snazzy with good performance and I paid nine dollars for it. Before I took to the drawing board, I called some old friends of mine in Hampton, Virginia, for some technical advice. Woody Blanchard is a retired NASA Aeronautical Engineer and Bob Champine was a NASA Test Pilot. Both are long time modelers and very serious glider competitors. Their collective advice was to use the Hobie fuselage in a 2-Meter design, because they felt it was a little too short to give me the longitudinal stability I desired. Woody sent me the ordinates of the Eppler 193 airfoil, since that was the "hot section" at that time, and Two Much I started taking shape. Other advice which has proven very good and has become one of my design philosophies is to build strong and not be too nit-picky about weight. Competition models take a real beating over a season of flying, and the extra strength will pay off in fewer nights of rebuilding. Also, since a few ounces of model weight increases the flying speed, the Reynolds Number (a measure of the effect of size and speed) increases, and sink rate performance suffers little as a result. A real plus due to the extra speed is penetration performance in the wind and the ability to cover more ground searching for thermals.

About The Author

Joe Lupton, age 42, is an Airline Transport Pilot flying a Short Brothers SD3-30 for Henson Airlines, the Alegheny Commuter serving Newport News, Virginia, where he lives. He is also rated in the Falcon 20 and has commercial ratings in gliders and helicopters. Joe soloed a Cessna 150 in 1964, and spent a year in Vietnam as an Army Huey pilot in 1967. With over 11,000 hours in flight time, he still looks forward to going to work.

Joe's first model airplane was a solid balsa B-29 which cost about 10¢ and had about an 8" wingspan. This was while he was in the fourth grade. His first income from a paper route when he was in the 8th grade went toward a Spitfire .045 and a Scientific U-Control model. By the end of high school he was designing his own combat models which he flew in competition in Winston Salem, North Carolina. He also designed several towline gliders, but there was not much interest in competition in that area then.

Joe spent one year in the NASA Apprentice School at Langley Field in Hampton, Virginia, where he helped build wind tunnel research models, which was "quite an education" in model building. After this, he returned to college and started taking flying lessons. College, flying, four years in the army and, finally, marriage caused him to abandon models for a few years.

He has been flying R/C models since 1978 and became interested in R/C sailplanes as an extension of full scale soaring interest about two years ago. He has designed several power models which attracted a lot of local attention and which may be the subject of future articles. Two Much IV is the outcome of his first sailplane design which is the result of over two years of testing and design improvements.

Two Much I flew pretty good but suffered from lack of yaw stability. It also tended to pitch down when the spoilers were extended. I had made a rather high aspect ratio stab and long spoilers. The inboard area of the spoilers affected about half of the stab span. The cure was to cut off 4" from the inboard end of the spoilers and 2" from the tip of each stab. The loss of stab area had no noticeable effect on pitch stability but now I could raise full spoilers and maintain good pitch control for precise spot landings.

The Hobie fuselage was discarded and a longer, balsa fuselage was built. Two Much II used the wing and stab from the previous version, but with the extra fuselage length, it became much more stable and a real pleasure to fly. Regrettably, it did not last very long. Have you ever launched your sailplane with the receiver turned off? If so, **you too** are on your way to becoming an expert! They (the experts) have already made all of the mistakes! The model climbed to about 75 feet and then veered off to the right. You can imagine my panic when I realized what I had done and that I had no control! The flight was terminated in a vertical dive still connected to the high start, so the impact was quite hard. The fuselage was destroyed but the only wing damage was to one outboard tip panel which hit the only rock around (Murphy's Law). The other three undamaged panels were a real surprize considering the impact, and that illustrates my point about building strong.

Two Much III was built using the same repaired wing with the addition

Linda Parker of Tidewater, Virginia, displaying the Two Much IV at the NASA Visitor's Center at Langley Research Center in Hampton, Virginia.

Bill of Materials

All Material is balsa unless specified.

Qty.	Size	Description
Wing		
1	4 x 1/16 x 48	Firm — T.E. bottoms
1	4 x 1/16 x 48	Med. — T.E. tops
4	3 x 1/16 x 48	Soft — L.E. sheeting
1	1/4 x 1 x 36	Trailing edge — spoilers
4	4 x 1/16 x 48	Med. — ribs & stab capstrips
2	1/8 x 1/2 x 48	Spruce — inboard spars
2	1/8 x 3/8 x 36	Spruce — outboard spars
2	3/32 x 1/4 x 48	Spruce — leading edges
1	1/16 x 6 x 12	Plywood — root ribs, templates, bellcrank
2	3/4 x 1½ x 7	Soft block wing tips
1	1/2 x 80 x 2 oz	Fiberglass trailing edge reinforcing tape
1	1/4 x 3 x 36	Shear webs, wing fillet, hatch, rudder spars
1	3/16 x 2 x 12	Shear webs
1	1/4 dia x 8½	Piano wire, wing rod
1	1/4 I.D. x 12	Brass tube, wing rod tube
Fuselage		
1	1/8 x 6 x 48	Lite ply, fuse sides & fwd. bottom bulkheads
2	3/8 x 36	Triangles, fuse longerons
2	1/4 x 36	Triangles, fuse longerons
1	1/8 x 3 x 36	Med. — top & bottom, rudder — stab T.E.'s
1	1/32 (or 1/64)	Plywood — verticle stab sides
1	1/32 x 1/2 x 36	Capstrips for rudder
1	3/32 x 12	Piano wire — stab rods & wing incidence rods
1	3/32 I.D. x 12	Brass tube — stab & wing incidence tubes
1	1/8 x 12	Piano wire — tow hook material
1	1/8 I.D. x 3/8	Brass tube — bellcrank forward pivot tube
Misc.		
2	36	Pushrods: suggest braided cable
2	1/16 I.D. x 20	Plastic tubing for spoiler cables
1	1/8 I.D.	Wheel Collar — tow hook adjustment
1	small x 9"	Gapless hinge (or 4 hinges of choice)
2	5/64 I.D.	Wheel collars — spoiler pulls
1	2 x 24	Fiberglass tape — wing polyhedral reinforcing

TWO MUCH IV
Designed By:
Joseph S. Lipton, Jr.
TYPE AIRCRAFT
2-Meter Comp. Sailplane
WINGSPAN
77⅝ Inches
WING CHORD
9" Root
6¼" Tip
TOTAL WING AREA
650 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Eppler 211
WING PLANFORM
Constant Chord Center
Double Tapered Tips
DIHEDRAL EACH TIP
Center Panel 1¾"
Tip Panel 2¼"
O.A. FUSELAGE LENGTH
42⅞"
RADIO COMPARTMENT SIZE
(L) 8" (W) 1⅝" (H) 2"
STABILIZER SPAN
22 Inches
STABILIZER CHORD (inc. elev.)
4¾ Inch (Avg.)
STABILIZER AREA
100 Sq. In.
STAB AIRFOIL SECTION
8% Symmetrical
STABILIZER LOCATION
Fin Mounted
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN WIDTH (Inc. rud.)
5¾" (Avg.)
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., Spoilers
BASIC MATERIALS USED
Fuselage ..... Lite Ply & Balsa
Wing ..... Balsa, Spruce
Empennage ..... Balsa,
Wt. Ready To Fly ..... 37 Oz.
Wing Loading ..... 8.2 Oz./Sq. Ft.

of the Horner style wingtips. The current fuselage design was employed using lite ply for the sides and has been flying now for well over a year, having won many local and regional 2-Meter events.

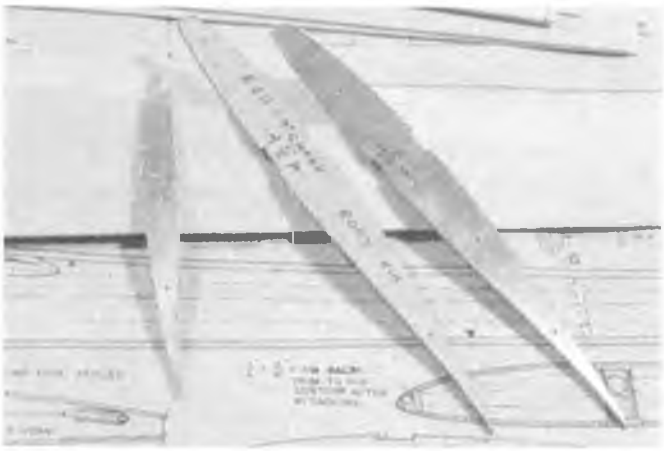
Two Much IV is a further refinement and is designed to obtain max altitude from a 12 volt winch. By "standing on the pedal" and using the "zoom launch," an additional 100 to 200 feet of altitude can be gained from the increased airspeed. The extra altitude and the superior penetration of the Eppler 211 airfoil in Two Much IV allows it to cover a lot of sky searching for thermals.

Since this design is intended for the serious competitor, I am assuming a certain degree of building competence, and I will not go into common building practices. There are several construction techniques I have developed, or learned through experience, which may be of help to others and I will try to elaborate. Let's begin with the wing!

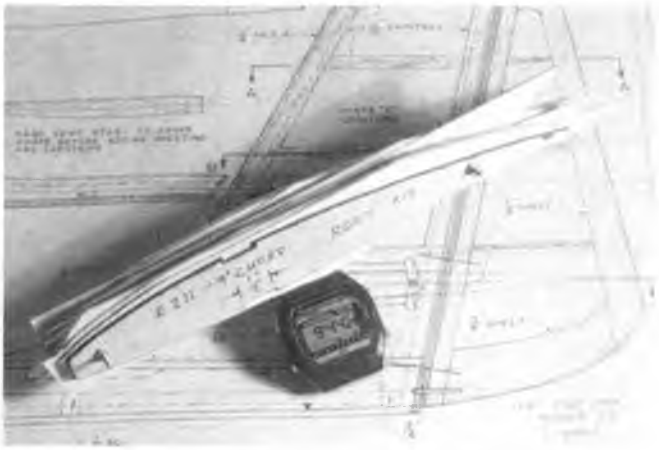
To take advantage of max winch energy, the wing must be **strong.** 1/8" x 1/2" spruce spars for the center sections with good shear webs assure this. I like to taper the spars to 3/8" wide at the polyhedral break and to 1/4" at the tip. The extra width is not needed at the tip and the weight just reduces roll response. I use plywood templates to cut the ribs and I face them with aluminum such as that used in gutters or siding. **Super!** Black the edges with a magic marker and stop sanding when you see the silver aluminum. This way each set of ribs is the same instead of getting slightly smaller per set. Three templates will be required: Inboard center section, outboard center section (which is also the inboard tip section template) and the tip rib. Cutting the notches in the ribs for tapered spars is easy this way since the center template has a 1/2" slot, the middle has a 3/8" slot, and the top a 1/4" slot. It's a good idea to make these slots slightly undersize since it's easier to enlarge a slot for a spar than vice versa. Rib material should be selected carefully since the rib is quite thin near the trailing edge and very light wood will only cause problems later.

The trailing edge technique was introduced to me by Woody Blanchard and makes a strong, lightweight structure which can be sanded to a very sharp, durable edge. The bottom T.E. sheet should be medium to firm balsa in the center section and can be light to medium in the tips. Sand the taper to as fine an edge as you dare on the bottom piece before gluing up the wing. The 3/16" square support (as shown in the **rib sections** drawing) will keep the spar surface flat on the table and properly set in the ribs. (Note that for the tip panels, this support tapers to 1/8" at the tip.)

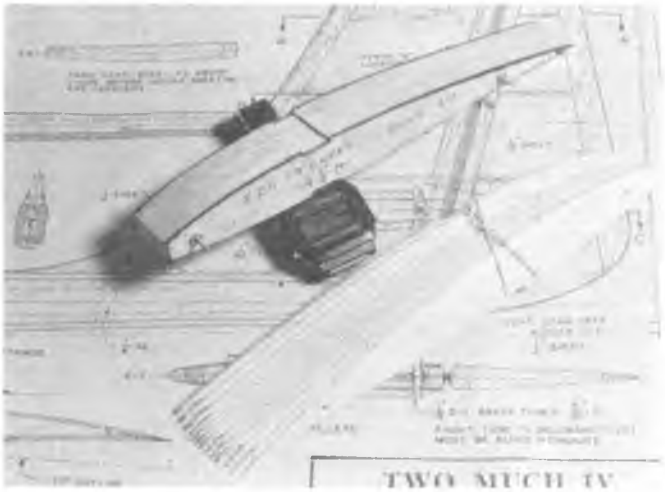
The upper T.E. is not tapered until final sanding of the wing to avoid damage during handling. The 1/2" wide fiberglass tape is the secret to this technique. This tape should be about as thick as 2 ounce cloth if you cannot locate 1/2" tape in rolls. By using a 30-minute epoxy, and holding the upper trailing edge piece in place with a wood yardstick as shown, and



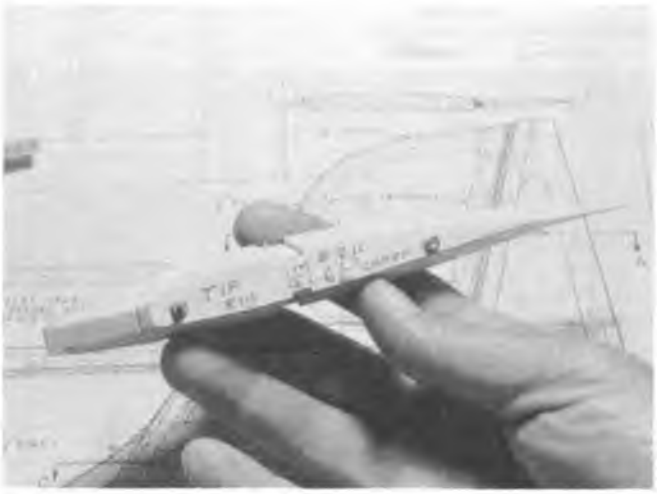
Aluminum faced wing rib templates.



A stack of wing rib blanks between templates at 9:44.



Finished ribs at 9:59, after 15 minutes, and a previous set of perfect ribs.



Set of tip ribs after shaping. Note bevel on outside edge of tip template only.

Tip ribs showing leading and trailing edge squared off before removing from templates.

Ribs after separating from template and squaring off top and bottom edges should be very uniform when restacked.

Jig made from 2 x 4 for cutting shear webs.

Lower trailing edge tapers to fine edge. Wing box ready for addition of tubing.

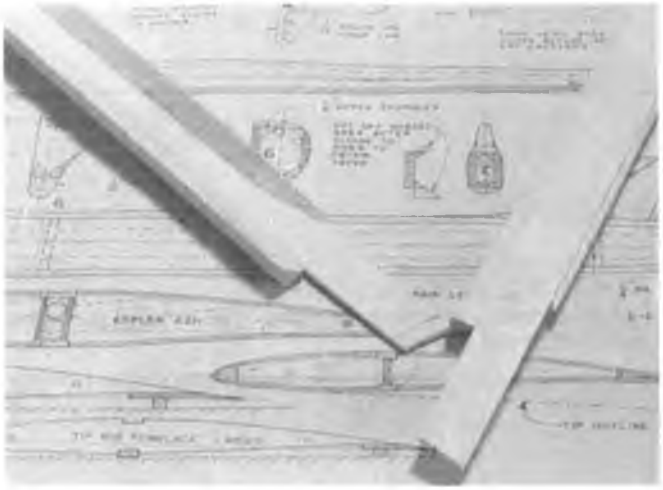
Fiberglass tape spot glued with CA prior to epoxy for top surface. Note 1/16" x 1/4" support under center of trailing edge — will preform lower surface curve.

Rubber bands and yardstick apply good pressure to trailing edge while epoxy sets up and will guarantee a straight trailing edge. Upper surface then sanded to fiberglass and epoxy for a sharp trailing edge.

Wing panels blocked to proper dihedral and wing tube spot glued in place with epoxy. Note web in trailing edge.

Left wing tube box complete, right ready to fill with epoxy and 1/16" plywood side. Saw apart after completion.

Prebending forward fuselage sides before gluing on triangles will hold curve and make forward assembly easy. Note bulkhead locations premarked.

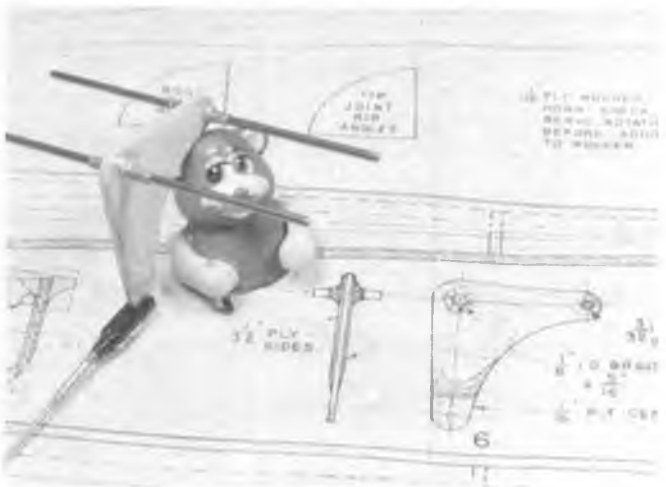


Aft fuselage showing triangles overlapping sides to cause taper when cut flush with fuselage top and bottom.

with a 1/16" strip under the trailing edge, you will produce a straightedge with the curve preset in the lower surface. (Don't forget to place waxpaper between your work and the building board.) Putting the 1/16" trailing edge web in the opening between the ribs prior to removing the yardstick is recommended and will increase the warp resistance. The 3/32" x 1/4" spruce leading edge is added last and will really protect the wing from damage from twig strikes, heavy weeds (haven't you ever missed the field?) and even small stones you may encounter.

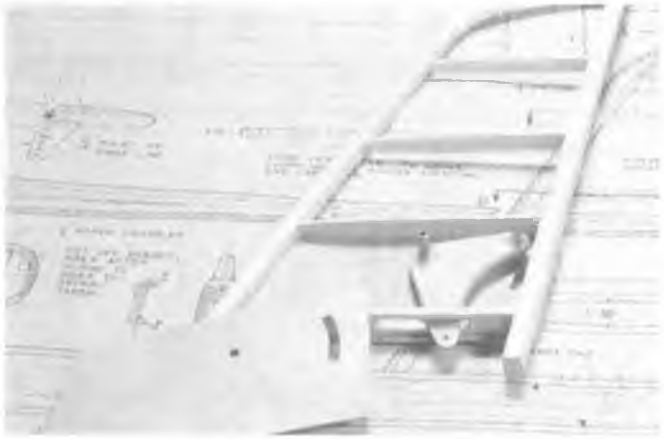
The wing rod tube should be firmly set in epoxy with spruce or ply spacers between the spars. The wing will be no stronger than this unit, so --- 'nough said!

The fuselage is very conventional in structure, having 1/8" lite ply sides with medium balsa triangular corner longerons and balsa top and bottom sheeting, but a few tricks will speed up building and assure a straight structure. When cutting the bulkheads, mark the vertical centerlines on each piece. This will



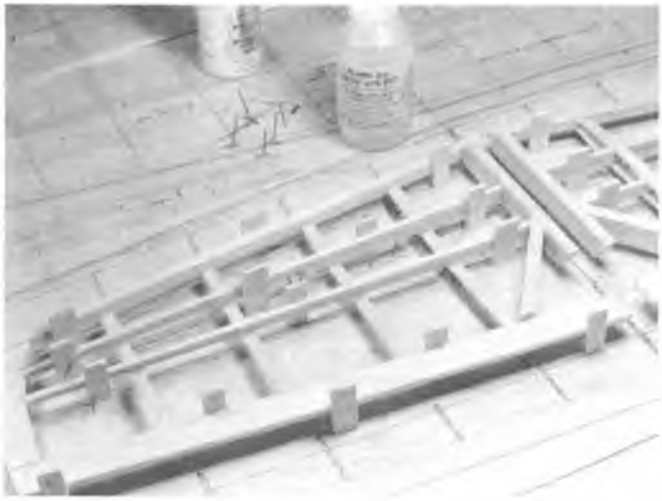
Bellcrank assembly. Forward long tube is glued into vertical stab and bellcrank pivots on it. Short 1/8" I.D. is epoxied to bellcrank.

Fuselage assembly showing wing tube and fillets before tapering to fuselage at leading edge. Wing should be fitted before fillets are shaped.



Vertical fin assembly with bellcrank in position ready for left side. Caution — assemble horizontal stab and position stab tubes before building bellcrank into fin.

Horizontal stab framed up on jigs. Centerline of stab is positioned 1/2" above building surface. Capstrips are added to one side at a time.

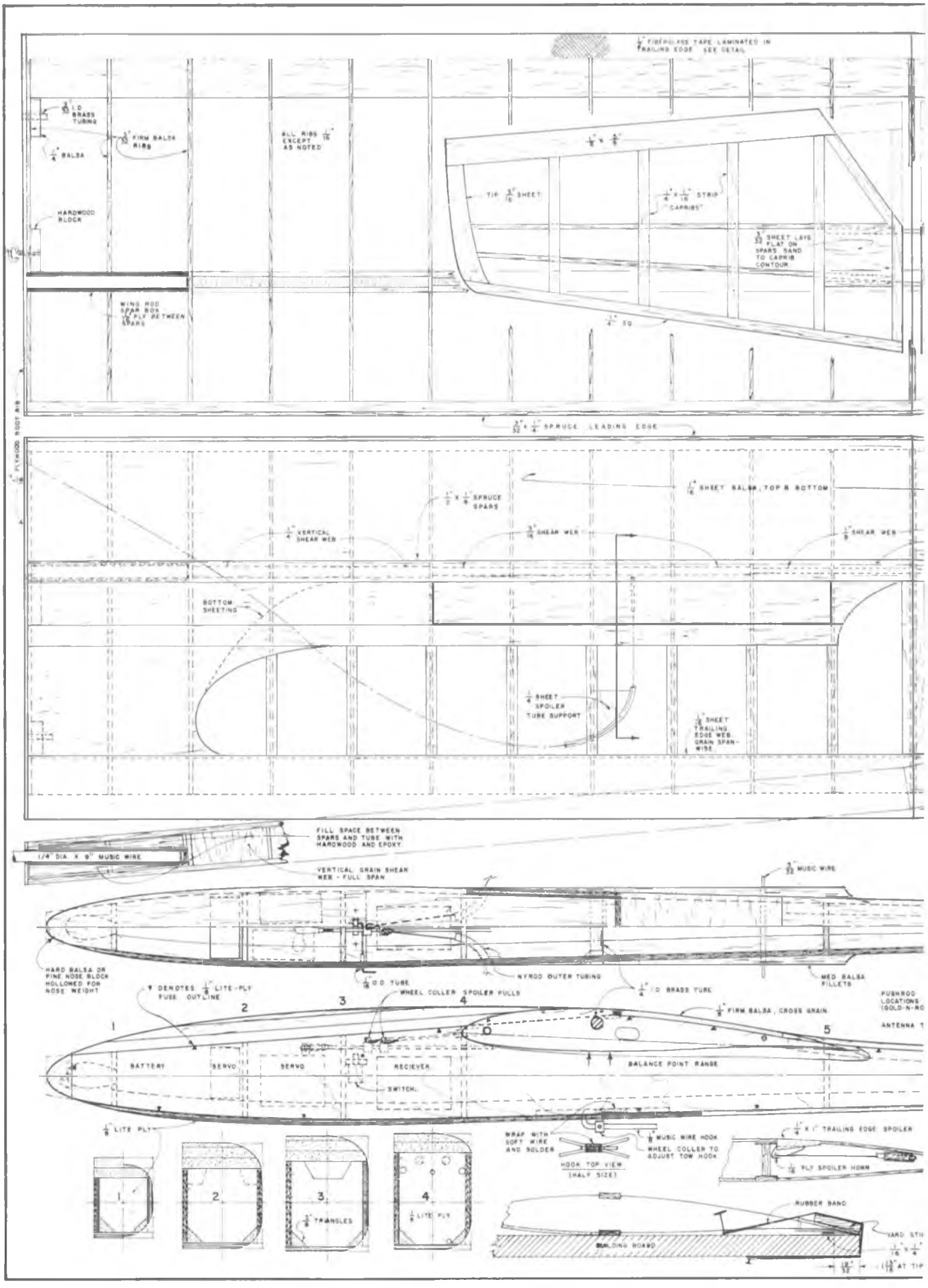


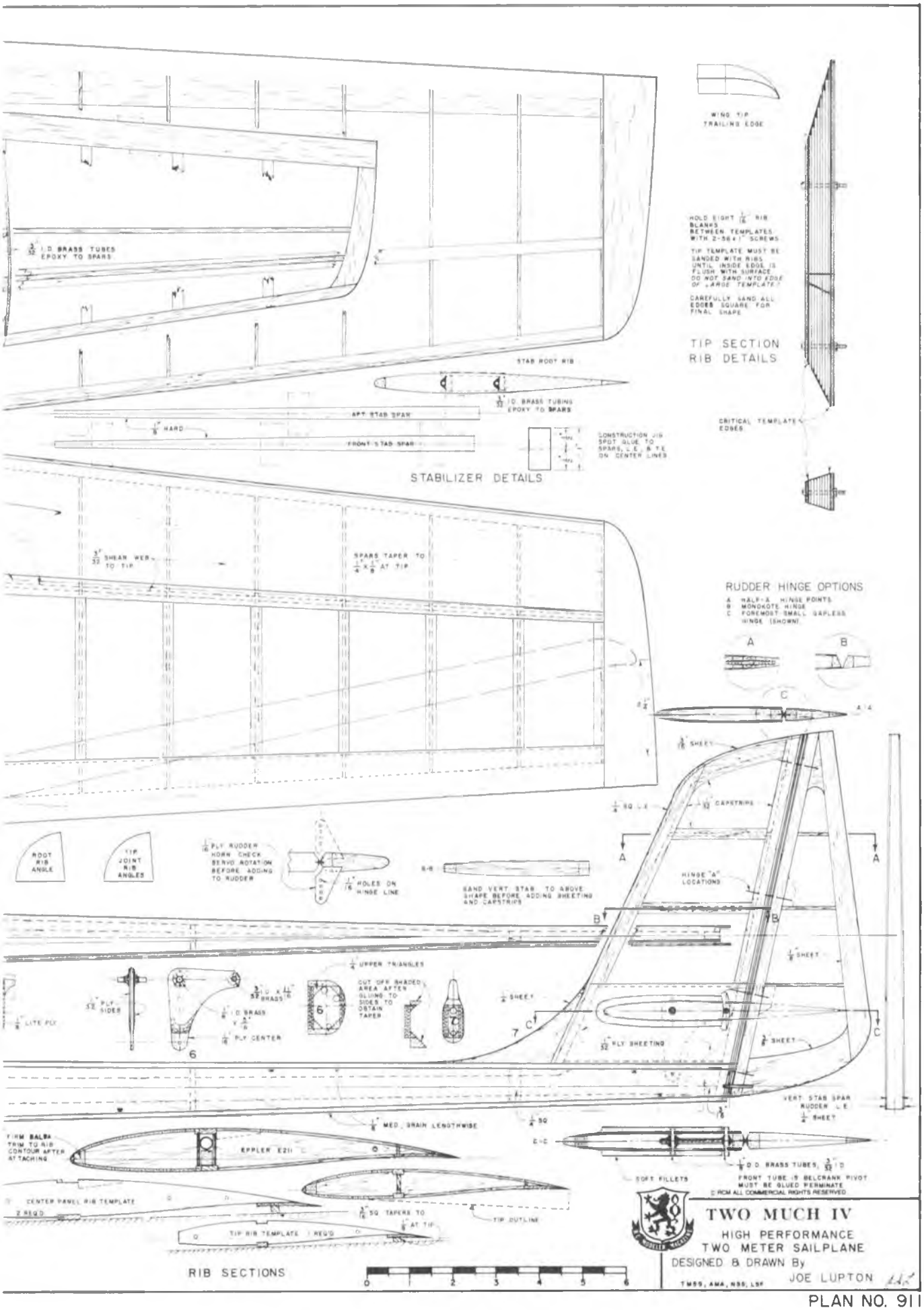
Stab has been flipped over and ready to add caps on this side. Be sure jigs are pinned down to board to assure symmetrical surface.

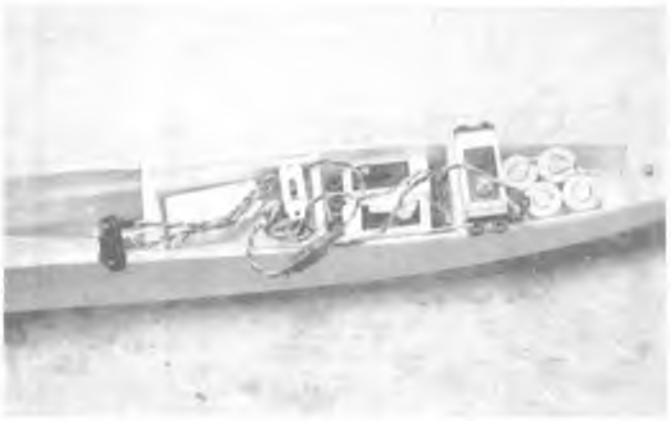
Wing and fuselage mating showing fillet contours.

help center each in position over the plan view. Also mark the bulkhead locations on the inside of each side for the same reason. The curve in the front of the fuselage will be difficult to make if the triangles are glued on the flat sides, so block up the front of each side to preform the curve and attach the longerons with CA glue flush with the edge of the fuselage back to bulkhead #5. From that point aft, move the triangle outward as you progress to the rear so that only 1/8" is attached to the sides at the rear. Be sure you don't make two of the same side. (Remember what I said about the so-called experts?) The top 1/4" longeron is treated the same way.

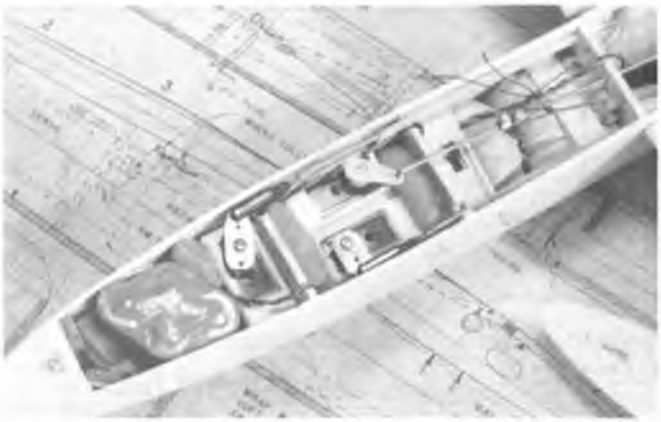
Before you trim off the triangle overlaps to create the tapered longerons, spot glue the fuselage sides together, outside to outside. Now when you trim down the triangles, you will be making the two sides match and can be sure of getting the corners square on both sides for good contact for the top and bottoms. Also, this is a good time to locate and drill the wing rod tube holes in the sides. This will allow you to use the rod in the sides


1/4" FIBERGLASS TAPE LAMINATED IN TRAILING EDGE SEE DETAIL
3/32 I.D. BRASS TUBING
3/32" FIRM BALSA RIBS
ALL RIBS 1/16" EXCEPT AS NOTED
1/4 BALSA
HARDWOOD BLOCK
WING ROD SPAR BOX 1/16 PLY BETWEEN SPARS
1/8 x 3/8
TIP 3/16" SHEET
1/4" x 1/16" STRIP "CAPRIBS"
3/32" SHEET LAYS FLAT ON SPARS SAND TO CAPRIB CONTOUR
1/4" SQ
3/32" x 1/4" SPRUCE LEADING EDGE
1/16" PLYWOOD ROOT RIB
1/2 x 1/8 SPRUCE SPARS
1/16" SHEET BALSA, TOP & BOTTOM
1/4" VERTICAL SHEAR WEB
3/16" SHEAR WEB
1/8" SHEAR WEB
BOTTOM SHEETING
1/4" SHEET SPOILER TUBE SUPPORT
1/8" SHEET TRAILING EDGE WEB GRAIN SPANWISE
1/4 DIA. X 9" MUSIC WIRE
FILL SPACE BETWEEN SPARS AND TUBE WITH HARDWOOD AND EPOXY
VERTICAL GRAIN SHEAR WEB - FULL SPAN
3/32" MUSIC WIRE
HARD BALSA OR PINE NOSE BLOCK HOLLOWED FOR NOSE WEIGHT
1/8 O.D. TUBE
NYROD OUTER TUBING
MED. BALSA FILLETS
▼ DENOTES 1/8" LITE-PLY FUSE. OUTLINE
WHEEL COLLER SPOILER PULLS
1/4" I.D. BRASS TUBE
1/8" FIRM BALSA, CROSS GRAIN
PUSHROD LOCATIONS (GOLD-N-RO
ANTENNA T
BATTERY
SERVO
SERVO
RECIEVER
SWITCH
BALANCE POINT RANGE
1/8" LITE PLY
WRAP WITH SOFT WIRE AND SOLDER
1/8" MUSIC WIRE HOOK
WHEEL COLLER TO ADJUST TOW HOOK
HOOK TOP VIEW (HALF SIZE)
1/4" x 1" TRAILING EDGE SPOILER
1/8" PLY SPOILER HORN
1/8" TRIANGLES
1/8" LITE PLY
RUBBER BAND
BUILDING BOARD
YARD STI
1/16" x 1/4"
1 1/2"
(1 1/8" AT TIP

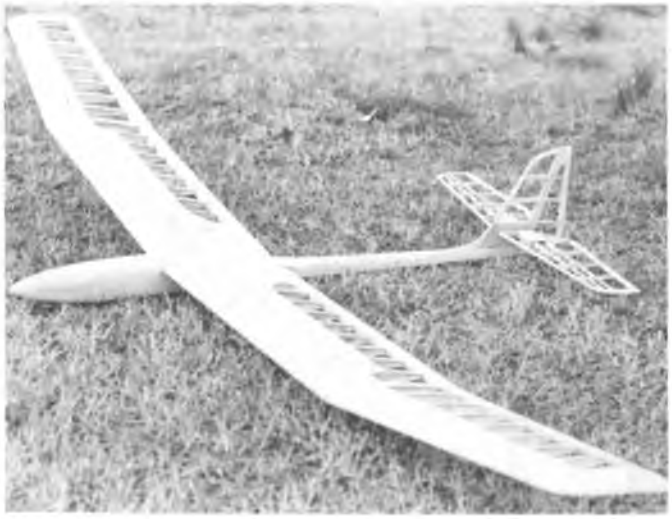


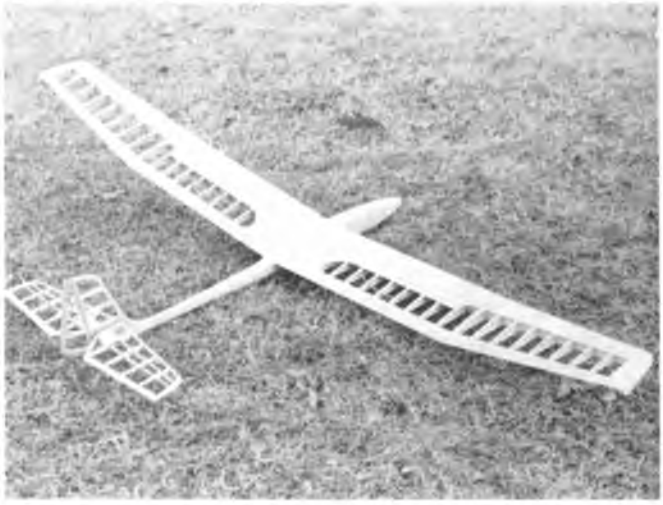


Preliminary radio component location.



Final radio installation — very tight. Note: Spoiler cable lead-in, spoiler adjustment wheel collars, switch installation, Goldberg hatch snap inlaid into forward end of hatch, much foam to cushion servos and receiver.





Completed structure ready for finish.

during assembly to help keep the sides square and the wing rod level. A good clean hole cutter for the wing rod can be made from a piece of the brass wing rod tubing about 2" long. Use a fine razor saw and cut teeth every 1/16" in the end of the tubing. Mounted in a drill, it cuts clean holes without splitting the plywood. This idea works well with balsa, also. The pushrod guides and antenna tubing (small soda straws work good for this and are light — just split one end, slip together and Hot Stuff) should be fitted and glued in before assembly. The wing fillet is just a piece of 1/4" medium balsa tapered to be flush with the fuselage sides at the wing leading edge and then is shaped with the X-Acto gouge or round blade to the lower wing surface and continues the wing upper surface across the fuselage near the trailing edge. Rounding the fuselage and shaping the fillets should be one of your last steps.

The fuselage hatch fastening method was not shown. I am using a Goldberg Nylon Snap Keeper inlaid in the top with a screw in the nose block. It would be just as easy to fit a screw in the top with a slot in plywood, ala Sagitta. Rubber bands should work well too. In any case, the hatch is fitted between the fuselage sides at the wing root and fairs into the wing.

The tow hook is designed for the strain of zoom launches. It will distribute the launch loads over a wide area in the fuselage and should be securely epoxied in place. I reinforce the entire hook area inside the fuselage by fiberglassing up both sides to the wing rod tube. After the tow hook is inserted, I epoxy glass around it. This serves to tie wing assembly and tow hook together. **Very Strong!** Try to keep the space between the hook and fuselage to no more than 1/8" so that the tow ring will not slip over the wheel collar.

The bellcrank is the next logical step as this is common to both the vertical and horizontal stabs. I like the plywood unit shown since it is custom made and is much stiffer than commercial plastic units. Most flying stabs I have seen tend to wobble — not this one. If you want to make your bellcrank out of 1/8" ply (aircraft grade) and sand it to 1/16" for the stab clevis, be my guest. However, by laminating it as shown, you can leave a large lightening hole (not shown) in the center piece between the 1/32" sides and still have a stiff bellcrank. The forward tube is 1/8" I.D. and pivots on the 1/8" O.D. tube (3/32" I.D.) which is glued into the vertical stab and fillets. Since this fixed tube and the rear bellcrank tube are both nearly 3/4" long, all wobble is eliminated.

In the vertical fin, I used some 1/64" plywood I had instead of the 1/32" ply shown on the plans for the stab mounting. If you have this available, use it in good faith. With the fillets for the stab on each side, it will be quite strong and will save some weight in the tail. If you elect to use the small hinge points which I prefer, the 1/64" ply makes a good thin capstrip for the rudder post as in Detail A for a very scale-like hinge.

The rudder may look small by comparison to other sailplanes. It is enough at the higher speeds this model normally flies at. If you're not convinced, then make it 3/8" wider. I

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think any more than that would have an adverse effect.

The horizontal stab structure is a little more trouble than a simple 1/4" flat stab structure but it does result in a nice strong and light symmetrical stab. If you decide to go to another type of construction, I definitely recommend an 8% thick section with good torsional rigidity. The only structural problem I had on the Two Much III was a stab which fluttered and broke both spars at the high launch speed I am attaining. This was due to using light 1/8" balsa spars and soft capstrips in an effort to keep weight down. Remember what I said earlier about strength? This model has a hard balsa front spar and a spruce rear spar and stiff capstrip ribs. This appears to have solved the problem as my best zoom launches to date have been very stable in pitch with no sign of flutter.

Although it looks complicated, it goes together very quickly. The little jig pieces which support the structure during assembly are the key and should be made from 3/32" sheet. Use a T-square or triangle and mark off 1/2" strips the width of a 3" or 4" balsa sheet and then cut it off every inch. Now you can just cut these off in 1/2" pieces and each will have a centerline. Mark the centerline on the spars, L.E. and T.E.'s and spot glue the jig pieces to them. Now, when you pin the jig supports to the board, the centerline of the stab will be exactly 1/2" above the board. Glue the capstrips to one side, flip it over and re-pin it and repeat the process. Presto — perfect! The small sheet area in the center is attached after the tubes are epoxied to the spars. Use the bellcrank with the center wires to position both tubes on the spars of each stab at the same time before you build it into the vertical fin. (Use hard sheet for this little pad as this is what you will be squeezing to push and pull the stab on and off. I have started gluing my mounting wires into the tubes of the stab.) I glue the front wire into one side and the rear wire into the other. Then after making a small bend in each wire, they will be very tight going together and should not work loose in flight.

My radio installation is very tight as you can see in the pictures. My equipment consists of a royal Vanguard receiver, Ace Bantom Midget servos and an Ace 450 ma battery pack. I have removed the batteries from the plastic case to allow a more compact arrangement. There are numerous other systems which will fit, but do plan ahead. By keeping everything as far forward as possible, I was able to keep the addition of lead for balance to less than two ounces.

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RADIO SPECTRUM

Jim Oddino

Getting The Most Out Of Your R/C System

Last month while discussing PCM I stressed the importance of having accurate neutrals and good resolution. Just buying the R/C system with the best specifications isn't going to guarantee you the best performance. How you set it up and install the linkages can have a big influence on results. What I'm going to try to do this month is to give you a few tips on how to get the most out of a system in terms of accuracy. Maybe some readers will think of some things to add. Please send comments. I'm going to give you a sketch but also give you some words to go with it. A few months ago, in Model Aviation, an author tried to show how to get differential ailerons by offsetting the pushrods on the output wheel of the aileron servo. He showed a photo and said it was worth a thousand words. I looked at it for a while and said to myself something's wrong. He's got the differential in the wrong direction. Well after a while I figured it out. He was flying a high wing airplane and the servo was mounted upside down. A few words would have been appropriate. I wonder how many guys out there are flying their low wing airplanes with the differential in the wrong direction.

When missile guys start designing a guidance and control system they establish an error budget. They recognize that every system has a set of error sources that have to be controlled to some tolerance if the missile is going to hit the target. We happen to have a man in our guidance and control system and he is going to be the biggest source of error so we want to make everything else as error free as possible.

First of all recognize that your R/C system is not perfect and has some drift in the analog circuits of the transmitter. The sticks don't neutralize perfectly, the servo amp has some drift and the servo feedback pot is not perfect, and probably the biggest error in modern systems is the fact there is some backlash in the gear trains. Granted, the new systems are very good but they are not perfect. So, the first thing you want to do is use the full dynamic range of each channel. Let me try to explain the concept of dynamic range. Let us say that the limiting item in our system is angle of servo rotation. If we start going more than plus and minus 45 degrees on the output of the servo it gets very non-linear and gives very little control surface deflection. But let's say we build an airplane (or buy it) and find that when we are out at the extreme end of the control horn on the elevator we have too much travel of the elevator. You have two choices: You can move the pushrod in on the servo arm or wheel or you can get in your new super transmitter and cut down the full throw of the servo.

Given these choices, the first is preferred but a better one is to go back and put a longer horn or crank on the elevator. The reason is that when you move in on the servo arm you do indeed cut the elevator throw for a given control stick throw but you do not reduce the amount of slop in the linkage and gear train by a proportionate amount. Let's try to go through an example. See Fig. 1. A typical elevator horn is about 1¼ inches long. A Futaba servo wheel has its hole pattern on about a 5/16 inch radius. For 45 degree servo rotation the pushrod moves about .22 inches. This yields an elevator movement of about 10 degrees. Now let's say you cut your throw down in the transmitter and you fly with your low rate giving 20 deg. of servo travel. This may seem like an extreme case but believe it or not a guy brought a friend's radio over to my place the other night and that is the way it was set up. If he is using standard Futaba servo wheels his pushrod only moves about .1 inches for full up when in low rate. Now let's say he has .01 inch total slop (that's 10 thousandths) due to gear backlash, pushrod bending, etc. His slop would be 10% of his total control. When you think how little control you use during a slow roll you can see that the amount of slop can be close to the amount of control. This is an extreme but real case.

The message is, use long horns on your control surfaces in order to cut down throw; do not cut servo throw.

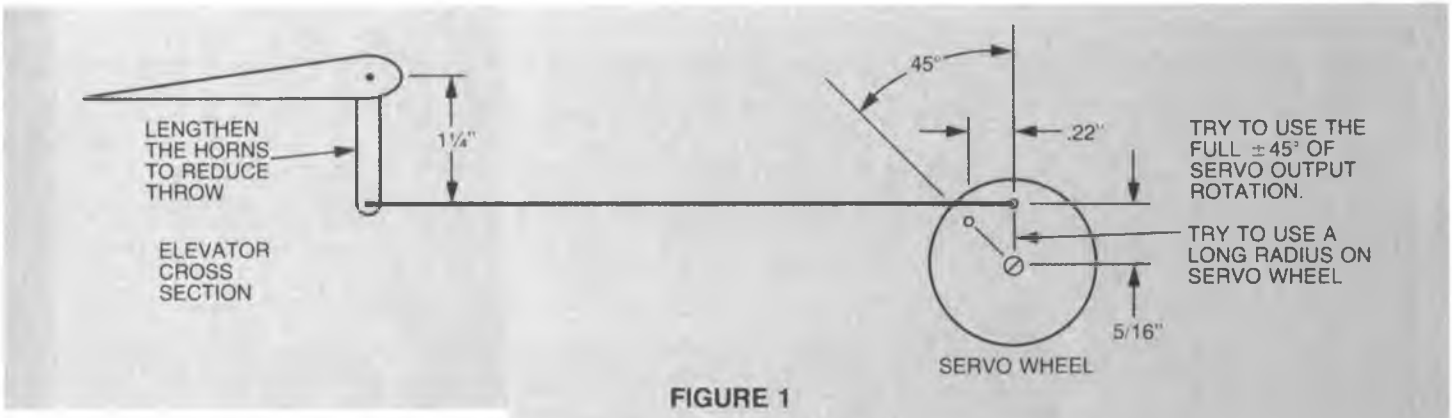

FIGURE 1

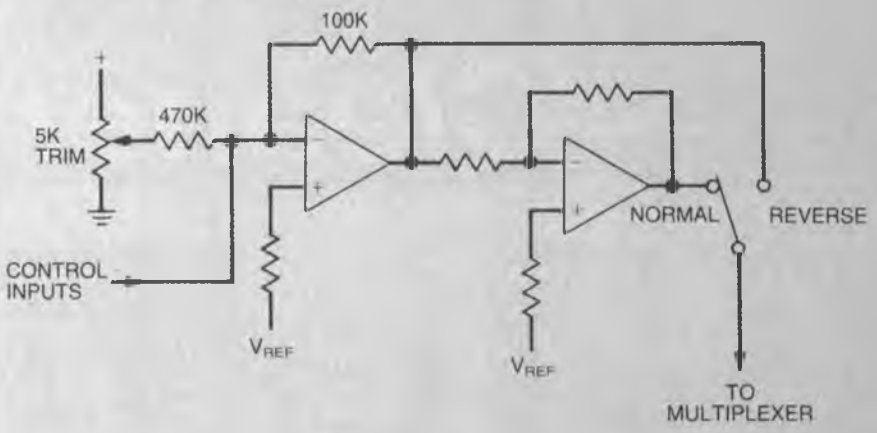

FIGURE 2

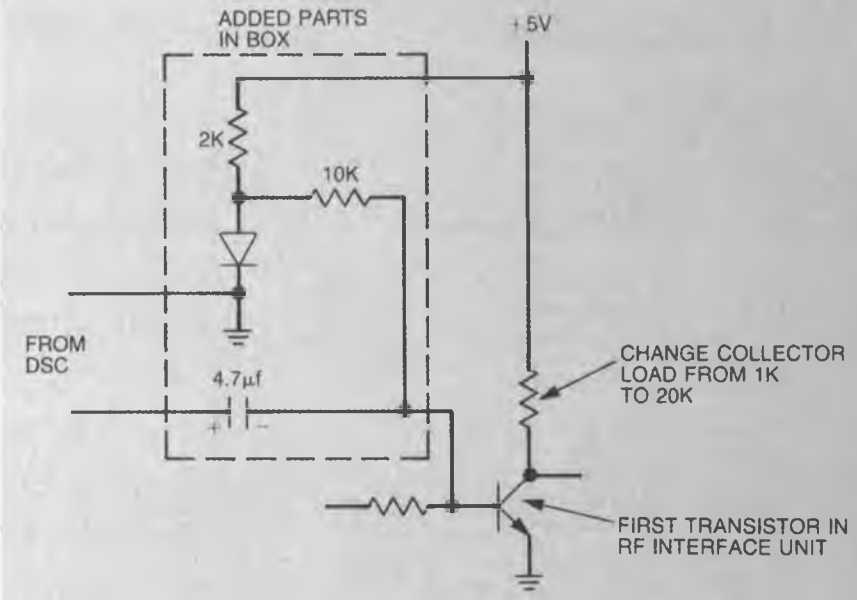

FIGURE 3

Another way you get hurt cutting down servo throw is the fact your electrical deadband, drift, noise corruption, etc., doesn't get reduced when you cut down throw. You may have 4µsec of drift and 5µsec of deadband. This would be a one percent error in a system that used 900µsec for full travel. But if you only use 400µsec (like the guy who turned his low rate down to ±20 degrees) you have over two percent. Now I'm sure a lot of you are thinking that I'm picky, but if you are flying a high performance pattern plane you might be a believer. To associate 9µsec with something you know, consider what two clicks of trim does on a JR transmitter. Most guys will admit that they are trying to trim between detents these days. That means they are trying to trim to less than 4µsec. Of course the real solution is to build airplanes that aren't so sensitive like we had in the old days. The turnaround pattern with slow flying airplanes might be the answer.

De-Sensitizing The Trim Functions

Now that I've surfaced a problem I'd better offer a solution. If you've acquired a JR or Futaba, you probably noticed that the trim lever will move the servo ± 7 degrees or more. This may be nice if you are flying an airplane for the first time, but is way too much once you get to the point where you are trying to fine tune your airplane. Fortunately, most of the encoders these days use OP amps which allow you to change gains very predictably and without affecting other functions. The JR unlimited series elevator trim circuit looks like Fig. 2. (The aileron and rudder channels are similar.)

The gain of an OP amp in this configuration is the ratio of the feedback resistor (100K) to the input resistor (470K). To cut the gain in half you would double the value of the input resistor. The easy way is to put another 470K resistor in series with the existing 470K. You could mount the resistor right on the trim pot and connect the wire that now goes to the swinger to the added resistor. Unfortunately, it is a bear to get at anything inside a JR transmitter. I recommend you see your local expert before attempting any mods. Of course, you can cut the sensitivity more by putting in an even larger resistor.

Now here is something else to think about. My stock JR has a neutral of 1.501msec on aileron with a total throw from 1.048 to 1.852 on the stick in high rate the way I've set it up. (Must have non-linear servo.) The total throw then uses up only .804 milliseconds of the total dynamic range. The trim uses .245 msec which is like 23% of the total. Terrible. If I cut it in two it's more reasonable and instead of getting 4µsec per click of trim I'll get 2µsec. But what I'd like to do then is to take the .1225msec of trim that I've thrown away and add it

to my control stick gain. So that instead of swinging .804msec I'd swing .9265msec. The idea is to use all the dynamic range I can so that the errors are a smaller percentage. Of course if the error is in front of the amplifier where I increase the gain it gets amplifed also, so you'd like to increase the gain as early as possible in the control channel. That is probably why many manufacturers use special pots on the control sticks which will give a very large voltage swing. Instead of the pot element being 300° it might be 180° or even 60° as in the case of Simprop. Anyway, the bottom line is that you want large swings whether it be voltage, pulse width or mechanical angles so that any errors are a small percentage of the total swing.

Digital Pulse Meters

Some of you might be wondering what kind of exotic equipment it takes to make some of these pulse width measurements. What I use is a digital pulse meter whose circuit was published in RCM in September 1979, Page 70. I modified it by adding another LED readout and one transistor which allows me to measure down to .001 millisecond or 1 microsecond. Ace R/C Inc., has a similar device called a Datamaster and unfortunately it needs the mod also because it only measures to .01 millisecond. However, it does have an added RF interface which allows you to check your transmitter without disturbing your receiver installation. You simply connect an alligator clip to your transmitter antenna, switch to the channel you want to check and read the pulse width. I often thought it would be nice to check all my trims just before my flight at contests and actually considered building an RF interface unit. However, right about that time I started flying a Kraft FM system and that makes the RF interface job a lot tougher. You need the equivalent of an FM receiver. However, there is a solution that might even be better. Most of the new systems have direct servo controllers (DSC) which allow you to plug your transmitter into your airplane and operate all the controls without even turning on the transmitter RF section. I figured there ought to be a way to plug my Ace Datamaster with RF interface into the transmitter DSC output and there is. The circuit is shown in Figure 3.

It was developed using a JR unlimited transmitter, and seems to work well. I can't say how it will work with anything else. The standard operation with AM transmitters is not disturbed.

Unfortunately, I'll probably start

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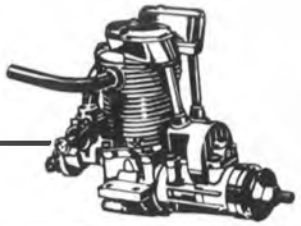
ENGINE CLINIC

Clarence Lee



The Jensen "Channel Island Special" is described in this month's Engine Clinic. At bottom center is the ignition breaker point assembly. The carburetor is shown at upper right.

The canister and metering adjustment screw for lubrication is at bottom right. The Jensen four stroker was thirty years ahead of its time.

Who would have ever thought a few years back in 1977 when Mr. Ogawa of O.S. Engines introduced the O.S. 60 four stroke engine (which was the first large scale production four stroke model engine to be offered to the modeling public) that current interest would take off like it has. In the following six years, numerous model engine manufacturers have gotten into the four stroke engine field. We now have a variety of displacement sizes ranging from the smallest H.P. 21 cu. in. engine through the 1.2 cu. in. O.S., Saito, and Condor in the single cylinder engines, and various multi-cylinder engines in larger displacement sizes up to the Kavan FK-50 3 cu. in. engine. I believe the Kavan FK-50 is the largest four stroke model engine commercially available. Also to be included are the multi-cylinder four stroke radial engines in the Technopower line. It certainly looks as if four stroke engines are to be the engine of the future.

Ironically, over the years other model engine maufacturers have thought there would be a market for a four stroke engine only to be met with less than enthusiastic reception. Many people have marketed four stroke engines in limited numbers or on a limited production basis over the years, particularly in England and Germany. One of the more popular four stroke engines manufactured in England for many years was the Gannet single and inline twins intended for model boat use. It was in the May 1982 Engine Clinic that I told you about the first U.S. engine manufacturer's endeavor — the Feeney four stroke engines that were first produced in 1938.

During the late 40's and early 50's a four stroke model engine was produced on one of the small English islands off the coast of France and appropriately called the "Channel Island Special." I had heard of this engine many times but had never seen one, other than in photographs, until this past year when I acquired one for my engine collection. Although my main collecting interests have always been the spark ignition engine of the U.S. manufacture, I do have a few engines of foreign manufacture that were a bit different, had unusual features, etc. One of these is a spark ignition O.S. 60 made shortly after WW II. When a gentleman in Canada (who had puchased the Channel Island Special in England in the early 50's) contacted me to see if I would be interested in trading his engine for a modern day four stroke, I took him up on the offer. So, before getting to the letters this month, I thought many of you might be interested in a brief history of the Channel Island Special — one of the early pioneers of four stroke model engines.

Not knowing too much about the actual history of the Channel Island Special, I got a letter off to my long time corresponding friend, Peter Chinn, in England. I am sure Peter needs no introduction to the readers of this column. Peter was able to provide some background information on the engine for which I wish to thank him very much. Peter was also able to supply me with a copy of the original instruction and operating manual that accompanied the engine which was of immense value to me. Another friend, Dick Hoff (we ran a picture spread on his multi-cylinder engines in the September 1983 Engine Clinic) by coincidence had a set of original machinest drawings for the Channel Island Special as the engine had been offered in both assembled and casting kit form. I was able to send Peter Chinn a copy of these which he did not have for his files.

The Channel Island Special was manufactured by two brothers named Jensen on the island of Jersey which is part of the United Kingdom located off the north coast of France. The engine also being known as the Jensen, or Jensen Channel Island Special. The engine had a bore of .9375 and stroke

of .875 for a displacement of .604 or 10cc. Although the glow plug engine had become universal by the late 40's and early 50's, the Channel Island Special was a spark ignition engine using either a conventional coil and batteries or an alternate magneto.

Upon receiving the engine I was quite surprised at the overall quality of the design. Here was an engine that had everything to offer that our present day four stroke engines have, and it was made over thirty years ago. In fact, I rather suspect, from ideas seen in the Channel Island Special, that some of our present day four stroke engines might have been influenced by this engine. The cam shaft is mounted horizontally above and 90° to the crankshaft and driven by a worm gear on the crankshaft very similar to the latest O.S. four stroke engines. The valve pushrods and rocker arm boxes are completely enclosed which is something some of our present day four stroke engine manufacturers have only recently gotten around to doing. Although it is nice to watch the valve mechanism in operation, it does not exactly make for long life because it is exposed to the dirt and foreign matter found at most flying sites.

The engine had an aluminum piston with two conventional expansion piston rings, a heavy forged aluminum rod with bronze bushings at both the wrist pin and crank pin ends, and a steel crankshaft supported by one ball bearing at the rear and the main crankshaft journal running in a bronze bushing. The overall construction of the engine was robust and obviously intended for long life. The design was very well thought out with no weak points that I could detect.

One very novel feature, and one that fellows nowadays would really appreciate, was a remote lubrication system --- a small oil reservoir on the side of the crankcase connected to holes drilled in the crankcase and crankshaft. The opening of the hole in the crankshaft was timed to draw a small amount of oil into the crankcase on the upstroke of the piston. The exact amount is regulated by a metering adjustment below the oil reservoir. No oil was added to the fuel — the engine ran on straight gasoline! A small one way poppet valve was installed in the crankcase so that negative pressure would occur on the upstroke of the piston but no positive pressure on the down stroke. A very clever lubrication arrangement. Lubricating of the valve mechanism had to be done by hand every time the engine was run. The oil reservoir was adjusted to last for about one hour of running.

Another item on the Channel Island Special that I was quite impressed with was the carburetor design. Back in the late 40's and early 50's most R/C type carburetors were of the simple rotating barrel type with an air bleed hole to lean the idle mixture. The Channel Island Special used a rotating barrel with the needle valve threaded into one side. The fuel inlet jet was mounted in the aluminum housing on the other side. The needle valve was held from rotating with the barrel so that as the barrel rotated the needle valve would, in turn, move in and out thus regulating the fuel mixture. It wasn't until many years later that our R/C engines started using a better means to regulate the fuel mixture and, even today, many carburetors are of the ancient rotating barrel with air bleed design.

My curiosity got the better of me and I had to run this engine to see how it would compare with some of its modern day counterpart. Would you believe it would turn a 14/6 Top Flite propeller at 7,800 rpm using plain white gasoline (not unleaded) and spark ignition. This is stronger than some of our present day .60 size four strokes will turn on glow plug. The idle was in the 800-900 rpm range but this is to be expected with spark ignition. Needless to say, here was an engine that was 30 years ahead of its time!

★

In the December Engine Clinic I commented on the lack of letters in regards to any problems associated with the new Perry Micro-oscillating pump. With over 9,000 pumps on the market I had yet to receive a single letter other than from one gentleman who had been a bit upset over requiring about an inch of space behind the engine for mounting. The response has not exactly been overwhelming as a total of four letters have been received and two of these were to tell me how well the pump worked in their particular application. Thanks to the fellows who did take the time to write.

Our first letter this month is from one of those readers who did have a problem.

Mr. Lee,

In the December RCM you asked about the Perry Micro-oscillating pump. Our application was a 7.5 OB on a prototype outboard B hydro. The engine is not stock. We have a model Marine Racing Specialties tuned pipe and adaptor on the engine to accept the old style K & B carbs. (The new carbs couldn't be drilled to change throat bore.) We made a new steering arm to

hold the pump as in Fig. 3 of the instructions. We tried several carb throat sizes and several pump volume adjustments but it just never seemed to deliver enough. We could bypass to pump, readjust the needle and go, but, when using the pump 1/2 throttle is all we could get fuel draw with on the big throat. We even changed pumps — it made no difference. We are currently using a .375 throat and crankcase pressure and have more engine than the boat can handle, so now we're back to working with the hull.

I know of other boaters in District 8 who have tried the pump with high hopes and ended up going back to pipe pressure. I ordered four; sold two to boaters and one to a sport flier and, to my knowledge, none of them are in use currently. We would appreciate some help and feedback.

Rick
R/C Hobby Supply
Bremetton, Washington

After receiving your letter Rick, I got on the phone to John Perry. John tells me that problems have been encountered when using the new pump in boats and they are no longer recommending using the new Micro-oscillating pump in boats. In model boats the engine is mounted so solidly that the hull and engine more or less becomes a single unit as far as vibration is concerned. The Micro-oscillating pump's operation is based on engine vibration. In an aircraft the airframe is more or less rigid and the shaking motion, or vibration, from the engine actuates the pump plunger. In a boat with the whole hull vibrating in unison with the engine, there is not enough differential vibration to make the pump work properly. All of my testing of the pump was done in airplanes and I did not think of this aspect. I guess if you were to use the pump in a boat it could be done by shock mounting the engine on rubber mounts isolating it from the hull. However, this could lead to drive line problems and excessive shaking. So, for you model boaters out there who have had problems with the Micro-oscillating pump, you now know why. The Micro-oscillating pump is not recommended for model boat use.

Dear Clarence,

Let me begin by thanking you for your most informative column; hope to read many more.

I have four gallons of Duke's fuel which has been sitting for many years waiting for me to use it. It has always been stored in the most temperature-constant areas, and has always been kept tightly capped in its original metal cans. The fuel cans were opened only for an annual inspection as to the condition of the fuel. Although it still smells "right," the castor oil is separating and forming white flakes in the fuel.

I seem to recall this problem being discussed in a past issue of RCM, but I cannot find it. Is it possible to filter out the castor oil flakes and replace the lost lubricant in the fuel with a synthetic oil like Klotz? If so, how much Klotz should be added? Or is there some way to make the castor go back into solution? With Duke's fuel priced in excess of $20.00 per gallon in Canada, I'd really appreciate being able to salvage it.

Thanks again for all your help.

Sincerely,
Rudy H. Ewert
Victoria, B.C., Canada

Some flaking in castor oil based fuel is perfectly normal in cold weather. Setting the fuel can in the sun or in a warm car should cause the flaking particles to go back into suspension. However, with very old fuel it is a different situation. The chances are pretty good that the castor oil has gone rancid. You would have a hard time smelling this over the odor of the alcohol and nitromethane in the fuel. Try setting the fuel cans in the sun for a while to warm them up and see if the flaking goes away. If it does, the fuel should be okay to use. If not, there is no way of saving it. Actually the flaking does not affect the lubrication qualities that much but, once this happens, the fuel will create excessive varnish in the engine, not to mention the problems with clogging the fuel system. Filtering the particles out does not help as more will return in a day or so. Sorry, but best to use your old fuel for weed killer.

Mr. Clarence Lee,

I read your article in RCM and I have a problem that I would like some help with.

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Engine — O.S. Max .20 installed in a Goldberg Eaglet. This engine came with muffler and pressure top which is used to supply pressure to the fuel tank.

Fuel — Red Max 5% nitro and synthetic oil.

Plug — Tower Hobbies; also tried K & B R/C long.

Prop — Break-in and a lot of taxiing using Master Airscrew 8/6, and then 9/4 when I was ready to take to the air.

The engine was run on a test stand first on the Red Max fuel at least three or four tanks with rich setting. No problem was noticed in running.

The needle valve was broken in a slight accident on take-off and was replaced with a new assembly and adjusted in the intake pack to the factory position. Also, I have tried one turn in and out.

The engine has been carefully checked for leaks, also fuel tank and tubing, several times. I removed the tank and replaced the brass and silicone tubing and careful attention to the klunk placement.

The engine is placed as high as it can be inside the fuselage with foam rubber under it and thin pieces on sides and top.

Trouble is as follows: The engine idles good at all times but sometimes when I open the throttle to full speed the rpm starts to die. But, if I reduce the throttle to idle it will continue to run on idle. However this loss of power does not occur every time. There may be a satisfactory flight and then next time on take-off it happens. Sometimes there are several satisfactory flights before trouble occurs.

The needle valve is tight in its keepers and does not move from a setting. This engine seems to be very peculiar in that one time the needle valve is set for proper operation, but within a few minutes it needs a different setting, sometimes turning leaner will do it and sometimes turning richer is needed. I have not been able to find a needle valve setting the engine is happy with for very long.

This is a first R/C venture for me and I did a lot of taxiing before flying. The guys in the club just say check for leaks, which I did.

I am sure that I have not given information sufficiently for you to know the whole picture, but I would appreciate any information.

Thanks,
G.B. Parrish
Tampa, Florida

To start off with, you do not ever want to break an engine in by doing a lot of taxiing. This is the best way in the world to badly varnish and carbon-up the engine and actually prolonging the break-in period. Metal surfaces have to wear and mate together. By getting everything covered with varnish there is no wearing-in action occurring. Secondly, the engine is not up to operating temperature so the parts have not expanded as they will under full throttle operation. You could taxi around for three or four hours and still have the engine stick up on the first take-off. Finally, is the dirt ingestion problem. There is no such thing as a clean flying site and excessive taxiing results in the engine digesting a lot of foreign matter unless an air filter is used.

As to the erratic needle setting --- providing your engine is sound, that is, good compression, the back cover is not leaking, etc., then the only things that can cause this would be foreign matter in the fuel, an obstruction in the fuel system such as a metal burr that can move around in the carburetor, or worn carburetor parts. If the carburetor barrel is a loose fit in the housing, it can cause this. If the needle valve threads are loose allowing air to leak in, it can cause this. Although you installed a new needle valve on the carburetor, make sure the holder portion was not cracked during your previous accident. Are you sure the carburetor is seated tightly on the crankcase? Maybe more damage was done on that take-off accident than you realize. Check for cracks around the crankcase intake. You might also consider trying a new carburetor.

Dear Sir,

Is there any significant difference in ring/piston and cylinder wear in mounting a .35 to .61 engine in the horizontal position versus an upright position? If there is a difference, would a 45° mounting angle correct the wear situation? I enjoy and appreciate reading your column because of the meaningful information you present in an interesting manner!

Thank you,
Richard Sobczak
Wind Lake, Wisconsin

This discussion goes back to the days of Henry Ford's first V-8 engine in 1932. There were those who said that the pistons were going to wear out right away bacause they were laying on their sides. Needless to say, this has proven to be incorrect. People did not take into consideration rotational forces of the crankshaft, thrust loads on the piston during the power and compression stroke, etc. It makes no difference whatsoever in regards to rings/ piston/ cylinder wear if the engine is mounted upright or on its side. The side of the cylinder opposite the direction of rotation always wears the most due to the thrust load of the piston.

□

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SUNDAY FLIER

Ken Willard

The "three stooges" live! Left, Lynsel Miller; right, Rich Spicer; pivot man, Wm. Purcell.

Some of the workers who helped build the glider port: Ranger Ed Stuckrath in tie; just to right of him, Bob Boass, Pres. of R/C Bees; left of Stuckrath, Dr. Carl Henning, head of steering committee for Sunset glider port.

Dear Mr. Cratchit: This letter is to inform you that effective 60 days from this date, the city will need the property on which your club is flying. We plan to develop it into a recreational area for golf, tennis, hiking, and quiet meditation. Your activity, the flying of radio controlled model aircraft, is incompatible with the intent of the area which we have planned. Therefore, you must vacate the property. Signed, Ebenezer Scrooge, Staff Advisor to the City Manager.

The above letter is, of course, fiction. But remember the old saying, "Truth is stranger than fiction." For various and sundry reasons, many R/C clubs throughout the United States are losing their flying fields as the urban sprawl reaches ever further into the outskirts of major municipalities. Some of the reasons are valid, some are political, and some are highly questionable, yet apparently nothing can be done about it. Take, for example, the instance --- and this is a true story --- in which the police were called because "One of them noisy airplanes was being flown in the playing field next to our house." The "noisy airplane" was a glider!

Another true story. A municipal park is under development. The park attendant was asked if an R/C airplane could be flown there.

"No."

"Why?"

"Too noisy."

"But it's a glider --- doesn't make noise."

Long pause. Then --- "too dangerous."

"Which is more dangerous, a glider at fifteen to twenty miles an hour, or a golf ball at one hundred and twenty miles an hour?"

Another long pause. "Dunno. But you can't fly that thing here."

So we forgot the whole thing --- and the golfers continued to play.

What it boils down to is a matter of education and cooperation. Offsetting all the "horror stories" about lost fields and such are an almost equal number of stories of R/C clubs and government officials --- be they city, county, or state --- getting together and developing good flying sites. 'Way back in 1955 the Los Angeles LARKS worked with the Los Angeles City Department of Parks and Recreation and created what was, at that time, one of the best R/C facilities in the country. It was in Sepulveda Basin, and was named the Los Angeles Model Airport --- although that name never did really take hold. Modelers always went flying at "Sepulveda Basin."

One of the most satisfying reports I have ever read is the story of the Sunset Beach Glider Site. For several years in the late sixties and early seventies, the annual RCM Trophy Races were held at the site. Then some environmentalists intervened. They believed that if sailplane flying were allowed to continue, the fragile structure of the oceanside dune would erode away due to the foot traffic. It became a very sensitive issue --- so

much so that the California State Department of Parks and Recreation was seriously considering the banning of all flying at the site.

Rather than writing it up myself, I asked John Kanzler, Editor of the South Bay Soaring Society's "Silent Flyer" newsletter to tell the story of how two clubs --- the Santa Cruz R/C Bees and the South Bay Soaring Society --- worked with government officials to solve the problems. Here is John's letter to me in response to my request.

Dear Ken:

I decided to write you a letter describing the activities of some local R/C pilots here in Northern California. While this letter describes the activities of some great people to save a slope soaring site, I believe the whole R/C community or anyone who uses the outdoors can use this project as a model for their activity.

The site is located just a few miles south of Santa Cruz, California, and called Sunset State Beach. It consists of a sand dune that faces the ocean and is roughly 500 feet high. The dune is covered with scrub vegetation. In the past few years this vegetation has been threatened and disrupted — enough so that large erosion scars were developing. A similar problem had occurred to the adjacent dune a few years ago: all vegetation is now gone and the dune has been reduced to about one-half of its original size. Stabilization of the dune has been estimated to cost California taxpayers approximately one-quarter of a million dollars. The head ranger for this site was ready to close the dune permanently when his deputy, Ed Stuckrath, suggested that the dune could be restored. Mr. Stuckrath proposed to erect a viewing stand, pathways made of wood, roping off a landing area, eliminating the myriad pathways that were destroying the vegetation, replanting the eroded areas, and placing small fences and signs to keep people from wandering in and around the site. In November of 1982, a meeting of all pilots who had used the site was convened and a steering committee was established to organize workers and acquire materials. Early in January about 25 people came to the site for a weekend of fun and work. About 300 feet of walkway had already been installed by convict labor. The volunteers erected fencing, planted grass and ice plants, roped off a landing area, and built a reviewing stand. The only cost to the taxpayers was $100.00 that was allocated by the state.

Since the restoration was completed this area has endured some of the worst and wettest weather in history. Recently, the head ecologist from the California Parks Department flew over

all the parks in the state and announced that the only area undamaged was "our" dune. Both he and the parks department were so impressed that they will use our project as a model for future glider ports throughout the state. Our dune is officially listed as a glider port by the California Parks Department. A contest is being held to find a symbol that will be used by other parks.

There are a number of things we have learned from this project which I would like to pass on to your readers. First, instead of costing the state $250,000.00 to renovate the dune, our total budget was only $100.00. All other materials were either donated or salvaged; for example, the old fire hose that was used to delineate the landing area. Secondly, we learned just what cooperation between government and private interest groups can yield given willing hands and understanding ears. It also helped to have an insider like ranger Ed Stuckrath on your side who is himself an avid glider pilot. Finally, we proved that the whole concept of our parks system is a viable one since we have not only increased the use of the site but stabilized the ecology of the site and improved its ability to withstand fierce storms.

The people involved were mostly from two clubs in this area: The R/C Bees of Santa Cruz and the South Bay Soaring Society of San Jose, California. I think every person involved in this project should be proud of their effort. Any time you are visiting the Santa Cruz area pay a visit to the Sunset Park State Beach Glider Port and bring your glider with you. The flying is great and the site itself is beautiful.

Sincerely yours,
John W. Kanzler
Editor, South Bay Soaring Society "Silent Flyer"

John sent along a couple of photos. One shows the R/C enthusiasts busily restructuring the site. Note the beautiful view overlooking the ocean. The other photo shows some of the RC'ers with Ranger Ed Stuckrath (in tie) assembled on the launch platform. They look pleased with their efforts, as well they should be.

So it can be done. It takes patience, perserverance, and time, but it's worth it.

For those of you who can make it, the AMA is having a symposium on flying sites during the Toledo R/C Show. The meeting is scheduled for April 7, 1984, at the Royal Toledo Hotel. If your club is having difficulty getting a flying site, the AMA can offer advice and counsel on how to meet and overcome those difficulties --- just as the R/C Bees and South Bay Soaring Society did.

Try and be there. □

GIVE IT A WHIRL

John Gorham

R/C Helicopter Radios:

Gongs, bells, whistles and then some. As you may remember from my last column, I have had the good luck to visit the Tokyo Model Trade show and see all the new helicopter radios, some of which are already available in this country. And as they say in the San Fernando Valley here in California, the capabilities of these new radios are "awesome." After returning from Japan and finding that some of the new radios are already available here, I decided that it was time to cover R/C helicopter radios again. It will probably take me several columns to cover the subject thoroughly, but I believe that there are now enough new would-be or bewildered present heli-fliers to make it useful. So, here goes.

First, let's look back on the use of radios in R/C helicopters and also assure you who are about to start your first venture in R/C helicopter flying that you don't **have** to own one of these new "all singing, all dancing" radios in order to enjoy great R/C helicopter flying and have a lot of fun. Equally, however, it is true that if you wish to become truly competitive and capture one of the top places in our own "Nationals" or International competitions, it is now almost essential to use one of these new sophisticated and "awesome" designs. However, before we launch off into "hi-tech blue sky," let's revert to fundamentals and discuss again what features are really required to fly our R/C helicopters.

The Simple Four Channel Radio:

It is necessary, with any of the model helicopters available today, to have at least a four channel radio. In a fixed pitch helicopter the four channels are used as follows:

Throttle:

One servo channel and, of course, its servo, is connected to the throttle lever of your engine in order that you may increase and decrease the **power** available to your helicopter. The change in engine power will result in a speed change of the main rotor blades and, hence, a change in lift of your "heli" (see Figure 1).

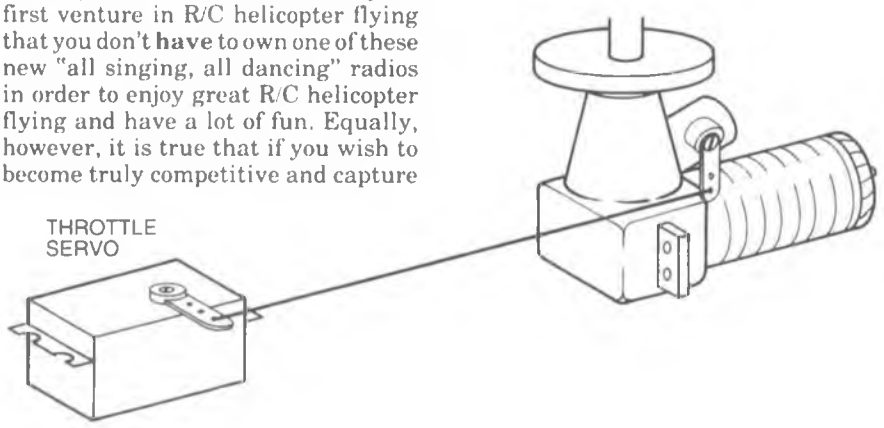


FIGURE 1: CHANNEL 1 THROTTLE CONTROL

Tail Rotor Channel:

The second servo channel of your radio will be used to vary the collective pitch control of your tail rotor. Movement of this servo will increase or decrease the pitch angles of both rotor blades simultaneously. This, in turn, will result in the helicopter's tail and, hence, nose, turning in one direction or the other. So, now we can steer our machine in the yaw axis. This channel of control is used, in fixed wing machines, to operate the rudder (see Figure 2).

Cyclic Pitch = Pitch:

In order to make the helicopter move forward and backward, the swashplate must be tilted in a fore and aft direction. When the swashplate tilts, various mechanical control arrangements are used in the rotor head to produce the aerodynamic forces required. The servo for this channel is known as the pitch servo since it "pitches" or rotates the helicopter's nose down or up. The fixed wing airplane pilot calls it the

elevator channel. There is sometimes confusion in use of this term since the Japanese, for instance, use the term "pitch" to describe **collective** pitch,

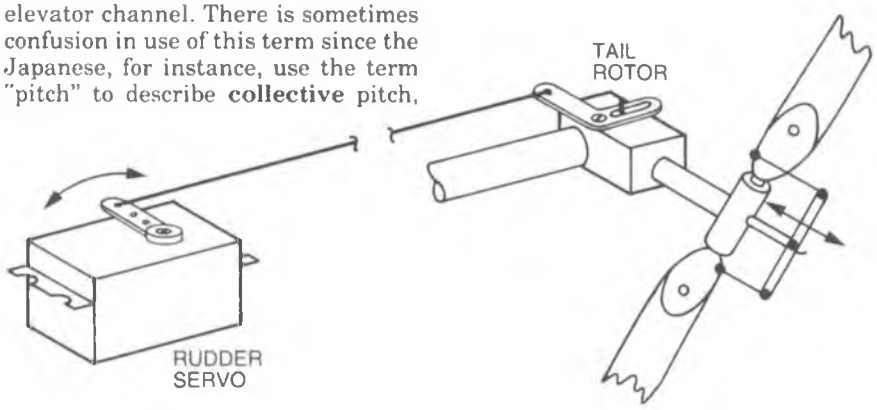


FIGURE 2: CHANNEL 2
TAIL ROTOR PITCH CONTROL

which is the simultaneous movement of both of the main rotor blades to accomplish increases and decreases in lift. However, we would still have a problem if we used the airplane term "elevator" since this could then also be confused with collective pitch, which "elevates" or "lowers" our helicopter. So, in the USA at least, we describe the movement of the main blades collectively as collective pitch control and the tilting of the swashplate fore and aft as pitch control (see Figure 3).

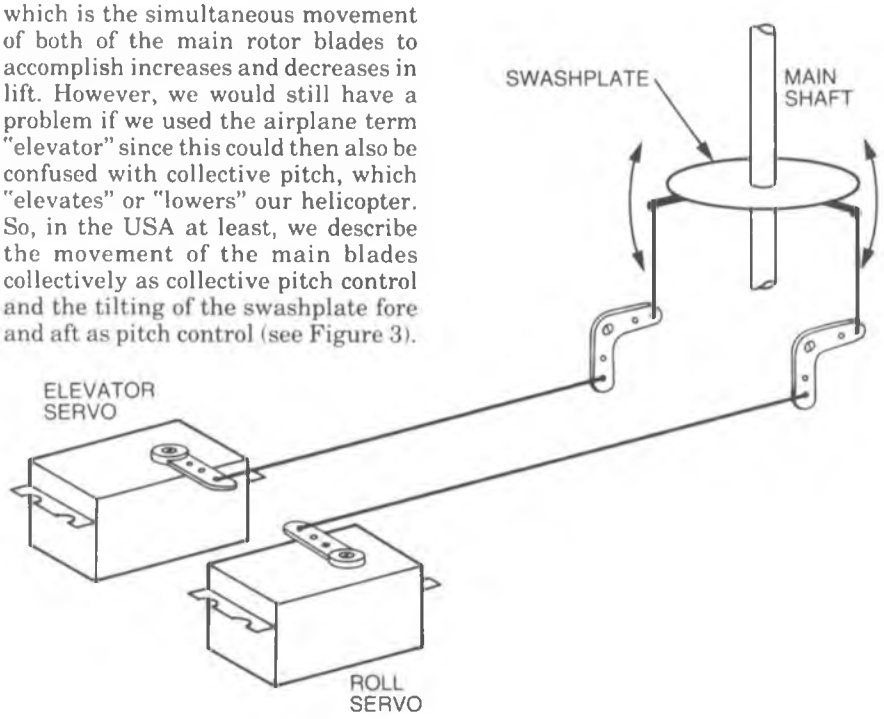


FIGURE 3: CYCLIC
PITCH AND ROLL CONTROLS

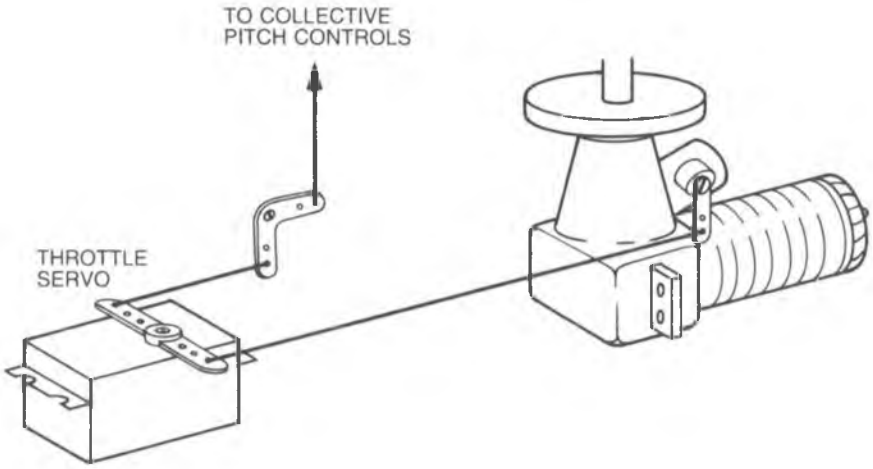


FIGURE 4: CHANNEL 1
PLUS COLLECTIVE USING SAME SERVO

Cyclic Control = Roll:

In order to make the helicopter roll and, as a result, move sideways, the swashplate is tilted in a sideways direction — right or left — according to the direction of motion required. The rotor head control system of the helicopter then accomplishes a tilting of the lift vector to the right or left which, in turn, causes the helicopter to roll and then move sideways depending upon what tail rotor changes are made in unison. This is known as "roll control" and it accomplishes the same effect as an airplane's aileron (Figure 3).

So, now we have our four basic channels of control — throttle, tail rotor, cyclic pitch and cyclic roll — and this is quite adequate to fly our fixed main rotor blade pitch helicopter.

Add Collective Pitch:

Now, let us add collective pitch to our helicopter (which means that the up and down control of the helicopter is accomplished not only by changes in engine power but also in changes to main rotor blade pitch angles.) The use of collective pitch speeds up the variation in lift which causes the helicopter to change altitude. Since we only have two levers on our transmitter and, hence, four axis of control, it is normal to couple collective pitch control to the throttle lever. The simplest arrangement is to use an additional mechanical linkage arrangement (or mixer) connected to the throttle servo so that this servo also changes the collective pitch of the main rotor blades. This method, while quite okay for small "helis," imposes a strain on the throttle servo with larger mechanics (see Figure 4). Another variation is to double up two servos to the throttle channel (using a "Y" connector) so that when the throttle lever is moved both servos move together. One servo can be attached to the engine throttle lever and the other servo to the collective pitch mechanism which changes the pitch angles of both main rotor blades. A more modern arrangement, which is now almost universally used with the more advanced collective pitch machines, is to have a separate servo for collective pitch and connect it to a fifth channel of your radio system. We now "step up" from using a simple four channel radio to a five channel radio with electronic mixing circuits to couple and mix the collective pitch and throttle servos. There can be, however, a considerable advantage in doing this since, with modern solid state circuitry, it is relatively easy to vary the relationships between your throttle and collective pitch servo in order to achieve wonderful results, as you will see later on in this series of articles.

So, to summarize, any helicopter can be flown with four servos. It is better to have five, from the point of view of "wear and tear" on the servos, and better still to have a five channel radio with a mixing capability if you want to take full advantage of all the control shaping that can be done within the electronics of your radio.

Let us now examine some of the important characteristics of the elements of your radio when used to fly an R/C helicopter.

Transmitter Design:

The transmitter design will be the one that suits your taste and handling the best. There is no need to have any specific design, mode or shape of transmitter, except that the control sticks must be of a reasonably high quality so that even very small movements of the control sticks will result in an electronic command to your receiver to move the respective servo(s). In other words, no mechanical "backlash" or "dead space" in the stick mechanisms. This is highly important in helicopter flying and, in fact, is essential if you wish to maintain very accurate hovering control. Another important factor in the transmitter design is that the stick spring tension should be quite light. Since a model helicopter is flown by relatively small movements, especially of the cyclic stick (the one on the right in Mode II), any high centering force is, to say the least, disturbing and can even lead to serious problems in hovering the machine. Most expert fliers decrease the tension on these springs to the point where breaking out of the center position requires a very light stick pressure. Another feature which can assist flying is to reduce the effect of the rachet mechanism fitted to the throttle lever. Believe it or not, a "one click" movement can be too great for very accurate hovering when flying one of the new, powerful contest machines. Some experts fit a piece of fuel tubing over the rachet arm so that the "clicks" no longer exist. Please, however, don't take chances by allowing the throttle lever to be so loose that it can inadvertently move to full throttle when you are starting up. So keep at least some friction on this important control lever.

Receiver:

The receiver for R/C model helicopter flying need have no special characteristics except that it is usually better for the sensitivity of the receiver to be lower than that required for fixed wing flying. There are two reasons for this. One is we do not fly so far away and, therefore, don't need the sensitivity and range and, secondly, our "choppers" are prone to produce electrical noise because of the movements of all the mechanical bits and pieces which, in turn, can cause chaos in your received signal and, hence, your servo movements. Of course this is an oversimplification of a complex subject but, in general, in the early days the very high sensitivities which most fixed wing fliers liked to have in their receivers were several times greater than the sensitivity which was needed to adequately fly a model helicopter with the minimum of "glitching." These days we have "FM" modulation and, as we will learn later, the even more sophisticated "PCM" (pulse code modulation) so that sensitivities can be increased again since "noise" problems are now dealt with in a more sophisticated manner. In fact, with luck, the new radio designs may have eliminated our "noise" problems altogether! Finally, your receiver/transmitter relationship must be accurately "tuned." Any inaccuracy in tuning can also lead to "glitching" which, of course, with a helicopter is not only scary but, in some instances, can be downright dangerous.

Servos:

The servos of your R/C helicopter should always be of a high quality. You should remember that a helicopter control system imposes quite high mechanical loads on your servos at a fairly high frequency and, unless the servo gear train is quite rugged and the output shaft is mounted in ball bearings, you can soon have excessive wear or even breakage of your servos due to the feedback of forces from the control system. Wear results in "dead space" and this may produce problems in hovering accuracy. Therefore, it is wise to have the highest grade servo that you can afford to buy for your R/C helicopter. A high grade servo will usually have a lower threshold which will also provide the hovering improvement in performance which we referred to earlier. So, look for the best servo but also keep the weight of the servo down. Remember, weight is an enemy of flight for any flying machine, but especially so with an R/C helicopter.

One other point about servos may be worth covering here and that is concerning "regular" or "coreless" motors. Many expert fliers "swear" by the use of "coreless" and others insist that they have a high failure rate. Well, most fliers probably know as much about the subject as I did (very little) and so I made a point of finding out a bit more about this currently controversial subject so that I could pass on the "info" to you.

It seems that a "coreless" motor consists of an armature which is wound just like the one in your automobile starter motor **except** that it is not wound on an iron armature or core. It is wound around "fresh air," hence the term "coreless." Then a strong permanent magnet is used as a stationary core. The result is a more efficient motor because of shorter and more efficient flux paths **and** a lower level of rotary inertia. This, in turn, means that the motor can accelerate or "get off the mark" much faster because of this low inertia. So with a coreless motor we get the advantage of improved threshold performance and our hovering accuracy **may** be improved. Disadvantage? Well, if not designed right, the coreless motor **can** be less rugged and, hence, can fail mechanically more readily. I'm told, though, that this problem has now been overcome and I guess you can assume that a modern coreless servo will give improved threshold performance and adequate reliability. Whether, for all practical purposes, the average flier will notice any difference is, to say the least, unlikely. On the other hand, the really expert flier may well make use of this improvement in threshold performance to give him an edge over the flier using regular servos. So much for regular vs. coreless motor.

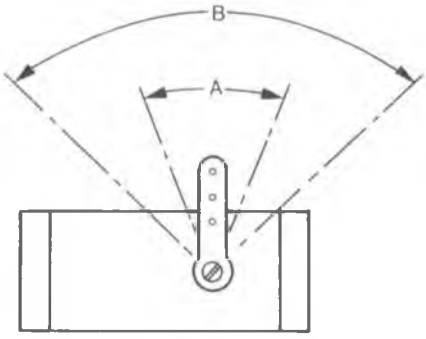
Gongs, Bells and Whistles:

Now let's look at the additional

options and features that could be added to our radio and then we can progress to describing how some of the various manufacturers achieve these features in the new "gongs, bells and whistles" radios.

Dual Rate:

A feature which is useful, even for simple helicopter flying, is to have individually switched "dual rates" on at least cyclic pitch and roll control. Now the term dual rate is misleading. What actually occurs when low rate is selected is that the normal servo movement is reduced (see Figure 5).



A — LOW 'RATE' TRAVEL (ADJUSTABLE)
B —HIGH 'RATE' TRAVEL (NOT ADJUSTABLE)

FIGURE 5: EFFECT OF DUAL RATE ON SERVO TRAVEL

There is no change in the actual **rate** of rotation of the servo output arm. Dual rate on rudder is also useful but not quite so important as the other two. Don't feel, however, that it is **necessary** to have dual rate. Very adequate helicopter flying and aerobatics can certainly be accomplished without this feature. However, a helicopter's flight characteristics are such that, under some conditions, more control movement is desirable (high rate). For smooth, low speed flight and hovering, a smaller total servo movement (lower rate) is used and the high rate is used to carry out maneuvers such as loops and rolls. There is another form of dual rate called "exponential." The use of exponential control provides, in my experience, a somewhat doubtful advantage and it has not yet proved itself to me to be desirable in flying helicopters. I would appreciate any inputs on this point and I'll be glad to publish them. By the way, exponential control simply means that the servos move faster (and further) the further the stick is moved away from center. It is almost like an automatic dual rate — low rate near center and high rate at the extremes of stick movement.

Throttle/Collective Pitch:

Even for normal hovering and flying of your helicopter an electronic mixing circuit between collective

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pitch and throttle is desirable in order to accurately match the power of your engine to the drag changes of your rotor blade system under various throttle settings (see "Give It A Whirl," September 1982 issue). In many of the newer helicopter radios the shape of this curve can be tailored to nearly exactly match what your machine requires. This leads to more efficient use of the power which your engine can give. It also makes for a more lightly loaded and, hence, lower wearing helicopter parts because your engine will run more smoothly with less frequent changes of speed under various flight conditions. Generally, this mixing is available for adjustment in the back of the transmitter case.

Throttle/Rudder Mixing:

With a collective pitch helicopter, when you move the throttle lever to change engine power you also change the pitch setting of the main rotor blades. This will result in a change in the torque reaction of the helicopter fuselage which, in turn, requires a change in the normal or datum setting of the tail rotor blades. This change of tail rotor setting is quite small but, nevertheless, if it could be done automatically, will make the flying of a collective pitch machine that much easier. In fixed pitch machines no direct compensation is required since the main blades can only increase their torque by increasing their speed and, since the tail rotor also is geared directly to the main rotor, it will automatically compensate for the torque change. Back to the collective pitch machine, however. There are mechanical mixes available in certain machines which will make the change for you but, of course, mechanical mixes can be prone to thresholds and dead spaces which, as we know, are the enemy of accurate flight control. So now, with modern radios (even the lower cost ones) there are usually one or more potentiometer adjustments available to you on the transmitter case and, by adjusting these, you can cause the rudder to automatically change its datum as you move your throttle lever. This feature is sometimes known as "ATC" (automatic tail compensation). We will describe, in more detail, how the new radios accomplish this later in the series.

Throttle Hold:

This feature is very useful, especially if you are flying a collective pitch machine with an autorotation capability. If the engine of your machine ever fails, you have, of course, a good chance of coming down in one piece or, in less pieces than you would without the autorotation feature. However, since autorotation is a unique maneuver needing practice to perfect, it is obviously better that you learn this without having to shut off your engine each time. Because of this need, many of our modern helicopter radios have a feature called "throttle hold." After you have selected throttle hold on the transmitter, the throttle setting of your engine power will reduce to, and remain at, a pre-set low idle, whatever you do with the throttle lever, while leaving your control over collective pitch fully available and unchanged (see Figure 6). As you can see, with this feature, when you want to practice an autorotation, you can flip the throttle hold switch and control your rate of descent in autorotation by means of your throttle lever which now only serves to change the main rotor blade's pitch angle. If, however, you decide, when close to the ground, that this "isn't for you" on this occasion or even "never again," you can restore power by flipping the switch back again and proceed to climb out into normal forward flight.

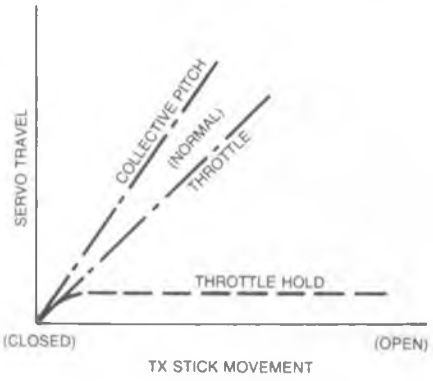


FIGURE 6:
THROTTLE HOLD MODE

Idle Up:

Another term which is being used in our new radios, "idle up," has caused confusion in many people's minds. Certainly it is the least understood feature of a modern R/C helicopter radio but, ironically enough, perhaps the most useful one to have. When we change the lift vector of an R/C helicopter by moving the throttle/collective pitch lever, we add and subtract the power necessary to maintain blade speed (as described earlier) as well as changing (collectively) the pitch angles of both main rotor blades. However, there are certain maneuvers, such as loops, rolls and even mildly aerobatic flight, in which it would be nice if your engine power never reduced below a value equal to about 1/3 to 1/2 throttle setting, while permitting you to adjust the collective pitch settings throughout the whole range — even to

zero — as desired. When "idle up" is selected by a switch on the transmitter, engine speed cannot reduce below a certain level which is pre-set by a potentiometer adjuster in the back of (or on the front of) the transmitter. Above this setting the collective and throttle will move together as usual but below this setting the engine speed stays constant, at a "high-idle" (see Figure 7). The major advantage of this feature is that you can reduce the lift on your helicopter in flight without reducing blade speed or power and, hence, you maintain the effectiveness of cyclic control (because blade speed is kept high) under all flight conditions. This makes for superbly executed rolls and loops and, in fact, many expert fliers now "pop in" their high idle switch soon after take-off and leave it in for the whole flight.

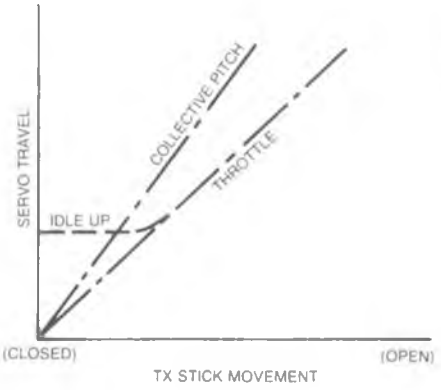


FIGURE 7
'IDLE UP' MODE

Even the final landing maneuver can be improved with the tighter control which exists because of the higher rotor blade speed at touch-down. After landing, of course, high-idle must be switched out so that the main rotor blades will stop turning. We'll talk more about this feature later on.

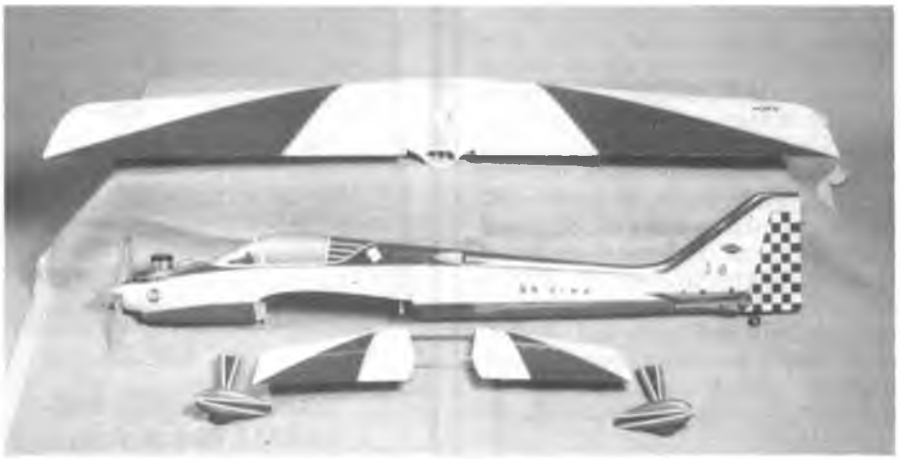
To conclude this month's column, I now have the opportunity to test several of the latest helicopter radios, including the new Futaba "PCM" model. From what I have seen so far it will take me between now and the time I write the next column to even understand all the features which are available. But I must compliment the radio manufacturers in that they have listened to us and tried to understand our problems. So now we, as a section of the modeling public, have a range of our own superbly designed radios just like the pattern guys have had over the past few years so that we will be able to do even more remarkable things with our choppers. About time! I look forward to discussing this subject further with you next month.

□

FLYING LOWE

Don Lowe

Chris Halgren and his Phoenix 8. Chris is the No. 1 flier in Zimbabwe. Note his clean method of burying the pipe.



Chris Halgren's Phoenix 8 disassembled. Plug-in stab allows stab incidence adjustments.

Auto Pilots:

We have previously talked about methods of mechanizing various forms of auto pilots for models. I described an experiment in which I installed a JR gyro in my Laser to level the wings. Essentially, the gyro sensed steady state yaw, interpreted that as a turn and fed the error information back to the ailerons to oppose the turn. The set-up worked, however, the gyro sensitivity is too low for a resonable system. We have previously flown designs of this type using high quality rate gyros and "fluidic" rate sensors in military programs which work well. The model gyros available on the market are really fairly crude devices, which work well for their intended primary application, i.e., calming the "twitchy tail" of a model helicopter, but are insufficiently sensitive for the application I described. As a second experiment, I installed the gyro in a fashion to sense the Laser roll rate in order to simply damp the roll motions of the aircraft. In this fashion the device will not level the aircraft automatically but will serve to prevent unwanted motions caused by gusts, etc. It will also servo to very quickly stop the rolling motion once the control is released.

A similar set-up could be used to damp unwanted yaw and pitch motions. For example, if you have a bird which has marginal directional stability and it really tail wiggles in rough air, you could damp the motion and greatly improve its flying qualities with a rate gyro. Norm Holland of the Orlando RCACF club is using gyros on the elevator and rudder of a large "Big Stick" to "tame it." He claims it works very well, especially for landings. I have found that the rate gyro aileron installation on my Laser is especially useful for landings in rough air since it greatly helps in keeping the ship level. It doesn't do much for normal flying since the aircraft has such good aerodynamic roll damping due to its excellent design.

One could install rate gyros on all three axes to really tame some of the unruly beasts that we are flying. The tradeoff would be, of course, cost and weight for improved flying performance. I have found the JR gyro very easy to use since it simply plugs in-between the receiver and servo and has an in-flight on/off capability using auxiliary channel. I plan to conduct additional experiments using a prototype "fluidic" rate sensor which was developed for military applications. I will also report on some work with Maynard Hills "Electrostatic Auto Pilot" which he developed as part of his RPV project development at John Hopkins University Applied Physics Laboratory.

"Turnaround" In Zimbabwe:

The new "turnaround" pattern has been adopted in the U.S. as an auxiliary additional event. In other countries it's the "way of life." For example, the African nation of Zimbabwe and the Republic of South Africa have adopted it for all classes. These two countries have always been very progressive in pattern matters and now seem to be stepping out to lead the world in this respect.

Zimbabwe has adopted a system which encompasses all classes and I thought you might be interested in the specifics. I am taking the liberty to copy the info from their monthly national newsletter "Propshaft" which they send me each month. Specifically, their October '83 issue described the details. Essentially, the Masters class uses the FAI pattern as is, without any election of maneuvers. The other categories (Novice, Intermediate and Expert) pick maneuvers from a list which they compiled having various K factors. The schedules are progressively difficult with total K factors required ranging from 18 for Novice to 42 for Expert (the FAI K is 54). They have also incorporated a very unique system of "progressive" turnaround where the lower classes will have some judged turnarounds but not all. Without further ado we will copy the Zimbabwe system for you from their "Propshaft" article. I might add that the system was primarily developed by good friend Roger Stern, who was one of our hosts in our trip to Zimbabwe.

1984 Turnaround Pattern

The following schedules have been finalized by N.A.Z.A. They were prepared by Roger Stern and adopted with minor amendments by a sub-committee requested to do the job. The new rules are as follows:

Novice

9 manoeuvres plus 3 turnarounds — K factor 18.

All turnarounds will be done on the downwind side only. The compulsory manoeuvres are take-off, rectangular approach and landing. The first manoeuvre after take-off will be downwind in front of the pilot — there is no free pass. The main manoeuvre in front of the pilot must not be a turnaround manoeuvre, e.g., stall turn, procedure turn, i.e., he must finish going in the same direction he started.

Intermediate

10 manoeuvres plus 5 turnarounds — K factor 30.

All 5 turnarounds will be done on the downwind side of the box only. The first manoeuvre will commence in front of the pilot going downwind — there is no free pass. Take-offs and landings are not included.

Expert

10 manoeuvres plus 9 turnarounds — K factor 42

There will be a turnaround after each main manoeuvre in front of the pilot. A free pass can be taken after take-off, i.e., to start the judged flight going into wind.

I might add some additional thoughts to the "turnaround" scene. We have been flying the FAI event as an added attraction in contests in central Florida. At such an event held in Tampa recently (the King Orange) we were permitted to fly any airplane in the event. I chose to fly half my rounds with my very light Phoenix 8 (7 lb.) and half with my large 17.5 lb. T.O.C. Laser. Guess what? My scores were almost identical with the two ships. I did find it easier to stay "in the box" with the larger, slower ship and the judges preferred the extra judging time available with a slower airplane. I was lucky enough to win the event, however, Jess Owens and Bob Violett were very close behind flying their standard pattern ships. Interestingly, we are seeing the emergence of lots of pattern ships with two wheel gear either retractable or fixed. An attempt to get weight down — the real secret in flying turnaround. Let me add one other very interesting "emergence" which has resulted from the FAI application of noise requirements. The use of much higher pitch props was a standard technique employed to slow down engines and to get the noise down at both the U.S. Masters Team selection and at the World Championships held in Pensacola, Florida. Properly applied, the high pitch not only reduces noise, but **improves performance.** A dramatic example happened at the Tampa "King Orange." One of the modelers (Juan Romero) was having difficulty getting good performance from his "Tiporarie" using "standard" prop sizes, i.e., 11/7½. In fact, changes of engines and pipes didn't do it. So I loaned him a DW "Airscrew" 11/10 prop to try — what an amazing difference! The ship was so quiet you could hardly hear it above the roar of the other standard set-ups. It also performed like crazy including **much improved verticals.** Since then, Juan has installed a DW "Airscrew" 11/9 on his Phoenix 8 and it is similarly improved. So, try it — you'll like it — and so will your neighbors!

Master

11 Manoeuvres plus 10 turnarounds. K Factor 54.
This is as per the F.A.I. Rules

1. Avalanche	K = 3
2. Half Reverse Cuban Eight	1
3. Slow Roll	3
4. Stall Turn (right or left for wind correction)	2
5. Square Loop with 4 half rolls	5
6. Immelmann Turn	1
7. Three Outside Loops	3
8. Half Roll into the Square Loop (from the top)	1
9. Top Hat	3
10. Stall Turn with 1/2 Roll in upline and downline	2
11. Four Point Roll	4
12. Crosswind flat top (right or left for wind correction)	2
13. Six sided loop	4
14. Half Cuban Eight	1
15. Square Horizontal Eight	5
16. Humpty Bump (pull vertical, half roll, push over, pull level)	1
17. Double Immelmann	2
18. Double Humpty Bump (Humpty Bump with 1/2 roll up and down)	2
19. Two rolls in opposite directions (from inverted)	4
20. Half square outside loop (from bottom)	1
21. Inverted 3 turn spin	4
	Total K = 54

For all categories the turnaround manoeuvres cannot be repeated.

The list of manoeuvres is as follows:

K Factor 1
1. Take-Off
2. Straight & Level Flight
3. One Loop
4. One Roll
5. Rectangular Approach
6. Landing

K Factor 2
1. Double Immelmann
2. Aileron Turn
3. Horizontal Eight
4. Three Outside Loops
5. Three Turn Spin
6. Reverse Double Immelmann
7. Cuban 8
8. Three Inside Loops
9. Straight Inverted Flight
10. Vertical Eight
11. Cobra Roll
12. Reverse Cuban Eight

K Factor 3
1. Three Reverse Inside Loops
2. Slow Roll
3. Top Hat
4. Three Horizontal Rolls
5. Rolling Eight
6. Two Rolls in Opposite Directions
7. Avalanche
8. Vertical Roll
9. Figure M

K Factor 4
1. Four Point Roll
2. Three Reverse Outside Loops
3. Eight Point Roll
4. Reverse Knife Edge
5. Reverse Top Hat
6. Inverted Spin
7. Triangular Rolling Loop
8. Vertical Downward 4 Point Roll
9. Four Turn Spin (two in each direction)
10. Six Sided Loop

K Factor 5
1. Figure M with 1/4 Rolls
2. Figure M with 1/2 Rolls
3. Square Loop with Four 1/2 Rolls
4. Two Snap Rolls in Opposite Directions
5. Square Horizontal Eight
6. Reverse Point Roll
7. Rolling circle with 4 Rolls

Turnaround K Factor 1
1. Half Reverse Cuban Eight
2. Procedure Turn
3. Immelmann Turn
4. Half Roll into Half Square Loop (from the top)
5. Half Cuban Eight
6. Humpty Bump (pull vertical, 1/2 roll, push over, pull level)
7. Half Square Outside Loop (from the bottom)
8. Split S (Reverse Immelmann)

Turnaround K Factor 2
1. Stall Turn (right or left for wind correction)
2. Stall Turn with 1/2 Roll in upline and downline
3. Crosswind Flat Top (Top Hat with 1/4 Roll) right or left for wind correction
4. Double Humpty Bump (1/2 Roll in up and downline)

SWEEPINGS FROM THE balsa dust factory

By Paul F. Denson

Paint Sprayer

Generally speaking, the words "paint brush" are just not a part of our vocabulary. No matter what finish we use for one of our planes, if we use a brush it looks as if we applied old half dried house paint with a steel wire brush. If it cannot be sprayed, we don't use it. Even though we have a spray system, if it doesn't come in a spray can we don't use it. That is, until Prevail®.

This is the greatest little gadget to hit the market since vacuum tubes. Recently, we decided upon flat camouflage colors for our Antic Parasol. To get certain colors, it was necessary to use a paint that had been given a fuel proof test. Secondly, we could not find a flat yellow for the under areas so, to fuel proof the plane and flatten the gloss yellow, we decided to use a flat urethane varnish. The flat varnish exists only in a brushable medium. Thanks to our local paint and glass store manager we were introduced to Prevail®. As you can see from the picture, the Prevail® sprayer is slightly larger than a spray can and just as easy to use. It is priced at just under $3.00.

Before spraying, dilute your medium with the solvent specified in the instructions or as indicated on the product container. The glass part of the sprayer is graduated so you can use as little or as much as you need. The power units will spray 16 oz. of the product. New power units are available for about $1.00. Since they are so inexpensive, you could have a power unit for each type or color you regularly use. If you follow cleaning instructions carefully, you can change from one color or product to another with no problem.

The flat urethane varnish does fuel proof flats and dulls the finish of glossies. We are well pleased with the finish of our Antic. If your dealer does not stock the Prevail® sprayer, have him order one from Precision Valve Corp., P.O. Box 309, Yonkers, N.Y. 10702.

Shoe Goo

We have found a new skid material for the underside of our gliders and sailplanes, it is called Shoe Goo. Shoe Goo, when spread on the bottom of the kids tennies, makes a brand new sole. If this will stand up to the gaff a normal kid gives the bottom of his tennis shoes, it will stand up to any surface you can dream up on which to land your glider.

Lay the fuselage upside down on your workbench. Build a dam using 1/8" balsa strips around where you want the skid. Use masking tape to hold the dam in place so you won't mar the fuselage surface. Then fill in the cavity with Shoe Goo, squeegie it level and allow to set up. Voila, instant glider skids.

We have also used Shoe Goo to manufacture wing saddles. Wrap the center section of the wing of your favorite power plane with kitchen plastic wrap such as Saran Wrap, then squirt a bead of Shoe Goo on each side of the wing saddle. Put the wing in place, tighten down the bolts slightly, or only use one rubber band, and let it sit overnight. Remove the wing, peel away the plastic wrap and trim the layer of Shoe Goo with scissors or a sharp knife flush to the sides of the fuselage. Makes a real fuel proof joint.

If the junction between the muffler and your engine leaks and you get oil all over your engine compartment, clean the mating surfaces with alcohol and wipe up with acetone and allow to dry. Neatly place a small bead of Shoe Goo between the two contacting surfaces, tighten up the muffler and leave overnight. Now, all the other goo will go out the muffler and exhaust port. In fact, most anything you use bathtub calking for, Shoe Goo will work just as well. Oh! yes, don't forget its original use on tennies. □

BIRDS FLYING WING CONTEST

The BIRDS Club perpetuates the former Northrop event

By Dick Tichenor

The R/C club at Northrop Aircraft in Hawthorne, California, originated an annual contest for flying wing aircraft several years ago. The BIRDS Club of Carson, California, elected to continue this very innovative event after the Northrop club became inactive. The 1983 contest brought out a wide variety of subject matter in free flight rubber power, free flight gas power, free flight glider, as well as R/C. Our coverage is limited to some of the most interesting R/C machines.

All of the flying wing models shown here were airborne. The performance ranged from missile type flight to the very marginal, underpowered efforts that had everyone sucking in a deep breath to help some of them off the ground. Regardless of how well they flew, it was refreshing to watch a gathering of models that dared to stray from the conventional.

While advertised as a contest, we didn't see any prizes being awarded — but who cares — it was a most enjoyable Sunday. The BIRDS Club is to be congratulated for adding the flying wing contest to their long list of innovative and forward looking activities. □

This Northrop N9M-A by Bill Young was powered by twin electric motors and features retracts.

Bill Young also built this Northrop XP 56. Electric power with contra rotating props.

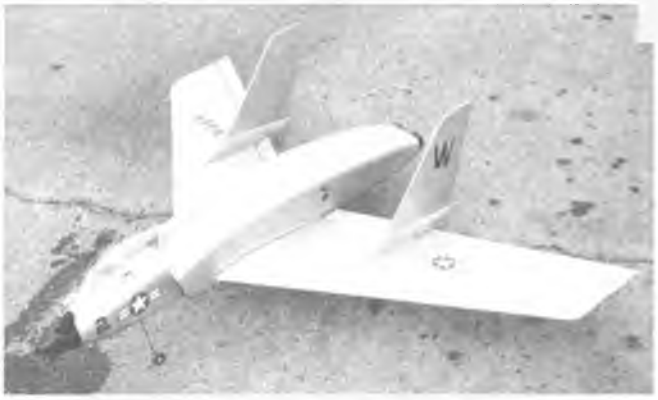
This machine appeared, did its thing, and disappeared. We think it is a Westland Pterodactyl, builder unknown.

Manta II by Bob Martz. Original design with unreal performance.

The Bat was probably left over from Halloween. James Rolf enjoyed flying it.

Tony Naccaratto called his original design "KuKu Bird." Speedy.

Bill Stullick's F7U-1 Cutlass was a performing dude with an O.S. .28.



Bob Baker's Cutlass had a .10 in the nose.

Who says modelers aren't ingenious? Clay Soule powered his wing with a Byrojet ducted fan unit.

An original White Spartan by Bruce Tharpe.

A screaming Simitar 540 by Wayne Sakamoto. RCM Plan #741.

Claude Brown's orange Pumpkin had a Halloween face on bottom side.

Jim Arnold's modified Force 1 on right (RCM plan #859) and Big Force (50% larger) on left.

An original by Bruce Tharpe with .049 power.

KITS

STACKED IN YOUR FAVOR

Stacked below is the largest selection of Scale R/C kits on the market today. All are designed to be actual scale replicas although with considerably less time and effort may be constructed as sport or semi-scale. Scale modelers the country over will attest to the prefabrication and flyability of the models, but the kits must be examined first hand to appreciate the craftsmanship and select materials contained within. In short, no matter how you stack the Royal line, our quality still comes out on top! Stop by your local dealer and compare for yourself.

KITS THAT NOW CONTAIN SUPER DETAIL WATER TRANSFER DECAL SETS

- Corsair Sr. and Jr.
- Zero Sr. and Jr.
- P-51 Sr. and Jr.
- C-47
- B-17

All Decal Sets give the option of at least two paint schemes and complete stencil markings.

ROYAL DELUXE R/C MODEL KITS

	WING AREA	PRICE
.60-.80 SIZE		
A6M5 Zero	706 sq.in.	*$114.95
Spitfire	736 sq.in.	*$109.95
Cessna 182	700-4/5 sq.in.	*$109.95
F8F Bearcat	652 sq.in.	$119.95
FW-190 Focke-Wulf	642 sq.in.	*$114.95
Ju 87-D Stuka	723 sq.in.	$111.95
F4U-1D Corsair	669 sq.in.	*$119.95
KI-43 Oscar	613 sq.in.	$104.95
Piper Colt	946 sq.in.	*$109.95
P-51D Mustang	777 sq.in.	*$119.95
Ki-61 Hien	676 sq.in.	$109.95
Pitts Special	856 sq.in.	$114.95
Pitts S-2	830 sq.in.	$116.95
Staggerwing Beech	907 sq.in.	$116.95
Cessna 206	654 sq.in.	*$109.95
F4J Phantom	477 sq.in.	$104.95
ME-109 Messerschmitt	697 sq.in.	$114.95
Spirit of St. Louis	958 sq.in.	$139.95
	WING AREA	**PRICE**
.40 SIZE		
P-51D Mustang	576 sq.in.	*$ 84.95
Bleriot	564 sq.in.	*$ 59.95
Spitfire	496 sq.in.	$ 74.95
Zero	577 sq.in.	*$ 84.95
Piper Colt	527 sq.in.	*$ 74.95
Hien	468 sq.in.	$ 74.95
Corsair	480 sq.in.	*$ 79.95
.20 SIZE		
Corsair	372 sq.in.	$ 59.95
Zero	356.5 sq.in.	*$ 59.95
P-51D Mustang	372 sq.in.	*$ 59.95
Cessna 172	388 sq.in.	*$ 64.95
Cessna 182	405 sq.in.	*$ 69.95
Bleriot 09-15	388 sq.in.	$ 44.95
Pitts S2A	335 sq.in.	$ 49.95
MULTI-ENGINE		
C-47 Skytrain – 40-61 Size	767 sq.in.	$149.95
Cessna 310-D – 35-61 Size	725 sq.in.	*$138.95
B-25 Mitchell – 40-61 Size	750 sq.in.	*$129.95
Cessna Skymaster – 35-61 Size	754 sq.in.	*$141.95
P-38 Lightning – 35-61 Size	695 sq.in.	*$142.95
P-68 Victor – 19-25 Size	502 sq.in.	$ 89.95
B-17 Fortress – 15-20 Size	806 sq.in.	*$174.95
Beech Baron – 35 Size	682 sq.in.	$139.95
Cessna Citation Ducted Fan	653 sq.in.	$199.95
½A SIZE		
Corsair – 049-051 Size	229 sq.in.	*$ 39.95
P-51D Mustang – 049-051 Size	217 sq.in.	*$ 39.95
Zero – 049-051 Size	232 sq.in.	*$ 39.95
Messerschmitt	220 sq.in.	$ 39.95
Spitfire	217 sq.in.	$ 39.95
¼ SCALE		
Super Cub PA18	1733 sq.in.	$179.95

*Contain scale cockpit kits

SEND FOR FREE KIT CATALOG

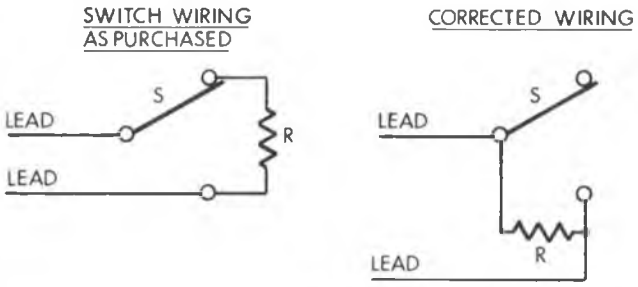
OR WHAT IT'S WORTH

From RCM Readers
Edited By Jerry Smith

Michael Mitchell of Lynnfield, Massachusetts, tells us of a manufacturer's design error.

In the interest of saving glow plugs, the "Thunder Tiger Super IC Mark III" has an easily correctable design error. The "Hi-Lo" glow range switch is a break make type and wired wrong. The resistor lead which they have going to the left set of contacts (panel face down, switch close to you), should be removed and soldered to the center contacts or just shunt the left contacts to the center contacts.

Their original wiring allows an infinite resistance when the switch is being moved and will blow the plug if the switch hangs up a little in the middle. The corrected version never allows more than the resistor. Sketch shows correction.



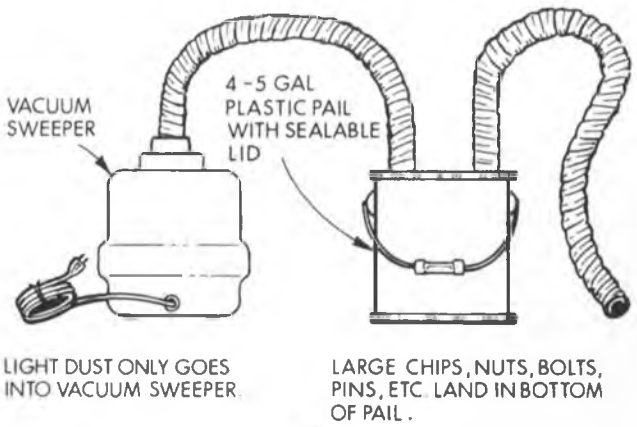
★

Here's an easy way to apply MonoKote with your sealing iron without scratching the MonoKote. Cover the sealing iron with a piece of cloth, all cotton works best. Staple the cloth together over the heat selector knob and tape the rear portion of cloth toward the handle to apply tension in order to get the cloth smooth on the bottom of the shoe. Andrew Bartosh Jr., of Sharon, Pennsylvania, has covered a P-51 with chrome MonoKote without scratching. This method also saves replacement of your iron shoe.

★

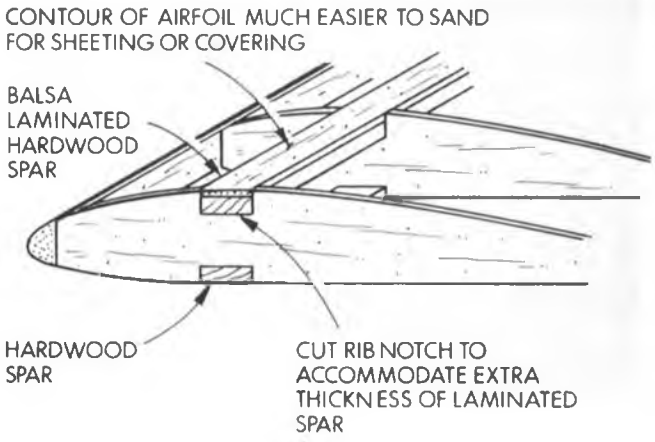
Recently, it seems like we have been getting many ideas on how to clean up the workshop in a more efficient way. That is to say, catching all those little goodies that get lost forever on the floor. Here's a suggestion from Kenneth Nuss of Omaha, Nebraska, with a slightly different twist. He thought of it after his wife complained about her vacuum sweeper being plugged up to the hilt with balsa chip, etc.

Ken went to a restaurant and talked the chef out of a 5 gallon pickle pail. Cost $1.00. He then went to the Goodwill or Salvation Army store and purchased a good long vacuum hose. Cost .50¢. From then on it was a simple matter of cutting two holes in the lid of the pail to fit the hose. About 1" in on each side. The hoses should fit tight. Now all the chips, nuts, bolts and kit parts land in the pickle pail while the dust goes on to the vacuum tank. The best part of Kenny's idea is that his wife now has stopped complaining. See accompanying sketch.



★

Ed Koporc of Cortland, Ohio, found that by laminating a thin strip of balsa along the length of a hardwood spar prior to building the wing, it was much easier to sand the proper contour to the airfoil. However, as shown in the sketch, it is necessary to notch the ribs a little deeper to accommodate the extra thickness added to the spar.



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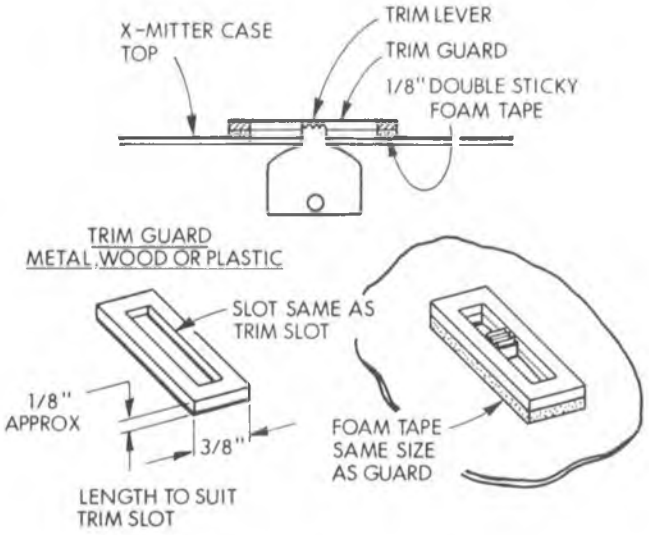
Gary Thornton, New London, Missouri, had a problem. Every time he put his transmitter down, or handed it to someone, the trim levers were moved out of position. This almost got him into trouble several times. After careful consideration Gary came up with a trim lever guard that is both simple and efficient. See sketch. It can be attached to the transmitter with 1/8" double sided foam tape. The tape also acts as a cushion, allowing the guard to be pushed

down, for better thumb access. The guard should be adjusted so that the trim lever rests slightly below it.



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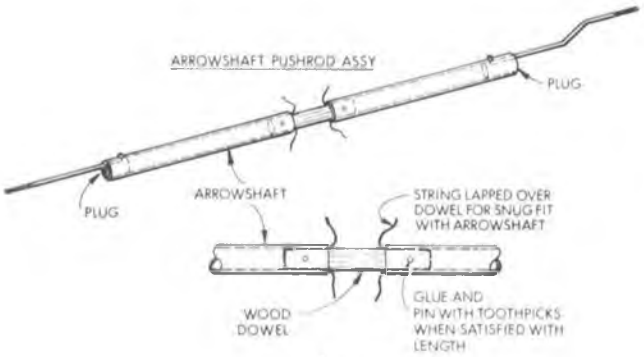
Mack Patterson, Lompoc, California, has found a delightful little device that's fantastic to use when covering with Worldtex, Coverite and other fabric coverings. It also works well with MonoKote, Kwikcote, and other film shrink coverings. It's called "Krazy Cutter" and is used to cut magazine and newspaper ads. It's distributed by A & W Products, Port Jervis, New York, and is sold through K-Mart stores for only 48¢. The neat thing about it is its ability to trim **after** you have sealed the covering down. It doesn't cut through the bottom coat. In using it you will notice that you get the cleanest cuts when you cut with the weave of the covering. When you cut on a diagonal, occasionally you get a frayed edge. The size and shape make it easy to use when you trim along the fuselage or wing, giving a clean even cut. They claim it will cut over 3,000 feet of paper. And that's a bunch. See sketch.

"KRAZY CUTTER" IS AN EXCELLENT TOOL FOR CUTTING AND TRIMMING WORLDTEX, SOLARTEX, OR ANY OTHER FABRIC TEXTURED IRON ON COVERING. WILL ALSO CUT PLASTIC IRON ON'S TOO.

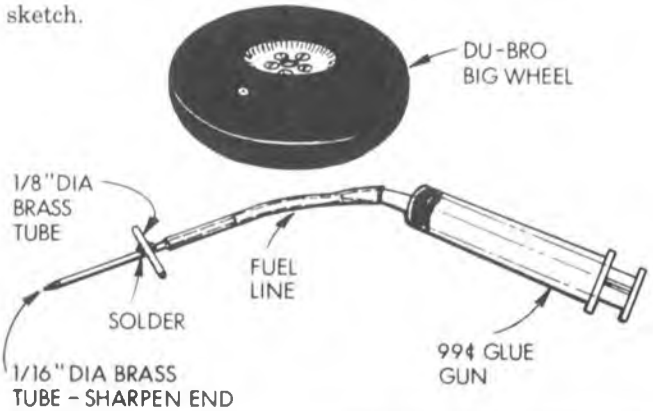
★

To build a pushrod that is easily tailored to fit your airplane, proceed as follows: First, cut a length of 5/16" fiberglass arrow shaft 1" shorter than required for the total pushrod length. Next, cut the fiberglass shaft in half. Cut a 3" length of 1/4" wood dowel. Slip the wood dowel (with a string lapped over the end) into one piece of the fiberglass shaft. The string will make a snug fit between the pushrod and the dowel. Now, join the remaining half in the same manner as described above and as shown in the sketch. Adjust the pushrod by hooking up a servo to the desired control surface while adjusting the dowel an equal amount in the fiberglass shaft for desired control set-up. Remove the pushrod from the airframe without disturbing the length, and pin and glue the fiberglass shaft to the dowel with toothpicks. The pushrod is now ready for use. This idea from Buddy Holmes of Ocean Springs, Mississippi.



★

From Walter Clark of Encino, California, is a suggestion for an easy way to increase pressure in those large Du-Bro tires used on 1/4 scale aircraft. It consists of a 99¢ glue gun, 3" of 1/16" OD brass tubing sharpened to a needle point on one end, a 1" piece of 1/8" OD brass tubing silver soldered across the 1/16" brass tube to act as a handle, and a few inches of 1/8" fuel line to connect the glue gun nozzle and 1/16" brass tubing. To increase the tire pressure, insert the sharpened 1/16" tube into the valve located on the side wall of the tire. Force down the plunger in the glue gun to add pressure. If more pressure is required, remove the tube from the tire, pull out the plunger, and repeat as before. See sketch.

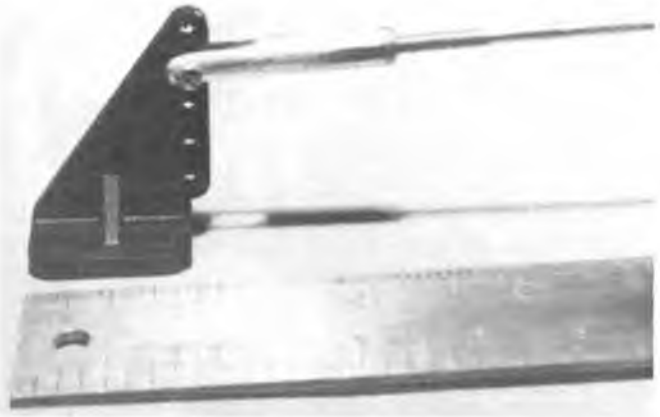


Send your hints & kinks to R/C Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 — win a free book from RCM's Anthology Library series if your idea is used.

BIG IS BEAUTIFUL

Dick Phillips

Airtronics servo used in author's Der Jaeger. Note the large arm permitting use of motorcycle spoke as connection between carbon fiber arrow shaft and servo arm. The heavier arm permits drilling a hole large enough to accommodate the spoke without weakening the arm excessively.



C.B. horn, author's "hone-brew" clevis and 3-48 threaded spoke make solid connection using a 2-56 screw through the clevis and the horn. Clevis is steel drill rod shaped, drilled and tapped. Generous adjustment is provided by the length of the clevis. Made up in about 30 minutes with basic hand tools although having a small lathe helps.

The old adage that "A chain is only as strong as its weakest link" has been around for a long time. That it is true is accepted by everyone. How does it apply to the building of large models? Well, just take a look at the method we use to transfer the movement of our servos to the control surface.

In most cases, we have a relatively small servo arm, through which we pass a light piano wire fitting, which is attached to some means of moving another wire at its other end, usually using a clevis or some such which is, in turn, fastened to a horn of some sort which is secured to the control surface.

If any part of this particular "chain" is weak, substandard or too light for the job at hand, then we have a chain that is going to provide us with an unpleasant surprise, likely as not. In this game of ours, any surprise is an unwanted one.

In most standard servos, the output arm is fairly light although adequate to the job. Whether or not it is adequate to the job we want it to do is something we must be sure about. I favor pretty husky output arms and have modified some of mine in order to give me greater peace of mind (note the photos). The ones I like best are the Airtronics ones shown in use in the Der Jaeger. Nice, strong nylon. Be careful of reground nylon (usually quite dark in color) as these get really brittle in cold weather. (You guys in the sunny south won't have to worry much about that.) If you fly in cold weather, put those dark colored servo arms in the freezer for about ten minutes and then flex them. If they are too brittle, you'll soon know about it. If they do break under these conditions, replace them.

Heavier servo arms will also permit you to drill the holes out a bit to use larger wire for the connections to the arm. I've been using sulky and motorcycle spokes lately and they work very well. They are soft enough to take a bend without cracking and yet strong enough to do the job without flexing. For solid pushrods, I like fiberglass or carbon fiber arrow shafts, both pretty readily available and usually quite inexpensive. They are

Ace R/C Inc. makes this multi-charger either in kit or assembled form. Provides charging for four RX batteries and two TX from one source. RX charge connections are marked with charge rate to prevent overcharging the wrong battery and connectors can be arranged to suit your own needs. (Note one TX connector for EK and one for Airtronics.)

long enough to work in almost every application we have for them. Now for what can be the weakest point of all, the connection from the rear end of the pushrod to the horns. I have used Dubro's large ball joints, the 4-40 size and I like them, they are convenient, readily available and they work okay.

The method I have been using lately will not come apart in the air under most any circumstances, but the adjustment available is limited. I make up an end for the motorcycle spoke by taking a small piece of 1/4" drill rod, boring it out and threading the hole 3-48. Then notch the end as shown in the photos, cross drilling the end and then tapping that hole 2-56. As you can see in the assembled pushrod end, there is an adjustment, more than you can use normally, and it's very secure. You can use the nylon type locking nuts on the 2-56 cross bolt and they won't fall off anywhere.

Any "chain" has its weakest point, of course, and the one described above must have one, I'm sure. Where it is I don't know, but I do feel that wherever it is, it's not weak enough to be any sort of danger for us.

The work described above is made a good deal easier if you have a lathe with which to counterbore the end of the piece of drill rod, but it could be done without one. A set of small taps and dies is a necessity, but as mentioned in an earlier column, a few taps and dies will be very useful to you anyway. As you can see in the pictures, I use the large CB horns.

If you are using heavy duty servos in your big birds, here's a couple of things to keep in mind. In a model that is at all in the high performance category, you'll be putting a heavier load on everything than would be the case in a more or less "normal" sized bird. That means that not only are the mechanics of the servo under heavier load, but so are the servo leads, and the wiring in your receiver. If these items were not

designed to carry those loads you could be asking for trouble. Now, there isn't a great deal we can do about the circuitry inside the receiver, but we can assure that we don't use any really excessively long leads on our servos. The longer the wire, the greater the voltage drop. This could be particularly worrisome if those leads are very light wire. The ability of a wire to carry a specific current is related to its circular mil area (thickness) and a lighter wire cannot carry a current as well as a heavier one.

Ralph Warner of RAM (Radio Controlled Models, Inc.) in Chicago has done some testing in this area and their results are rather interesting. The following table is reproduced to give you some idea of what Ralph means when he says, "Warning: Big Models Require Big Wires."

	LENGTH OF WIRE TESTED		
Wire Gauge	1 Foot	3 Feet	6 Feet
26	4.64v	4.37v	3.84v
24	4.70v	4.50v	4.20v
22	4.73v	4.61v	4.42v
20	4.76v	4.66v	4.54v
18	4.77v	4.73v	4.65v

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These tests were made using a good quality stranded hook-up wire, a standard 4.8v Nicad along with a 2 amp load in a servo circuit. It's easy to see that the longer the wire and the smaller the wire, the greater the voltage drop. That includes not only the servo leads, but also the battery leads and anywhere else within the system that you have any control. As the battery is used up during a days flying, it will deliver a lower voltage as well, and at that time the voltage drop caused by wires too long or too small could be the straw that breaks the camel's back. Best bet is to keep leads as short as you can and to use leads intended for longer runs. That is to say, those made of heavier gauge wire. Don't forget, too, that excessively long servo leads in some radios can create a problem in that the signal coming from those un-shielded long leads can get back to your antenna and cause some pretty strange "glitches." Where available, use choked servo leads or Ace's Noise Traps to assure a clean signal.

If you are going to use an engine cut-off switch (On-Off ignition switch) on your model gas engine, keep the switch and its wiring as far from the radio as you can. I've had a few reports of problems arising from running the wiring to the ignition switch back into the cockpit and giving a radio the heebie-jeebies. Not worth the risk, you can almost always find an inconspicuous place for that switch ahead of the firewall location.

I prefer to have another such switch being operated by low throttle trim on my transmitter. It permits shutting the engine down from the transmitter without having to throw a rag into the prop or try to stop the spinner by hand at low throttle or other such inane and dangerous stunts, both of which I have seen done by those without much respect for their equipment or their fingers! If you mount a micro switch where it can shut the engine down when you pull back to low throttle and then to low throttle trim, it makes for a much safer operation. It will also give you the chance to shut your engine down in the air if that ever becomes necessary. I know of a couple of cases where being able to do so would have saved a model. Let's suppose you have an idle that's too high to permit landing (it's happened) what do you do now? Fly around hoping to run out of fuel before you run out of battery? Better still, if you could kill the engine on command, you could line up for a landing and simply kill the engine. It's a heck of a lot better than finding you had run out of battery before running out of gas. (Yes, Virginia, it's happened.)

If you are using an electric starter on your model, be sure you have some means of assuring that the engine cannot be started at any throttle setting but **low**. If the throttle is left forward, for whatever reason, and you start the engine, and it fires right away, you will now have a projectile, looking for something to bite. Whereas, if the starter system is disabled until the throttle is set at low, then it can only start at low throttle and no danger of anyone being bitten. This is a simple matter to arrange, again using a micro switch which is set up to be closed only at low throttle settings. Micro switches are pretty neat items for a lot of good things. Radio Shack or your local electronic supply has them in a variety of sizes and types at modest prices, and, if you're unsure of what to do, check with the local club's electronic genius or with the guy you buy your switches from.

I've said before that those of us who write for the magazines often assume that our readers are more knowledgeable than they actually are and, for that reason, we fail to cover some of the simple things we know and do with our models because we assume everybody knows. It's not always true, of course, and I thought I'd pass along a couple of things that fall into that category. Three point airplanes (tail draggers, if you will) need a couple of minor adjustments to make them track better on the ground. The wheels should be a bit further apart at the top of the wheel than at the bottom, and they should "toe-in" just a bit. Set up this way a tailwheeled airplane will taxi a lot better than if the wheels are parallel to one another. Don't ask me to tell you why, I haven't the engineering background to do so, but it is true and it does work.

Most of us are careful to balance an airplane as required on the plans before trying to fly it. Those of us who have tried to fly tail heavy airplanes will tell you that it is one of life's hairier experiences and one to avoid if at all possible. So assuming that we have the CG (Center of Gravity) where it belongs, we're ready to go fly — right? **Wrong**! There's one more balancing act to complete for a fine flying model. Balance the bird across the wingspan. There are few models that don't require some spanwise balancing despite how often you hear the claim, "She flew right off the building board!" Hogwash, it just doesn't happen that often. Even if you don't have a sophisticated means of checking the spanwise balance, picking the model up by the spinner and the bottom of the rudder will at least give you some idea of the balance. If you try this stunt two or three times and the same wing wants to drop each time, chances are that the wing which drops is heavier than the other. It usually doesn't take much to balance a model across the span. I keep a few pieces of lead around and placing one or more of them on the light wing will soon establish how much is needed. Then, a small operation on the underside of the wing to implant the appropriate amount of lead in the light wingtip will solve the problem. If you've never done this and have had a model that wants to start into a slight bank as soon as it's

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RCM PRODUCT REVIEW

Sig Manufacturing PIPER J-3 CUB

SPECIFICATIONS

Name	1/4 SCALE PIPER J-3 CUB
Aircraft Type	1/4 Scale
Manufactured By	Sig Manufacturing Co., Inc. 401 S. Front St. Montezuma, Iowa 50171
Mfg. Suggested Retail Price	$174.95
Available From	Both Mfg. & Retail
Wingspan	105 Inches
Wing Chord	15¾ Inches
Total Wing Area	1600 Sq. In.
Fuselage Length	65 Inches
Stabilizer Span	29 Inches
Total Stab Area	273 Sq. In.
Recommended Engine Range	.61-1.3
Recommended Fuel Tank Size	16 Oz.
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply
Wing	Balsa
Tail Surfaces	Balsa
Building Instructions On Plan Sheets	Yes
Instruction Manual	Yes (32 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Ace Silver Seven
Engine Make & Displacement	Fox .78
Tank Size Used	16 Oz.
Weight, Ready to Fly	219 Oz.
Wing Loading	19.7 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Excellent instructions, scale tailwheel assembly and appearance.

WE DIDN'T LIKE THE:
Tape together plans and printed parts.

You could get a new Piper Cub in any color you wanted as long as Yellow was your favorite. But even with the limited choice of color, the Cub with its distinctive black lightning stripes was one of the most popular airplanes of the day. Actually, it still is, especially when it comes to models. The J-3 makes an almost ideal giant scale airplane; like the original, the models are quite slow and easy to fly. For the scale enthusiast, there are a lot of subjects available, almost any airport will have at least a couple. There are also a variety of special features to pick from, Cubs have been used for everything from glider tows to cropdusters.

Since the Sig Manufacturing Co., Montezuma, Iowa 50171, has produced one of the better regular size kits of the Piper Cub for many years, it wasn't too much of a surprise to see the 1/4 scale version. This is an impressive kit and not just in size. From the color pictures on the 45" x 12" x 4½" box to the scale tail wheel, the Cub is first class. Some of the features include fiberglass pushrods, a full cowl complete with dummy engine, and a decal sheet that has the famous Teddy Bear emblem. The hardware package has all the nuts and bolts, clevises, and real hinges (ones with pins, not the funny ones that look like waffles) that are needed to build the J-3.

Construction:

All 32 pages of the instruction book are liberally sprinkled with pictures and drawings of the Cub under construction. It's obvious that many years of model building experience went into this kit. If there is the slightest bit of question how something should be assembled, it is detailed in either the instructions or on the plans. The plans are all 48" x 50" sheets with all of the parts shown full size and several different views. Unfortunately, when you are dealing with a 105" wingspan and a 65" fuselage, you just can't put it all on one 50" length of paper. We have a basic dislike of cutting up plans but at least these are accurately drawn and the pieces all fit together.

We've come to expect high quality wood from Sig and we weren't disappointed in the Piper kit. You get large bundles of stick wood, many sheets of balsa, die cut ribs and, like almost all Sig kits, several of the balsa sheets have parts printed on them. On most kits you can just run an X-Acto knife around the printing and be done with it. With the J-3, that method is going to take a while. The parts are big and the balsa is thick, our Dremel jig saw got quite a workout building this kit. All the way through the instructions they tell you to use certain lengths of sticks for various parts; pay attention or you will end up with a lot of useless pieces of wood.

If you have ever built a stick and tissue rubber powered model, the fuselage of the Cub will look very familiar. It is a built-up structure with lite-ply doublers from the trailing edge forward. The CA glues are ideal for this type of construction and we used Goldberg's Super Jet because it

will bridge small gaps and still make a good joint. Both fuselage sides should be identical before the doublers are added and then be sure to make a left and right side. About the only critical area is in the wing saddle or upper part of the cabin. At this point it pays to take a little extra time and be accurate. If you haven't been making use of squares and rulers in your building up to now, it's time to change. The "eyeball" method may work okay on some smaller models, but on the big ones a couple of degrees error makes a major difference at the end of a nine foot span.

A really clever system is used on the wing of the Cub. One of the biggest problems we've had with quarter scale is transportation. Once it's built, how do you get it out to the flying field? Also, it is difficult to stand a nine foot wing in the corner of a house with eight foot ceilings. Sig solved the problem by designing a neat two piece wing. The left panel and center section are one piece and the right panel slides on to a stub spar. The whole thing is then bolted to the fuselage with very little effort. Actually building the wing went very smoothly, just like almost every other built-up wing. The ailerons are cut out after the wings are complete and you have a choice of how to hook up the aileron servos. We elected to use one for each side with the servo mounted out at the control surface.

The rest of the building just follows the excellent instructions. One other nice feature of the instruction book is the scale information and pictures of full size Cubs. If you want documentation Sig also offers picture packages that will help you add extra detail.

Covering:

There is a wide range of choices in covering material available, but since the original Cubs were covered with fabric we immediately narrowed down the field. It seemed almost blasphemous to even think about one of the plastic films! We've tried many of the fabric materials and had good results with most, but there always seemed to be at least one drawback. Some turned your iron black and others wouldn't stick to themselves. Now picking a covering material for a 1/4 scale gets to be serious business; it takes a lot of material and a mistake can be expensive. After reading Hobby Shack's ad for Solartex several times, we finally decided to give it a try. Covering tennis balls is fine but we figured the Cub would be a real test. It comes on 27" rolls either 2 or 5 meters long and for the J-3 you will need at least a couple of the 5 meter size depending on how efficient you are in cutting out the pieces.

We cut off a section and started in on a wing panel — it stuck to the balsa just fine. The other side went on just as easily and, joy of joys, the lap seam glued down nicely and stayed glued. Covering the Cub was one of the easiest covering jobs we've ever done, compound curves were a snap, and the Solartex will really shrink. Drawbacks? We couldn't find any! Our iron is still clean, the seams are still glued and, best of all, since it's fuelproof and comes in Yellow, we didn't even need to paint the Cub. Now where did the tennis balls go?

Engine:

Sig's instruction book shows quite a selection of engines mounted on the Cub, from .61 on up. One thing they do not recommend is one of the chainsaw type engines we usually think of on quarter scales. There are a couple of good reasons. The full size Cub carries a fairly small engine and the model just doesn't need brute power in order to fly very nicely. Also, there just isn't enough room to stuff a chainsaw engine inside the scale cowl. One of the recommended engines is the Fox .78, and that is the one we decided to use. The .78 is a solid performer with enough power to swing a fairly large prop and, with the Fox up front, the Cub actually has more power than would be scale. Just about the right combination for comfortable flying with enough reserve to stay out of trouble.

We used the Fox aluminum mount but instead of mounting the engine inverted as Sig suggests we decided to sacrifice a little scale appearance for easier access and starting. With the Fox .78 on its side with the exhaust pointing down, the cylinder head just sticks through the cowl on the right. A Semco boat muffler was used and just fits inside the cowl. The end result worked out very well and the cylinder is nearly concealed by the dummy engine. You will need to use a prop shaft extension in order to make the prop clear the cowl; the 3/4" Fox extension worked out about right. For a large engine, the .78 is quite economical; a 16 oz. Sullivan tank gave 15 minute plus flights with a bit left over.

Radio:

Our Ace Silver Seven looked lost inside the Piper; even with a 1200 MA battery pack there was lots of room left. We managed to make the Cub balance by stuffing the battery clear up against the firewall, but a word of caution — it would be real easy to get this beastie tail heavy, especially if you are painting it. You could add quite a bit of lead in the nose if you have to and not make the J-3 overweight. The only thing out of the ordinary in installing the radio is the aileron servos — one for each side. If you mount them out at the control surface as we did, it means long extensions to a "Y" connector. The long leads are a potential source of interference; we didn't have any problems in our set up, but don't take any chances. If there is any hint of a problem, put in one of the noise trap filters.

Flying:

Test flights are fun, but once in a while they get more exciting than necessary. This one was! We usually try a couple of taxi tests first just to get the feel and about half way down the runway the back end decided to lead the parade — around she goes. Yes,the Cub will ground loop. While checking for damage we noticed that the mains had a little toe-out when the tail was up; this almost guarantees ground handling problems. After bending a touch of toe-in, we fired up the Fox and tried it again. This time it went better, a nice gentle lift-off and the Cub was on its way. Time for a left turn in the pattern so we fed in some aileron and waited — not much reaction. The J-3 really does want coordinated rudder and aileron. By the time we remembered, the ailerons were hard over, so when we hit the rudder the reaction was instant. So much for gentle turns. With a little practice, coordinated turns become second nature and we have never felt the need for a C.A.R. system.

The Cub is mildly aerobatic, loops and stall turns are easy, but rolls are definitely a planned maneuver. Everything happens slowly, it's really a pleasant experience to just motor around with the Piper. The Cub does nice slips and one of our favorites is to come in a little high, drop a wing and push opposite rudder, then flatten out just above the runway for a touch and go. You can land the Cub either on the mains or three point but you do have to keep flying it until it stops, especially if there is any kind of crosswind. Tail draggers need a little more attention on landings and take-offs but once you get the hang of it you'll wonder why they put a training wheel on some airplanes.

Conclusion:

From start to finish the Sig Piper Cub is a very well-done quarter scale kit. The wood was excellent and the plans (once you get the pieces put together) are easy to follow. Add to this an outstanding set of instructions and you have an airplane that is well-worth the $174.95 price tag. Even if you only add a minimum of scale detail, the end result is an attention getter. By the way, if you add a pilot, remember that the full size Cub was flown from the back seat. For those who want a more aerobatic version, Sig also offers the Clip Wing Cub in quarter scale — it's all a matter of preference. Either way, the J-3 Cub will make an excellent first large kit or an addition to your quarter scale airforce. □

airborne, check it out, you may well have a slightly heavy wing on the side toward which the model banks. A little lead in the other wing tip may well solve the problem and you may then be able to rig both ailerons level instead of the way they are now!

It's always a good idea to provide access to all the good stuff inside your model. Servos, fuel tanks, fuel lines and so on can give trouble and it's darned annoying to have to "un-build" a model to get at such items. Some plans do not show how to arrange such access to important areas and it's wise to put your own ingenuity to work to provide it. So long as you do not interfere with the structural integrity of the fuselage or wing, you should not have a problem. If you are in doubt, ask one of the more experienced modelers in your club. I know there are lots of you who live where **you** are the only modeler around, let alone the most experienced one, and, in your case, I can only suggest that you let your own common sense be your guide. Most of you have a high ingenuity quotient anyway or you'd be sitting in front of the TV watching Monday night football!

While it is not a good idea to change things on a plan for the simple purpose of stamping it with your own hallmark, there are few models I have built that have not contained some changes to accommodate my own ideas or likes and dislikes. That's not to say the designer was at fault, he has his own ways of doing things which he undoubtedly prefers or he wouldn't use them. However, without faulting the designer, I have a few things I like and I don't hesitate to incorporate them into a model if it is at all possible. On a bipe, for example, I prefer to be able to remove the cabane struts. I have a couple of good reasons for this, my envelope covering method works better if there isn't something sticking out of the model to prevent getting the envelope all the way forward, for one, so I usually make my cabanes removable. Easy to do, I incorporate a slotted fuselage cross member in the appropriate location which permits me to slip the cabanes in and out at will. Most changes I make are functional and made from past experience. What I'm suggesting is that changing a way of doing something during construction is not a heresy and, if it makes the model better, more convenient for you or better looking without compromising structural integrity . . . well, heck, have at it. It's also a good way to gain experience in building.

I had a note recently from a full scale pilot friend who has logged over 5000 hours as pilot in command in full scale machines. He used to model many years ago, has built a number of full scale home-builts and has recently returned to the fold. Not content to build just anything, he has a 1/3 scale Nelitz J-3 under construction. This past year he has been learning to fly coached by another high time model pilot and using a Buzzard. (You old guys out there will remember that one!) Anyway, his comment on learning to fly models went something like this, "I have well over 5000 hours full scale aircraft as 1st pilot and it's been a real humbling experience, learning all over again to fly. Boy, do I have respect for these guys who can do the whole ball of wax with no effort showing!" Those of you to whom the "no effort showing" part pertains can take a small bow. I meant to ask my correspondent if he felt his previous full scale experience was any help in learning to fly, but forgot. Those I have asked the question of in the past usually think that their past full scale flying is a handicap more than a help. They expect to come to such a simple thing as flying an R/C model and find it as easy as falling off a log . . . as we all know, it's not quite that easy. I don't doubt my 5000 hour friend will become an excellent model pilot as well, he's that kind of guy.

I recently added one of Ace's new Multi Chargers to my stable of goodies. That's the one that will charge two transmitters and four receiver batteries all at the same time (and on a variety of charge rates) which sounded to me like a really fine idea. Mine is in kit form and is presently under construction. I'll give you the lowdown on it probably next month.

I've had a surprising number of letters recently on a variety of subjects and almost without exception the writers have said they enjoy the column and read along every month. To those who have written and said such nice things . . . sincere thanks . . . I hope you'll continue to visit this corner every month

Every once in a while I read something that really tweaks my funny bone. A recent item went something like this, "Those who claim some idea or device is foolproof, do not have an adequate understanding of the ingenuity of fools!" Next month?□

PIT STOP

Gene Husting

4th Annual U.S. Indoor Championships With 333 Entries!

The 4th Annual Indoor Championships were held in Cleveland, Ohio, at the Cleveland Hilton South and were sponsored by Sanyo. The track was set up in the main ballroom.

Three hundred and thirty three entries! Do you realize how many that is! It's a bunch! It was the biggest indoor race ever! If bigger is better, this was certainly better. Hosted by NORCAR, the Northeastern Ohio R/C Auto Racers club in Cleveland, Ohio and held at the Cleveland Hilton South hotel, this was an event to remember.

It was held over Thanksgiving day weekend, as in the past three years. We arrived Wednesday evening and were delighted to find that the Hilton hotel had graciously supplied our rooms with extra work tables. This might not seem like a lot, but to a racer it's very important — so, thank you, Hilton. We checked in, ate, unpacked and then got down to business. We, meaning Associated, had just designed a new fully independent suspension front end for our RC12i car. My son, Curtis, made one prototype front end, which we put on Mike Toland's car. We got to run this front end for three battery charges at Cunninghams track between rain storms. But this was enough to tell us it was definitely an improvement. So I had Curtis make five more prototype front ends. He finished them the day we left for Cleveland.

So here we were, sitting in a Hilton hotel room and I'm asking our guys if there's anyone who wants to try these new front ends. They said, let's talk about it first! So I had Toland explain to them the difference between his stock RC12i car and the RC12i with the new front end. Now, you've got to put yourself in their place. They've been running the 12i cars for a couple years, so they know the cars inside and out. They're at a carpet race, which they haven't even run on carpet for a year, the track here isn't set up yet, so they don't even know what it looks like, and here I am asking them if they want to make a radical change on their car. Mike Lavacot asked the most questions, and Toland's answers must have been most convincing, because Lavacot said he wanted to try one. Kent Clausen quickly decided he wanted one. Ralph Burch had decided earlier on the phone, when he heard about them, that he wanted to put one on Ralphies car. Tony Neisinger had never run on carpet before, so he was ready to try anything. That left Terry Rott and Re-Pete Fusco both volunteering to try one, but I only had one left. I decided to wait until they had both run on the track and then make a decision. I figured it would probably go to Re-Pete, because Terry was on a hot streak. He was MART Champion, Regional Champion and was certainly the man to beat in the Midwest, so I really didn't want to change a winning combination like that.

That night they were busy putting the new front ends on their cars, and the next morning I could hear cars running up and down the hall, which was carpeted, of course. They couldn't tell much, other than the car would go straight. The race was to be held in the main ballroom, except there was a Thanksgiving dinner party in there and the track wouldn't be ready till 9 p.m. So Thursday was used mostly for check in. Each racer was given a Racers' package, which contained a

US Indoor Championships "T" shirt, as well as something from Novak, BoLink, Parma, Associated, Twinn K, Competition Plus, American Modeler, Hobby Hut, Team Checkpoint and Airtronics. To these companies, a big thank you from the racers.

At 9 p.m. the track opened. With 173 racers wanting to get on the track, a long line soon formed awaiting their chance to run. The track looked like a perfect indoor layout. It was probably larger than most indoor tracks and certainly smaller than most outdoor tracks. But one thing soon became apparent. It was certainly the bumpiest indoor track I've seen. A lot of cars were rolling over quite easily. We found out there were as many as five layers of carpet on the track in places. The straightaway and the area to the right of the driver's stand was smooth, but the area in front and to the left of the driver's stand was like a washboard. The cars were bouncing all over the place here. We had put our new green dot rubber on the front and rear, which is what almost everyone uses on carpet, but the new front ends were working so well the cars had way too much steering and were rolling over. It looked like Arturo Carbonell had his Delta car running the fastest and most consistantly fast during this practice session. His car was still bouncing around, but it appeared to be smoother than most of the other cars. When Art was done running, I said, "Art, this track looks more like an off-road track. I bet our gas cars would run great on here." He said, "Your right! I've got my Eagle in the trunk of my car, but I don't think they'll let me run it."

The next morning Lavacot suggested we all get together and discuss what the cars were doing with the new front ends and compare notes.

Now, I don't know if you can fully appreciate what this is all about. Here's a group of guys who are all Regional Champions, National Champions and a World Champion all meeting to help each other. They each want to win this race as much as the next guy, yet they're willing to help their strongest competition, their own teammates. I can't tell you how proud I am to be acquainted with this group of racers. They all decided the green dot front tires was way too much steering, even with the rate trim at minimum. So the front tires were changed to super softs or SK compounds. Lavacot double checked the camber and toe in on Neisinger's car. Clausen showed Burch how to adjust the tweak from the rear end. Ride heights were lowered. We had a starting point, but a lot to learn on set-up yet. There was only one round of practice and after that round it was apparent Mike Toland's car was handling the best, so we tried to duplicate his set-up on the others.

Mike Toland's basically stock RC12i car with the new fully independent front suspension featuring coil over shocks. Adjustable camber, castor, toe-in, spring rate, dampening and ride height. Mike had to add 5 quarters to his car to bring it up to weight.

The Hilton Hotel provided work tables in our hotel rooms, so most of the racers pitted in their rooms, but these racers preferred to pit by the track. With about 3½ hours between rounds, it was easier to pit in the rooms.

With 173 entries in Stock class it would be a long day. But for Richard La Plante and Don Smolik the co-race directors and the rest of the NORCAR club members, it would be an even longer weekend. How would you like to be a race director with 173 entries? It means you get to work from 7 a.m. to 10 p.m. and on one day 7 a.m. to 2 a.m. non stop! You say you just resigned?

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Mike Toland was in the "B" qualifying heat and turned 46 laps in 8:01, which was 2nd overall, with Tony Neisinger at 46 — 8:08. In the "A" qualifying heat it was apparent Joel Johnson came to race. Actually he came to race about a week earlier. Ernie Provetti of Trinity motors brought Joel to New Jersey a week early so he could spend a week practicing on carpet and test motors with Ernie. Well, Joel certainly got his Delta car running the way he liked it. In every one of the qualifying heats Joel was in the first corner first and long gone. He was Top Qualifier in the Stock class by half a lap with 47 — 8:06. Ralphie Burch followed in 3rd spot with 46 — 8:02. Lavacot was 4th with 46 — 8:05. One of the problems with testing something new like this at a big race is that all the things you're testing has to be done during qualifying or mains, instead of during practice sessions.

Although it looks smooth in the photo, this was the roughest part of the track. You had to be able to get through this section of the track fast to be able to get a good time.

Stock "B" Main

For qualifying the cars were lined up side by side, which resulted in a lot of crashing before the first corner. For the mains the cars were lined up 2 by 2 to make for a better race. The cars in this race had almost identical qualifying times, so it should have been a close race. But someone forgot to tell Bob Light. He took off like he should have been in the "A" Main. Quite a few drivers tried to keep up but they couldn't do it. However, Kent Clausen was able to keep Bob in sight and very slowly started closing in on him with 3 laps to go Kent passed Bob and went on to take the win with Bob 2nd and Greg Fox 3rd.

STOCK "B" MAIN RESULTS

	Qual.
1 Kent Clausen	45 — 8:06
2 Bob Light	45 — 8:06
3 Greg Fox	45 — 8:06
4 Kevin Orton	45 — 8:07
5 Ron Schuur	45 — 8:07
6 Cliff Garra	44 — 8:00
7 Bill Jeric	44 — 8:03
8 Mike Hamilton	45 — 8:09

Stock "A" Main

The cars were lined up 2 by 2. At the start Joel was in the first corner first with Mike Toland in 2nd and Mike Lavacot 3rd. Ralphie Burch had gotten terrible starts in his qualifying heats, but for the Main he was in the 2nd row and figured he had a chance for a good start. But he was wrong. At the corner, at the end of the straight, he was drilled and got stuck in the boards.

Meanwhile, Joel continued to lead, but Toland was staying close behind. Toland was trying to catch Joel and stay ahead of Lavacot. Not an easy job.

STOCK "A" MAIN RESULTS

	Qual.	Car
1 Joe Johnson	47 — 8:06	Delta
2 Mike Lavacot	46 — 8:06	Associated
3 Mike Toland	46 — 8:01	Associated
4 Art Carbonell	45 — 8:03	Delta
5 Rod Galloway	45 — 8:00	Delta
6 Ralph Burch, Jr.	46 — 8:02	Associated
7 Tyree Philips	46 — 8:10	Delta
8 Steve Koepp	46 — 8:08	Delta
9 Tony Neisinger	46 — 8:08	Associated
10 Jim Dieter	45 — 8:00	Delta

MODIFIED "B" MAIN RESULTS

	Qual
1 Bob Light	46 — 8:08
2 Kevin Orton	46 — 8:09
3 Bud Bartos	46 — 8:06
4 Dave Hechler	46 — 8:07
5 Steve Koepp	46 — 8:06
6 Mike Toland	46 — 8:01
7 Mike Hickman	46 — 8:02
8 Ron Schuur	46 — 8:09

MODIFIED "A" MAIN

	Qual.	Car	Motor
1 Terry Rott	48 — 8:06	Associated	Reedy
2 Mike Lavacot	48 — 8:03	Associated	Reedy
3 Joel Johnson	49 — 8:08	Delta	Trinity
4 Tony Neisinger	48 — 8:09	Associated	Reedy
5 Rod Galloway	47 — 8:06	Delta	Delta
6 Greg Fox	47 — 8:08	Delta	Trinity
7 Ralph Burch, Jr.	48 — 8:10	Associated	Reedy
8 Jim Dieter	48 — 8:13	Delta	Trinity
9 Arturo Carbonell	47 — 8:01	Delta	Delta
10 Tyree Philips	48 — 8:06	Delta	Trinity

It seemed Lavacot's car was now working a little better than Toland's. But Toland was going just fast enough that Lavacot couldn't pass. At the 3 minute mark Toland finally made a small bobble in traffic and Lavacot got by to take over 2nd. Lavacot was now about 20 feet behind Joel with both cars going about the same speed. It stayed that way with neither driver making a mistake until the 7 minute mark. Joel came up to pass two other Delta cars who were involved in their own individual race. Just then the two Delta cars in front of Joel bumped each other and Joel hit them and all three cars were stuck at the boards. Lavacot went by to take the lead. With

2 laps to go, it looked like Lavacot had a sure win. But there was one car in front of him that didn't seem to want to let him pass. Lavacot tried to pass him on the straightaway, but they both got stuck in the boards. By the time Lavacot got turned around, Joel went by to take the win, with Lavacot 2nd, Mike Toland finishing 3rd and Arturo Carbonell taking 4th.

Joel is certainly a super driver, and he certainly didn't have anything to do with Lavacot's crash, and I would have to believe Joel would rather win his races by himself. He's more than capable.

Joel does it again. Joel Johnson was the Top Qualifier in both Stock and Modified classes. He won the Stock class, and took 3rd in the Modified class.

Mike Lavacot led the Stock Main for awhile, but ended up second. He also took 2nd place in the Modified class. He came close.

Mike Toland is always up there, and this time he took 3rd place in the Stock class.

Modified Class Qualifying

Did I say Joel was capable? He proved it again by taking Top Qualifying honors with 49 — 8:08. There were only 2 qualifying rounds in modified. Joel had his car dialed in about as close as you can get. On his fast run his batteries dumped right at the finish line and his car punched in the boards. Lavacot was getting his car working better each run and qualified 2nd with 48 — 8:03. Tyree Philips put in a super run and took 3rd spot with a 48 — 8:06. Terry Rott wasn't going as fast on this bumpy track as I thought he could in Stock class, so we put the last new front end on his car and he qualified 4th with 48 — 8:06. It looked like everyone picked

up 2 laps with the modified motors.

Modified "B" Main

Bob Light wasn't going to let the same thing happen to him twice in a row. This time he got the lead and he was long gone. He drove absolutely perfectly for 8 minutes. Kevin Orton took 2nd place with Buddy Bartos following in 3rd.

Modified "A" Main

The cars were lined up 2 by 2 for the start of the "A" Main. This was the first race all weekend that Joel didn't make the first corner first. Lavacot got about a half a car lead on Joel and Joel backed off to let Lavacot go around the turn first. Joel was a couple inches behind Lavacot with Terry Rott a couple feet behind Joel. Lavacot started pulling away from Joel, while Joel and Terry were racing for 2nd. Lavacot had been trying different settings on the front end every time he ran and he must have found the setting he liked, because no one could keep up with him.

The cars stayed this way for the first 2 minutes when Lavacot started coming up on traffic. He knew Joel wasn't that far behind that he could take too much time in passing other cars. But he did try to take his time and Joel and Terry got closer. Then Lavacot tried to pass a car, but unintentionally got bumped and Joel took over the lead. Lavacot was now right in front of Terry Rott with Joel about 15 feet ahead. Lavacot started closing on Joel and just when it looked like he could race Joel for first place, he tapped another car while trying to pass and Terry passed Lavacot. Joel was now about 15 feet ahead of Terry with Lavacot about 5 feet back. I was sitting by the drivers stand with Bill Campbell and with about 45 seconds left I said Joel's car seems to be slowing in the infield. But on the straightaway it looked as fast as ever. But the next time it definitely was coming off the corners slower. Terry got closer and closer. There was only one lap to go. They were starting the straightaway. Joel slowed more and

The cars are lined up for the start of the Modified "A" Main. The 2X2 lineup made the starts much more accident free. Mike Reedy is standing there seemingly saying, "C'mon babies — do your thing!" They did!

Terry went on by to take the lead. The room exploded! There was whistling, clapping and yelling. I didn't understand what was happening at first. Then I realized. It's always been someone from California or Texas winning the race. For the first time someone from the Midwest was leading the Cleveland race! And most of the crowd was from the Midwest. Hometown hero wins! It couldn't have been better. By this time Terry indeed did win the race with Lavacot taking 2nd again, about 2 seconds behind Terry, with Joel another 5 seconds back in 3rd, and Tony Neisinger in his first indoor race ever, taking 4th place.

Congratulations Terry!

I also want to thank all the NORCAR members for a job well-done and a special thanks to Bob Rule for his help and his BoLink computer which made it all possible.

□

Popular winner, Terry Rott, won his biggest race ever. Every race he runs he gets better and better and this time he won the Modified class.

Flying Near Airports? Be Careful!

Free Flight or Radio Control flying near airports, or in any situation which might involve the possibility of models being in the vicinity of full-scale aircraft operations, must be avoided—or conducted so as to eliminate any dangerous situations. Models should not be flown in the proximity of full-scale aircraft operations unless the flyer has someone else with him for the sole purpose of watching for full-scale aircraft and supervising the flying so as to prevent accident possibilities.

PROTECT YOUR RIGHT TO FLY!

Safe Flying Is No Accident!

PHOTO #1: A typical example of the first page, with some simple art to lend interest.

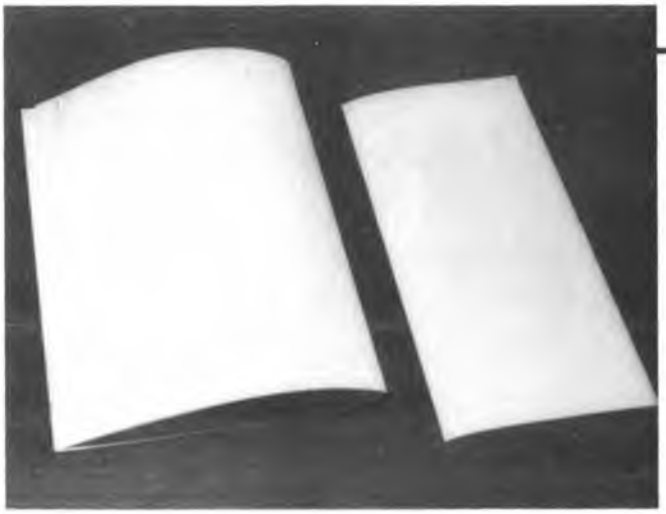

PHOTO #2: Folding is a matter of personal choice. Either way is acceptable for mailing.

Communicate or Perish
As An R/C Club

By Michael R. Gabriel

Many R/C clubs have newsletters, but are they really as effective as they can be as a tool for communicating to members? Here are some ideas on how to put together a worthwhile newsletter, or make the one you have even better.

"I didn't know there was a meeting last night. Why hasn't anybody told me?" asked the disappointed, unhappy member of the R/C club.

Another uninformed member questioned, "When will the next Fun Fly be held?"

"I wish I knew what was going on in this club!" the angry club member exclaimed. "I don't feel like I belong to the club."

Questions. Questions. Questions. Why are there no answers? Why are your members so much in the dark about what is going on in your club? If you have this problem, and the pleading voices of the questions asked above are familiar to you, then it's time to take action to remedy the situation or the club will surely perish.

All of us in R/C know that the most

PHOTO #3: Rather than typing across the page, shorter lines of type make it more comfortable for the reader .

PHOTO #4: Creating an ad for the local hobby shop can be fun. It can stimulate sales, too!

important item for a club to have is a flying site; then, if the club is lucky, to have an alternate flying field. There is, however, another item that your club must have in order for it to survive: an instrument of communication --- a **newsletter.**

If you are now putting out a fine newsletter and you feel that you cannot improve it in any way, then you are in a minority and the information which follows should be "old hat" to you. On the other hand, let's see.

The approach, really, is a reasonable and straightforward one. Since the president of your club is the one who will ask (in most cases, **beg**) for volunteers to do the jobs which must be done, then it is he who must get the ball rolling. Your newsletter will need an editor, one who possesses certain qualifications. Don't laugh and shrug your shoulders and give up, convinced that this is an unrealistic and unlikely project; every club has someone with the potential to undertake this task. Find him!

Having found this willing candidate, it is time to get to work to produce this important letter, making it an exciting experience for all the members, as well as for the editor. The information and examples that follow in the article, the hints and the suggestions which I am proposing, therefore, are pointed directly at the one whom I shall now refer to as the **editor;** namely, the individual who has accepted the responsibility of getting out a newsletter for his R/C club and who can use a few clues on how to make it better.

First off, you should know how to type or have someone to do the typing for you. Some talent for writing coherently is necessary, and, above all, you should derive enjoyment out of doing editor's work.

A way to begin is to decide upon a name and a logo; that is, provided you do not already have one with which you and the members are satisfied. You may put on a contest for this and offer a prize to the winner, e.g., an airplane kit, or a paid-up membership for one year. If the response is poor, then, **you** decide upon a name and a logo, and there will be no objections from the members, you can be sure; the passing of the buck and the avoidance of work and responsibility is not uncommon in a situation such as this.

Design a simple logo, one that can be sketched very plainly with India ink and ballpoint pens of various sizes, without your having to be a fine artist. Naturally, the name you choose for the newsletter should be related to the hobby. Find something different, unique, and not the worn-out "aero news" or "flying news" --- names which create no spark of enthusiasm for those who must read it. (See photo #1.)

The aim is to keep the newsletter modest and inexpensive to produce. Use 8½" x 11" typewriter bond, and no more than four pages for each issue. This will keep the cost of mailing within the limits of first class postage. It can be stapled together in the upper, left corner, then folded in half, or folded twice, and then taped to hold it

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closed. (See photo #2.)

The keys of the typewriter should be clean and the black ribbon always fresh. To make the reading of the letter easier and more like a newspaper layout, it can be set up in two columns, rather than typing a line straight across the page. Since the typing is single spaced, the reading is easier if the line of type is shorter, enabling the eye of the reader to make less fixations than are required when words run from the left margin to the extreme right. (See photo #3.)

A newsletter which includes photos creates a great amount of interest. The use of black and white film makes the reproduction less expensive; color will increase the cost. Remember, we are going to put out a newsletter which will not drain the funds of your club and still be a communicative tool which will work. Use a 35mm camera, and when the film is processed, have a contact sheet printed by the film processor. The size of these prints will be exactly the size of the 35mm negatives and adequate for your purposes. If you want to have a particular photo enlarged, this can be done with little extra cost.

Talk to as many printers as there are available in your area about your ideas of layout work, and agree to the most reasonable bid. The cheapest may not be the best; on the other hand, the most expensive may not be much better.

To fill the pages of a newsletter, you must have ample material. See to it, therefore, that you cover all the events of the club. If you cannot report on the story yourself, then you must appoint someone to cover for you, so that the affair does not go without being reported. The **point** is that you must get copy, as much of it as possible. Words are the tools of your trade and you cannot get along without them. You can cut down on too many words, but it is difficult to fill a space when there is nothing to report.

How do you, the editor, gather all of this material to fill your letter? Here are some of the methods you can use to stimulate submissions:

1. President's column: The newsletter should run some regular features. Each month, the president's message to the membership is probably the most important, and it should appear always, and occupy the same space in each issue. It should contain the main topics of the previous meeting, and any other message the president wishes to convey to his members. Those members who were unable to attend the meeting will then be brought up-to-date on the progress of the club.

2. Member submissions: The editor should encourage submissions by the members. Invariably, there are certain members who possess a particular expertise in the hobby, and they should be persuaded, through their writing, to share the skills which they have acquired and which they can pass on to the members, especially the fledglings. These experts can contribute each month to the newsletter and create a regular feature which will undoubtedly be popular with the members.

3. Advertising: Advertising is a good idea. Local hobby shops can be persuaded to place a small ad in the newsletter and pay a small fee to the club to help decrease the cost of printing the newsletter. This should be worked upon diligently since it is wise to support your local hobby dealer. Establishing a good relationship with the owner of a hobby shop can be helpful to the R/C modeler in many ways. When the local shop is patronized by the beginner, especially, he can usually have a lot of questions answered about the products he buys. The editor should confer with the hobby shop owner and discuss with him what it is he wishes to feature in his ad, and, if he can use the help, the editor can work with him on putting together some catchy

slogans. I have not as yet met an editor who does not have an ability to sketch a little. Printing letters with India ink and speedball pens, and even sketching little figures, e.g., planes, insignia, or any little decoration, can help to make the ad more striking. The drawing need not be expert and artistic; the idea is to have a personal touch. (See photo #4.)

The result of all this is beneficial to the shop placing the ad, inasmuch as he will be saving money which would have been used for an ad made up by an advertising agency. Any hobby shop owner would never refuse this kind of arrangement. His ad will reach a specific reader, one who needs the products he sells to carry on with his hobby.

4. Special features: (a) Plane of the Month; (b) Hints and Tips on Building Techniques; (c) Dates to Remember; (d) Short Biographies on Members; those are but a few of the articles which can be included in a newsletter. Depending upon your imagination as an editor, there can be many more interesting areas to cover. Naturally, they should all be related to the hobby.

You should establish a deadline for all the copy which will be submitted so that you, the editor, will have the time necessary to put all of it together. This is the time when you must do the typing and set up each page's layout just as you want it photographed by the printer. You must know, for example, how much time you will need to type the copy, make the layout, process the film if there are any photos, before you can be ready to send all of this to the printer. The logical time to begin to get the newsletter planned is immediately after the monthly meeting, when a great deal of business is transacted by the club officers and members. It is reasonable to plan for the members to receive their copy of the letter at least a week before the monthly meeting; therefore, you must estimate the amount of time the printer takes to finish the newsletter after you have submitted the sample to him. By this time, you can easily see that you, the editor, are many things: a writer, a photographer, and a layout man.

Because you will be handling the mailing, you should have an up-to-date roster of the club members, and when a new addition is made, an item should be placed in the letter so that all the members may know. A

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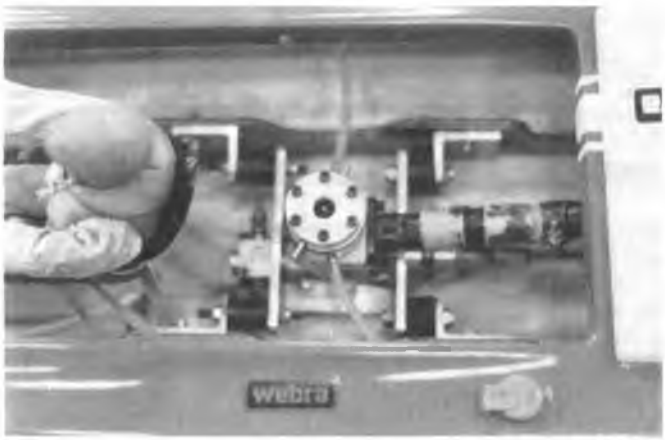
POWER BOATING

Howard Power

(1) Bjorn Stenerfelv's deep vee in action.

(2) Carlson 10cc boat showing typical Swedish set-up.



(3) Rubber engine mount system.

(4) Typical surface drive set-up.

This month we have a report on R/C boat racing in Sweden, from Bjorn Stenerfelv. The Stockholm club, of which Bjorn is a member, primarily races on oval courses very similar to those we use in the U.S. They tend, however, to have longer straights with very sharp turns. The Swedes also do some straightaway speed work with their boats. Bjorn holds the 15cc speed record with his 15cc deep vee boat at 40.08 knots, or 45.5 mph. The hull is a Carlson design deep vee which is moved by an Octura X465 propeller. The first photo shows his boat in action. You will notice the very large rooster tail behind the boat caused by running the propeller on the surface. Most of the competitive deep vees in Sweden use the surface drive system. They run this system because of its straightaway speed advantage over the more conventional under the surface drive system. Since the time spent turning is very small compared to that which the boat spends on the straights, the surface drive boats get more laps on the Swedish course.

The second photo shows a Carlson 10cc boat that is typical of the Swedish set-up. Their rules require drivers and paint jobs that are representative of full scale craft. The vee bottoms are much deeper than those used in the

U.S. You can also notice the deep fore-foot of the hull bottom profile. This particular boat has a length of 4½ feet and is powered by a Webra racing 10cc engine. The Swedes use only muffled tuned pipes because of noise limitations in their country. The boat in the photo has a Rossi muffled pipe, an Octura X455 prop, and the hardware is manufactured by R/C Boat.

Because of the noise restrictions, all of their motor installations are rubber mounted. The third photo shows such an installation. The motor is hung from four aluminum angle supports that are solidly mounted to the hull rails. Rubber cylindrical pads connect these supports to the engine mount to isolate engine vibration transmission to the hull. The prop shaft must also be mounted so that it can move. A typical set-up uses the normal prop shaft and bearing assembly mounted in rubber with respect to the hull. The prop shaft then hangs between the engine U-joint and the propeller outdrive U-joint. The Webra racing engine shown has been highly modified and uses a Kavan carb. Bjorn indicated that this carb and the OS carbs have proven to be the most reliable and popular means of throttle control. In fact, he says that all others are good candidates for the "circular file."

The fourth photo shows a typical surface drive set-up. The strut assembly is mounted so that the centerline of the prop shaft is above the vee bottom of the hull. The Swedes use solid straight shafts with U-joints on each end. This allows strut angle changes to help trim the boat. The Swedes use no cavitation plates. Notice also that the hull bottom is round, not sharp as our U.S. hulls are. Bjorn indicates that this is essential for reasonable turning performance. He indicated that hulls with true vee bottoms tend to "hook" and jump around in the corners. The advantage of the surface drive is that it reduces propeller load from that encountered when the prop is submerged. In this

(5) Note rudders are mounted ahead of the prop.

(6) Bjorn's four foot tunnel hull powered by Picco 61 marine.

way, a larger, higher pitched propeller can be used to load the engine properly. If the prop bites the water efficiently the result is higher straightaway speed for a given horsepower. In addition, the underwater drags of a prop strut and drive line are eliminated by this system.

As with anything else, the surface prop system also has disadvantages. Propeller thrust and torque applied to the hull are a function of the amount of water that the blades work on. In anything but smooth water conditions, the surface drive system sees a large variation of water worked on by the prop. If water conditions are a bit rough, the boat changes its angle of trim or can leave the water completely. When prop load is decreased, engine speed will increase and torque decreases. When water inflow increases, the engine slows down and torque increases. Variations in torque will tend to rock the hull, scrubbing off speed and decreasing stability. The big offshore boats have a throttle man to help drive the boat. His job is to chop the throttle when the hull leaves the water. This insures that the engines don't overspeed themselves to destruction. Models exit and enter the water much more quickly than their more massive counterparts in full size racing. As a result, it is very difficult (bordering on impossible) to use throttle movements to prevent overspeeding. You may then have to operate your motor at a significantly lower operating rpm to prevent engine destruction when unloaded. The variations in applied torque also put cyclic loading on all the drive line components. Increased vibration and cylic loadings make it more difficult to keep the boats operating systems together and operating as efficiently.

When you use a big propeller and operate the engine at a lower rpm, the horsepower of the motor will be lower than if you could operate it

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(7) Engine installation in the tunnel hull.

(8) Homemade outdrive system on tunnel hull.

continuously at the highest possible rpm. During oval racing, the hull will see choppy water especially when running through the corners. Since the surfacing propeller torque varies in these conditions it is very difficult to control the hull when turning. As a result, most model surface drive systems use double rudders, or a very large area single rudder, to help control the boat while turning. You may also see very large skid fins mounted on the right hand side of these hulls to keep them under control. These large rudders and fins create drag and as a result most of the drive line drag reduction advantage of the surface drive is cancelled out. It has been my experience, after trying both ways, that the surface drive is only a bit faster on the straights, but the underwater drive is much faster in the corners and has far superior handling when turning. At least for the courses we use, I believe the use of the conventional system will result in lower lap times. On longer courses or

(9) This one has a K & B 6.5 marine engine mounted inboard.

(10) Five foot boat with 45cc chain saw engine.

for straightaway speed runs the surface drive's ability to generate more speed will dictate its use.

The boat shown in the fourth photo uses double rudders for stability. Bjorn indicated that the rudders he used are really too small and should be enlarged for better handling. Bjorn prefers to mount the rudders behind the propeller. The propeller drive dog is mounted 5" behind the transom. The distance from the transom to propeller is critical to get best performance. This distance can be used to control the amount of water the prop works upon. As the hull moves through the water it makes a wave that depresses the water at the transom. In fact, water is deflected below the hull bottom level and then rises to a level above the undisturbed water surface before returning back to the undisturbed level. By positioning the propeller at various distances from the transom, propeller load may be adjusted. If you mount the prop too close to the transom, prop bite is

reduced and efficiency is lost. By positioning the prop further aft, the prop works better and effective boat length is increased. You would expect that the optimum distance is a function of the weight of the boat, the angle of the vee and the type of propeller used. Only by experimenting will the best combination be found.

The fifth photo shows the rudders mounted ahead of the propeller. Some hulls turn better when the rudders are mounted in this way. Notice that the transom has been cut out and the prop is, therefore, mounted closer to the transom. Bjorn indicated that this configuration did not work out well on this hull but might be good for another hull type.

The sixth photo shows Bjorn's tunnel hull. The 4 foot long tunnel is powered by a Picco 61 marine engine. The boat is not powered by an outboard engine but has the inboard engine installed behind the driver's head. The next photo shows the installation. Notice the plastic fuel tank mounted around the carb for spray protection. The Kavan carb is used on the Picco with very good results. The pipe coupler is not connected to the pipe. Bjorn made the fuel tank from tin stock and positioned it close to the balance point to reduce trim variations when running. The aluminum motor mount is glued directly to the hull using silicon glue. The resulting thickness of the rubber between the bottom of the mount and the hull bottom is about 1/2". The mounting method has proved to be very trouble free. The next photo shows the homemade outdrive system. Notice that the pivot angle of the outdrive is tilted backward to achieve a degree of automatic power trim. This feature keeps the hull in trim while turning. The drive line uses a straight solid drive shaft with U-joints at both ends.

The next photo shows yet another of Bjorn's tunnel hulls. This one is powered by a K & B 6.5 marine engine mounted inboard. The boat is 3 feet long and its design was copied from the Vernon tunnel. It is obvious from the picture that Bjorn used the fake outboard as a tuned pipe muffler chamber. The tuned pipe was bent on purpose so that the cowl would fit.

The Swedes are also experimenting with gasoline powered boats. The boat in the next photo has an overall length of 5 feet. It is powered by a modified chain saw engine whose displacement is 45cc. The boat has a top speed of about 45 mph. The engine cylinder fins have been cut off and a water cooling sleeve is used. This boat also uses the surface prop drive system and Octura X460 to X465 propellers. The drive line is speeded up 2 to 1 using cogged belts and matching gears as shown in the last photo. Bjorn indicated that the speed of the boat almost doubled when the gearing was added. He, therefore, considers a geared engine essential if performance is to be reasonable when using chain saw engines.

I want to thank Bjorn for his very informative report about boating in Sweden. I would also like to take this opportunity to invite all of you out there to contribute your ideas to this column. Let us all know what you are

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(11) Shows drive line geared up 2 to 1.

1983 NMPRA

By Dave Shadel

In October of every year since 1973, the National Miniature Pylon Racing Association holds its premier event — the National Championship Formula 1 Race. The event rotates through locations around the U.S., and this year's race was held at the world famous site of the California State Championships in San Luis Obispo, California.

Contestants for this race must qualify in the top 20% of their home districts, place in the top ten at the AMA Nationals, or the top three at the Canadian Nationals, be an NMPRA officer or a past winner of this same race.

These qualifications attempt to insure that only the most competent pilots are invited to attend and help to maintain the quality of competition found in few other modeling events.

This year's event was attended by 47 pilots from as far as Connecticut, Minnesota, Georgia and Canada. The contigent from Texas was nearly as

The top three finishers: Dave Shadel, 1st; Gary Hover, 2nd; Jeff Bertken, 3rd; with the Texan's mascot and Jim Shinohara.

Engine expert Clarence Lee (center) was inducted into the AMA Hall of Fame by Betty Stream and NMPRA President Ron Schorr.

Stinger with its designer Bob Root, NMPRA Champ in 1979. Bob is a noted aerospace engineer.

Dick Ritch for Houston, Texas, and mascot with his best-finish winning Polecat.

"Wild Turkey," a radical new design, was flown by Scott Manning (L) and caller Bill Malo.

Ed Allen and Harley Condra demonstrated their "Texas Gem."

"Pitts Pellet" by George Parks of Austin, Texas.

large as the one from California, and came complete with a Phugawi Indian Chieftain who became the target for a multitude of practical jokes throughout the weekend.

A major highlight of the race came on Sunday when Clarence Lee was inducted into the AMA Hall of Fame. This very famous model engine expert has contributed to our sport in innumerable ways and is directly responsible for designing many of the model engines in use today. Congrats, Clarence, you've earned it!

Normally the Formula 1 event is dominated by heavily modified K & B and Super Tigre engines. This year, however, several fliers used O.S. engines, with three placing in the top ten. Pete Reed, from Connecticut, ran one in box stock condition and consistently ran in the high teens. Tom Christopher and George Parks ran slightly modified versions with similar times. This is very good news for prospective racers, as these engines are available and not too expensive.

A couple of very unusual racing aircraft showed up. Scott Manning flew a brand new Wild Turkey, designed by Howard Gard, for several rounds until it sustained damage on landing. The design shows a lot of promise and, with some further development, could become a force to reckon with. Two "retired" Formula 1 racers, Ed Allen and Harley Condra of San Diego, showed up to demonstrate their radical "Texas Gem." Although it still exhibits some control problems, they hope to have it race-ready in the near future.

There was quite a variety of aircraft in the top 10 this year. Four Little Toni's, four Denight Specials, a Polecat and a Pitts Pellet. Texan, Dick Ritch, captured best finish with a nice Polecat built and finished by Bruce Richmond, who failed to show up after his resounding last-place finish at an earlier California District Race. (Sorry, Bruce, I promise better equipment next time.)

The crew from Texas had almost universally bad luck. Dub Jett destroyed his #1 aircraft on test flying day by spearing the #3 pylon, then proceeded to wipe out his back-up during the contest. Better luck next time. Dick Ritch crashed on test fly day, too, with radio problems. Fred French hit a pylon. The list goes on and on. The Texans brought a small (Texas?) flag for their mascot to hold and the Samurai Team rubbed salt in the wounds by drawing an X'ed out racer on the flag each time a Texas airplane went down. At last count there were nine. Seriously, the Texas group is a well-prepared, highly motivated and tough to beat bunch, and we're sorry they didn't do better. Next time, guys.

By the eighth round on Sunday, the workers from the SLO Flyers and Jim Sneed, the C.D., were ready to call it quits. They had changed the course direction twice due to wind shifts and ran nearly 100 flawless heat races. We thank them for their very hard work.

Fly-offs to determine the top 10 places were uneventful except for Gary Hover's crash. Ask him about it if you dare.

The Samurai Racing Team dominated this event by capturing first through fifth plus eighth place and Fast Time. Team Captain Jim Shinohara smiled a lot!

The awards for this year's event were picked by NMPRA President, Ron Schorr and were truly fitting of an event of this stature. The winners will treasure them for many years to come. Thank you, Ron.

The Top 10 places at the NMPRA Championships are shown in Table A.

The Formula 1 season is over for 1983. Next year promises to be bigger than ever. Will we see you at the races? □

CHAMPIONSHIP RACE

TABLE A

Name	Equipment	Best Time
1 Dave Shadel	Little Toni/Super Tigre	1:11.30
2 Gary Hover	Little Toni/Super Tigre	1:13.39
3 Jeff Bertken	Polecat/K & B	1:12.67
4 Kent Nogy	Denight Spl./K & B	1:11.73
5 Eric Ristrim	Little Toni/Super Tigre	1:14.54
6 Pete Reed	Denight Spl./O.S. Max	1:17.46
7 Mike Helsel	Little Toni/Super Tigre	1:18.34
8 Mike Atzei	Denight Spl./Super Tigre	1:11.35
9 Tom Christopher	Denight Spl./O.S. Max	1:17.47
10 George Parks	Pitts Pellet/O.S. Max	1:16.21

Published by Rawson Associates, 597 Fifth Ave., New York, New York 10017, this 248 page hard-bound gem sells for a mere $22.95.

Building and Flying Giant Scale Radio Control Aircraft

It's certainly not news that giant scale has hit radio control modeling in a **big** way. A look at recent magazine coverage and the increasing numbers of these one-quarter full size or larger craft flying at fields around the country should confirm this. What is news, however, is the publication of the first complete how-to-do it guide to this exciting new facet of the hobby.

Veteran modeler Bob Beckman takes you through the whole process: choosing your first giant scale kit, selecting an engine and radio, building models with built-up wooden or fiberglass/foam structures, installing the control system, operating the engine, and flight testing the completed aircraft.

Beckman uses both the Great Planes fiberglass and Jim Messer balsa Piper Tomahawk kits as construction examples, explaining each step with exceptionally clear black and white photos, line drawings, and well-written text.

Although this large size soft-bound work resembles a magazine on the outside, that's as far as the similarities go. In a mere 88 pages, this book takes all the hassles and guesswork out of your first attempt at giant scale.

Available from Kalmbach Publishing Co. (1027 N. Seventh St., Milwaukee, Wisconsin 53233) for $9.95, this book is a must for anyone planning a giant scale project, whether a beginner or an experienced R/C builder, wishing to move up in size.

The following titles represent some of the latest additions to the ever expanding aviation reference library being offered by Squadron/Signal Publications, Inc., 1115 Crowley Dr., Carrollton, Texas 75006.

This prolific publisher has, for the past several years, continued to supply modelers and aviation enthusiasts with a wide variety of high quality, inexpensive, soft-bound books on hundreds of aircraft.

These new works are no exception to the familiar Squadron format. They feature hundreds of black and white and color photos (many from private collections and never before published) and lavish illustrations including line drawings, airbrush paintings, and three-views. Aircraft details are given particular emphasis as are markings, colors, and cockpits.

The text complements these graphics with a host of other important information on markings, specifications, and history.

Painstakingly researched, these short volumes are an invaluable source of hard to find information for scale modelers and should be a welcome addition to any aviation library.

Fighting Colors: P-51 Mustang in Color ($5.95)

Larry Davis has created a beautiful

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By
Rick
Christoph

THE CONFESSIONS OF THE FIRST TIME PATTERN FLIER

My Sweet Stik was in perfect trim! I considered myself ready for the big day — my first contest! First, however, let me digress a bit and describe how I got myself into this situation. I had been flying for about two years and had progressed to the point where my maneuvers were usually recognized and my plane landed more often than not in one piece (sometimes even on the runway!). I had always enjoyed watching our club's outstanding pattern fliers in action, so I decided to give pattern flying a try — after all, it sure didn't look hard! I decided that the right place to start my pattern career was in some small, local contest where there would be other fliers with very little experience in the competition and we could compete on a more or less equal basis. I also felt that my noble .40 powered Sweet Stik (complete with several patches) would do the job; after all, the only problem that the aircraft had in doing the maneuvers was its pilot's nervous thumbs.

Finally, the big day arrived. However, my small local contest turned out to be the South Carolina State Championships! "Well, might as well start at the top," I muttered to myself. My fellow club members all gave me appropriate encouragement such as, "You might as well crash in style," and "Be sure to announce the maneuver clearly to the judges so they know what it is supposed to be!" Anyway, I arrived at the flying site bright and early to get acquainted with the lay of the land and to register. About that time I saw it! A **paved** runway! I had never flown off the unforgiving stuff. I must admit that about this time my knees were beginning to shake but I was determined to at least make a showing. Besides, I had talked my wife

into coming and the old male ego couldn't back down.

I proceeded to get the rubber bands out and fasten the wing on as usual — thinking that the old bird didn't look too bad; until I began to really look at the other planes at the meet. It soon became painfully apparent that I was the only flier who would be flying a high wing plane. On top of this, I had the dubious honor of having the smallest engine at the field and was one of two folks who didn't have retracts (this was before the advent of the new novice class of competition in which retracts are not allowed), I began to feel a little outclassed, like a Spad trying to dogfight an F-16. I still hoped that most of these fliers would be old hands at the sport of pattern competition and thus not be in my class. Wrong again! My class was the largest group and thus the most competitive. Well, it was too late to back out now and my wife kept urging me on with comments of, "Maybe they don't fly well — they probably just like to build." I had to agree with that; it would explain the fantastic paint jobs on the other planes. My Stik was starting to look mighty pale by comparison.

Anyway, the flying started. I checked and double checked everything on the plane and suddenly it was my turn to show the crowd what I could do. I really hoped as I walked toward the transmitter impound area that I wouldn't splat my poor bird during the first flight. I was **nervous!** George, my caller, said he'd help me by talking me through the maneuvers and said I had nothing to worry about. After all, George had entered a meet once before. I felt as though the blind were leading the blind as we walked to the pit area. Other contestants were very helpful, telling me to take it easy, etc. This encouragement helped and we got the go ahead to fire up the reliable old K & B .40. She kicked right over and it was time to fly! I announced I was ready for take-off and punched the throttle. With that, the #$**# engine died — first time it had done it in months! George raced out to the plane and fired it back up, I just punched it and yanked back on the stick. The good old K & B hung in there during the resulting stall and we made it into the air. George advised me that the next maneuvers were easy, just fly down the runway, turn and fly back. Well, I did pretty fair on these, just like the practice flights. With my confidence starting up, I announced I would do a stall turn. It is a good thing that you do announce the maneuver because otherwise the judges would never have decided what it was. Anyway, I was still in the air and it was time for the Immelman

Turn. Did okay on that one too. Next for the three loops. I did one loop, one semi-Immelman and one unidentified stunt. That shook me up because loops had been my best maneuver in my practice flights. Anyway, the inverted flight was easy as was the single outside loop so I felt things were back on track.

The next maneuver called for three rolls. I started the rolls in good shape but it seems I became a bit confused on just when to give that touch of down elevator required to keep the plane level in the inverted portion of the roll and almost succeeded in digging a nice crater next to the runway. I still don't know how I pulled out in time — I could hear the crowd gasp. I am sure all the other spectators and fliers were impressed with the strength exhibited by those rubber bands as they strained to hold the wing in place.

I was totally unglued by this time and I was glad it was time to land. I was still worried about the paved runway and set up a long, smooth approach, determined to really "grease her in." Unfortunately, I was so busy I just didn't see the tree looming up at the end of the runway and suddenly I had a very sinking feeling — my pride and joy was **behind** and **below** the tree! I opened the throttle at the exact time the tree jumped up and "grabbed" my wing. The plane staggered and began to pivot around the branch as the engine caught. Suddenly, the branch broke and my plane was headed toward me — still carrying part of that wretched tree in its wing. I tried to set up a landing but the plane just wouldn't fly right with branch and leaves impaled in it. I guess I couldn't really blame it. I touched down hard and bounced down the runway, shedding leaves and wing covering as I went. Finally, the plane stopped and I announced that my flight was complete. Turning to the judges I noticed one judge wiping the tears of laughter out of his eyes while his companion was trying hard to keep a straight face. George went out and removed the stick from the plane and made me a present of it, much to the delight of the crowd. So ended my first pattern flight.

The first time you do anything, you will make mistakes and, normally, it will be your worst performance. I was able to prove this by patching the Stik up and really improving during the rest of the meet. I didn't win but I didn't place last either (close, but not last). Still, it didn't matter where I finished for I met a number of new friends, all eager to help me in any way they could. Every person, even today's experts, had a first time and it shouldn't stop you from trying your hand at a contest of any sort. I'm sure you will enjoy it if you give it a try. □

POWER BOATING

from page 153/146

doing and why. What works for you? Contributions like Bjorn's are what keeps this column interesting. There is more than one way to skin a cat. Let us know your way. If you disagree with something in the column I will gladly give anyone space for their point of view. We only learn when we are open to discussion. Send your contributions to the address at the end of the column. Howard Power, Hobbies Unlimited, 766 Broadway, Seaside, California 93955, (408) 394-1200. □

COMMUNICATE OR PERISH

from page 145/138

mailing list of neighboring R/C clubs should be established, and an exchange of newsletters can be initiated. This can be a good source of gathering information, and some of it the editor will wish to publish in his own letter.

Individuals who are very prominent in the field of modeling and who are within reach of the location of your club should be invited to speak at your monthly meeting. Many of these notables will be very happy to oblige. Of course, their expenses should be paid by the club, making it no burden for them to accept your offer. Thereafter, their names should be included on the mailing list; it is not surprising to learn that they are very happy to get the literature.

Your newsletter should have a dynamic effect upon the members. Strive to make your newsletter as personal as you can by reporting as much as you can about the activities of your club and about your members. People like to read good things about themselves.

It is apparent, then, that you, as editor, have an important and resposible and active job. Do it to the best of your ability and the rewards will undoubtedly be gratifying for both you and your organization. Through your efforts, you will be instrumental in the survival and growth of your R/C club. A club with an effective and meaningful newsletter is a club which will flourish. Communicate or perish. □

RADIO SPECTRUM

from page 66/62

flying PCM now which means I'd need a different interface. That's the price of progress.

New Electronics For R/C Aircraft?

Speaking of progress, I'm kind of excited about the turnaround pattern and the possibility of flying slower more scale-like airplanes. I'm thinking a four cycle engine with a variable pitch prop might be the best way to get engine horsepower converted to thrust horsepower. The question is, do we want constant rpm? If so, do you operate at the peak of the horsepower curve? If you did it would seem to me you would decrease the pitch when climbing vertical which would slow the airplane down or conversely you would increase the pitch on the horizontal which would speed it up. This might be what you want but I would think a more constant air speed would be desirable. This would indicate that you wouldn't want to use all the power available on the horizontal and you should throttle back. It sounds to me like there is some optimum mixing of throttle and propeller pitch that needs to be established. Of course, coming straight down you want to use the prop to slow you down. Let's hear from the airplane designers and maybe we can come up with some new electronics to solve the problem. I am planning to talk to John Gorham because it seems to me the helicopter guys have the same problem.

Till next time, stay tuned. □

TWO MUCH IV

from page 58/46

My fuselage was completely covered with one ounce fiberglass cloth and then painted with epoxy paint. I mounted one of the servos sideways in the nose battery area to help keep the weight forward. To do this it was necessary to trim off the plastic mounting lugs. I have been using servo mounting tape in Too Much from model number 2 on, and have not had any problems at all. Just prepare the mounting area for the tape by sealing it with epoxy, Hot Stuff, or anything else the tape will bond to other than bare wood.

By all means try to mount the receiver in foam with at least 1/2" of foam in front of the receiver. Dorking in spot landings are hard on crystals, not to mention unplanned vertical landings. I also plan to keep my receiver in the back just so nothing will come forward in a crash and destroy it.

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TWO MUCH IV

from page 192/46

Two Much IV will definitely weigh more than the typical lightweight type of 2-Meter sailplane. My uncovered and unpainted complete structure weighed about 21 ounces. MonoKote covering and the fuselage paint job added another six ounces. Total ready to fly weight was 37 ounces. The projected wing area is 650 square inches, producing a wing loading of 8.2 oz./sq. ft. This is rather low when compared to F3B types, so it is very much in line. Adding one pound of ballast raises this to 11.7 oz./sq. ft. and that really makes it penetrate.

Flying the Two Much IV with the Eppler 211 airfoil is a little different than flying the slow, flat bottom floaters. This airfoil is basically a laminar flow type and is more efficient at higher Reynolds Numbers than the flat bottom family. Therefore, you will find the best speed for minimum sink and best L/D to be much faster than you may be used to. This is what we want since we can now cover more ground without having to dive the airplane. How does it thermal? Very well, thank you! Those windy weather contests will now be something you will almost look forward to, since with ballast, you will be moving upwind when everyone has to dive just to stay over the field.

I hope you have as much success with this model as I have. I am looking forward to seeing Two Much IV in competition this year, but good luck --- I'll have mine too! □

DAKOTA HAWK 76

from page 45/42

Since we did not intend to use the engine mentioned, we followed the instructions and replaced the rubber dampeners with 1/4" ply spacers. The engine we used was an Enya .60 Schnuerle.

We installed a Kraft 16 oz. fuel tank as instructed, on the bottom of the two front compartments so the midline of the tank would be directly under the leading edge of the wing. This was the suggested position if a pump was **not** to be used. The engine ran well with the tank in this position, however, it would cut out any time the plane was upside down. We installed a Perry

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pump on the engine and the cutting out tendency ceased. The upper portion of the forward compartment, usually reserved for the tank is rather vacant and we would recommend that if you do not intend using a pumper, you should plan from the beginning to raise your tank to the usual position, high in the forward compartment.

Radio:

We found room to spare in the radio compartment; in fact, you can work hands on even at the bottom. Since there are no aileron horns, the compartment is free of encumbrances. Our Kraft KP7C MK IV flight gear seemed lost in that cavern. We placed three KPS 24 servos in the fuselage and one in each wing using an extension to reach them.

Flying:

On the first flight, at the top of a loop, we had an indication of the flight characteristics of the Hawk. When the engine quit, we felt we had enough altitude to do a regular landing pattern. The Hawk, for all its eight plus pounds, floated all the way around the pattern, came in over the edge of the field at a normal height then floated the full length of the runway before settling down on the far end. The second flight was similar, she cut out upside down in a roll and ditto'ed the first flight. The next weekend, after we installed the pump, we found out what the manufacturer meant when they said, "Put a hot .60 engine up front and it turns into a breathtaking performer, or throttle back a little and it becomes a lazy Sunday Flier."

The semi-symmetrical wing makes upside-down flight a snap and, as far as we can see, it is very predictable and has absolutely no bad habits. It would be a great plane for the intermediate flier, Sunday flier, or expert flier.

Conclusion:

We are not too well-acquainted with the weather in North Dakota but we understand what we call a wind here, is a spring breeze there. We have flown the Hawk in our wind and she penetrates exceptionally well and holds a stable course. So, if you live where the wind blows a lot, this should be just the plane for you --- build and enjoy.

Priced at $99.95 for the kit, the accessory package is $38.95 which leaves you with only radio, covering material and engine to complete your model. □

SUPER SPORTSTER 60

from page 14

Pacer Technology's Zap and Zap-A-Gap was used throughout the building of the Super Sportster 60, with some GMP 6-minute epoxy for the major areas of stress.

Covering:

After a coating of Balsarite, the iron-on fabric from World Engines, called Worldtex, was applied. Everything was painted white with Pactra Formula U spray cans, followed by masking and painting the red and blue trim with the same type of paint. Worldtex iron-on covering is the easiest to apply that this reviewer has ever used and this Worldtex and paint method, while more time consuming than a mylar, allows more intricate trim schemes.

Engine:

A brand-new H.B. .61 engine with Perry Directional Porting (PDP) fit in the nose on the supplied mount. A Sullivan 12 ounce fuel tank supplies the juice for this powerhouse of an engine. When more air time has been accumulated, a tuned pipe is going to be added to this already potent combination.

Radio:

To keep the whole package brand-new, a Futaba 6 FGK FM radio was installed. Having always used Futaba radios, this reviewer expected good things from this new radio and they were there in abundance. Two little items regarding servos are examples. The servo leads exit the bottom of the case so they can easily be slipped in and out between servo rails, even when very little space between the servo and rail is available. The old technique of notching the rail so the leads could be slipped past the rail is no longer needed. The screws used to fasten the servos to the rails have a built-in washer which is a nice feature. The servos (S128) are not compatible with other Futaba systems.

Flying:

With the power package coupled with a weight of 7¼ pounds, a hot performer was expected and there was no disappointment. A milder .60 would be plenty for excellent performance. The Super Sportster 60 handles very well and is capable of those things that the pilot is capable of telling it to. By toeing in the main gear, take-offs are easy and if you have no tail dragger experience, don't be skeptical about being able to handle this airplane.

Conclusion:

The Super Sportster 60 is for a builder with at least one kit under his belt and for a flier who feels comfortable with aileron airplanes. With the added attractions of wheel pants, it builds into a very attractive sport airplane. □

SOARING

from page 12/6

The mass in the nose is well below the wing, the wing is on top of the fuselage, and the mass at the tail is a bit higher. A line through these masses will droop toward the nose. Thus, the principal axis is not well-aligned with the roll axis (which, at least for higher speed rolls, should correspond to an angle of attack of the wing near zero lift). Consequently, the aircraft will tend to wobble as it rolls.

We can move the principal axis by shifting the masses. It usually helps to raise the battery and nose weight. If you must have the low nose, at least prop these items up inside the aircraft. Even more useful is to lower the wing. With dihedral taken into account, a low wing aircraft places the wing's mass near the center of the fuselage. Even better is a mid-wing design, in the sense that the center of mass of the wing is at the center of the fuselage, taking into account dihedral and taper (which means the wing mounts somewhat below the center). The mid-wing design is structurally more complicated, but the wing is less prone to damage in landings.

The tail should not be too high. It can, to some extent, compensate for the location of the wing. With a low wing, a slightly higher tail (horizontal stab location) may be more appropriate than with a mid-wing. In any event, a T-tail configuration is not likely to be desirable in an aerobatic aircraft. It should also be clear that if large amounts of ballast are carried, they should be distributed both above and below the wing.

The above discussion is over-simplified in that other factors beside mass distribution affect "wobbling" in rolls and in that more than one distribution of masses can yield the same principal axis, but there is little doubt mass distribution is important. It is also an area quite often neglected in glider design.

Well, that's all the design secrets you're going to get this month. Guard them well, they will be worth money some day. Catch you next month, all being well. Howzat! □