RCM radio control MODELER

49115 MARCH 1981 $2.25 U.S.

THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

RC MODELER

VOLUME 18 NUMBER 3

USPS 509190
ISSN 0033-6866

MARCH 1981

From The Shop ... *Don Dewey* 4
canadian customs changes ruling.
Sunday Flier ... *Ken Willard* 6
why is a canard called a canard?
Here's How ... *Jerry Smith* 12
build a super paint stand.
Pit Stop ... *Gene Husting* 14
1/8 scale gas winternationals
Durex V ... *Bob Hansing & David P. Andersen* 16
beautiful unlimited class sailplane.
Give It A Whirl ... *John Gorham* 26
r/c heli saftey and etiquette plus training.
Fokker D. XXI ... *Ed Miller* 32
.049-.09 stand-off scale.
Warbirds Rise Again ... *Walt Wilson* 37
st. louis club's scale competition.
Big Is Beautiful ... *Dick Phillips* 38
dick talks about the kioritz engine.
Cunningham On R/C ... *Chuck Cunningham* 39
customizing a kit for a new look.
SD-500 Mk II ... *Val Ure & Arthur York* 41
.40 powered sport and pylon.
Soaring ... *Al Doig* 46
al covers some facts on airfoils.
Power Boating ... *Howard Power* 49
howard discusses propeller selection.
Radio Spectrum ... *Jim Oddino* 51
getting ready for new contest season.
RCM Product Test: Train-Air .40 ... 54
rcm builds northeast aerodynamics trainer.
RCM Product Test: C-40 ... 55
rcm tries out continental rpv's new one.
Scale Views ... *Claude McCullough* 56
pilots and engines for scale.
The Hughes H4 Hercules ... *Dick Tichenor* 58
the spruce goose does it again.
Engine Clinic ... *Clarence Lee* 62
engine questions and answers.
RCM Product Test: Skyjammer ... 64
models west inc. newest .40 design.
Sweepings From Balsa Dust Factory ... *Paul Denson* 66
build a simple anemometer.
RCM Product Test: Gentle Lady ... 67
rcm builds carl's latest creation.
Airplane Wt. & C.G. Analysis ... *R.J. Tonneman* 68
aerospace method described for models.
How Much Flying Time ... *Eloy Marez* 70
how to calculate and increase radio system time.
Getting It All Together ... *Bud Weber* 74
building straight and proper trimming.
The Pooch ... *Wayne Knaust* 78
watch dog timer for your receiver.
For What It's Worth ... 79
new ideas for you modelers.
Graphics Planning ... *Robert L. Plogman* 82
how to plan your color scheme.
For Roper Lovers Only ... *Dario Brisighella Sr.* 83
some good advice on large engines.
Showcase '81 ... 84
highlights on new products.
RCM Model Of The Month Contest ... 99
win a free dremel moto-tool.
Readers Exchange ... 204
classified ads.
Advertisers Index ... 205

This Month's Cover
Amidst the scenic splendor of a wooded glen, typical of the countryside in the Rebild Hills area of Denmark, Miss Rose Marie Deardorff (an avid sailor, recently featured on the cover of a yachting magazine and appearing in a series of television features), demurely shows off the Danish Fokker D.XXI (a feature construction article beginning on page 32 this issue). Ektachrome transparency by Ed Miller.

R/C MODELER is published monthly by R/C Modeler Corporation, Don Dewey, President. Editorial and Advertising offices at 120 West Sierra Madre Boulevard, Sierra Madre, California 91024. Telephone: (213) 355-1476. Controlled Circulation postage paid at Los Angeles, California and Sierra Madre, California. All prices appearing in this magazine are subject to change without notice. All subscriptions will be taken at the prevailing rate. Postmaster: send address changes to R/C Modeler, P.O. Box 487, Sierra Madre, CA 91024

EDITORIAL CONTRIBUTIONS are welcomed by R/C Modeler, but cannot be considered unless guaranteed exclusive. Manuscript must be accompanied by return postage and any material accepted for publication is subject to such editorial revision as is necessary, in our discretion, to meet the requirements of this magazine. Editorial material is selected on the basis of general interest to the radio control enthusiast and the publisher assumes no responsibility for accuracy of content. The opinions stated in published material are those of the individual author and do not necessarily reflect those of the publisher. R/C Modeler Corporation assumes no responsibility for loss or damage of editorial contributions. Upon acceptance, payment will be made within 30 days of publication, at our existing current rate, which covers all authors rights, title to, and interest in, the material mailed including, but not limited to photos, drawings and art work which shall be considered as text. Submission of the manuscript to R/C Modeler expresses a warranty, by the author, that the material is in no way an infringement upon the rights of others. Note: The review or discussion of any product by RCM does not constitute an endorsement of that product nor any assurance as to its safety or performance by RCM.

SUBSCRIPTION RATES: The United States $24.00 per year, $47.00 two years. Single copies $2.25 U.S. each. Foreign subscription including Canada and Mexico $32.00 for one year (no two year foreign). For further information, see subscription ad. Change of address notices, undelivered copies and orders for subscriptions are to be sent to P.O. Box 487, Sierra Madre, California 91024. Allow 6 weeks for new subscriptions and changes of address. Back issues available: $2.50 U.S.

ADVERTISING: Send advertising copy and complete instructions to Advertising Department, R/C Modeler, P.O. Box 487, Sierra Madre, California 91024. Telephone: (213) 355-1476

FROM THE SHOP

Don Dewey

Darrell Meyer pours champagne over the nose of his Hughes H-4 Hercules immediately following its first flight. See our feature article elsewhere in this issue.

We have a feature article this month on the Hughes H-4 Hercules that was built by Darrell and Merle Meyer. Needless to say, we have been tremendously impressed by their project since we first became aware of it some time last summer. Dick Tichenor visited their shop frequently during the construction stages and was present (with Instamatic) for the first flight.

About the same time that we learned of the Meyer's craft, we found another 1/20th scale Hercules being built in southern California by Ray Baker. Ray has eight K & B .40 engines mounted in his flying boat and it should have flown by the time this appears in print.

Then, in November, we discovered that a gentleman in Canada had successfully built and flown his 1/20th scale Hercules several times. This boat is reportedly powered by eight .25 cu. in. engines. Unfortunately we have received no details on the Hercules in Canada.

Interesting is the fact that three versions of this same aircraft were undertaken close to the same time, each unbeknown to the others, and all 1/20th scale. How's that for coincidence?

★

A recent letter from Ron Shelter, the man who made the Quadra famous (or vice-versa); contained some noteworthy information that is of considerable value to Canadian modelers and to the model industry in the United States. A portion of Ron's letter is as follows:

One of the strangest things to happen in our aviation interest is our inability to name exactly what we are doing, and what we call our aircraft. 'Models' is now another word to describe 'toys.' While this might be acceptable to some, it has placed everyone's products into a category that 'enjoys' some of the highest Customs duties thoughout the world. We have finally convinced the people in Canada that these large aircraft are ***not*** *toys and have obtained the right for some products related to this field to come in as aircraft parts with a resultant reduction and, in some cases, elimination of Customs duty which can increase the final cost to the consumer by as much as 50%. A re-evaluation has resulted in the term 'reduced size aircraft' which carry neither passengers nor cargo. They now enter Canada duty-free. What a difference a word makes!*

Many thanks, Ron, for the info — this is really a big step in the right direction.

★

Ken Willard, our Chief Sunday Flier and the original Mr. Dum Dum, will probably get on our case for invading his territory by using the following material. We found it in the Michigan Radio Control Association News, Milan, Michigan; Jerry Adkins, Editor.

First Flight From Water

At the end of September I put a set of Gee Bee 32" pontoons on my Quaker. I called Kenny Mullins to see if it was O.K. to fly in front of his house; he agreed. As you may know, Kenny lives on Belleville Lake and from his driveway to the water it seems about half a mile when you tote your plane, flight box, spare parts, and another box with the rest of your goodies.

Now we are ready to get the big water bird in the air. I started the K & B .61 and peaked it out, high range good and the low idling great. Kenny put the plane in the water, crawling down large rocks to the beach. He had to hold the tail of the plane until I got on his dock as it will travel when idling. I gave it full throttle and it took out like a racing boat, about 20' and quit — the engine was too lean.

Kenny ran next door to his neighbor to get a row boat. Well the neighbor had put it away for the winter in his garage which was located on the lake and used for storing all his equipment. The neighbor and Kenny had to pull out wheelbarrow, garden tools, lawnmower, edger, and several other items to get to the row boat and then carry it down to the lake.

While they were getting the boat, my plane was going down the

to page 202

Local clubs such as the Mountain Flyers shown here at the Whitesburg, Kentucky, airport are vital to the growth of the R/C hobby/sport. Photo submitted by Clyde Quillen.

SUNDAY FLIER

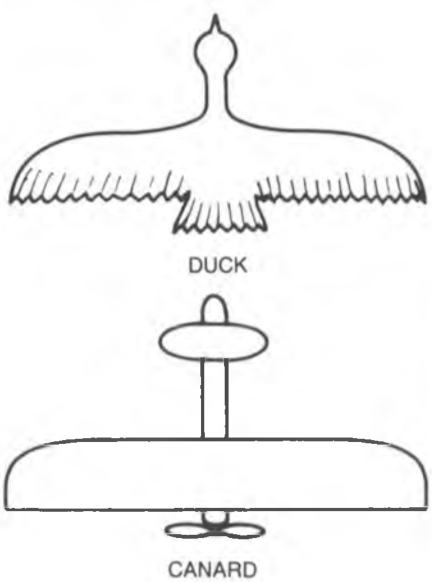
Ken Willard

Last month I delved into some of the background and lore of canard aircraft. With an ear towards alliteration (you can look that up if you want to) I titled the column "The Case of the Curious Canard." Since then, I've been looking further into these fascinating aircraft, and maybe you might even call them contrary, capricious, and even cantankerous. But never, never dull.

One thing has bothered me since I started experimenting with canards. Why are they called "canards?" I looked up the word in the dictionary; all it said was that a canard was a hoax, or the French word for duck --- the bird, not the motion --- or an airplane that flies with control surfaces ahead of the main supporting wing. I then went to the Encyclopedia Brittanica. Nothing more enlightening there, either. Same with the World book. Next to the library, and the librarian wasn't able to help. So, I still don't know the origin of the term "canard" as the identifying term for an airplane that flies tail first --- that is, relative to the normal aircraft configuration which has control surfaces behind the wing.

So, my question is, "Do any of you Sunday Fliers out there know why a canard is called a canard?"

A couple of possible answers did occur to me. Many other experimenters were pursuing the elusive goal of man-carrying powered aircraft at the same time that the Wright brothers were making their historic flights at Kitty Hawk. Their first successful flights were witnessed by only a handful of observers, but the word spread rapidly. Could it be that when the news was received by the others, they said, "We don't believe it; it is a hoax --- a canard!"



The other possibility is that a canard airplane has some resemblance to a duck when in flight. True, the duck doesn't fly tail first, but the tail feathers are close to the wings, and the duck's head, out in front of the wings, could be viewed as resembling the control surfaces of a canard aircraft. Now the French word for duck is "canard," so when the French saw the airplane in flight, they said "It looks like a duck." Duck-canard. See sketch.

Neither of those ideas would stand up too well under close scrutiny, but they're the best I could do.

So, if you know the real derivation, enlighten the rest of us. It should be interesting.

Earlier I said that canards can be contrary. Here's a case in point. For the fun of it, I put together a little three foot canard, and flew it as a slope soarer. Here's a shot of it in that configuration:

What fun! With any wind over eight miles an hour against the slope, it goes fast, flies inverted, does great aerobatics, and lands quite slowly. After a few flights over a period of several days, I tired of driving the forty miles up to the slope sight, so I decided to convert it into a 1/2A powered job. No problem; just cut off the nose, move the battery back in front of the wing, and mount a Golden Bee or a Black Widow .049 in the nose. No landing gear --- just a skid under the firewall to keep the prop clear on landing, and some wingtip skids on the main wingtips, plus another in the center under the fuselage.

Again, more fun. Hand launched, it scooted up and away and was remarkably

fast. Rolled like a dervish. Landed nice and slow. Hey, let's try to skid it off the runway on the nose skid, like I do with the Blue Birds.

What a surprise! When released, with the engine running full speed, in about three feet it swerved to the **right** and went ground looping down the runway until we caught it.

Next time we tried a different technique. Before releasing the model, full up elevator (on a canard that means the elevators actually are depressed) was applied. The model started to turn to the right, but got off the ground in about four feet.

Once airborne, the flights were great. But just for the record, we again tried a normal take-off. And, as before, the model swerved to the right, started ground looping, and wouldn't quit. Remember, the only controls we had were elevator and aileron.

Normally, a taildragger of conventional design will tend to swerve to the left, due to P factor, slipstream, torque, and gyro forces. So how come this canard goes the other way? Let's try an experiment. The Black Widow is a reed valve engine, and will run in either direction. So, we put a "left handed" prop (one that rotates clockwise when viewed from the front) on the engine. Sure enough, on take-off, the model swerved to the **left** and ground looped, unless we held full up control and got it off the ground before the ground looping took hold.

Yes, with a rudder added, the take-off direction could be controlled. That's not the mystery. The mystery is, "Why does this particular canard configuration tend to turn contrary to a conventional plane when it starts the take-off run?"

Got any ideas, all of you aerodynamicists?

★★★

In the December RCM I printed a photo of Wally Rinker and Dick Hershey lolling under the wing of Wally's Stolp Starlet. I also mentioned that in the background you could see the tail surfaces of a huge Grumman Goose, which I said was being built by Mo Curry. Well, Mo wrote me a letter, said I couldn't be wrong, so he went over to Dick Hershey's house to get the Goose. He got the goose, all right --- but not the Grumman variety. Seems that I goofed: Dick is the sole designer and builder of that Grumman Goose. Sorry about the mistake. Dick now you know why I'm also known as Chief Dum-Dum.

Incidentally, the Sunday Flier fraternity must be getting pretty sophisticated. So far I've only received a few letters entering the biannual Dum-Dum contest. Doesn't

to page 196

HERE'S HOW — By Jerry Smith

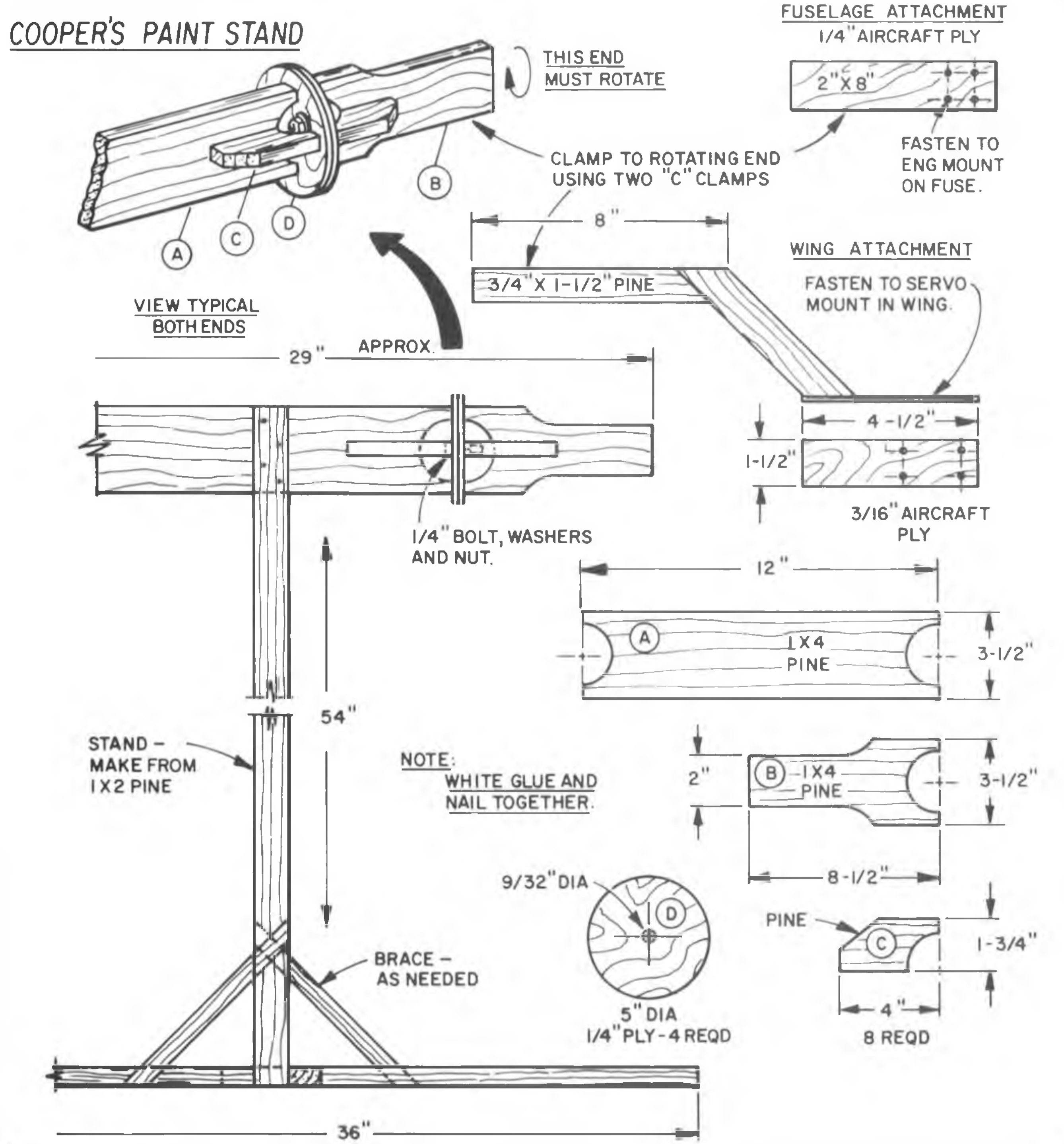
Many of you like to paint your airplanes. And, it can be quite messy if you hold on to the parts while trying to paint them. After painting comes the problem of where to set them to dry. All this can be quite frustrating, to say the least.

Let me introduce you to a simple paint stand that will eliminate virtually all your holding problems. And the best part of all is, that it can be built in one evening, once you get the material together. The entire stand is made of wood and the dimensions shown are only to give you an idea of the size. Better known as "ballpark" dimensions.

One of the neat aspects of this stand is that the ends on the crosstree rotate allowing the user to paint the part all over without removing it. And, if you will note, there are two special attachment adapters that hold the part to be painted. The fuselage is held by the engine mount. A piece of 1/4" plywood is bolted to the engine mount while the other end is fastened to the rotating end of the paint stand with two "C" clamps. On the other hand, a wing is held very much the same way except it is necessary to build a special adapter. The wings are generally held by the servo mount on one end of the adapter while, again, the other end is held to the rotating end of the crosstree with two "C" clamps. This is the general manner in which parts to be painted are temporarily held to the paint stand.

A modeler by the name of Bruce Cooper of Kelso, Washington, designed this paint stand. Bruce has painted quite a number of airplanes using this particular set-up. He designed it quite simply by using the "KISS" method. That is — Keep It Simple Stupid! And, you know, I think he succeeded.

Many thanks for your great idea Bruce; especially from all of us painters.



PIT STOP

Gene Husting

24 HOUR ELECTRIC CAR ENDURO

I've been to hundreds and hundreds of big car races, including my own 12 years of drag racing on Southern California tracks, as well as Dry Lakes time trials and 2 Bonneville meets. I've enjoyed watching midgets, sprints, roadsters at all the Southern California tracks, as well as the Indy and Stock Cars at Ontario, the Can Am, F5000 and Stockers at Riverside and the Formula I cars at Long Beach. Just when you think you've seen it all, along comes something different.

Two years ago we were in Orlando, Florida for the annual 1/8 scale gas Winternationals race. We arrived about midnight from our flight, got our hotel room, and immediately took off on the 1 hour car ride to Daytona Beach and the Daytona Speedway, where the annual 24 hours of Daytona was underway. We got there about 2 a.m. and stayed until about 4 a.m. This being February and the middle of winter, there were only about 500 brave and hardy spectators left. Most of the thousands on hand for the beginning of the race, would be returning in the later, warmer, morning to watch the finish.

But I had the feeling we were there at the perfect time to really understand what an Enduro is all about. This race doesn't stop because it gets dark or rains or anything else. It runs for 24 hours. We virtually had the run of the track and watched the race while walking halfway around the track. A totally exciting experience was to stand at the end of the straightaway, next to the fence, which is on the outer wall, where you're not more than 5 feet away from the cars, where they're going close to 200 mph. I'll never forget seeing, but not hearing, Danny Ongais come by in his Turbo Porsche 935 coupe. We had just walked up to the fence and looked out at the track and we saw these headlights come out of the total darkness, down the straightaway towards us, but we couldn't hear anything. In a couple of seconds the black coupe was alongside us in a blur and gone, and all we heard was a WHOOSH sound as the body shot through the air. There is no exhaust sound on the turbo 935's, because the exhaust goes through the turbo to drive it, and thereby totally muffles the exhaust noise, better than any muffler. It's errie to see a car going that fast with no noise. As Danny went by we could see the whole exhaust system in the back, glowing cherry red from the extreme exhaust temperatures, then a gigantic flame shot out from behind the car, a fireball larger than the car itself! At the end of the straightaway Danny had to

The first ever, 1/12 Scale, electric 24 Hour Enduro Race was won by Team Associated — England. Standing, from the left, drivers Walt Bailey, Phil Booth, Debbie Preston, Paul Pagdin, Dave Preston & Bill Burkinshaw. Kneeling, Team Manager, Derek Kirsopp & Marshall, David Hardy. This race was held in Birmingham, England, at the Birmingham Motor Show 80.

brake hard and make a 90 degree turn into the infield portion of the road course. At this moment, as Danny took his foot off the gas pedal, the turbo caused this ball of fire out the twin exhausts. A sight that will never look the same in the middle of the day, as it does in the pitch black of the night at 2 a.m.

It takes a different kind of strategy to win a 24 hour Enduro race. All the successful Enduro drivers agree you only drive 9/10ths in an Enduro race, rather than the normal 10/10ths as in any other races. Not all race drivers make good Enduro drivers. Some specialize in Enduro's only. Some drivers can do both extremely well, such as Danny Ongais. I don't think there was ever a harder charger than 4 time Indy winner A.J. Foyt. Yet did you know that A.J. also had the mental prowess to be able to race 9/10ths? A.J. Foyt won the 24 hours of Le Mans sports car race. He's done it all!

Because the big cars had Enduro races lasting 4, 6, 12 and 24 hours long, naturally we had to have Enduro races also, for our 1/8 R/C cars. But we started here in Southern California with 3 hour Annual Enduros. In the beginning, the challenge of a 3 hour Enduro was equivalent to climbing the tallest mountain in the world. The cars weren't all that reliable in the beginning, but the first race was such a success it turned into an annual event. The last 3 hour Enduro I ran in, a few years ago at Mile Square Park, I was teamed up with Earl Campbell. Remember I told you, that you only drive 9/10th in Enduros? I lied! This turned into a 3 hour trophy dash! The team of Mike Morrissey and Don Amedo and ourselves were never more than 1/2 a lap apart for 3 hours! Everytime one of us made a pit stop the lead changed. It was going to boil down to who had to make the least pit stops. Drive 9/10ths in a situation like this? Forget it. I was driving 10/10ths and Earl was driving 11/10ths! It ended up with Morrissey and Amedo winning, just 1/2 lap ahead of Earl and myself! Talk about tough racing.

Well, after we'd run the 3 hour Enduro a few times, a group of racers in South Africa decided they had taller mountains to conquer and they started holding 6 hour and 9 hour annual Enduros. Well, if 9 hours was possible why not 24, asked Junior Pasqual in Hawaii? Junior wasn't thinking so much as a race, he just wanted to see if a car could run 24 hours. Outside of the usual tire changes on his Delta car, the only problems he encountered were a couple servo changes, in his 24 hours of running. After hearing of Juniors' accomplishments, a group of Delta drivers in Miami, Florida, said why not a 24 hour Enduro race? So, they started the Annual Miami 24 hour

to page 191

DUREX V

Designed by Bob Hansing **Article by David P. Andersen**
Photos By Michael Kuller

Built from all balsa, the "Durex" is an unlimited class competition sailplane. It was overall champion of the 1979 Suds City Soar-In, placed 4th in 1979 AMA Nats and 5th in 1980 AMA Nats. It has acquired the name of "The Minnesota Floatah."

Winner of the 1979 Suds City Soar-In and fifth place in the 1980 AMA Nationals, Bob Hansing's Durex is an unlimited class sailplane that was designed for competition. It combines a light wing loading with a strong wing. The sink rate is extremely low, which makes it a floater in the Duration events, but when ballasted with up to 34 ounces of lead it can be very competitive in the speed and distance events as well. But light wing loading and a strong wing are important for another reason, too. In sailplane competition, it is necessary to first get a high launch; and the height of the launch is simply a function of the sailplane's lift to weight ratio. This also requires a strong wing and light weight.

The attractively streamlined fuselage has a round cross section with wing fillets. In turbulence or circling flight in a thermal, a glider is always yawing to some extent, and the wing fillets smooth the wing to fuselage airflow during flight. In addition, the wing fillets reinforce the fuselage sides in the wing root area, and increase the support of the wing rods. Adding this reinforcement to the outside of the fuselage, where it helps aerodynamically, leaves more room inside for ballast.

The thick symmetric stabilizer airfoil gives exceptionally smooth handling at all airspeeds.

Five Durex prototypes have been built and tested during the last two years. Early versions had a shorter wingspan and a longer tail moment, and their outer wing sections used turbulator spars. Later versions improved the speed range by a change to a faster airfoil. Strength was improved based upon experience. The wingspan was lengthened, and the fuselage shortened when it was decided that the predecessor had more stability than required. An all moving rudder was changed to a hinged design with a slight amount of sweepback. This change traded off excess rudder control for drag reduction, and no buffeting in speed runs. Wing incidence was reduced based upon appearance in the air. Much experimentation was also performed to determine the best towhook and C.G. location. Many of these changes were evaluated by using the "poor man's wind tunnel": the new version was flown side-by-side with the old version. Differences in speed, sink rate and control response were observed this way.

The design presented here is a well proven competition sailplane that is a joy to build and a thrill to fly. If your joy is to build, and your thrill is to fly, then you'll be pleased with this design.

CONSTRUCTION

Fuselage:

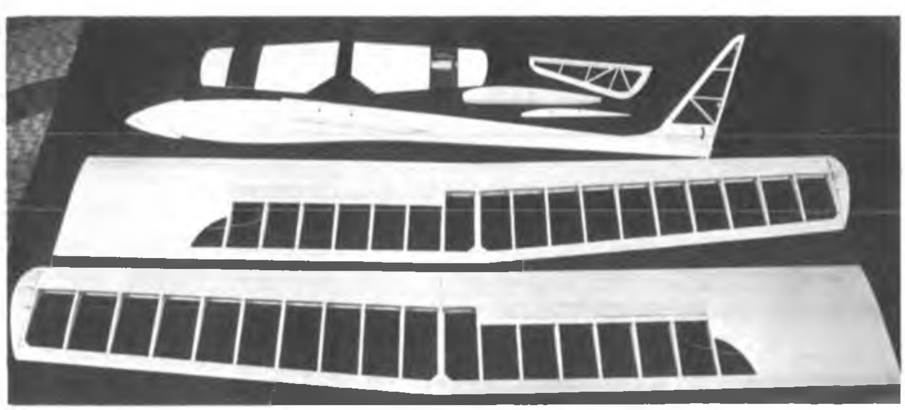
The fuselage has a round cross section with large wing fillets. Impossible to build? Look again! The fuselage is the traditional box and former construction. The important difference is that the sides are thick, and the corners have triangular stock gussets. Extreme rounding of the corners with a razor plane and sanding block reduces the box to an almost round cross section. The wing fillet is a sheet of 1/2" balsa carved to shape with a wood carver's gouge or an X-Acto ring blade.

The fuselage shape is similar to the Borne Free sailplane (R/C Modeler Magazine, Nov. 1977), but Durex's fuselage is easier to build. Start by cutting the fuselage sides from 1/4" medium balsa. Because these sides are more than 48" in length, it will be necessary to splice two pieces of balsa sheet. The diagonal splice midway between the two wing rods is the best place for the splice. If you are expecting some hard landings, you may use medium hard balsa for the forward part of the fuselage sides.

The two fuselage sides should be as identical as possible. One way to do this is to trace the fuselage outline with carbon paper over one sheet of balsa. Trace the canopy outline also, it will be needed later. Then stack this sheet on top of another sheet with a few strips of double sided Scotch Tape between them. Cut out on a jig saw, and drill the wing rod holes on both sheets simultaneously. Then separate and add the inside 1/32" ply doublers.

The 1/2" triangular corner bracing may be installed either before joining the fuselage sides or after, whichever you prefer.

The noseblock is two pieces of 1⅛" balsa (you probably won't find any 1⅛" balsa at the hobby shop, so use 1" sheet plus 1/8" glued together with Elmer's Woodworking glue). Lay your battery pack on one of these pieces and trace around the battery with a felt tip pen. Now clamp the two pieces together and lay the battery pack on one end of the aft side and trace around it again. Unclamp the two pieces and carve out the wood according to these outlines. Rough out a small hollow in front of the battery cavity in case nose weight needs to be added later. If you don't keep the tail light, you



The framed-up components, fuselage bottom ready for sheeting.

Mrs. Lori Allen — daughter of Bob Hansing and a stewardess for Northwest Airlines, displays the long, sleek lines of the Durex V.

might have to add 3 or 4 ounces of weight. A soup of lead shot and epoxy poured into the nose weight ballast hole can be a final trim adjustment after the rest of the airplane is completed.

Remember that every ounce of unnecessary weight in the tail required three ounces of unnecessary weight in the nose to balance it, for a total of four unnecessary ounces of weight.

The top of the fuselage from the tail to the leading edge of the wing is flat, so the fuselage may be assembled upside down on a flat surface directly over the plans. The only bending of the fuselage sides occurs between formers F2 and F3.

Do not sheet the bottom of the fuselage at this point.

Cut out the wing fillets from 1/2" balsa sheet. Drill the holes for the wing tubes and glue the fillets to the fuselage, aligning the holes in the fillets with the holes in the fuselage.

The wing tubes will be aligned using the completed wing as a guide. Insert slow epoxy in the fuselage holes and insert the tubes, being very careful not to get any epoxy inside the tubes. Add the 1/8" plywood ribs to the fuselage, insert the wing rods and slip the wings on the rods. (It might be a good idea to try all this without the glue first.) Remove the wing and wing rods as soon as the epoxy sets. Then add some more epoxy where the wing tubes meet the inside of the fuselage. Cut the 1/8" plywood root rib slightly oversize and slip it on the wing rods. Add the wings too. Trace the outlines of the wing roots on the ribs. Cut to shape and glue them to the fuselge with epoxy. Note that the wing fillets and the 1/8" plywood ribs are very important structural supports to the wing tubes.

Next add the vertical fin to the fuselage and install the pushrods. When the pushrods are proven to be friction-free, sheet the bottom of the fuselage.

Most of the fuselage bottom is sheeted with the grain running across the fuselage. This prevents lengthwise splitting during

hard landings, but a portion of the fuselage bottom ahead of the tail has lengthwise grain. This protects the tail during "dork" landings.

You may ask --- why does hitting the ground hard on the nose cause a bending stress near the tail? One spot landing technique is to approach the landing spot fast and straight. Then push down elevator to dive the nose into the ground. This is known as "dorking" or "spiking the point," and it is frowned upon by most flyers because it lacks the beauty of a flared landing --- but it wins precision landing points, so it is commonly used. The strain on the tail is caused **after** the nose hits. The force on the nose has a strong upward component which slams the tail downward. The portion of the fuselage forward of the tail is flexed upward, hence the need for lengthwise wood grain along the bottom of the fuselage in this area. If you are a sport flyer, or you swear never to dork your sailplane, you will still need this strength because sudden downdrafts caused by the wind, irregular surface terrain, or pilot error can cause the same stresses as an intentional dork.

Draw the remaining canopy outlines on the fuselage and cut it free with a razor saw or X-Acto blade. Next, drill holes in the canopy for the hold-down pegs. Insert and glue the pegs in place in the canopy. When dry, put the canopy in place with the front peg against the nose block and push just enough to leave a slight indentation in the nose block. Carbon paper will help leave a mark. Drill a hole at this mark and slip the canopy in place. Now push down on the rear of the canopy to leave two impressions of the rear pegs. Drill holes at these marks and coat the insides of all three holes with glue. When dry, the canopy should slip in place and remain in place due to the friction of the hold-down pegs.

Rough carve the fuselage to a well-rounded shape with a razor plane. Don't plane too much in the area below the wing, because a flat surface is required here in order to hold onto the fuselage with one hand when launching.

Wing fillets are concave surfaces. These can be carved with a wood carver's small gouge or a ring shaped X-Acto blade. Final carving and sanding should be done after the 1/8" Siglite ply root ribs are trimmed to shape using the completed wing as a pattern and glued to the fuselage.

Fin and Rudder:

Modify the Craft-Air bellcrank as shown on the plans by cutting it short, filing the end flat, and drilling a 1/16" hole. Be sure to use the black bellcrank with the diagonal crossbrace. This is the same bellcrank that Craft-Air supplies with the Sailaire.

Stack two pieces of 1/32" plywood and cut out two crank box sides at the same time so that they are identical. Glue the 1/16" plywood bearings in place.

Build the fin over the plans, omitting the stab fairings. Insert a piece of 1/8" tubing into the forward hole in the crank box before the glue dries and verify that this tubing is exactly perpendicular to the surface of the fin. Adjust the position of the left crank box side as required.

After the glue dries, remove the fin from the plans and add the 1/4" stab fairings. Insert the 1/8" inside diameter brass tubing into the forward crank box hole, installing the modified Craft-Air bellcrank at the same time. The tubing extends through the crank box and the stab fairings. It is the bearing on which the flying stab rotates. Epoxy or Hot Stuff the tubing in place. The 1/8" forward stab wire fits inside this tubing, and the wire is removable.

Install the fin in the fuselage by gluing it in place in the 1/2" slot cut in the top of the fuselage. Align the fin by sighting the front stab wire to one of the wing rods. They should be parallel.

Build the rudder over the plans. Use light balsa. Bevel the leading edge of the rudder to a point as shown in the rudder cross section view. Notch the leading edge slightly where the hinges will be installed. Also cut a V-groove in the fin's rudder post at the hinge location.

Install the hinges without gluing, for a trial fit. Cover the leading edge of the rudder with MonoKote, and epoxy or Hot Stuff the hinges in place.

There should be as little air gap in the rudder hinge line as possible. Any air that can flow through the hinge line will reduce the effectiveness of rudder control and increase drag.

Horizontal Stabilizer:

The stabilizer is 3/4" thick at the root and has a symmetric airfoil. This contrasts with the 1/4" flat plate stabilizer of many popular sailplanes in Durex's class. It is believed that the airfoil shape produces no more drag than the thinner flat plate airfoils, but the extra thickness makes the stab rigid without an increase in weight. But, most importantly, the thick symmetric airfoil gives a smooth response that does not become overly sensitive at high speed, but retains positive control at low speed. Pitch response is smooth and positive at all speeds.

The structure of the stab is not very new. It is similar to the stab of the Buzzard Bombshell, a forty-two year old design.

Start by cutting out the spars, diagonals, root ribs, and tips. Then follow this sequence:

(1) Pin or nail the shims to the building board at the positions shown on the plans. **Fasten them securely.** They must stay in place when the structure is turned over.

(2) Pin the 1/4" sheet root ribs in place.

(3) Pin the 1/4" x 1/8" leading edges in place. Do **not** add the 3/16" x 1/4" leading edge caps at this time.

(4) Pin the front spars to the building board.

(5) Pin the rear spars in place.

(6) Pin the trailing edges in place.

(7) Pin and glue the tips and diagonals in place.

(8) Pin and glue the upper surface 1/16" x 1/4" rib strips in place.

Build both stab halves at the same time. Epoxy the stab tubes in place. Measure the distance between the tubes. There should be 1¼" between them. You may use the Craft-Air stab crank to align the stab tubes if you like, but micrometer precision in locating the tubes is not necessary because a little friction of the tubes on the stab wires will be required anyhow.

(9) When the glue is dry, unpin the stab from the building board, flip it over and pin it back down.

(10) Add the remaining 1/16" x 1/4" rib strips.

(11) When dry, remove from the building board, cut away the rudder swing area, and separate the two halves by cutting the tubes with a razor saw.

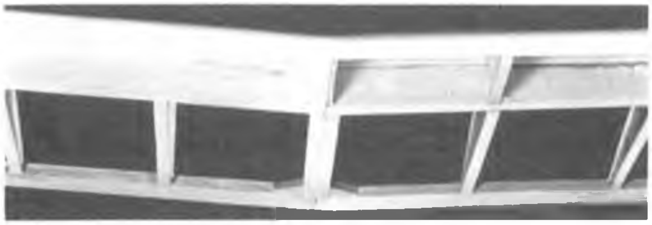
text to page 20

DUREX
Designed By: Robert Hansing

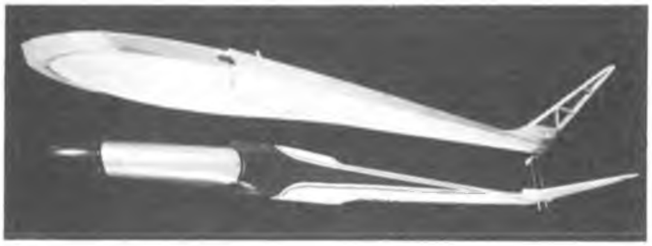
TYPE AIRCRAFT	Competition Sailplane
WINGSPAN	135 Inches (projected)
WING CHORD	Root 10½" — Tip 7½"
TOTAL WING AREA	1273 Sq. In.
WING LOCATION	Upper Mid-fuselage
AIRFOIL	9% Flat Bottom
WING PLANFORM	Constant Chord Center, Double Taper Tip Panels
DIHEDRAL EACH TIP	3⅜" Break, 7⅜" Tip
O.A. FUSELAGE LENGTH	57¼ Inches
RADIO COMPARTMENT AREA	(L)12" x (W)2" x (H)2"
STABILIZER SPAN	27 Inches
STABILIZER CHORD (incl. elev.)	6⅜ Inches (Avg.)
STABILIZER AREA	166 Sq. In.
STAB. AIRFOIL SECTION	Symmetrical
STABILIZER LOCATION	Lower Fin
VERTICAL FIN HEIGHT	12 Inches
VERTICAL FIN WIDTH (incl. rudder)	10" At Stab
REC. ENGINE SIZE	N.A.
FUEL TANK SIZE	N.A.
LANDING GEAR	N.A.
REC. NO. OF CHANNELS	3
CONTROL FUNCTIONS	Rud., Elev., Spoilers and Towhook

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Spruce
Empennage	Balsa
Wt. Ready To Fly	**56-58 Oz.**
Wing Loading	**w/o Ballast 6.6 Oz/Sq. Ft.**
	With 34 Oz. Ballast 10.5 Oz./Sq. Ft.

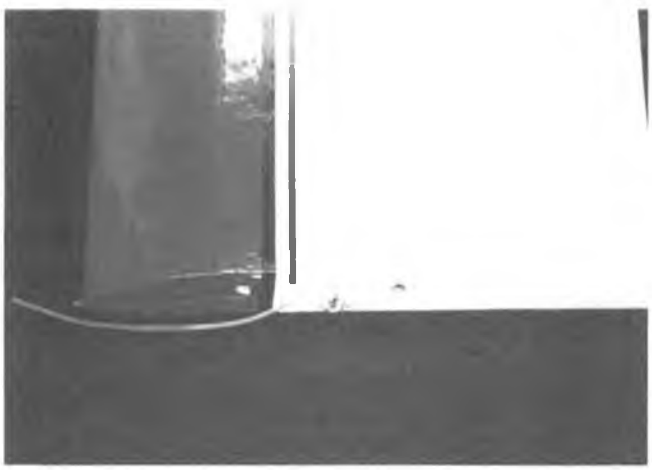


Wing bottom at polyhedral joint. Bottom of outer section is not sheeted. Full chord capstrips instead.



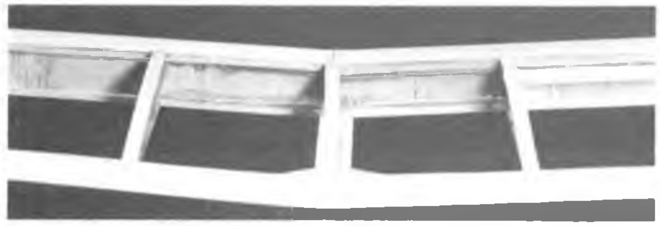
The fuselage before and after shaping.

The completed fuselage. Note wing fillet.

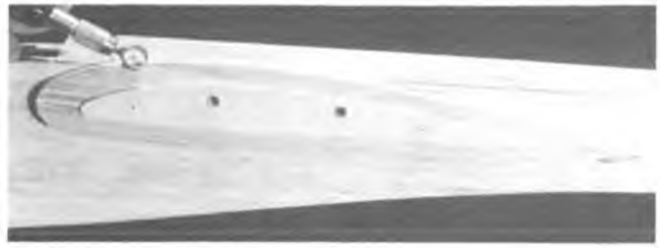


Wing root. Tube holds spoiler cable. The screweye connects to rubber band through fuselage to other wing.

The radio compartment. Spoiler servo also operates releasable towhook. Canopy is friction fit.

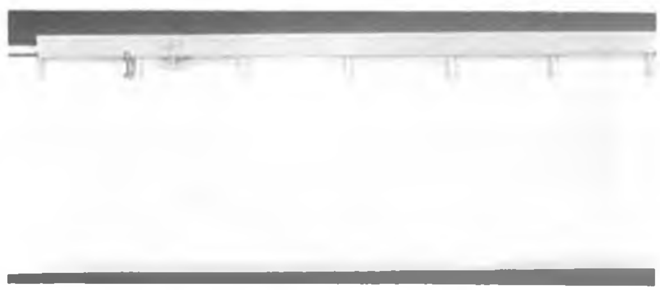


Polyhedral joint. Note wire epoxied to spar and shear web.

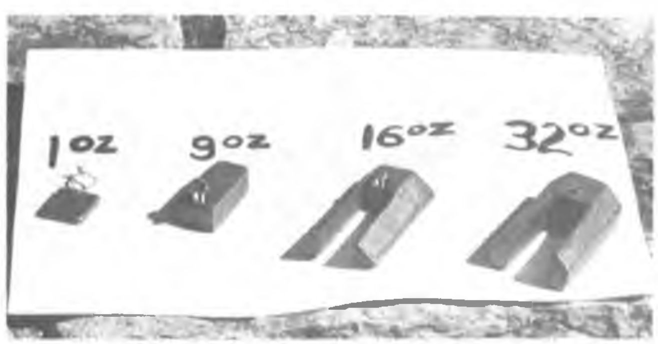


Fuselage wing root detail before shaping. An X-Acto blade is used to carve wing fillets.

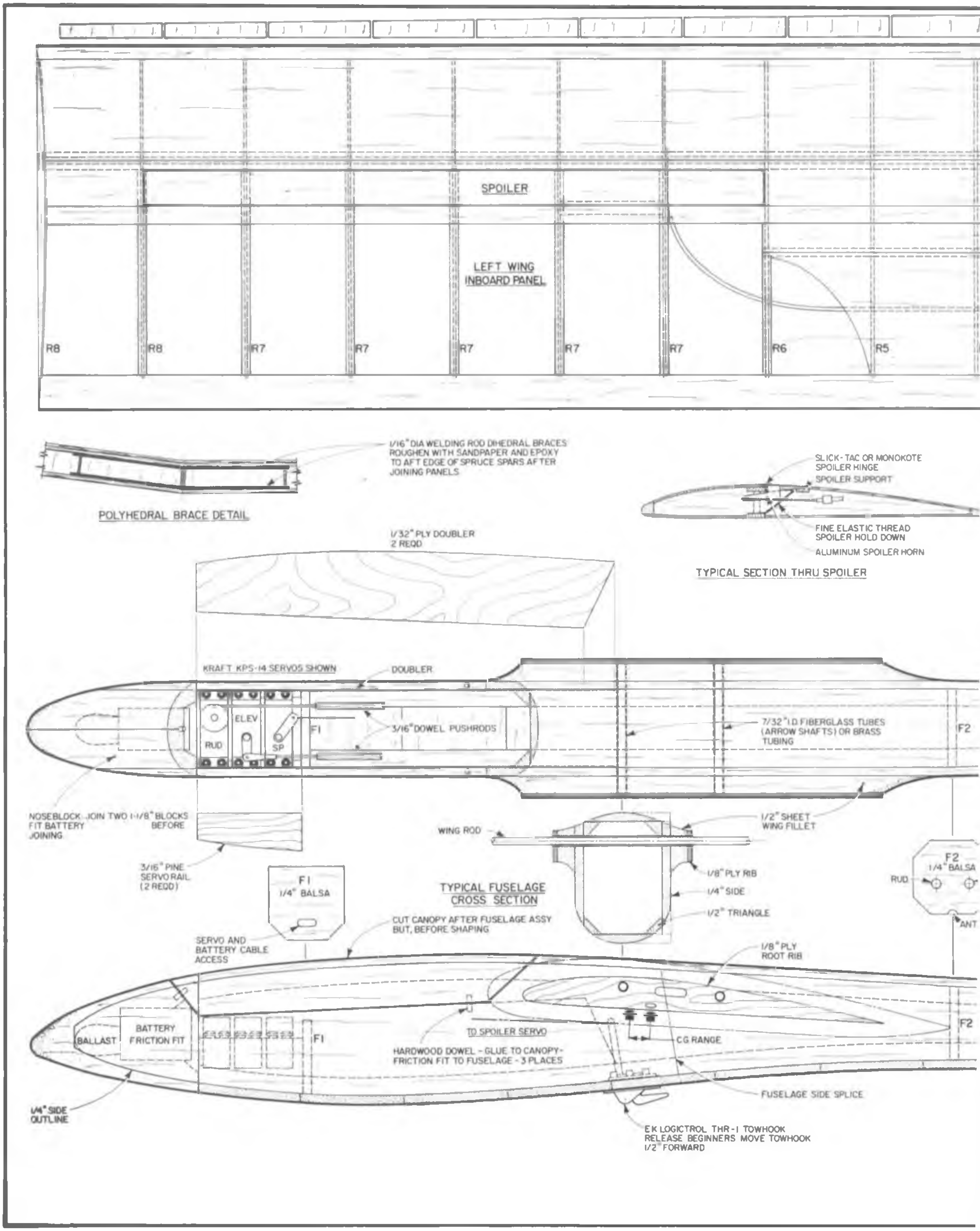
Stab rods and rudder pushrod details.



Completed spoiler. Note the spoiler horn and the elastic sewing thread hold-down.



Lead ballast weights — bolt to fuselage floor.

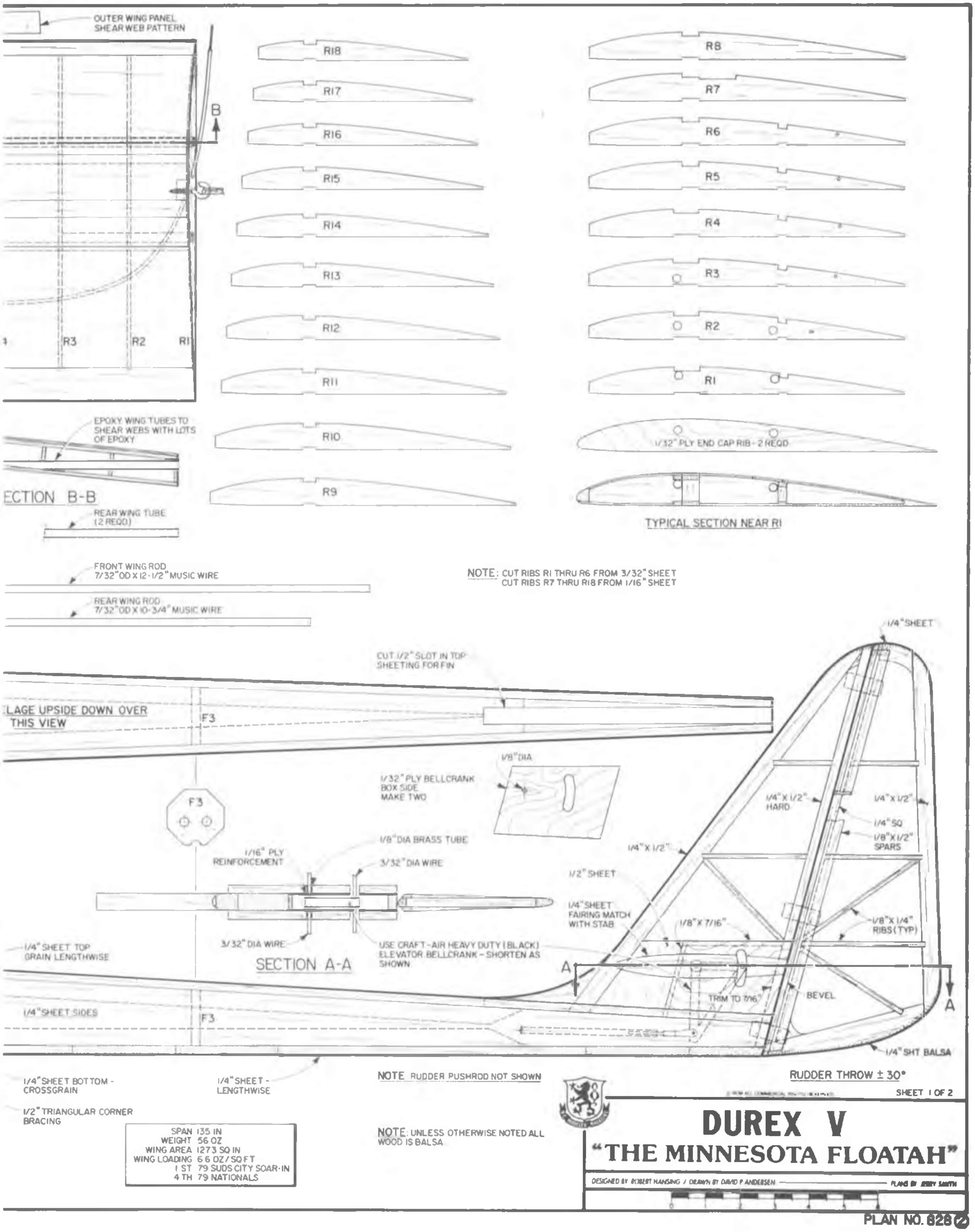


(12) Add the 3/16" x 1/4" leading edge strips and plane and sand the edges of the stab to shape.

The completed stab should slip onto the stab wires with enough friction to prevent the stab from coming off in flight. If the fit is too loose, bend the tips of the rear stab wire **slightly.** The amount of bend required is really miniscule, so don't overdo it.

Wing:

The wing is, of course, the most important part of a sailplane. If it is accurate, strong, light and true, you'll have a winner. If not, you'll have a dog. Select materials to be warp-free. Check the grain in

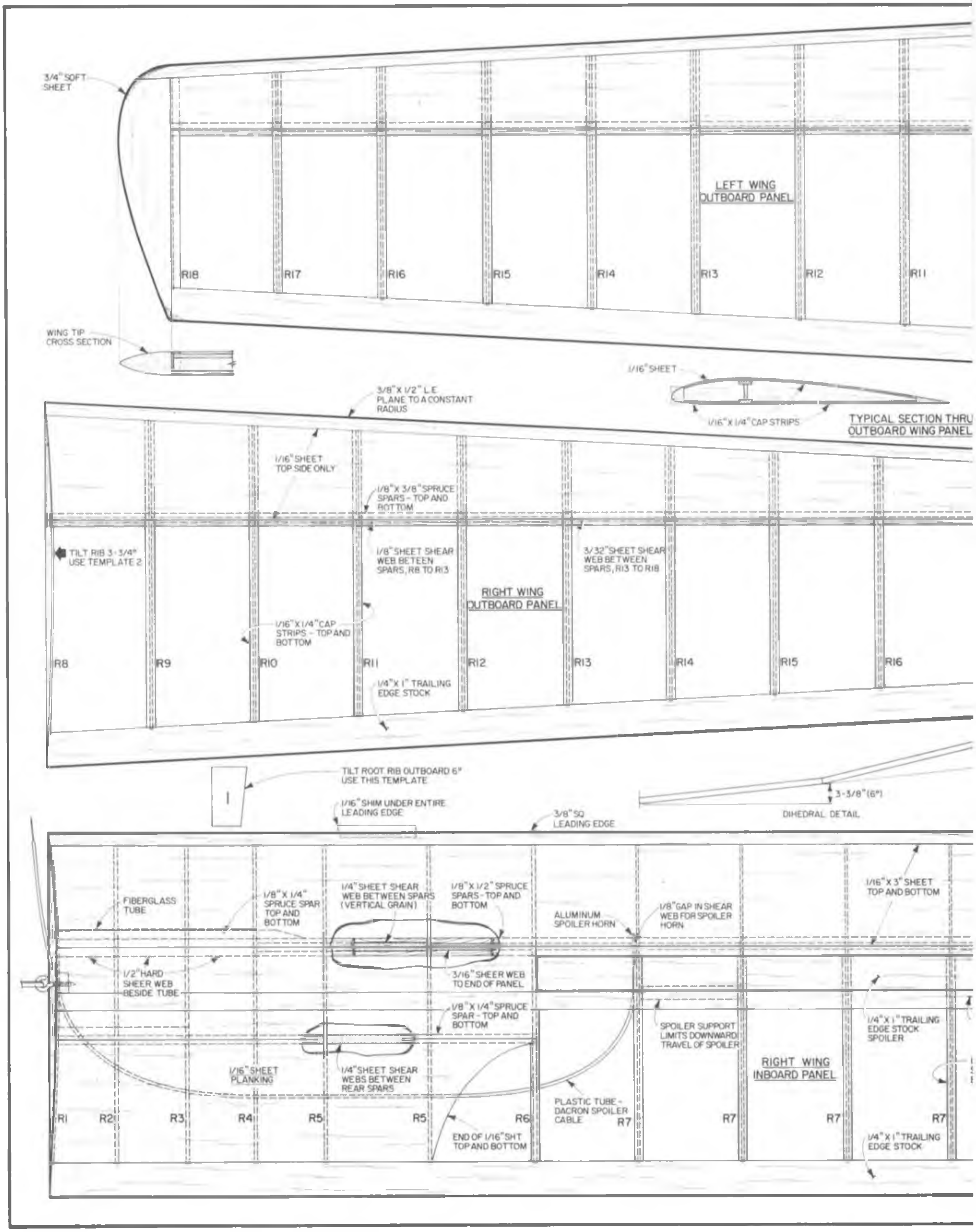


the spruce spars. The grain should be straight and parallel to the length of the spar. The leading and trailing edge materials should be absolutely warp-free. Match materials by weight and grain so that the same weight and grain are used in both wings. Soft balsa may be used for the capstrips and wingtips.

The completed wing is used for aligning the wing tubes in the fuselage, so the wing must be built before the fuselage can be completed. Start the wing construction by making the **outer panels.**

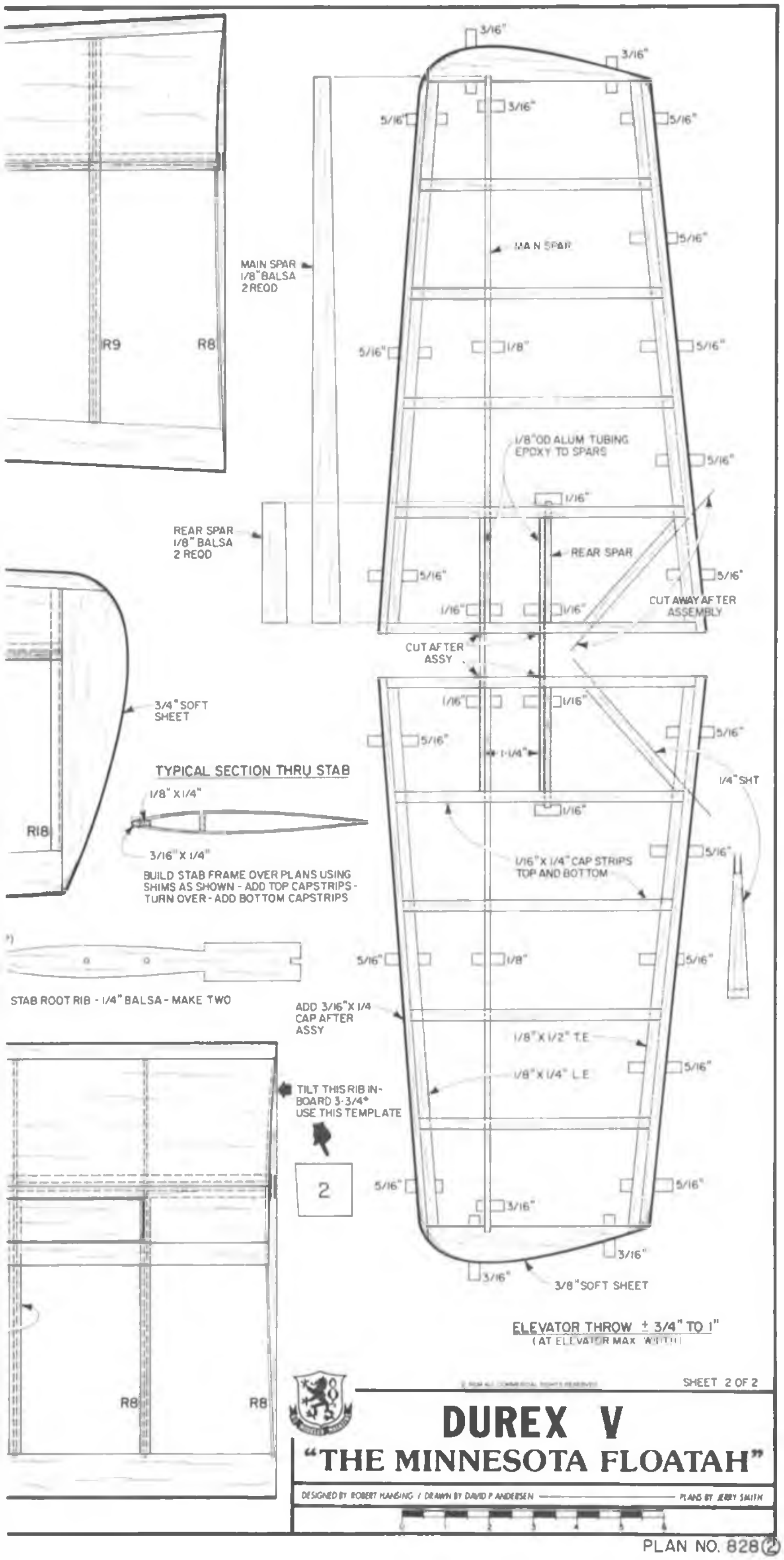
Panels:

Stack two sheets of 1/16" x 3" x 36"



medium balsa. Attach them together with double sided Scotch Tape between them. Then trace the ribs onto the upper sheet from the plans and cut out the ribs. This guarantees that the ribs in each wing will be identical. Build the outer panels over the plans. Note that the 1/16" leading edge sheeting is only on the top surface of the outer panels. The bottom surface is capstripped.

Lay the bottom capstrips and the lower spar on the plans. Shim up the leading edge of each capstrip with a scrap of 1/32" balsa. Glue the ribs in place. Cut the shear web accurately. Making shear webs is a tedious



task that no one likes, so a pattern is provided on the plans to speed up the process. It is important that the shear web grain is vertical.

The inner panels have construction similar to the outer panels, except that sheeting appears on both top and bottom. Cut and drill ribs W1, W2, and W3 very accurately.

Install the spoiler cable tubes before sheeting the top surfaces.

Make the spoilers before sheeting the top surfaces also, and use them as guides for positioning the sheeting around the spoiler's bays.

Inner and outer panels are joined before the inner top sheeting is attached by laying the inner panel on a flat surface and butt-gluing the outer panel to it, raising the wingtip by 4". After the glue is dry, cut away part of rib W8 and epoxy the 1/16" welding rod dihedral braces in the corner where the spars meet the shear web. The wires should be nicked and scratched so that the epoxy will grip them well. This method has also been used on the Sailaire and several other sailplanes. A dihedral brace failure has not occurred.

Fiberglass wing tubes made from arrow shafts are recommended, but brass tubes may also be used if they are well roughened before gluing. Install the tubes in both wings with the wing rods in place and check the alignment with both wings elevated 3⅛" at the dihedral break. Spot glue with 5 minute epoxy. Puddle in lots of 5-minute epoxy all around the tubes. When dry, stand the wing on its trailing edge and fill the remaining space around the wing tubes with micro-balloons and 5-minute epoxy. Note the addition on the 1/4" section to the inner portion of the upper and lower spars. This addition will allow the wing tubes to be completely encased in the micro-balloon and epoxy mix.

Add the top sheeting last.

Spoiler hinges are not shown on the plans. Use small Klett hinges, MonoKote or high tack tape.

Cut the 1/32" poly end cap rib slightly oversize and glue it to the wing root. Trim away the excess. The root of the completed wing may now be used as a pattern for trimming the 1/8" Siglite fuselage root rib to shape.

A screweye may be added to the wing root rib. A hole through the fuselage to connect the two wings via a #64 rubberband doubled over will hold the wings snugly to the fuselage.

Use dacron thread for the spoiler cable. Goldberg 1/2A control line string is a good source. Don't use nylon fish line. It will sag in humid weather.

The wing should be covered with MonoKote. It has the stiffness required for glider wings. Both sides of the spoilers should be covered to prevent warping in wet weather.

Flying:

Note that the towhook is aft of the Center of Gravity. The towhook position shown on the plans will get the highest possible launch height. But this configuration requires that flying air speed is reached before the airplane leaves the pilot's hand. So launch with plenty of tension on the winch line or high start line and throw hard. If you haven't had much experience with winches, or if you are not very experienced at sailplane flying, it is recommended that the towhook

to page 190

GIVE IT A WHIRL

John Gorham

R.C. Helicopter Saftey And Etiquette

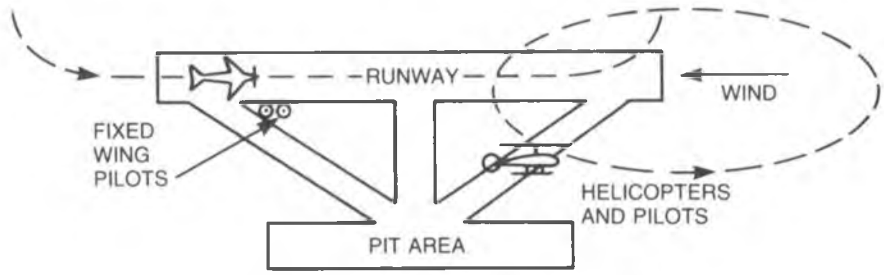
Hope that you all had a very happy Christmas and by now have built and flown all the new helicopters that you received as Christmas gifts. Mail still continues to come in from heli-flyers, old and new, indicating that many modelers are at least trying out R/C helicopters. Since there seems to be so many newcomers to the 'whirly bird' branch of our hobby, perhaps a few hints and comments on the safety aspects and some 'good neighbor' ground rules of R/C helicopter flying would be appropriate this month.

An R/C helicopter is more complex than a fixed wing plane and it spends much of its early flying near ground level, where people tend to spend their time also. Because of this, the heli-flyer has to be more careful when he commences his flying sessions than the fixed wing flyer does. Fortunately much of the initial flying is conducted in backyards (If big enough!) or streets/parking lots in unpopulated areas (or after everyone has gone home). In these cases the the saftey rules should be obvious for the flyer but we must still realize that we attract spectators, especially children, and a child's head is about the same height as our fast rotating blades when we are hovering our choppers. So keep the kids at a good safe distance.

Next, watch for your own saftey. Don't forget that a model radio-controlled helicopter system is composed of several small systems and many hundreds of individual parts. The systems include:

- The helicopter
- The radio-control equipment
- The power plant and fuel system

Each system is complex and, in itself, contains many individual pieces. The systems are also manufactured by different manufacturers. Although great care is taken by each manufacturer to ensure that his product can be used safely by the modeler, the final safety of the R/C helicopter system (and its component sub-systems and parts) must rest solely with the operator, since it is he who has combined all the elements/systems together into one working product. It must be stressed that by its very nature an R/C helicopter system cannot be designed to be completely 'fail-safe' and it can only achieve a reasonable safety level provided that the builder assembles the R/C helicopter kit and all of the other systems in a careful manner. It can suffer a failure at any time and, consequently, must only be operated in accordance with all the instructions and also in such a manner and location that, if a failure does occur, damage to property or hazard to human health/life cannot occur. The instructions contained in the R/C helicopter kit must be read carefully but, in addition, good sound common sense, judgement and discipline must also be excercised. **Do not**, for instance, hold the tail boom in your hand while running-up the main rotor blades.



SEPULVEDA BASIN MODEL AIRFIELD

Please be very careful and **only** proceed with starting, running or flying after taking all recommended precautions. Do not proceed if in doubt. Consult an experienced modeler or call the manufacturer(s).

Also **believe** that a failure can occur and may cause an injury to **you**, so be sure that, if you would get injured, help is obtainable within shouting distance. If you don't believe that this is important, listen to this, a true incident that occurred in California about five years ago. A new heli-flyer decided to test out his helicopter on a disused airfield. He had asked an experienced friend to help him but couldn't wait for him to arrive. So he started up his chopper and was holding the tail boom while checking the blade tracking. The wind gusted (he was facing into the wind) and the chopper blades came down onto both of his arms, cutting them to the bone. If his friend had not arrived at this time he would have been in serious trouble, but anyway, this incident ended with a hospital visit. The irony of this incident occurred when the rescuing friend fainted from the shock of it all after arriving at the hospital and fell down, sustaining a mild concussion.

Well, such events are very infrequent, fortunately, but please believe they **can** happen to you. So be careful.

Another aspect of R/C helicopter flying which is not always obvious is the proper social behavior when flying an R/C chopper at your local modeling field. Of course, many clubs have already faced and solved this problem to suit their own circumstances. Some clubs have solved it simply by saying "no R/C helis at our field." Others have built special heli-pads and try to encourage the local 'chopper' tryers.

Certainly one basic rule is obvious — no air-taxiing in the pit area. Start up the engine if you must, but hold the rotor head at all times until you have carried your chopper out and cleared your fellow flyers by at least 200 feet. Then you can release the blades and start your hovering. At our local 'Sepulveda' model field here in California we finally arrived at a method of operating 'choppers' which was acceptable to the fixed wing flyers. It took quite a few years of trial and error. The sketch shows the layout of the Sepulveda model flying field and you will notice that the choppers do their flying from a spot which is at least 200 feet from the pit area, and as far as possible from the fixed wing guys as they operate their models. You see, we soon found that the fixed wing flyer was very unhappy with the sounds of chopper flying just behind him (and so would you be). He couldn't keep an eye on his plane and also on the helicopter. Very reasonable. He also was understandably upset if the chopper flyer was hovering on the runway when he wanted to land his plane. After all, full-sized helicopters don't land on the airplane runways. So the compromise shown was arrived at. It works.

Let us know how you are solving the co-habitation problem of these two aircraft with basically different landing and take-off characteristics and we will publish any good ideas. Maybe then we will persuade the 'no choppers allowed' clubs to change their minds.

Now to our list of helpers. Richard Gielow of Rantoul, Illinois, wants you to note that his phone number is (217) 892-4410, not (217) 892-2971 as published in an earlier issue. Richard, by the way, heads up the Illinois Helicopter Pilots Association. Paul Butte, of St. Paul, Minnesota, is willing to help local flyers. His phone number is (612) 457-2092. Thanks Paul. Noel Martin of McMinnville, Oregon, wrote a nice newsy letter. Noel

to page 28

from page 26

says "I don't fly that well, however I enjoy **helicopters**." Noel's phone number is (503) 472-2348 and he flies with Jerry Holcomb of Vancouver.

The Vancouver group held an R/C model helicopter rally last fall at Porteo Park. Their newsletter stated:

"This R/C model helicopter rally is intended to bring together, at one field, a large variety of machines for an afternoon of relaxed flying. There will be no formal competitions or trial, just an unhurried opportunity to observe other enthusiasts operating their models and, in turn, allow others to see your efforts. There will be ample time for the more expert pilots to share experiences and skills with those new to the hobby. Spectators are welcome, but must observe field restrictions and the fragile nature of these models. Please, no pets on the field. All pilots must show a current FCC license appropriate to their radio system and be a current member of the Academy of Model Aeronautics."

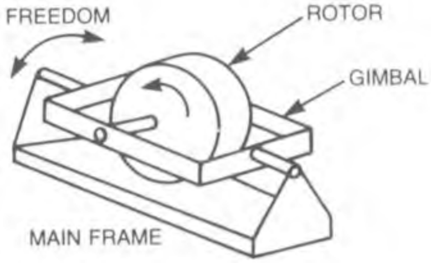
Jerry Holcomb is also willing to assist flyers in his area. His phone number is: (206) 982-7732. And anybody in the Seattle/Everett area can call on John Smith at: (206) 353-9464.

Flight Training

This month we decided to give you (and myself) a rest from flight instruction and cover a subject which I am often asked about. This is the use of gyros in R/C helicopters. So I will try and cover the basic principals of the subject in this issue and the available hardware in a later issue.

First, I suppose, we should define what we mean by a gyro so far as it is applied at this time to model helicopters. I have phrased the preceding sentence carefully because gyros and other sensing devices have a considerable application to our sport but we and the sensor manufacturers are not quite ready for this yet. Don Lowe covered this subject a few months ago and, apart from some physical size restrictions, a fully automated model helicopter (and plane, of course) is feasible and nearly practical right now. It would just cost quite a bit at this stage of development of the sensors.

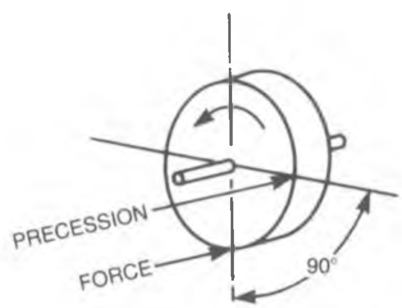
Well, to get back to the sensor which is now available to us. It's a gyro, but a specific type of gyro called a 'rate' gyro. Now a rate gyro measures, or senses, rate of movement usually in one axis only. Several gyros can be used, of course, to measure several axis at once. How does it do it? Well, the gyro has a relatively heavy rotating wheel which is run at a high speed. This wheel (or rotor) is mounted in a frame and the frame is gimballed or pivoted in at least one other plane of movement, as shown:



ONE GIMBAL GYRO

The outer or main frame of the gyro would have to be fixed, or grounded, to the body which is to have its movements detected by the gyro — in our case, the helicopter or plane. The first well known characteristic of a gyro is that it wants to stay where it's put. That is, if we move its gimbals around the gyro wheel will try to stay still.

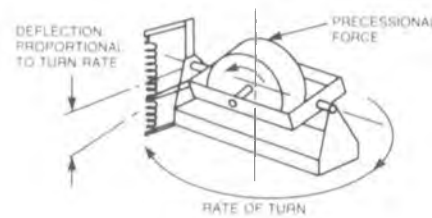
The **second** characteristic we must know about the gyro is that if we try to rotate the gyro at a right angle to its spin axis it will resist our attempts to move it. What it will do, however, is to move readily in the axis 90 degrees around from the one which we tried to disturb. Also it will move in the same direction as our applied force, but of course, 90 degrees later.



SPERRYS RULE OF PRECESSION

This is known as Sperry's rule of precession. A gyro will precess (or move) 90 degrees later (in the direction of rotation) in the same sense as the applied force. So, if our aircraft moves in the non-free axis of our gyro (thus causing a force to be applied) then the gyro will respond by precessing in the other and free axis. A rate (or speed) of rotation of the aircraft will result in a rate of precession of the gyro.

If we restrain this precessional motion with centering springs on the rotor gimbal, then the gyro will move until the force reaction from the spring equals the precession forces caused by the rotational rate of the aircraft. Hence, the gyro **movement** in this precessional axis will be proportional to the **rate** of movement of the aircraft. We now have a 'rate' gyro and, if we fix a potentiometer to the gyro gimbal, we can measure an electrical signal which will be proportional to the aircraft's rate of movement. Mix this electrical signal with one of the channels of our airborne radio and we can then cause the appropriate servo to move an **amount** directly relative to our aircrafts **rate** of motion.

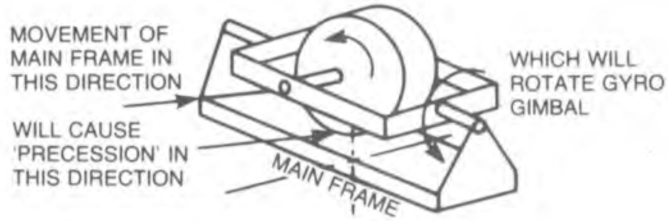


TURNING RATE MEASURED BY GIMBAL DEFLECTION

Now, what's the most 'squirrelly' axis of a chopper? The tail, of course. So, if we mount a rate gyro in our chopper so that it will measure yaw rate and mix its output (in the right sense, of course!) into our tail rotor servo --- Eureka!, when the tail twitches to the right, our friendly servo will move, just like we would if we were fast enough, to oppose or dampen the motion. This will keep happening, too, even if we don't look at the chopper. It's completely automatic and tireless. Sounds terrific, doesn't it? Well, it certainly can be, but you must also realize that you never ever get all good without a little bad, too.

The first 'bad' is you must carry the weight of the gyro, wiring, etc., and, of course, a flight pack to run it. Second, and most important, while the gyro will automatically oppose unwanted tail twitches, it will also oppose **you** when **you** do want the chopper to swing right or left, so it will slow down the wanted tail movements. If you have a well-damped helicopter in yaw it's probably better all 'round to leave well enough alone **but** there is no doubt that the simple rate gyro can help damp down a too active or twitchy tail or

to page 190



MAIN FRAME 'TWIST' CAUSES GIMBAL TO ROTATE

Dorrie Ann Deardorff poses with the Dutch model D.XXI.

FOK D.X

A unique model of historic interest, this Fokker D.XXI is a suitable project for modelers with moderate experience. Designed for use with .049 to .09 engines and lightweight R/C systems.

On March 27, 1936, the prototype of Fokker's model D. XXI fighter took to the air on its maiden flight. An obscure aircraft, the D. XXI nevertheless played a pivotal role in the early days of World War II. In addition to its native Holland, this historic aircraft was also produced under license in both Finland and Denmark.

The Danish Army Air Service procured two machines direct from the Fokker factory, and then built ten more D. XXI's at their Royal Army Aircraft Factory in Copenhagen. Optimized for the close air-support role, the Danish D. XXI's were the most heavily armed aircraft of their era, equipped with twin 20mm Madsen cannon. It would be several years later before the other major powers would recognize the merits of such heavily armed ground-attack fighters, and follow the pioneering lead of the Danes by equipping their fighters with similar weapons. Having recognized the threat of attack by a massive armored force, the perceptive Danish military leaders anticipated that, with sufficient strategic warning, their anti-armor Fokkers could thwart such a strike against them.

With Germany and Russia united in an unholy alliance that had already devastated Poland, only tiny Finland actively opposed their military advance throughout the long dark winter of 1939-40. The first aerial victory by the Finnish D. XXI fighters was scored on December 1, 1939, the day after

Danish model D.XXI showing details of the 20mm Madsen cannon gondolas beneath each wing. This particular model was fitted with a Cox Medallion .049 with throttle.

Frontal view of a Fokker D.XXI in Dutch Air Force markings illustrates minor differences in details such as gun sights and wheel pants.

By Ed Miller

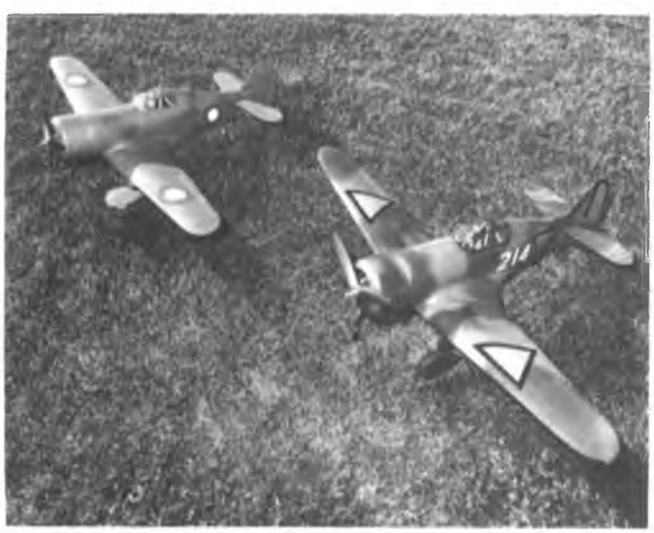
Rose Marie Deardorff displays the Danish Fokker D.XXI.

hostilities broke out on their own frontier. Aided by Danish "volunteer" pilots who, in some instances, comprised thirty percent of the Fokker squadrons personnel, the Finnish Air Force fought against overwhelming enemy numerical superiority.

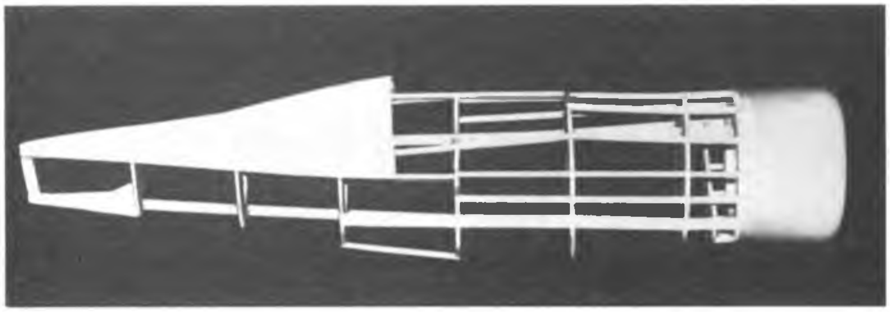
Fighting against such massive forces of the combined German-Russian Axis Powers was to typify every campaign in which the Fokker D. XXI's were to be engaged. The strategic warning of impending attack for which the Danish military leaders had hoped for was to be denied them, however: neutral Denmark was overrun by the savage German blitzkreig on April 9, 1940.

The bitter Danish experience served as fair-warning to their nearby Dutch neighbors, who learned well the lesson that the ruthless Germans would respect no nation's claim to neutrality. So on May 10, 1940, when the German Luftwaffe launched an armada of almost 1,000 aircraft against them, the determined Dutch were as well prepared as their small country could be. The nimble Dutch D. XXI fighters fell with an avenging fury on the attacking Germans. Some Luftwaffe squadrons were almost totally annihilated, losing over ninety percent of their aircraft and crews. In nine days of savage fighting, the dogged Dutch resistance was the first to militarily stalemate the German blitzkreig. Only after the massive carpetbombing of their civilian centers, however, the Dutch finally

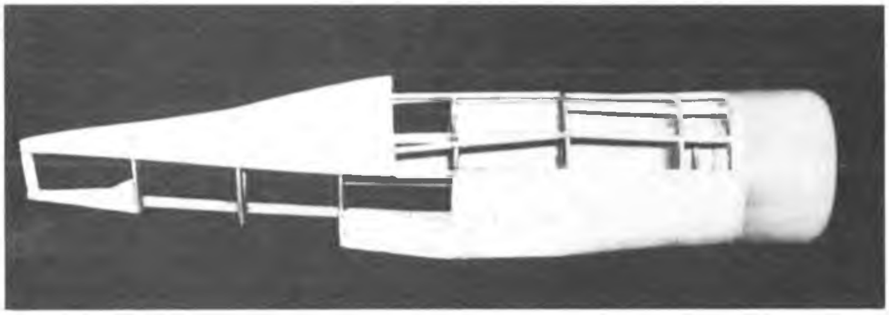
A Dutch Air Force model D.XXI which was equipped with a Cox Medallion .09 engine.



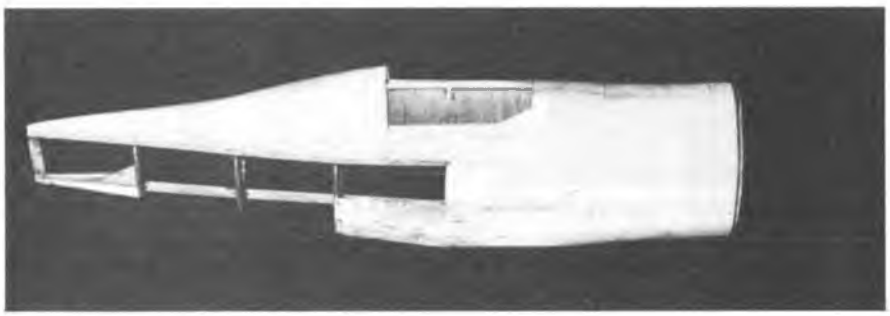
Two of the prototype model Fokker D.XXI's side by side. These models were actually built at various sites in northern Iran during a recent assignment there.



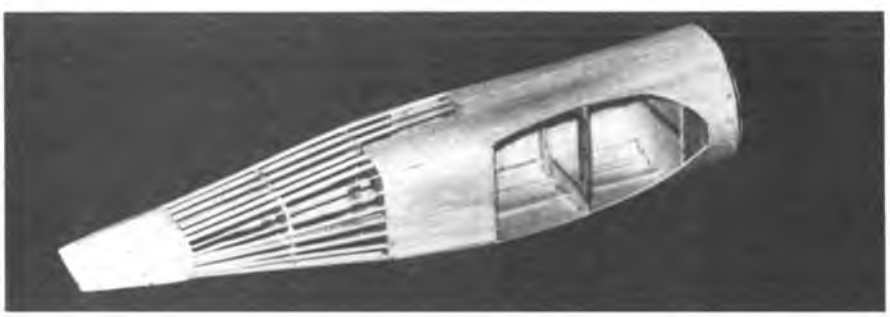
Fuselage Stage One Assembly (completed). All 1/8" square balsa stringers installed, ready for sheeting. Engine cowl temporarily in place.



Fuselage Stage Two Assembly (Step One). Fuselage side sheeting (1/16" hard sheet balsa) installed. Engine cowl temporarily in place.



Fuselage Stage Two Assembly (Step Two). Cockpit flooring (note cross-grain installation) and fuselage top decking added.



Fuselage Stage Two Assembly (completed). Aft sheeting and all 1/16" x 1/8" balsa stringers in place. Bottom center stringer is 1/16" sq. on top of keel. Lower center piece of F5 is still temporarily in place.

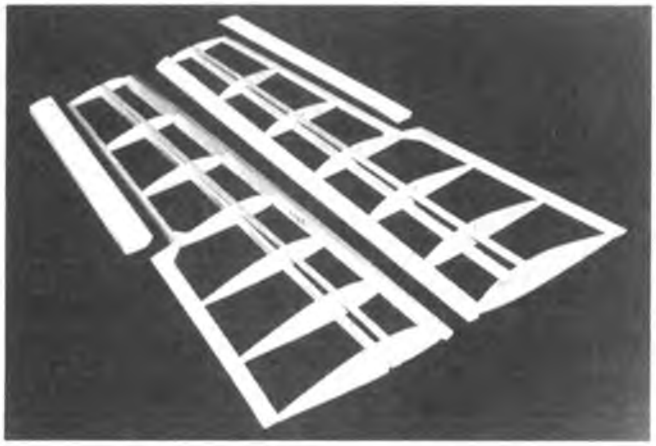
FOKKER D. XXI
Designed By: Ed Miller

TYPE AIRCRAFT
1/2A Stand-Off Scale
WINGSPAN
36 Inches
WING CHORD
5¼" (Avg.)
TOTAL WING AREA
190 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Semi-Flat Bottom
WING PLANFORM
Double Taper
DIHEDRAL EACH TIP
1⅜ Inch
O.A. FUSELAGE LENGTH
24 Inches
RADIO COMPARTMENT AREA
(L) 7" x (W) 3" x (H) 2"
STABILIZER SPAN
12 Inches
STABILIZER CHORD (incl. elev.)
3" (Avg.)
STABILIZER AREA
36 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Upper Fuselage
VERTICAL FIN HEIGHT
3½ Inches
VERTICAL FIN WIDTH (incl. rudder)
3½" (Avg.)
REC. ENGINE SIZE
.049-.09 Cu. In.
FUEL TANK SIZE
1-2 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3-4
CONTROL FUNCTIONS
Elev., & Throt., Ail., Rud., (optional)
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage .... Balsa and Ply
Wing .... Balsa and Ply
Empennage .... Balsa
Wt. Ready To Fly .... 27 Oz.
Wing Loading .... 20.5 Oz./Sq. Ft.

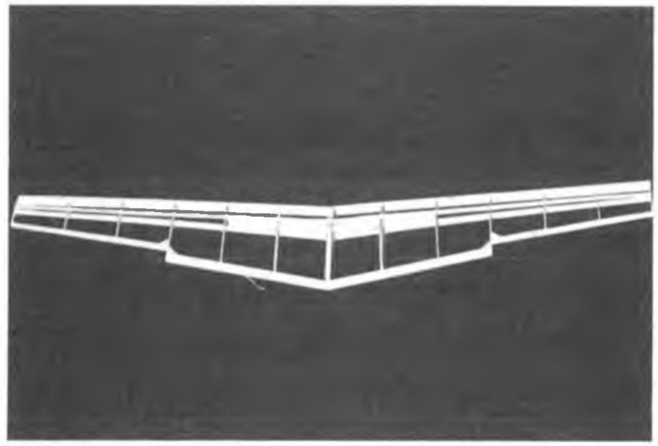
surrendered their last military forces on May 19. But in the interim period, the Dutch armed forces, spearheaded by their Fokker D. XXI squadrons, had accounted for the destruction of some 328 Luftwaffe aircraft, an appalling loss for the Germans.

This determined resistance by the Fokker D. XXI fighters in the skies over Holland was to be the first ill portent for the previously uncontested aerial supremacy of the Luftwaffe. Indeed, if the 328 aircraft lost in the Dutch campaign had still been available during the Battle of Britian in the Autumn of 1940, they may well have provided the extra impetus needed to overwhelm the already hard-pressed Spitfire and Hurricane squadrons of the Royal Air Force.

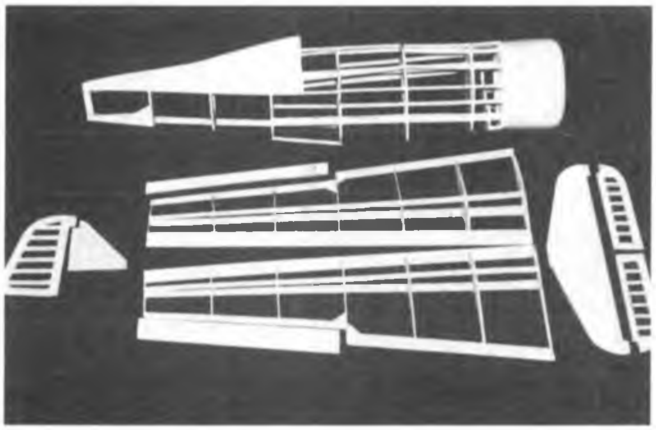
But of even more significance, perhaps, was that many of the German pilots lost during the fighting in Holland were instructor pilots, temporarily withdrawn from Luftwaffe flight schools for what they considered to be an easy assignment to conquer the Dutch. As a direct result of the loss of so many of their experienced instructor pilots at that time, the avenging Allied bomber forces that finally attacked Germany itself during the period 1943 through 1945 were opposed by poorly trained Luftwaffe fighter pilots: pilots who as students had been denied the wisdom to be derived from an experienced staff of instructors. Such was the heritage bequeathed to the Luftwaffe by the valiant Fokker D. XXI's from their own Valhalla.



Basic wing panel assemblies.

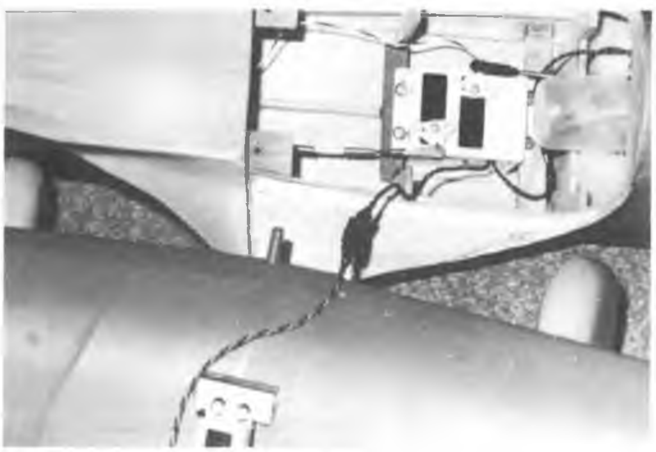


Assembled wing panel assemblies joined by epoxied 1/8" ply dihedral brace (aft view).



Basic airframe sub-assemblies, with fuselage shown at completion of its Stage One Assembly.

Completed airframe prior to covering and installation of canopy frame.



Wing removed to show typical R/C installation. Modified Cannon 3 channel equipment used for aileron, elevator and throttle.

Cowling removed to reveal the engine mount details. This is the .049 equipped Danish model D.XXI.

As a Stand-Off Scale R/C model, the historic Fokker D. XXI fighter makes an interesting and unique subject which can be finished in the colorful markings of either of the three countries that operated it. For reference material, consult the Profile Publication Number 63, or see Air Combat magazine's September and November 1975 issues (Challenge Publications, 7950 Deering Avenue, Canoga Park, California 91304).

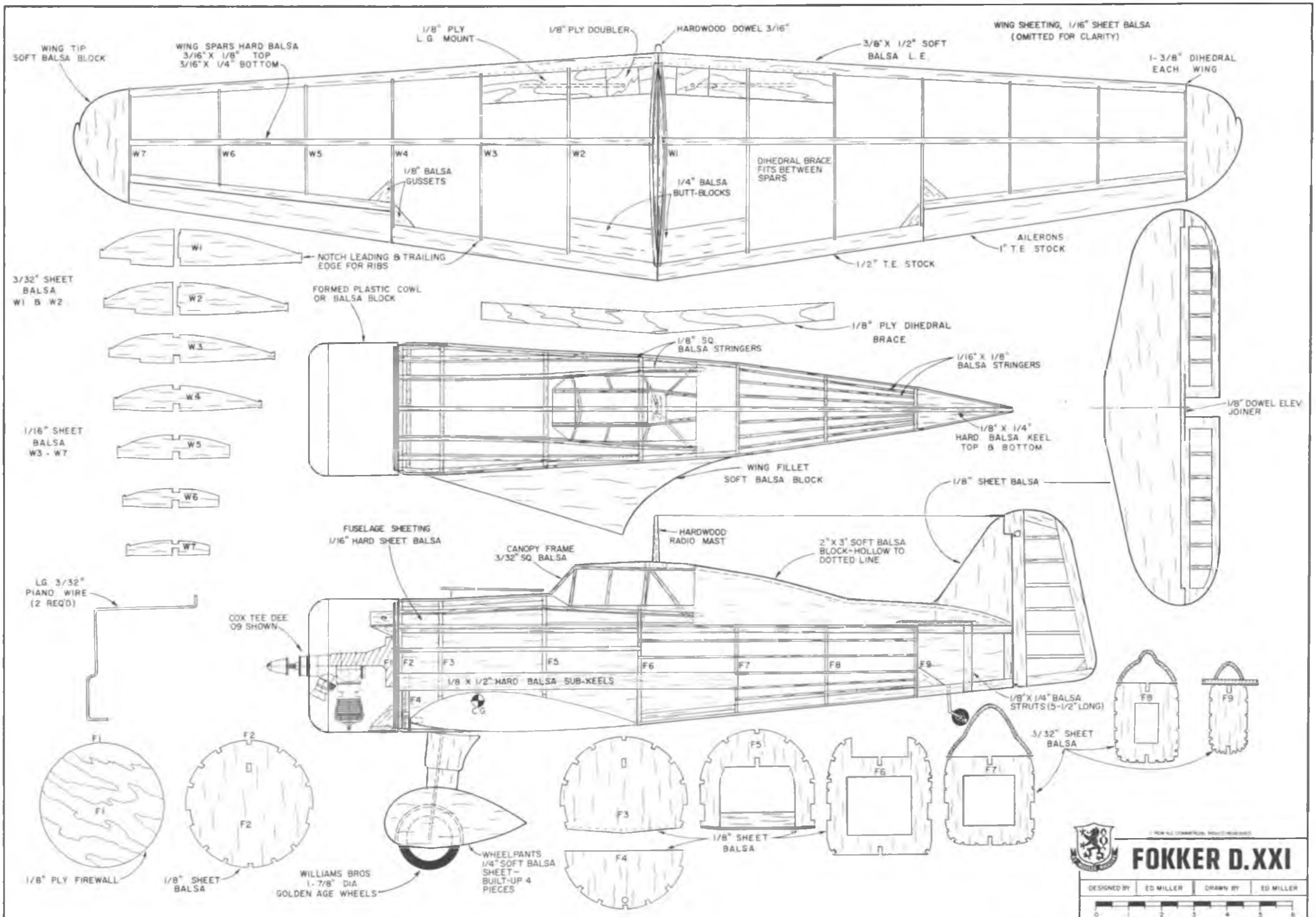
Modeled to a scale of one inch to the foot (1/12), the Fokker D. XXI is an ideal size for .049 to .09 R/C, a size range that is rapidly growing in popularity. The only major deviation in scale was to increase the wing chord to provide greater wing area (190 square inches, rather than 174 square inches that would have been exact scale).

Since it is the most complex structure in the airframe, the fuselage should be the first item on the agenda. Patterned after the full-size D. XXI's own actual construction technique, the fuselage builds into a strong but amazingly lightweight structure.

Start by fabricating the nine fuselage formers: F-1 from 1/8" plywood, F-2 to F-6 inclusive from 1/8" sheet balsa; and F-7, F-8, and F-9 from 3/32" sheet balsa. Note that the lower center piece of F-5 is tack-glued in place, to be removed at the completion of the fuselage assembly, thereby allowing unimpeded access to the spacious fuselage radio/servo compartment.

text to page 182

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



PLAN NO. 829

WARBIRDS RISE AGAIN

Chuck Smith's House of Balsa P-51 turned fastest time of 2:20.9 on the Formula I course. The front rotor K & B 6.5 engine pulled the little bird very well.

This FW190D-9 was entered by the Focke Wulf Racing Team of Doug Fuller and Don Babbitt. A Platt kit, it's powered by a Kraft .61 with a Perry pumper.

By Walt Wilson

Photos by Joe Lunti & Dick Teneau

Have you ever wondered how some of the World War II high performance aircraft from the axis countries might have fared in unlimited pylon racing if they had had the opportunity to compete? We'll never know how the real ones would have compared, but the Spirits of St. Louis Annual Warbirds Unlimited Pylon Race brought together some interesting competitors with some surprising results.

In an attempt to break away from the traditional concept of scale competition, the Spirits have created a sport scale contest where the planes are statically judged and then raced. Points were accumulated in each event and were then combined to determine the winner. There were wing area to displacement ratio requirements. The planes which were entered ranged from the conventional well-executed sport scale subject to others designed with speed as the primary concern.

Contest Director Don Hoelting and AMA District VI Vice President Horace Cain.

For the second year in a row a well-known scale competitor has flown an old faithful bird smoothly and consistently (but not really fast) to win top honors. Hal Parente narrowly took top scale points (by 1 point) and, in spite of some problems, won three of four racing heats to take first place. Ralph White won last year with a similar performance.

The second place finisher, much to everyone's surprise, was the slowest plane in the contest. Wayne Nenninger flew his O.S. .40 FSR powered Jemco AT-6 consistently to finish every heat and amass second place points. Hal and Wayne were the only ones to finish all four heats. Joe Naber got third place in static points and looked like he was going to match Parente's racing record but his Super Tigre .60 flamed out in the last heat and he had to land his Fliteglass P-51 two laps short. He finished third overall.

Chuck Smith flew a House of Balsa P-51 powered by a K & B 6.5 engine to take the fast time trophy but, like all of the others who tried to go fast, he had problems and

to page 177

Don Allen works frantically on the Martin Baker. It has a K & B 7.5 pumper engine and is very fast for its size.

Hal Parente's P-39 Aracobra has weathered, painted MonoKote finish. Well-down bird got top static points and won three of four heats for 1st Place.

BIG IS BEAUTIFUL

Dick Phillips

STARS WW1 Armada of the Air, Fokker DVIII's and Bristol Scouts pair off at Olean, New York Scale Rally. Field is Olean Airport, made available annually for the rally. (Lou Eltscher photo.)

Jim Messers' new Piper Tomahawk. Model flew before full scale prototype. Plans and kit available soon. (STARS photo by Lou Eltscher.)

Doug McBrien (L) taxies his Druine Turbulent out for take-off accompanied by safety officer at STARS Rally. Turbulent is 1 3 Scale and flies very well, plan is available. (Lou Eltscher photo.)

I hope some of you Quarter Scalers out there noticed in the October RCM that Clarence Lee of RCM's Engine Clinic did something we have been waiting for for some time. I know I have had a great deal of comment on the lack of any reports (other than mine) on the larger engines. Clarence has been the dean of Engine people for many years, but his time has been very full with reporting on glow engines and when you are already overloaded with work, where do you get the time to do more?

I have neither the expertise, nor the facilities to properly test engines and so my comments are made from observation and from the comments of others. Not the best criteria for an engine evaluation. Hopefully, Clarence will be able to do more of this sort of work in the future. His comments on the Kawasaki engine marketed by C.B. Associates were certainly welcome.

I have recently received two engines for my own use, one is getting pretty well known and the other is a stranger.

The Kioritz engine has received some comment here in the past and certainly appears to be well made. I won't go into the details again as I have mentioned its construction in the past. At first glance the engine gives every evidence of great care in construction and manufacture. There are no rough edges or obvious careless workmanship anywhere on the engine. The carburetor is well placed and the throttle linkage is arranged to be at right angles to the thrust line which makes it a lot easier to hook the throttle linkage up. In addition, the carb adjusting screws are a good 4" behind the face of the prop hub so hands and fingers are in a much safer location than with some engines.

Kioritz engine is beefy and well-built. It is easy to believe the manufacturer's claim that wearing it out in model use would be hard to do.

While the engine seems a bit heavy, in comparison to some of the others on the market, it produces over three horsepower, and that weight forward allows good, solid construction in the empennage with no subsequent weight penalty up front to balance a model properly. Better a bit nose heavy than a bit tail heavy any day!

The prop hub is a six bolt and is available in several lengths in order to accommodate practically any 'reach' you might need to accommodate practically any model. The hub is nicely machined and very substantial. The engine is standard magneto fired and I suspect it would not be difficult to adapt it for the commercially available solid state ignitions now on both the model and chainsaw markets. I have seen the engine torn down and it is just as substantial inside as out, well made using quality materials. The U.S. marketing agency claims it would be difficult for us to wear this engine out over a very long period of time and I am inclined to agree with them due to the care taken in manufacture and the high quality material used.

The engine is marketed by Gibbs Hobby and Research (6195 Hillfield St. N.W., North Canton, Ohio 44720), and you'll see their ads here in RCM and elsewhere. John Gibbs was having a problem getting enough engines to supply the demand earlier last year but says he has a good supply system set up now and there should be no more than minimal delays in the future.

Dario Brisighella's Starduster Too. At 28% of the full scale bird, should be ideally suited to the Quadra engine. Model is superbly engineered, much detail shown of plan. (See text for additional detail.)

Every once in a while, not too often I hope, I get some information which I use in good faith, and then find that it is in error. Such a bit of information came to hand not too long ago and I passed it along to you as gospel. This was that the Quadra factory had begun doing the Dario Brisighella balance job on the engine and that, henceforth, all engines would be as good as those balanced by Dario. **NOT TRUE!** Dario is still the only guy who does the real Dario B. over-balance job. Now that he is also Quadra USA for warranty repairs and parts, etc., if you have occasion to send your un-balanced engine to him for repair (warranty or otherwise) get him to do his magic with your flywheel while it is there. You'll be glad you did.

If you have one of the older engines which has never been done, whip the flywheel off it, send it to Dario along with $12.00 and he'll do his thing for you. If you have one of the factory balanced flywheels (two nail-like objects driven into the flywheel), send Dario the flywheel only and for $15.00 he'll tame it for you.

Removing the flywheel requires the removal of the prop hub which unscrews, and then tapping the flywheel off **(gently)** with a plastic or leather hammer. **Don't use a metal hammer as you'll mark up your flywheel!** Be careful you do not lose the little halfmoon key that keys the flywheel to the shaft. Send the flywheel to Dario, along

to page 172

CUNNINGHAM ON R/C

Chuck Cunningham

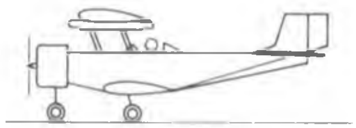
What do you do on a cold, crummy, miserable weekend — especially after the football season has ended? Not much, right? Wrong! If you're an RC'er the whole world is before you. Even though the months of not flying have tended to start driving you a bit buggy, the flying season is really not very far away. Of course, if you live in the sunny parts of the country you have been lucky enough to get in some flying all during the winter, but it's still not quite the same as spring and summer flying. All parts of the country have bad weekends, sometimes it seems like more bad ones than good ones. You can spend the poor weekends a lot better than your neighbor, who's only weekend pastime is watching the new TV show "NFL Cheerleaders Go Ape." You can get to work on your latest creation or, better yet, you can create your latest creation.

There are many fine kits on the market --- so many that it sometimes seems a bit foolish to try to create, or design, your own. However, the pride that comes with creating your own model design is really a great feeling. A number of times I have presented my series "RC Design Made Easier," and we will probably be repeating it again before too many months, but this month I would like to talk a bit about the idea of changing-up an existing design, or kit, to come up with an individual looking aircraft. You can do this quite easily by finishing out your kit aircraft in a color scheme that will reflect the look of a full size aircraft. You can also modify an existing design, or really change it around, to come up with a totally new look while using the components in the kit. Many modelers do not enjoy the tedium of cutting out wing ribs, etc., — they much prefer to have the kit manufacturer do it for them. So, why not use what you get in the box, and create something different from it.

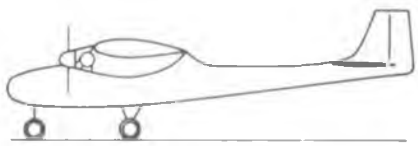
First you have to decide what it is that you want to build, then decide if you have a kit stashed away under the bed that will serve the purpose. Most simple, straightforward kits can be easily modified to suit many things.

An easy way to customize a design is to add a nose cowl. You can change the entire appearance of the aircraft with just this slight addition. There are several sources of cowls, you can check the pages of RCM to find some that are being offered, or you can check your local dime(?) store for inexpensive aluminum pots that can quite easily be modified into a nose cowl. These pots come in a wide range of sizes, and at a price ranging from two bucks or so for a small one to six bucks for a cowl large

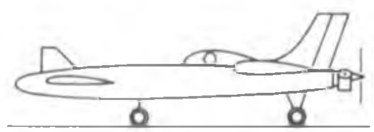
CUSTOMIZED UGLY STICK



SCOOTER II BIPE



TWIN RCM TRAINER



FALCON 56 CANARD

enough to fit on a Quarter size model. Consider what the simple addition of an aluminum cowl does to the looks of a standard Ugly Stick? Go one step farther and put a windshield, pilot, and head rest on top of the wing, mount a machine gun made of a couple of scraps of balsa; even add a brace strut for flying wires on the top of the fuselage, with the flying wires running out to screw eyes in the spars on the outer wing panels, and you have a totally different looking aircraft.

If you want to go a step farther, remove the nose gear, move the main gear forward so that the wheel axles are just under the leading edge of the wing, put on a pair of Williams Brothers Vintage Wheels, add a tail wheel at the aft end, and you'll begin to wonder where the Ugly Stick disappeared to. Naturally, the same can be done to the Senior Falcon, and Falcon 56. Often, if you rotate the engine from an upright position to laying on its side it becomes easy to put it inside the cowl, with the muffler sticking out of the bottom. This is a good idea anyhow, keeps from spreading the engine goop all over the pilot's face.

The simplest way to make any aircraft look sharper is the addition of wheel pants to the landing gear. Wheel pants can sometimes cause you a bit of misery if you fly from a field that has long grass, but if you fly from a paved field, or a closely mowed grass field, a snappy pair of wheel pants really set off a model. If yours is a trike geared ship, add wheel pants to the nose gear too.

Another easy modification to a standard type kit is to reverse the location of the wing. From top to bottom that is, not fore to aft, though we will get to this later. Just for the heck of it, you can take a standard shoulder wing type model, turn everything over, and you will come out with a totally different looking aircraft. You must be careful when doing this modification. You need to keep the basic incidence angles (the angle formed by the chord line of the wing in relation to the chord line of the horizontal stab and the main line of the fuselage) the same as they were on the original design. Take the plans and draw chord lines on the side view, and measure them in relation to each other. Then, when you turn the aircraft upside down, make sure that you have "designed" in these same angular relationships. The best example that I can give is that many kits are designed with lots of down thrust. When you turn the fuselage over to create a low wing from a shoulder wing, you suddenly have lots of up thrust. You must reverse the thrust line and then keep the wing and stab angles, in relation to the fuselage line and the thrust line, the same. If you're confused by all of this, simply roll out a set of plans and look at it. This should clear up any questions that you might have.

Now you have turned a high winger into a low winger. You can continue with your customizing with paint job, wheel pants, a cowl, a changed vertical stab and rudder outline, and it would be pretty hard to find the original aircraft.

So far, the change-ups have been relatively easy. How about trying a modification that is a bit more difficult. How about making a bipe out of a standard kit design. Now, you're getting into the realm of design. You simply cannot convert a standard monoplane into a bipe without a number of changes. You may have to get into the scratch building act and slice up some extra wing ribs, but now that you've come this far, why not go a bit farther. To make it easy, let's select a candidate for this modification. Flite Line Products' Skooter II is a super candidate for any modification. Rily Wooten's little aircraft is just as basic as it can be, and lends itself to all forms of customizing, so let's see if we can turn this aircraft into a bipe. As it comes, it is a low wing aircraft with the option of being a trike

to page 166

SD-500mkII

Designed as a pylon racer, this model features simple lines, low building costs and builds into a sport-type model with aerobatic abilities. With a hot .40 on the nose, it is a fast racer.

Designed by Val Ure **Article By Arthur York**

Most modelers are basically the same when they pick up their latest magazine — a quick skim through for content and then they zero in on their pet section. By the time they get to read the articles about models, they have assessed all the latest ads, looked at photos, and studied drawings. Occasionally this quick skimming will interrupt your normal habit because a model catches your attention. How did you arrive at this part of the magazine? Was it the simplicity of construction that appealed to you? Simple lines of a .40 powered model with obvious low building cost, or did it meet your need for a simple, everyday, sport-type model with aerobatic abilities? Yes, it has all of those features, but with a hot .40 bolted to the nose, it is a fast pylon racer of the 15-500 class.

The SD-500 series were designed as pylon racers, with easy take-offs, landings that could be dragged in, stability and grooving qualities of a good pattern model. The parent design years ago started as a sport model, progressing into the pylon circuits. The SD-500 started the other way and now is showing up in novice pattern events with success. Do you recognize the family lines — well straighten the wing, place it on the fuselage bottom, lengthen the nose, add down and side thrust. Wallah! an RCM 15-500. That is what the SD-500 MK II is with improvements in handling and flying.

Val Ure, an old buddy of mine for the past three decades is responsible for the SD-500 series design. He is well known in Canadian modeling circles and lately the western states are becoming aware of his many talents.

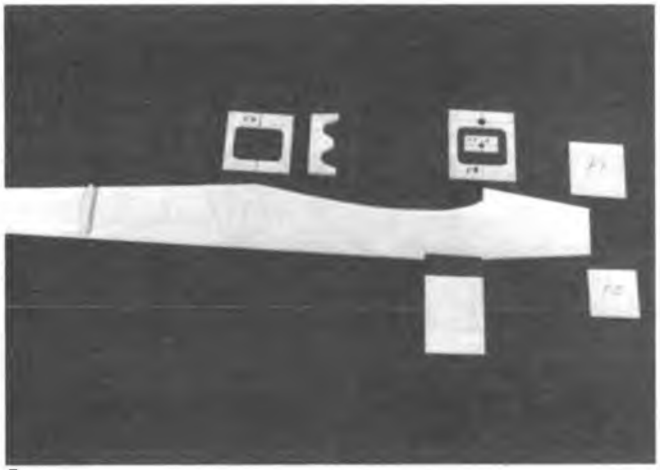
We, in Canada, have AMA's counterpart known as the Model Aeronautical Association of Canada (MAAC). In their pylon rule book is a set of 15-500 rules known as the "Winnipeg Rules," in an attempt to define minimum requirements for cross country competition. Some members in the local club and in the province felt they were too lax, advocating a one model design as the only way to go, stressing the RCM 15-500. An annual zone meeting almost became a disaster over this issue, but a one model design concept was lobbied through for a one year trial. Selection was delegated to the Pylon Committee between the RCM 15-500 and the SD-500. At this meeting, I volunteered (in a moment of weakness or frustration!) to make drawings of the model, if the design was selected, as it and all

SD-500 MK II
Designed By: Arthur E. York

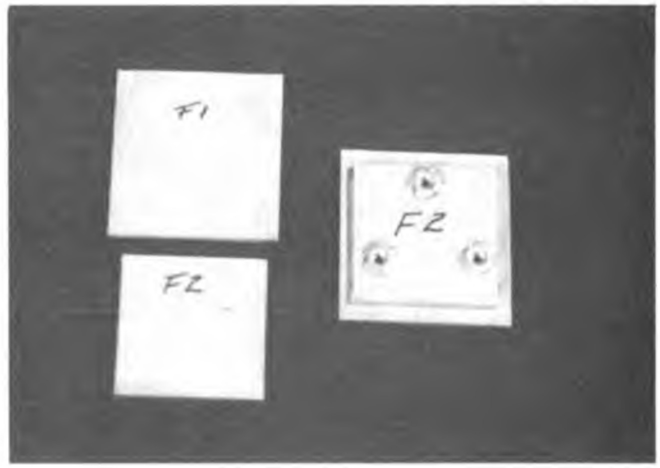
TYPE AIRCRAFT
Sport/Pylon
WINGSPAN
52 Inches
WING CHORD
10⅛ Inches
TOTAL WING AREA
519 Sq. In.
WING LOCATION
Shoulder
AIRFOIL
15½% Symmetrical
WING PLANFORM
Constant Chord (2" Sweep Back)

DIHEDRAL EACH TIP
1¼ Inch
O.A. FUSELAGE LENGTH
36½" (Less Engine)
RADIO COMPARTMENT AREA
(L)10 3/16" x (W)3" x (H)2¼"
STABILIZER SPAN
18¼ Inches
STABILIZER CHORD (incl. elev.)
6" Average
STABILIZER AREA
109½ Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5¾ Inches

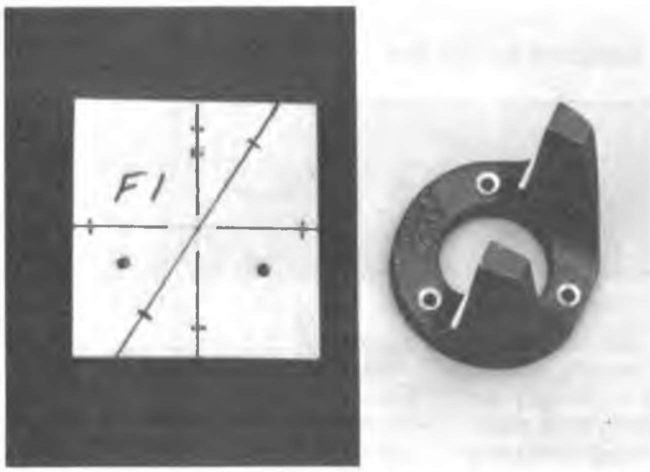
VERTICAL FIN WIDTH (incl. rud.)
5⅝"
REC. ENGINE SIZE
.29-.40 Cu. In.
FUEL TANK SIZE
6 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage .... Balsa and Ply
Wing .... Balsa and Ply
Empennage .... Balsa
Wt. Ready To Fly .... 56 Oz.
Wing Loading .... 15.5 Oz./Sq. Ft.



Fuselage parts cut and ready for assembly stages.

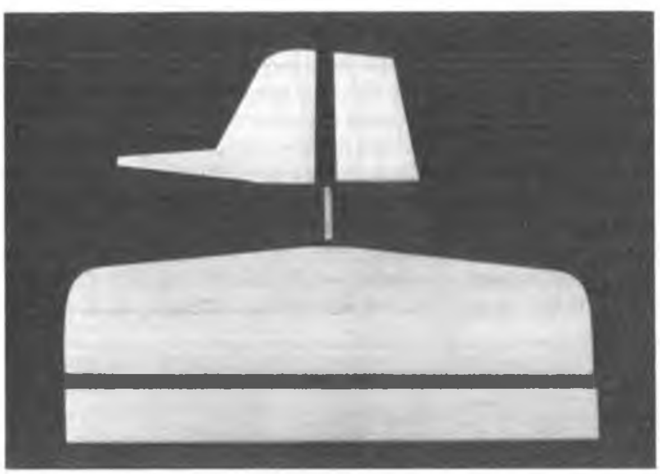


F1 and F2 shown separately and laminated with blind mounting nuts in place for motor mount.

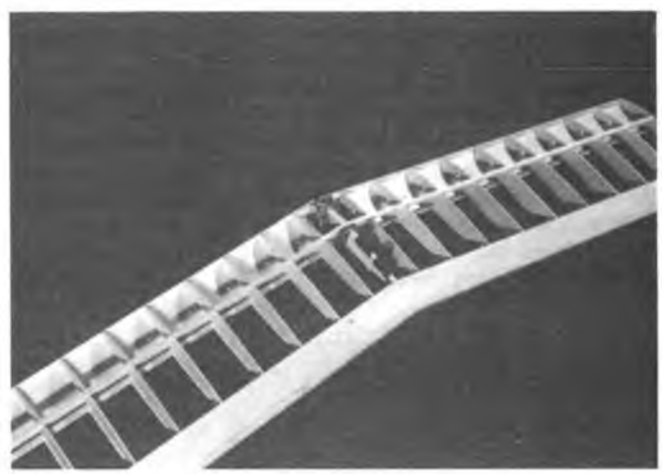


F1 marked and drilled for Kraft aluminum mount. Note — engine is mounted 60° to right of center.

Fuselage built-up on flat building board. Keep everything square.



All necessary tail components cut. Note 1/4" dowel drilled for tailwheel wire.



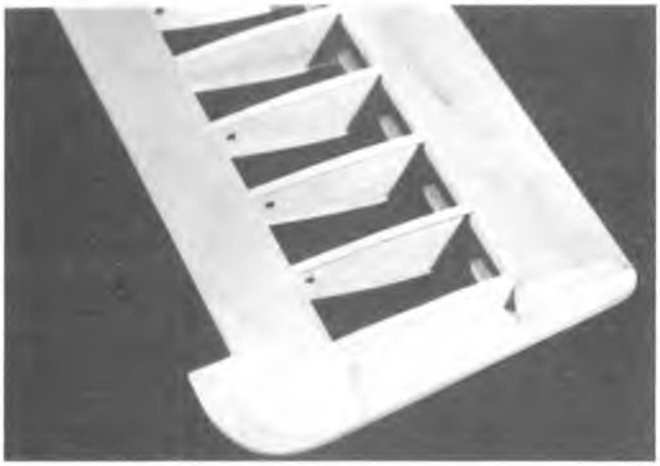
Wing panels being joined and held together with clamps while epoxy sets.

sketches were non-existent.

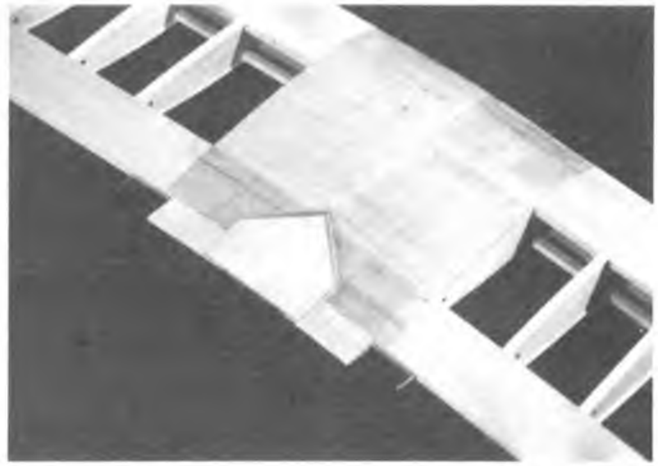
Weeks later, just before Christmas, I received some written information, a piece of folded cardboard and a set of RCM 15-500 plans, along with the decision of the Pylon Committee in favor of the SD-500 design. Up to this time the design had been nameless, references to the model being unprintable profanity; no one wanted to be associated with it and so would not suggest a name. As a joke, I selected the first letters of the most common profane references, applied a 500 after them to designate wing area followed by Mk I. Blueprints were made available four days later to the joy of locals, enabling them to go on a building spree during the holiday season.

I built two, each different from the other in minor aspects. A few days before the local pylon meet I covered an SD-500 Mk I, installed the radio and bolted on a hot engine. My first encounter with flying an SD-500 Mk I was the night before the meet. Like flying other tail draggers I applied right rudder as the take-off started; the result was a violent ground loop.

The second attempt at take-off was without using rudder — a classic take-off resulted, straight, and a gradual climb-out. A little aileron trim was all that was required; it flew just great. It was found in doing turns and loops that the elevator was very effective. With a 1/4" up and down



Wing tip detail. 3/8" trailing edge block is faired into tip.

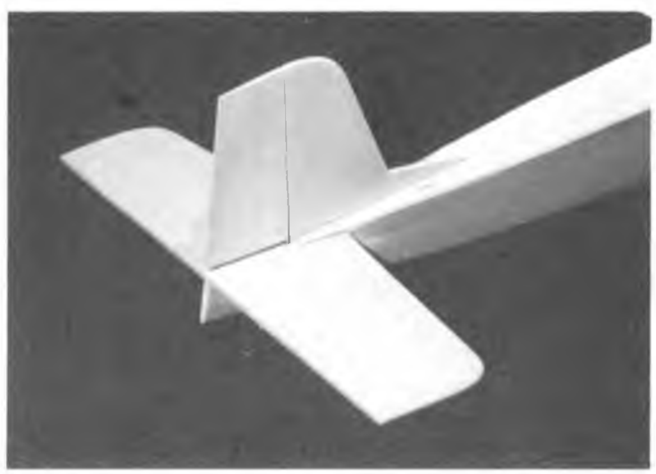


Center section of wing with aileron torque rods installed. Fiberglass has been applied along with ply plate for wing hold-down screws.

Mock-up showing method of installing wing tip weight for lateral balancing. Works well after model is completely covered.

Bottom view of tail wheel assembly. Wire runs through 1/4" drilled dowel in fuselage.

Tail wheel wire shown protruding through stab and bent for rudder.

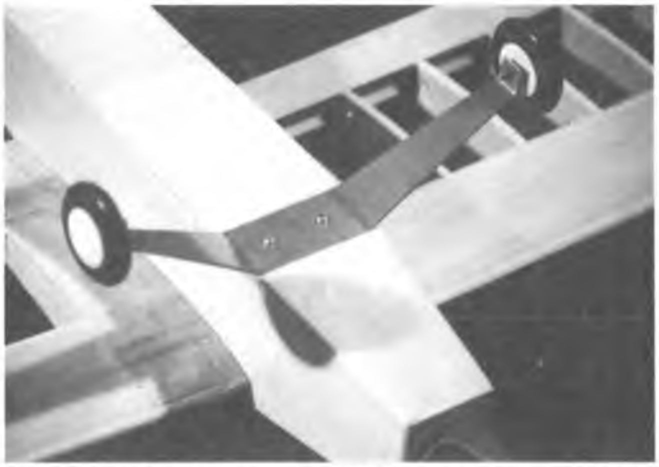


Completed tail assembly minus elevator.

elevator movement, about half the stick movement was needed for large smooth loops. The exact C.G. to now was not known; everyone balances his model on the spar, at the fuselage. Mine was where I thought it should be — 3/4" further back. This was checked out by trying a flat entry into a spin; results were satisfactory with snappy, precise entry and recovery. I felt pleased with this first flight. A low pass was made across the field, followed by a roll to the left. The roll required no control movements other than aileron, beautiful but slow. It was so slow it used up the air space needed to perform four rolls. There was no time to figure this out before the meet; besides pylon flying makes no demands on rolls — just turns and they were fine.

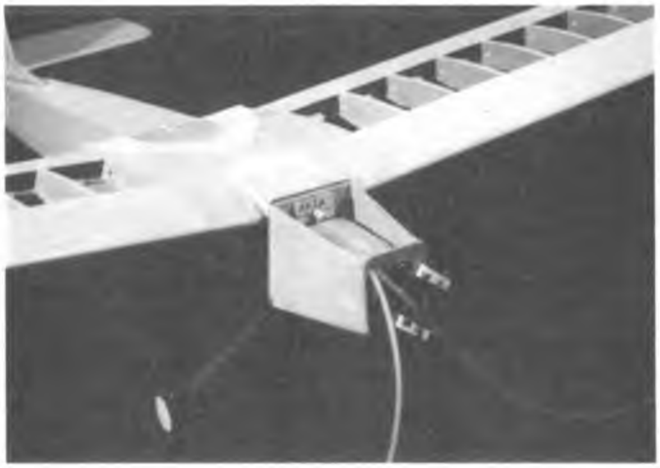
While racing the next day, I encountered turning trouble around the Number 1 pylon. Half the turns resulted in a ballooning climb. I fly Mode 1 and thought possibly a little top rudder might be unknowingly applied. This was not the case, as later I found out that in my hurry I had forgotten to balance the model laterally. Three-quarters of an ounce of lead was installed in the left wing to counteract the weight of the canted engine.

The SD-500 Mk II differs from the Mk I in simpler wing tips and increased aileron area. They both flew great with the following amount of throw — ailerons and



Landing gear bolted in place. This makes a very neat installation.

Close-up of F3A and wing dowel. An easy way to get perfect alignment.



With Sullivan fuel tank and lines in place, we just have to bolt engine to mount.

HP-.40 installed with pressure line to tank.

SD-500 MKII makes a low fly-by for our photographer.

The SD-500 MKII flying around a pylon.

elevators 1/4" up and down; rudder throw was 30°. With these throws, the model is very responsive and can be a handful on first flight if one lacks experience. As others before me have stated — get your local expert to test fly and trim the model for you. The models have been test flown and in pylon races with the rudder servo disconnected, pinning the rudder in neutral. No one noticed this and once I forgot, until trying to taxi back to the pit area after a race.

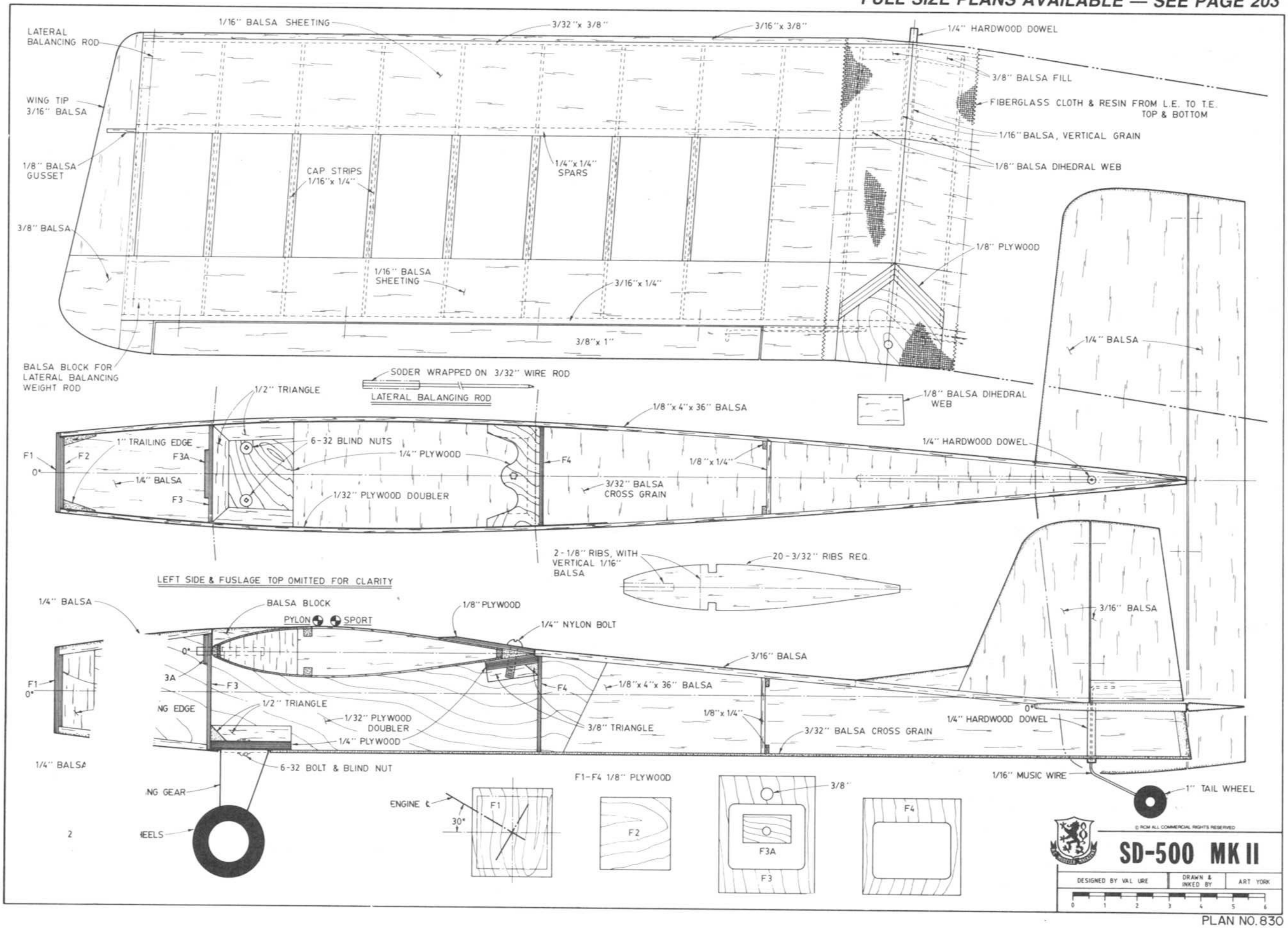
CONSTRUCTION

Wing construction is quite simple; do not let the swept back wing upset you. Each panel is built separately directly on the plan, then joined. First cut out the fuselage sides from 1/8" x 4" x 36" balsa sheets and set aside; we need those pieces of 1/8" scrap for the two center ribs. Make a rib template out of your favorite material, unless you have an old RCM 15-500 template around — yes, same chord and airfoil. Mark one of the curved edges of the template with a felt pen. Now cut out all 3/32" and 1/8" ribs needed and mark each rib the same as the template; this may sound fussy, but I will explain this later.

Take the two 1/8" ribs, make a cutout for the 1/4" dowel, laminate on one side of each rib, 1/16" vertical grain balsa; **important** — one left, the other right. Select two 1/16" x 4" x 36" balsa sheets

to page 146

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



SOARING

Al Doig

The lead photograph shows Pam Leidig of Grantham, Pennsylvania, launching Robert Barrett's modified Wanderer 99. Pam is a member of the West Shore Flying Society and flies sailplanes just fine. She should be a good candidate for the WINGS organization — Helen Olson take note. Bob says the T-tail modification allows storage of the plane in a 5" thick box and improves the flight characteristics. I might also note that a high tail will help reduce damage when landing in that field shown in the background! You might ask Bob for mod plans, c/o Messiah College, Grantham, Pennsylvania 17027.

★

2 Meter Class — Quo Vadis? From time to time I raise the question of interest in the smaller gliders, either 6 ft. or 2 meters. I suspect that most glider guiders are flying this size airplane. I think that they represent the greater part of glider kit production today. I know that the Wanderer is a big seller at Mark's Models, and I hear that the Gentle Lady is a very big seller all over the U.S. I have always been interested in the 2 meter contest class because I believe that contest requirements lead to the development of better all around ships. I like to hear from flyers around the country to find out what is going on in their area. One such letter from John Dalman, Wisconsin, outlines what looks to be a very worthwhile 2 meter program.

Dear Al,

I was hunting through old issues of RCM for info on Lee Renaud's Sagitta, when I came across your first column (Jan. 1980). After reading your comments on 2-M sailplanes I thought you might be interested in knowing what plans we have for 2-M in the Madison and Eastern Wisconsin area.

Basically 5 clubs in this part of Wisconsin sponsor contests for the 'Wisconsin State Points' which ultimately, every Fall, leads to a state champ. In 1980, a 2-M ship could be flown in Standard Class at any contest, whether for State Points or not, but nobody took them seriously. A couple of guys had Drifter II's but that seemed about it. But in July, I built an RO-8 and Al Scidmore built a Gentle Lady, and started 'talking up' 2-M. As a result of that, and coverage of the 2-M World Cup, etc., there are now about 10 or 12 more 2 meter planes being built. Most are Drifter II or Gentle Lady designs, but there are at least two more RO-8's in existence.

In October, Al Scidmore and I sponsored a 2-M sailplane workshop and contest here in Madison. Although weather was cold and windy, we had 10 flyers from our club alone! 1981 plans are for two 2-M sailplane workshops, to enable new sailplane pilots to get experience and instruction on winch use, thermal flying, etc.

The Madison club, Madison Area Radio Control Society, is tenatively planning to award 'Best of 2-M' trophies at their contests, and Fon du Lac, Appleton, and Milwaukee are considering doing the same. My hopes are that we can form a 3rd class at our contests in Wisconsin. I would also like to see a Midwest 2-M championship, perhaps held near Chicago in the next couple of years. The catalyst seems to be someone coming to the field with a competitive looking 2-M airplane. It got people thinking of 2-M planes as more than trainers. Getting a 35 minute thermal flight with my RO-8 helped also. You and I have both seen some contests where 2-M did as well (sometimes even better) than Standard. I believe as 2-M designs improve and as more pilots practice with them, we will see consistently high scores. For example, at the LSF Regional Tournament in Plainfield, Illinois this last August, 3rd place in standard was taken by R. Miller flying a 2-M canard! How well I remember — I took 4th in Standard!

As a closing statement, sometimes it seems Standard Class airplanes are caught in the middle. They incur all the weight penalties of Unlimited Class ships but retain less area. 2-M ships, although of limited wing area, can be built much lighter. In other words, to have a rigid, strong fuselage for 100" wings takes the same materials and weight as for 120" wings (example: Aquila and Aquila Grande). Perhaps as we develop 2-M we'll see a splitting of the Standard Class pilots, some moving up to Unlimited and some to 2-M.

One last item. As built per the plans published in RCM, the RO-8 has stabs permanently attached to the fin. After three trips to the flying field and six repairs to the fin, I rebuilt the fin and stabs to utilize plug-in stabs. I cut the stab down the center line, and buried 1/8" brass tubing in the stab halves. After burying another piece of 1/8" tubing in the fin for a pivot point, the job was done. Took about 6 hours including covering.

Sincerely,
John Dalman
1509 Trailsway #5
Madison, WI 53704

I thought some of the points in John's letter were neat. The idea of a workshop and low-key contest for new flyers is very worthwhile. It lets the newcomer ease into competition without the sheer terror of being dumped into a contest with experienced flyers and not knowing what to do. Also, the idea of regional 2-M contests is appealing. As this is written, this season's premier 2 meter event has not yet taken place. The "2-Meter World Cup" has been held in January in the Lancaster/Palmdale desert area of Southern California. Sponsored by the San Fernando Valley Silent Flyers and the Antelope Valley Soaring Association, this contest drew 52 entries in 1980. I'm anxious to see how many entries 1981 will bring. This may be an indicator of future 2 meter interest as the contest was well publicized.

A less publicized 2 day, 2 meter contest was held in Los Angeles in November 1980. This contest was held on the campus of Cal State, Dominguez College, and was sponsored by the Soaring Union of Los Angeles. Only 16 flyers entered. Those who did enter had a ball, getting 16 flights in the 2 days. The tasks for these two contests are quite different. The World Cup features Speed, Distance, and Duration. The SULA contest was strictly Precision and Duration events. I detect that interest in 2 meters is slowly on the increase, but there sure is no land rush.

As far as new 2 meter ships are concerned, I've seen several lurking in the wings. Mark's Models has a prototype 2 meter Bird of Time. A 2 meter Sagitta has been burning up the California skys. Lee Renaud has been seen testing a prototype Olympic 650 with good results, I'm told. And there's Dodgson and the 2 meter Camano, called K-Minnow. I don't have any hot scoop, but I think you will see a couple of these kitted soon.

Don Edberg with 2-M Sagitta.

Carl Goldberg and his 2-M Gentle Lady.

Bob Dodgson's 2-M Camano "K Minnow."

Center — Lee Renaud's 2-M Oly 650.

★

It's been a couple of months since we talked about some of the technical aspects of sailplanes. It doesn't hurt to go back and review some of the fundamentals once in a while. Ask ten people what camber is and you won't get two right answers. A lot of flyers think it has something to do with the shape of the bottom of the wing or something like that, when it doesn't at all. If we're going to keep running into these kinds of terms, we'd better understand what they mean. You don't have to understand all this technical junk to have fun flying gliders, but it's fun to be able to follow what someone is saying. At least you will know when to nod your head.

Let's first consider airfoils. Figure 1 shows a typical looking airfoil. This one happens to be an Eppler 392. I don't think the number 392 has any particular significance. Perhaps it's the 392nd airfoil that Prof. Eppler thought was worthwhile. Some airfoil numbers, however, do have significance. If you understand the code, you can describe the shape of the airfoil from the number. But, back to Figure 1. The base line of the whole shebang is the **chord line**. The chord line connects the most forward point of the airfoil with the most rearward. It can coincide with the bottom surface of the wing, but mostly it doesn't, due to the leading edge radius. On a flat bottom wing, the lower surface may, however, be considered the chord line without measurable error. The chord line sometimes falls partially outside the airfoil in, for instance, undercambered shapes. The chord line is the reference to which angle of attack is measured. The length of the chord line is called the **chord**. In models, the chord is measured in inches.

Another useful reference line is found by inscribing a large number of circles within the airfoil that just touch the top and bottom of the outline. A line drawn through the centers of all these circles is called the **mean camber line**. This line is obviously just half way between the top and bottom surface at all points. Now, if you will find the greatest distance between the chord line and the mean camber line, you will have the **camber**. Camber is measured in percentage of chord. Dividing the measurement of camber by the measurement of chord and multiplying by 100 will give the percentage camber. Thickness is just the fattest part of the airfoil. It is expressed as a percentage of chord. It is found by dividing the measurement of the thickest point by the measurement of chord and multiplying by 100. The **leading edge radius** is the radius of the circle that best fits into the leading edge of the airfoil.

Aspect ratio is the total wingspan divided by the average chord. It is just a number and has no dimension.

If you've stuck with me this long, you deserve more than a bunch of definitions. Let's see how these parameters affect the performance of the sailplane. As camber is increased, lift will increase — high camber, high lift. With increased camber comes increased pitch instability. The stabilizer area must be increased, or the Center of Gravity moved forward. Up to a point, thicker airfoils will yield a higher maximum lift. If the design objective is to maximize lift, 12% or 13% thickness is about optimum for normal airfoil shapes. A smaller than normal leading edge radius will decrease the maximum lift available. Thick airfoils provide good performance over a wider range of angles of attack than thin ones. However, there ain't no free lunch Profile drag substantially increases with both thickness and camber. This means that at the angle of attack giving the best glide ratio, the performance of a thick wing will generally be poorer than a thin one. Thin wings are typically weaker than thick ones because of smaller spar depth. Thus, wing airfoils are a compromise, enhancing the particular set of parameters the designer thinks important. High aspect ratio wings, i.e., long and skinny, will perform better than low aspect ratio wings of the same airfoil shape at a fixed Reynolds Number.

A discussion of Reynolds Number is beyond the scope of this column. Suffice to say, it is a correction factor related to air density and viscosity; but more importantly to chord length, and velocity of the wing. The greater the chord, and the higher the velocity, the higher the Rn. As **very** narrow wing chords are increasingly inefficient, a high aspect ratio wing gets very long. This poses structural problems as the stress on the center section goes up as the square of the span (2 times span means 4 times center section stress). The reason we see many low aspect ratio wings (Paragon, Windrifter, Oly II, etc.) is that the designer chose certain compromises. The chord can be increased with very little weight penalty. This reduces the wing loading. Also, minimum sink rate is lower and the glider will go up on tow better, for a higher launch. The pitch stability will be reduced, requiring either a longer tail moment or more stabilizer area. All of these results lead to the "floater" type glider which flies very well under some type conditions.

As you can see, glider design is concerned with an infinite number of variables, each of which is infinitely variable. The designer must choose one characteristic at the expense of others to achieve his particular design goal. Designers are constantly looking for that magical combination which will outshine all others. It may be akin to Captain Ahab's search for the great white whale. Howzat!

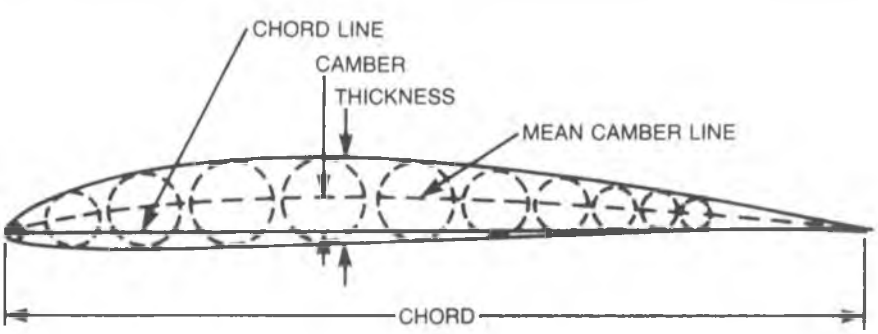


FIGURE 1
AIRFOIL DEFINITIONS

Flash:
FAI Finals are to be held in central California on July 12-17; the exact location to be announced in an upcoming issue.

□

POWER BOATING

Howard Power

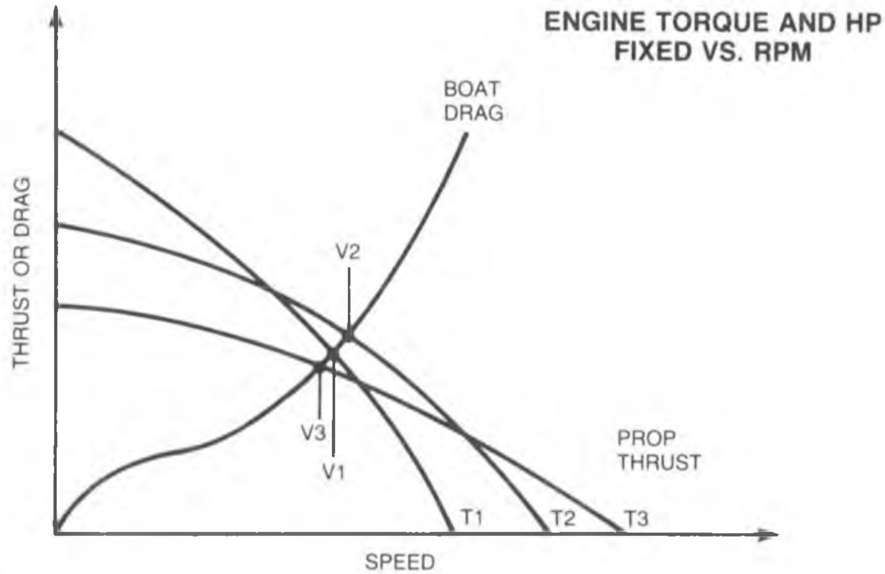


FIGURE 1

We will start the column this month with a look at a new engine offering from World Engines. The engine in question is the OS 46 VR Marine. In fact, the actual displacement is .455 which makes it legal for NAMBA Class B and for IMPBA Class D events. After watching several examples of this engine used in both monoplane and hydroplane applications for the last three weekends, I have come to the conclusion that this engine may be the most powerful out-of-the-box engine in its class. To say that I am pleased with the motor is an understatement.

The motor has very good workmanship throughout and comes complete with water cooled head, flywheel, and a unique, hexagonal drive universal joint. An excellent dual needle-valve carburetor is supplied which really works well. The only thing you will have to buy extra is a pipe and a water cooled exhaust header. The exhaust header supplied is not really long enough to securely fasten the pipe connector. I do not intend to do a complete engine review here, but will only touch on the highlights of the motor's design.

The layout of the motor is typical of most of the rear exhaust, rear rotor, Schnuerle ported racing engines on the market today. The combustion chamber volume and deck clearance were designed with high nitro fuel usage in mind. We just poured 60% nitro fuel to the motor and once the carburetor needles were set correctly, no excessive plug damage was noticed. The engine has what looks to be a very strong bar stock rod that is bushed at both ends and has nice large oil holes that are chamfered to force lubrication to these critical spots. The wrist pin is also heavy duty. The motor should have an excellent long lifetime since it uses OS's special low-friction plating for the ABC piston and liner set-up. The piston and sleeve fit is slightly tight at the top and, at least in the motors I have seen, has a very good seal. The piston skirt has its diameter relieved below the wrist pin and the piston has a bypass port notch. The backplate assembly has a very good seal which is important for good power development. All in all, this motor will, no doubt, be the one to beat next racing season. The best news of all is the modest $150.00 list price of this engine.

• •

The majority of questions I have received lately have to do with propeller selection. Many boaters have realized that the propeller system is the only thing that transforms engine horsepower into propulsive work. If you have more power than your competition but cannot efficiently transform it into thrust, you will be at a disadvantage. For the purpose of this discussion I will assume that the drive line is as frictionless as possible and that your hull and underwater hardware are as clean as you can make them. If the hull riding trim is proper and if you have a fixed engine, the speed capability of your boat will be determined by the propeller you select.

Boat maximum speed occurs when the thrust of the prop equals the drag of the boat. At this condition the boat does not accelerate but travels at a constant speed. Below this maximum speed the excess thrust (thrust minus drag) accelerates the boat. The shape of the thrust versus velocity curve of a propeller is determined primarily by the prop diameter, blade area, and pitch. Propellers produce thrust by accelerating a quantity of water with respect to the boat through a circle formed by the blade tips. Enlarging the rate of flow through the prop disc increases the thrust. Therefore, increases in blade diameter, blade area, and pitch, results in an increase in thrust. Engine torque available must also match propeller torque required at the operating rpm condition. This requirement limits the blade diameter, area and pitch that can be used on a particular boat. Figure 1 shows typical propeller thrust characteristics for a given engine power output for three different cases.

The first case shows a large diameter, low pitch propeller and the second case represents a smaller but higher pitch propeller. This example shows that large, low pitch propellers produce more thrust at low speeds and, therefore, accelerate the boat faster. Smaller diameter, higher pitch props do not develop as large an excess thrust at low speeds but generate more thrust at a higher speed. As a result the boat maximum speed of case two (V_2) is larger than that of case one (V_1). Case three shows what happens if blade diameter is reduced too far in order to increase propeller pitch. In this case the prop thrust curve intersects the drag curve at a speed lower than the previous cases. You can now see that the best maximum speed can be achieved only by carefully adjusting propeller characteristics.

Now that we have established that propeller thrust is of major importance in propeller selection, I am also forced to admit that there is almost no way we can easily predict thrust characteristics of

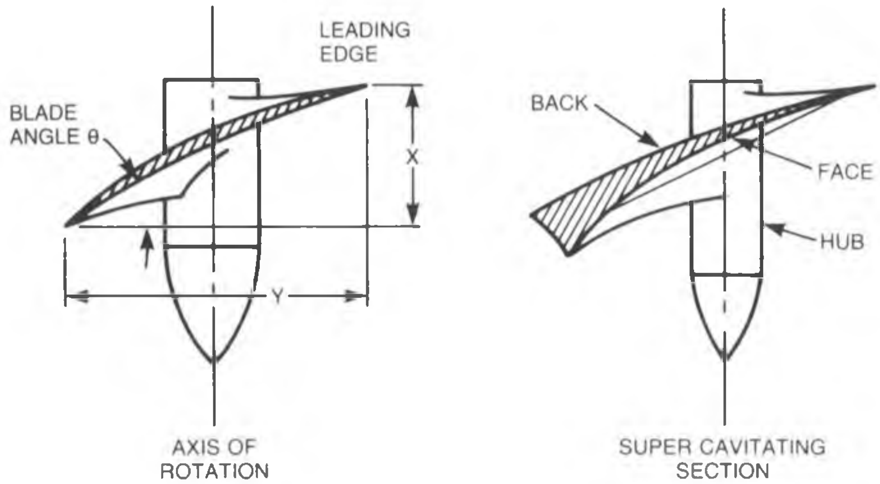


FIGURE 2

marine props and, further, that the estimation of hull and underwater drag of model boats is very difficult. We are lucky, however, because a relatively simple analogy can lead to very good propeller selection results.

The marine propeller may be considered as a screw. In fact, it is not! Propeller blades are low aspect ratio rotary wings operating in an incompressible liquid medium. Thrust is developed by hydrodynamic lift generated by the foil section much the same as an aircraft wing does in air. For this reason the best propeller blade section for low speed and rpm conditions is a thin cambered shape with sharp leading and trailing edges as shown in Figure 2. This is why the thin stainless steel blades used by Dee Hughey's Dial-A-Prop system works so well. A considerable increase in performance can be accomplished just by sharpening and thinning a cast propeller blade. If the thinning is taken to excess, however, the blade may bend or may be thrown from the hub.

As speed and rpm is increased the low pressure region generated on the back of the blade can reach pressures equal to the vapor pressure of water. When this occurs bubbles of water vapor form along the blade surface and a cavity of gas disrupts the smooth flow of water over the blade section. This turbulent area produces a loss of thrust and since the gas cavity offers little resistance to rotation, the prop speeds up and loses "bite." This condition is cavitation.

Propellers can be designed to operate under cavitating conditions by using a super cavitating blade section. These sections try to produce a stable cavity pattern by using a cambered wedge shaped section. Such sections have smooth flow patterns over the blade face and back and have a gas cavity only at the blunt trailing edge of the section. This flow pattern is necessary if good thrust is to be produced. In general, small diameter, high revving propellers suffer from cavitation. These are exactly the conditions that we encounter in model power boating. In addition, operating a high pitch propeller partially submerged results in conditions that lead to cavitation. Efficient surface operation of props usually requires super cavitating prop sections. Propeller efficiency is lower than a submerged prop under these conditions but, since prop drag decreases, a larger diameter and pitch may be turned by the power available. In this way a higher boat speed may result. Cavitation can be stopped by selecting a different propeller or by lowering the operating rpm of the prop. Cavitation also occurs when rudders are used at high angles of attack. The wedge section rudder reduces this cavitation and results in more turning force because the flow pattern is more stable.

Now that we have a better feeling for what a propeller really is, we will return to the screw analogy. Let us, for the purposes of discussion, assume that a propeller "screws" its way through the water as if the fluid were solid. The distance that the screw advances every complete revolution is called the geometric pitch of the prop. The geometric pitch (P) can be calculated from the blade angle (Θ) with respect to the axis of rotation by:

$$P = 2\pi R \tan \Theta \qquad (1)$$

where R is the propeller radius at which the angle is measured. Notice that as the radius R is decreased, the angle Θ must increase to keep the pitch constant. This is why propeller blades appear twisted with higher angles at the hub than at the tip section. Pitch also can be determined by the distance measurements X and Y as shown in Figure 2 by:

$$P = \frac{2\pi RX}{Y} \qquad (2)$$

This later relationship is used by the pitch gauges sold by Dee Hughey and Steve Muck. The pitch of a propeller blade may vary along the blade radius. For reasons that we won't go into here, the standard distance from the hub centerline that is used to determine the average pitch is at 7/10 of the propeller radius. In this case the average pitch may be calculated as:

$$P_{ave} = 4.4D\,(X/Y)\;R = 7/10 \qquad (3)$$

where D is the propeller diameter.

The maximum speed attainable for the screw propeller can then be calculated by using the rate of rotation:

$$V\ max\ mph = \frac{RPM \times P\ (inches)}{1056} \qquad (4)$$

This maximum speed can never be attained because in fact the propeller slips since it is operating in a fluid medium. In terms of the percentage slip (S) the actual speed (V) is related to the theoretical maximum speed (^{V}max) by:

$$V = {}^{V}max\,(1 - S/100) \qquad (5)$$

so that a 20% slippage results in an actual speed that is 80% of the ideal maximum speed. Notice that the boat speed may be determined by just knowing propeller pitch and the operating rpm if an estimate of slippage can be determined. It has been found that for reasonable propeller-boat combinations, the slippage is between 15% and 20%. My own experiments at record trials indicate that monoplane hulls with submerged propellers have a slippage of 20%. Lightweight hydros with surfacing props may have slippage values as low as 10%. As a result we may conservatively estimate maximum boat speed by using the 20% slippage value. You can estimate boat speed within 2 or 3 mph using this method.

Hughey Boats sells a handy plastic speed card which uses the above equations to estimate boat speed in terms of prop pitch and engine rpm. If you would like a handy list of the Octura, J.G., and Hughey propellers in production and their pitches, drop the good people at The Pipeline (Box 1868, Fremont, California 94538) a self-addressed, stamped envelope and they will send it to you. The measurement of engine rpm is easily accomplished by using an audio tachometer. I have found that few people can accurately estimate rpm by ear only. The audio tach emits a tone which is matched to the engine pitch. The resulting reading accurately measures engine rpm at the operating condition.

As an example of the use of these relationships, let us consider the case of a 46 powered deep vee hull. Let's assume that we have tried a JG I-27 prop on the boat and have determined that the rpm is 22,000. Since the I-27 has 2.75" of pitch and ideal maximum speed can be calculated as 57.3 mph. Using a 20% slippage value the predicted actual boat speed would be 45.8 mph.

By testing various props and noting the operating rpm, we can determine the prop that results in the best speed. It is also interesting to use the speed equation to predict the relative importance of increases in rpm at constant pitch and of increases in pitch at constant rpm. If we assume that propeller pitch is constant, the speed

to page 144

RADIO SPECTRUM

Jim Oddino

It is the time of the year when I get in an experimental mode, hoping to establish what I'm going to use for next year's contest season. I had a fairly decent 1980, in spite of very little practice, probably due to the fact that I used the same tried and proven airplane (Curare), engine (Rossi) and radio (Kraft FM) that I had used the year before. About the only change I introduced was a six ohm motor in my aileron servo. I can't really say that it had any effect on my flying, so you might conclude that sticking with what you have, and making no changes is the best way to improve your performance. I believe this is true up to a point. I think you finally need to make a change just to get your enthusiasm back. You always hope that some miracle will occur when you change airplane, engine or radio and that you will overnight be ready to challenge Wolfgang Matt, Prettner, Brown, et al. The truth is, if you change something you will probably take a step backward before you go forward, but hopefully, you will eventually attain a higher level. Let's hope so.

So what have I been doing? First I built a new transmitter. I started with a set of Proline custom competition gimbals with precision instrument pots. The mechanism in these gimbals assures a perfect return to neutral and the design is such that there is no friction or slop. If they have a problem, it is the fact that they are too soft if that is the right word. I've shortened the springs so that it takes a little more force to deflect them, but they are still not very stiff.

For electronics, I have a separate RF board, AM for now, that can be changed at the field if desired. I plan to have an interchangeable FM board. The encoder is on a separate board and uses the Signetics NE 5044 integrated circuit. I've added operational amplifiers between the control pots and the 5044 to facilitate summing, mixing, and all the trick things one might want to do. I did a lot of thinking about this and still don't know if it is worth it. The Ace Silver Seven circuit uses resistor summing, similar to the Royal Omega, but without the OP amp and does the job very well.

The NE 5044 is really a neat device but it is sensitive to RF so one has to be very careful laying out the circuit and providing adequate filtering and bypassing. My criteria is to be able to handle the transmitter, take the back off, probe with the oscilliscope, etc., without having the pulse lengths change by more than a microsecond or two. This wasn't easy, but I seem to have done it. To measure this you need to get out your RCM Digital Pulse Meter and add another digit to it. This is pretty easy to do as I'll explain later. I've only had a few flights on this transmitter and so far so good. We'll keep you posted.

While breaking in the new transmitter, I decided to kill two birds (not airplanes) with one stone. I'm currently testing a YS .60 rear exhaust engine. The only airplane I had that I could fit it in was a Stilleto built by Daryle Bergstrom a few years ago. We had collaborated on the design and built two airplanes. I wrecked mine and he repainted his and it got very heavy, over nine pounds, which was too much for the Veco .61's we flew in those days. So the plane had been in storage for about four years.

When I started playing with the YS I was almost ready to give up. It has a pressure system and carb that is different than anything else I've ever seen, so it takes getting used to. I even had the carb apart one night and convinced myself it would never work. But with a lot of persistence, and hoping for that miracle, I kept at it. The results are fairly spectacular. That Stilleto that must be over 10 pounds with the YS and tuned pipe flys straight up until I get scared. (The eyes ain't what they used to be.) The jury hasn't returned yet on the YS, but it is looking good. The real question is whether it will be consistent and reliable because if you want to challenge the big boys, you need to do the same thing everytime you go out, with no surprises; no trim changes, no poor engine runs. Then all it takes is practice.

Digital Pulse Meter Modification

When I first saw the Digital Pulse Meter, I believe at one of the trade shows, I fell in love with it. Ken Jesser sent me one to evaluate prior to its publication in RCM and my only negative comment was that he didn't add the last digit so you could measure down to the last microsecond. Ken's response was that most systems had pulse jitter that makes it impossible to read the last microsecond. If my system would jitter more than one or two microseconds I would think about a better one. However, on all of the systems I've tested I've had no trouble reading the last digit.

It turns out the circuitry to expand the meter is already included in the 74C926 so that all you need to add is one transistor and one LED display. I had to put it in a bigger box in order to put the added digit to the right of the existing digits. This meant I had to make a new ruby window, but, all in all, the mod was very inexpensive. The addition to the circuit is shown in Figure 1.

The seven segments are wired in parallel with the other digits. You don't have to break any PC board leads as Figure 1 might indicate. Just jumper from the existing LED's over to the new one. I used magnet wire which is insulated so you can jumper without worrying about shorts.

If you didn't see the original article in RCM, look it up in the September 1979 issue. If you really want to evaluate your

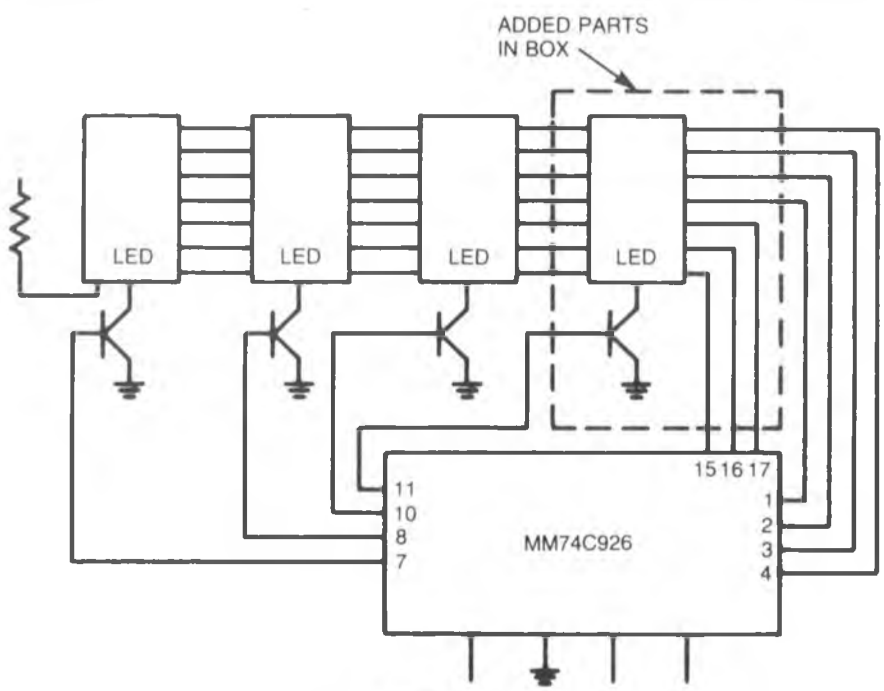


FIGURE 1

transmitter this is an excellent piece of test equipment. You can see how stable it is, how well the sticks return to neutral and a host of other things such as linearity and throw measurements. If you've got a plane all trimmed out and want to use the transmitter for another plane, you can measure all the neutrals, throws, push button settings, rate settings and so on, and when you get ready to go back to the original plane, you can adjust everything back just the way it was. I'm sure everyone with one of these new-fangled transmitters can see the usefulness.

Battery Cyclers

I still get a lot of letters asking about Flite-Life and Super Cycle battery cyclers. The following is typical.

Dear Jim;

A couple years ago Electrostar Systems, Inc., of 116 Toledo Street, Farmingdale, New Jersey, manufactured the "Super Cycle."

This instrument cycled the transmitter and receiver nicads and had separate dials for the transmitter and the receiver to show how much juice was left in the nicads before the Super Cycle recharged.

I'm interested in obtaining their Super Cycle, but calling them by phone (the number has been assigned to someone else) and mail (letter returned marked "Forwarding Address Expired.")

Do you know where they went? --- or do you know of any other manufacturer of a re-cycling charger?

Sincerely
Bill Daniels
Escanaba, Michigan

As far as I know the Flite-Life and Super Cycle were both manufactured by the same outfit at the same address although they had different company names. In both cases, they sold a bunch of units and then disappeared.

The cycler I use is the Digipace by Ace. It used a digital readout instead of the Electro-mechanical clocks. It also can handle transmitters with 12 volt and 6 volt batteries as well as the standard 9.6 volt units. On the receiver side you can charge at either 50 ma or 20 ma. One other feature I recently "discovered" (it was probably explained in the instructions) is the fact that if you are testing 500 ma-hr batteries, the readout in minutes is also the capacity of the batteries expressed as a percentage of the nominal capacity. If the batteries last 66 minutes on the discharge, they had 66% of their original capacity.

$$66 \text{ min.} \times \frac{1 \text{ hr}}{60 \text{ min.}} = 1.1 \text{ hrs.}$$

1.1 hrs. x 300 ma (discharge current) = 330 ma-hr

$$\frac{330 \text{ ma-hr}}{500 \text{ ma-hr}} = 66\%$$

I might add that the current is regulated in the Ace Digipace instead of the usual load resistor.

Another battery cycler on the market, which is more similar to the Super Cycle, is the L.R. Taylor Power Pacer. So take your pick and pay your money.

Operating 60 Hz Chargers on 50 Hz

Dear Jim,

I enjoy your column every month. The time and effort required is very evident. In that same line of thought, if the questions I have turn out to be too involved or time consuming, please say so.

(1) My power source is 100 volt, 50 cycle. I have no alternative to this so I have to live with it. My rechargers are designed for 110/120 volt, 60 cycle power; a Cannon dual charger and a Taylor Power Pacer. My nicad packs are all GE cells; 100 mah, 250 mah, and 450 mah. I follow the instructions provided by Cannon and Taylor and use Cannon's charge limiter when recharging the 100 mah packs. No problems to date. What is the actual effect of the 100 volt, 50 cycle power from the battery-eye view? Should I do anything to compensate?

(2) I am not really satisfied with the Taylor Power Pacer for my application, since I work mainly with the smaller batteries (100 and 250 mah). If it is feasible, I would like to modify the Power Pacer to include the following features:

(a) Automatic step-down to trickle charge when the batteries are fully charged.

(b) Variable charging current.

(c) Charge current meter.

(d) Current limiter to allow cycling of 100 mah packs.

If possible, I would like to have your opinion of the above mods and a brief how-to-do-it. I have built a lot of electronic kits, including a Heathkit TV, but I don't pretend to understand what I did (but it worked). I am capable of using basic measuring instruments such as a multimeter. Electronic parts are hard to get over here (hard to believe, but true), so I would also appreciate it if you could name a source for me.

As I look back over this letter, I think I may have overstayed my welcome. If you have time for any of my questions, it will be much appreciated.

Sincerely,
Jack R. Stephens
Camp Zama, Japan

It is hard to say what effect the 100 volt 50 Hz has without knowing what the circuit looks like. The Ace Digipace has constant charge current regulators as well as the constant discharge regulators, but I can't say what Cannon or the Power Pacer does. The 50 Hz will definitely affect the clocks on the Power Pacer so you must mentally compensate. Multiply the measured time by:

$$\frac{60}{50} \text{ or } 1.2$$

I don't think there is any good way of switching to trickle automatically unless you had some kind of a timed charge and then switched at a precise time.

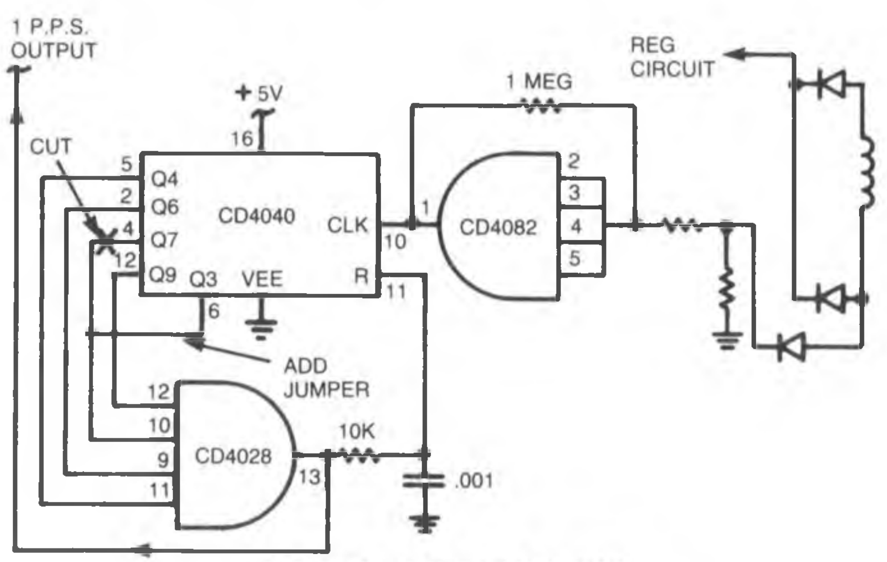
I would suggest a switchable charging current for the different size cells, but again, without schematics I can't tell you how to modify your equipment. You could try putting resistors in series with the batteries until you got the proper current.

In the cycler, the current flows both directions so you would want a center reading meter that could deflect both ways. I don't know if there is anything like this available at a reasonable cost.

Let's hear the answers to some of these questions from our readers with Cannon equipment and Taylor Power Pacers like the following one on the Digipace.

Dear Jim Oddino:

I had purchased the new Digipace from Ace last month and threw it together in one long evening. When I fired it up it worked fine the first time. However, it quickly dawned on me that the clock time base was



DIGIPACE SCHEMATIC MOD

tapping off of the AC line signal and being overseas this suddenly presented a problem — the clock was 17% slow (50 vs 60 CPS!)

The circuit is somewhat inaccurate even on 60 Hz because it employs a CD 4040 Binary Ripple Counter as the sole means of getting 1 PPS, and the tap off of certain outputs **doesn't quite** *hit 60, etc.*

I have examined the chip and have made 2 minor changes that now allows all of us Digipace owners to operate overseas on 50 Hz with a properly counting clock! Actually, there is just one plating cut on the P.C.B. and one jumper wire added.

I wrote to Tom Runge at Ace on my idea. He wrote me back in thanks, for he had many requests for such a modification and didn't know what to tell them!

Like many of us in the service, we find our assigments taking us back and forth overseas. For this reason, it might even be a good idea to install a DPDT, one side to make and the other to break (the jumper). Anyway, I'd appreciate putting some of this in your columns for the benefit of many!

Sincerely,
Frank Miller

Kraft Dual Rate Modification Addition

Dear Mr. Oddino;

I have just completed the installation of the dual rate aileron and elevator circuits you have published in your columns. I am very satisfied with the elevator circuit as it works just as advertised. It is very easy to install and is just what the doctor ordered for a budding pattern flier who demands that his trim does not change when going from high to low rate. The same circuit, if installed by a professional would have cost me from forty to fifty dollars. The total cost was less than five dollars at my neighborhood Radio Shack and a half hour of time. Thanks!

Now for the bad news. After having installed the elevator dual rate circuit in my Kraft series 79 7-channel transmitter and having verified that all was working correctly, I proceeded to install the dual rate circuit for aileron. Things did not work out as expected.

First I must say that electrically, things are as they should be. At least they are as far as two friends who have checked my wiring and myself can tell. There is one area where I do have a little apprehension though. In your board layout sketch (May 1980, RCM), it appears as though both ends of R32 are connected to the encoder circuit board and that you have indicated that an orange wire with a white stripe is what carries it all back to the wiper connection of the added aileron trim pot. I found, and utilized, the one hole in the PC board for R32 which connects it to R31. I could not find another hole for R32 as shown in the board layout sketch. I did connect the free end of R32 (470K) to the wiper terminal of the added 5K pot as indicated in the schematic. Other than this one deviation from what is shown, everything is the same, and electrically, this should be the same as pictured in the schematic.

The problem is that I have a noticeable jump when switching rates on aileron. The added 5K pot acts as a centering device for both high and low rate switch positions. That is to say that when I fired the transmitter up for the first time, both high and low rate neutrals were off center. The added 5K pot brought these close to center again but would not eliminate the offset of three to four degrees between the two rate switch positions. Also the trim is affected by the rate switch which is what this circuit was supposed to eliminate.

I would appreciate receiving your thoughts concerning this problem. I am in somewhat of a bind. I can't seem to figure out the problem and I don't have the nerve to send it to a technician to get it all sorted out. It's my mess and I'll fix it. I will admit that I occasionally cast a suspicious eye at the aileron trim pot (added) and I wonder why it isn't switched out of the circuit on high rate. I would like to find a suitable dual rate circuit for the elevator function of my Kraft KP-5T series 79 transmitter. I haven't seen anything published concerning this.

Now for the flowers. I thoroughly enjoy your column and it is the first thing I search for when I receive my latest copy of RCM. I find that I agree with you most of the time especially when you say that a servo can't be too fast or that more emphasis should be placed on the human engineering aspect of our transmitters. The one area in which we differ is concerning the use of pre-programmed maneuvers. Why not just forget the airplanes altogether and have contests in which a computer decides who has written the best program for an aerobatic performance? Just think, no messy, oily airplanes, nothing to build and it could all be done indoors in front of a CRT without worrying about the weather or equipment. You could even have contests by mail or phone! Nope, that's not for me. I believe it's all in the thumbs even if mine leave quite a lot to be desired! Of course it's possible that I've missed the point of your comments altogether. Maybe you could elaborate a bit further concerning this subject in your column? (Something tells me I've just invented a new electronic game!)

Thanks for the many hours of enjoyable reading you have provided.

Sincerely yours,
Ed Cregger
Pennsville, New Jersey

When I read this letter I couldn't wait to pull out the magazine (May 1980) to see if I really could have left out one very important step and sure enough I did. To make the circuit work right you must have the aileron control pot and trim pot at the electrical center, when the stick and lever are at neutral! The aileron pot was originally set up this way at the factory but probably got moved when installing the new trim pot, although it wasn't mentioned if the old trim lever was removed or not. Anyway, pot must be recentered. The best way to set the pot in the center is to measure the voltage between the pot wiper and the junction of R1 and R2 on the circuit board. You should have zero volts when everything is right. You will need to loosen the set screw on the pot shaft to make the adjustment. The right spot on the board can be found near the 1458 OP amp IC as shown in Figure 2.

Well I think I'll quit and save some letters for next month. I'm starting to get caught up on the mail which has fallen off lately. Even if you don't have questions, drop us a line and give us your likes and dislikes. We might be able to influence the radios of the future. □

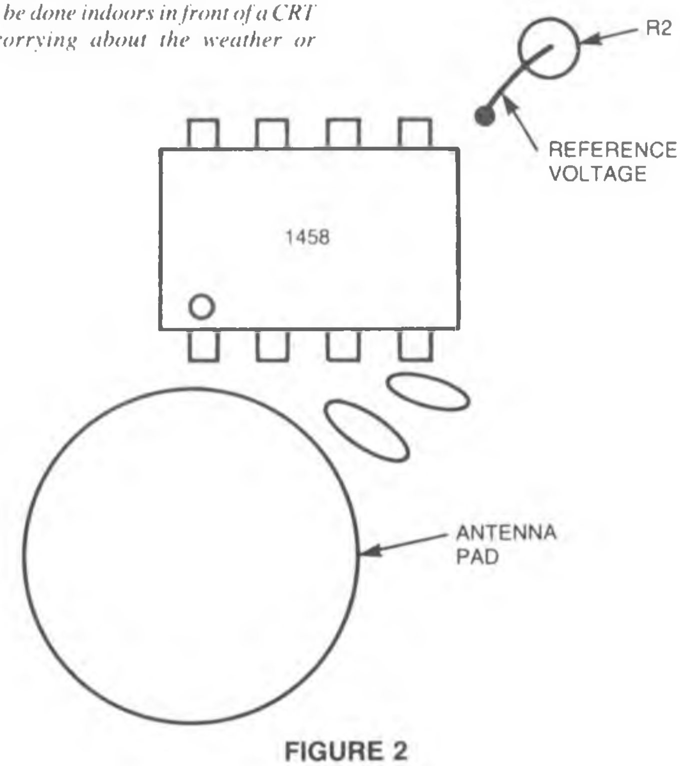
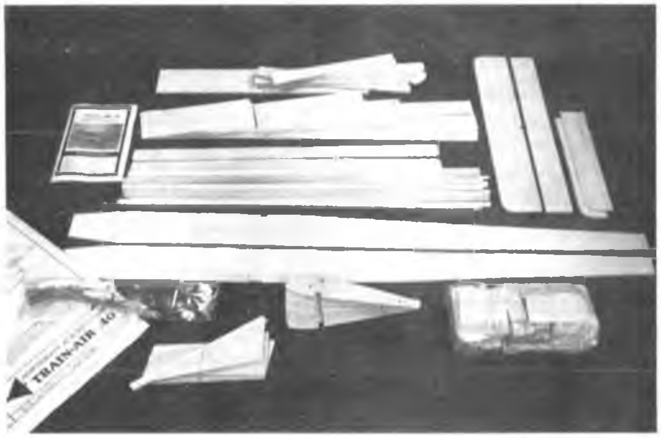


FIGURE 2

RCM PRODUCT REVIEW

Northeast Aerodynamics TRAIN-AIR .40



SPECIFICATIONS

Name	TRAIN-AIR .40
Aircraft Type	Trainer/Sport
Manufactured By	Northeast Aerodynamics 568 Main Street Haverhill, Massachusetts 01830
Mfg. Suggested Retail Price	$58.95
Available From	Both Mfg. and Retail
Wing Span	58 Inches
Wing Chord	10.8 Inches
Total Wing Area	625 Square Inches
Fuselage Length	42 + Inches
Stabilizer Span	18 Inches
Total Stab Area	144 Square Inches
Mfg. Rec. Engine Range	Non-Schnuerle .40
Recommended Fuel Tank Size	8 Ounce
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Balsa
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (16 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Futaba 6 channel
Engine Make & Displacement	K & B .40 w/muffler
Tank Size Used	8 Ounce
Weight, Ready to Fly	77 Ounces
Wing Loading	17.7 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

Detailed instructions, quality and fit of parts, ease of assembly, flight characteristics.

WE DIDN'T LIKE THE:

Aileron horn solder sequence, small wing bolts, difficulty in identifying small parts.

The dictionary defines trainer as a contrivance or apparatus used in learning a skill. It is also a word used to describe a wide range of airplanes, so it was with interest that we looked at the Train-Air .40 by Northeast Aerodynamics of 568 Main Street, Haverhill, Massachuetts 01830. The manufacturer states that this is an aircraft capable of basic training, general sport, and aerobatic flying. Quite a tall order but a check of the specifications shows that they are on the right track, a large wing (625 sq. in.) with a semi-symmetrical airfoil, relatively long moment arms, and generous tail surfaces.

The Train-Air arrives in a box measuring 44" x 9" x 3½", and on opening it we immediately checked to see if everything was included. There is quite a bit of extra room, but our examination provided reassurance. Virtually every piece is cut to size with the small wood parts neatly bagged and tucked in one corner. The hardware package, including pre-bent landing gear, hinges, control horns, and assorted nuts and bolts, is in another corner. The excess room is occupied by crumpled paper to keep things in place.

Construction:

Construction information is provided on two plan sheets each 24" x 48" and a 16 page instruction booklet that is one of the best we've seen, with more than 30 construction photos. It was definitely written to help the new builder and gives information from building boards to radio installation. Wood quality is consistently good and the parts-fit, both to each other and to the plans, can only be described as excellent.

We followed the recommended sequence and built the wings first. The ribs are all identical with a flat portion on the bottom from the spar to the trailing edge to allow building directly on the board without the need for spacers or blocks. The ribs are also drilled for use with a wing jig if desired. We elected to build on the plans and encountered no problems. Actual construction of the wing is covered by 31 step-by-step instructions complete with check off blocks. Both panels are shown so the complete wing may be built without delay. White glue is recommended, however, we chose to use Carl Goldberg's Super Jet instant glue as we've done on several other projects. The center section joint was done with Devcon epoxy and reinforced with 6 oz. glass cloth. We used 30 minute epoxy, thinned to a paintable consistency with acetone, to attach the fiberglass. This method has worked well on many models and there is no glue compatibility problem.

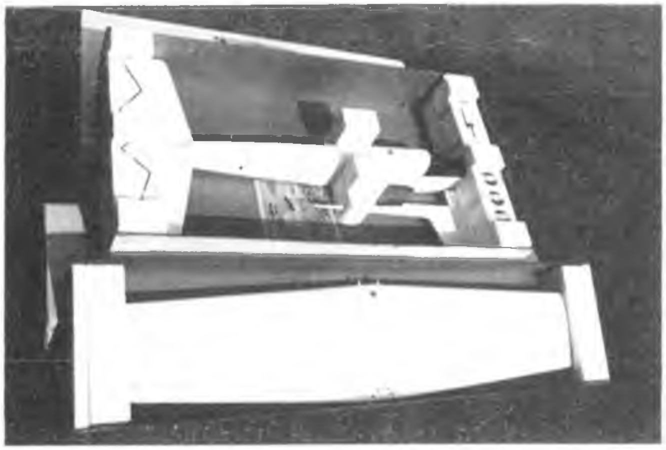
One change in the building sequence is suggested. The instructions call for soldering the brass aileron horns on the torque rods when the radio is being installed. We strongly recommend that this be done before the torque rods are installed in the wing. The use of a hot iron or torch this close to the highly flammable balsa invites a fire or at least damage to the finished wing.

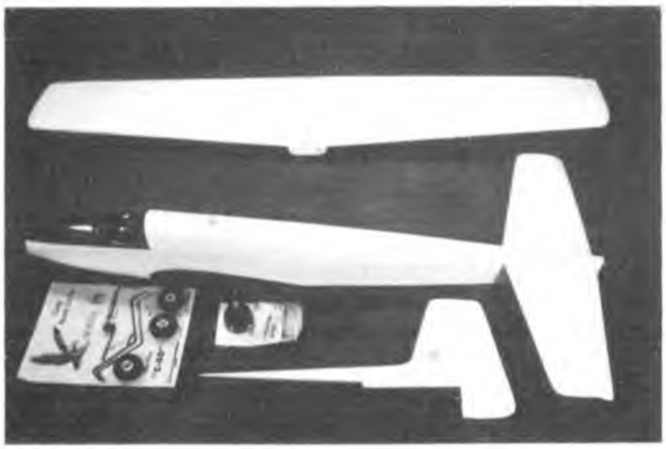
The fuselage is well engineered with the sides notched for the bulkheads insuring accurate placement. An option is offered on the fuel tank hatch for either a fixed or removable hatch. We encountered a bit of difficulty at this point in identifying which of the hatch parts went where but the parts are cut to shape and a little fiddling got everything in its place. We elected to use the fixed hatch since there is ample room to install the Sullivan SS-8 tank and battery through the wing opening. As designed, the nose gear is

to page 138

RCM PRODUCT REVIEW

Continental RPV's C-40





SPECIFICATIONS

Name	C-40
Aircraft Type	Sport Pattern Trainer
Manufactured By	Continental RPV's 1050 Marchetta Lane Pebble Beach, California 93953
Mfg. Suggested Retail Price	$179.00
Available From	Direct From Mfg.
Wing Span	52 Inches
Wing Chord	9¼" Average
Total Wing Area	481 Square Inches
Fuselage Length	48 Inches
Stabilizer Span	23 Inches
Total Stab Area	121 Square Inches
Mfg. Rec. Engine Range	.40
Recommended Fuel Tank Size	8 Ounce
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Ail., Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (1 page)
Construction Photos	No

RCM PROTOTYPE

Radio Used	Airtronics
Engine Make & Displacement	K & B .40 w Muffler and C B Spinner
Tank Size Used	8 Ounce
Weight, Ready to Fly	74 Ounces
Wing Loading	22 Oz. Sq. Ft.

SUMMARY

WE LIKED THE:

Quality of the workmanship, completeness of accessories, ease of getting model ready to fly and the flying characteristics.

WE DIDN'T LIKE THE:

Lack of good instructions — Kit now has additional sheet of sketches added.

Over the past years we've had the pleasure of opening up and digging into a goodly number of kits in all sizes. For the most part they have all been satisfactory, some better than others. When we opened up the two boxes that held the "Truly Ready to Fly" C-40, we knew that we had one of the better ones. We could probably take up the entire review just describing the packaging on the C-40.

When you realize that the entire plane is built up of balsa and ply (no foam), you can well imagine that the packing must be done very well indeed - - - and it is!

As mentioned above, the plane is shipped in two boxes. The 7" x 25" x 44" carton held the fuselage, with the stab already mounted and dual clevis pushrod installed. The rudder, wheels, main and nose gear were stowed away in individual foam recesses. C B spinner, along with the necessary wheel collars, clevises, and other small parts, are stapled to the side of the box. The 4" x 14" x 55½" carton contained the completed wing, held in block foam saddles.

CONSTRUCTION

As Continental RPV's advertisement states, the C-40 has very little left ot get it ready to become airborne. The landing gear was installed first by just cutting out the MonoKote where you can see the mounting block. Drill holes for the retainer clip screws; push gear into place and screw two clips on each gear leg. Cover over with a piece of white MonoKote and slip the wheels onto the axles using the furnished wheel collars.

The rudder was to be installed next. We discovered the pre-installed hinges were slightly off-center which could cause some misalignment. Before the epoxy was mixed, we phoned Continental and informed them of the problem and a new rudder and fin was received in a few days; the manufacturer has since corrected this operation at their plant. The rudder pushrod was already in place.

The nosegear installation is very standard and requires only drilling or cutting a small hole through the bottom portion of the nose block. The main hole for the coil spring is already cut out. The steering arm is already attached to the pushrod. After installing our

to page 135

SCALE VIEWS

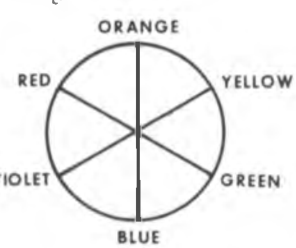
Claude McCullough

Pilot Roundup — II

As promised, here is the second edition of our survey of all available pilot figures --- leading off with Dave Platt's 1/5 scale fighter jockey. You need only look at the startling realistic face to see what an exceptionally well done work of art it is. Made by a hand lay-up process in 5 separate molds from Micro-Lite auto body filler putty, Dave recommends it be assembled and filled with a mixture of micro-balloons and fiberglass resin. That nice touch in the photo of a flexible oxygen mask tube isn't one of the parts but is easy to come by. It consists of 4 or 5 "concertina" sections from elbow-type soda straws, slipped over a piece of fuel tubing. Other extras needed are a few bits of RC hookup wire for the intercom leads and a piece of tubing for the control stick. The grip for the stick is part of the hand molding.

Note how the fine details --- individually painted eyebrow hairs, shadow under the brow, accent lines around harness, restrained lip color, etc. --- enhance the effect.

Included with the figure is a painting instruction booklet. The comments he makes gives new insight into how proper use of colors can avoid the cheap doll look seen in so many RC scales. They get that look from parts that are painted in stark, unshaded, unmuted, straight out-of-the-bottle colors. The use of just one shade, say "flesh" on a face, gives poor results. Take a look at an oil portrait of a face and see how many subtle shadings are blended together. The same thing goes for clothing.



COLOR WHEEL

Dave has a simple color wheel drawing to illustrate this point and says; "Theoretically all colors may be produced from the three basic colors --- red, yellow and blue. Violet, orange and green are produced by mixes of the three basics, and so on. But what concerns us is that in order to dull a color, to use it for shadowing, we mix a touch of the color opposite it on the color wheel. When, for example, a hint of green is added to the predominately reddish tint of the face, the result is a duller tone useful for shadowing areas such as under the brow ridge and beneath the nose and chin. To shadow a blue shirt, mix in a touch of orange; conversely an orange shirt would need a touch of blue, and so on. When you have a brown (helmet, etc.), a dab of dark blue will often give the desired shadow tone. It is important to experiment to achieve the best color note. If you add blue to your brown and it seems too green, the color wheel will indicate you need to head in the direction of red so a drop or two of red is probably the solution."

Please note that Dave is not talking about shadowing a blue shirt with orange, etc., but with making a slightly different shade of blue by mixing in the dab of orange in the primary blue shirt color and then using this slightly different shade of blue in the shadow areas.

He feels that use of out-of-the-bottle black should be avoided as too harsh and stark. Instead, a "black" should be mixed from a combination of other dark colors. A few of the other good suggestions from the booklet: Use a magnifying device. Buy quality brushes, using #0 and #00 for fine detail. Military miniature paints such as Floquil are good or use flat plastic model enamels. Avoid gloss finishes. Give the entire pilot (or at very least, the face) a base coat of flat white first. Dave goes on to very detailed directions for face and eye coloring. The booklet is furnished with the pilot figure, which is available direct from Dave Platt at 6940 N.W. 15th St., Plantation, Florida 33313, for $20.00.

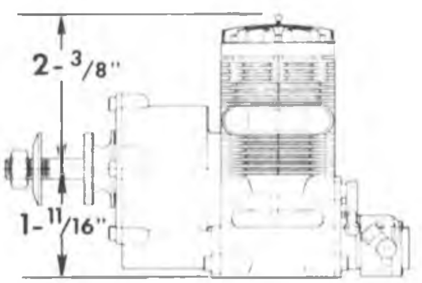
The same sculptor who made the pattern for the 1/5 scale pilot is working on a 1/4 scale military bust and a 1/4 scale civilian full figure and these will be available soon. We'll have photos and information in Pilot Roundup — III in Scale Views sometime soon. Which reminds me to ask any manufacturer of pilots who haven't been covered here, please send in photos and information. If you don't have photos, I'll take them if you send the pilot.

Circus Hobbies (1241 E. Glendale Ave., Sparks, Nevada 89431) is importing and distributing the I.M. Products line from Japan and included are two pilot figures. They are molded from a white flexible plastic and are well detailed. The smaller pilot would be about 7" tall if he were standing, weighs slightly more than an ounce. The larger one is 9" tall, which would be 1½" scale, and is just over 2 ounces. They are completely assembled except for the legs. I couldn't get cyanoacrylate super-type glue to bite into the plastic but silicone bathtub seal, such as Devcon or G.E., worked fine. The IM 10131 Pilot Figure "M" is $5.45 and the IM 10130 Pilot Figure "L" is $5.95.

Available from dealers serviced by Circus Hobbies' distributors.

Engines For Scale

The new Webra 1026-RCG Speed 61R with built-in gear reduction unit is just the ticket for swinging a more efficient, large diameter prop that will clear a big cowl or pull a 1/4 Scale. But it is also notable for a side feature that solves another common scale model problem. In fitting the gear box, the thrust line of the prop has been raised from the usual position. This makes the height to the top of the glow plug about 7/8" less than it is in the standard ungeared Webra .61R. For a design that has a limited amount of space under the cowl, this compact power plant should do the job without chopping an ugly hole for the head, as might be the case with a standard .60. The prop shaft is also offset to the side about the same amount as it is raised above the engine crankshaft, so the engine head will not be located in the center of the firewall. This will not be an inconvenience in most installations, though with a round cowling a little more diameter might be needed than the actual engine height to accommodate this sideways displacement.



The Webra 1026-RCG 61R will fit inside a small cowling with room to spare.

I believe it was Maynard Hill who said the government had an expensive experimental program some years ago to produce a geared model airplane type engine for target drones and gave up on the project. They should have let the model industry do the job. I have no doubts, looking at the husky steel helical gears and ample bearings of the 1026-RCG, about the durability of the arrangement. It is one of those propositions covered by the adage, "If it looks right, it probably is right." The gear box can be removed and rotated to 3 other positions on the crankcase, providing a variety of layouts for specialized cowling or cooling requirements. Since the engine has been set up at the factory to run opposite the usual direction (so that the geared output comes out right) by rotating the backplate and carb 90 degrees, I see no reason why the backplate could not be rotated back to the standard .61R position, thereby providing a left hand engine for pusher props or for use in a balanced twin engine installation.

The gear ratio is 1.655 to 1 or, to put it another way, the engine turns 48 times for every 29 prop revolutions. With the right diameter and pitch prop, the engine will be running at or near its peak brake horsepower and flying a much larger model than could ever be possible with a standard .60 turning the usual 11" prop, or lugged down with a bigger diameter. A starter will turn the 1026-RCG over okay, but there is an extra load. Hand starting characteristics are excellent; that gear train imparting a smart and snappy flip over, that starts the fire easily. The manufacturer suggests a 16/6 prop, but it will turn 18" diameters also without serious loading down and drop in engine rpm.

Webra geared .61 installed in the nose of a Sig 1/4 Scale Cub. Engine and Semco Pitts muffler fits entirely within the cowl.

Maxey Hester had a radio problem at the Quarter Scale Association of America Fly-In in Las Vegas last October that shot down the Sig 1/4 Scale Clipped Wing Cub he was flying. It was powered by a Webra .90 swinging a 16/4 prop and was a lively performer with this installation, although the engine was not operating near its peak brake horsepower when loaded down with that large a prop. The .90 was inverted so as not to interfere with the scale dummy engine cylinders on the side of the cowling. As with any inverted engine, there were a few inconveniences and occasional slow starts to be tolerated. So, while rebuilding the crack-up, he has mounted a geared .61R as an experiment. This fits entirely under the cowl of the Cub when mounted sideways, getting away from the inversion and not interferring with the dummy engine. In tach tests on the engine he got 9,500 rpm on a 14/6, 8,500 on a 16/5 and 8,200 on a 16/6. The weather has prevented flight tests as yet, but it appears from these figures that performance on the geared .61 will not be all that different from the ungeared .90.

Webra deserves a salute for the engineering investment in this unique piece of machinery so useful to the scale builder. I hope it is a commercial success and that they will be encouraged to proceed with another geared job. How about a .90 next?

Scale Bookshelf

Air Force Colors — Vol. 2. By Dana Bell. 8½" x 11", 96 pages, soft cover. Published by Squadron/Signal Publications, Inc., 1115 Crowley Drive, Carrollton, Texas 75006. Available from aviation book dealers — $7.95.

Inside "Fighters of the World War II" — P-51 cockpit layout and a color 4-view of famed "Miss Velma."

When I reviewed "Air Force Colors — Vol. 1" in the December 1979 Scale Views, I concluded, "Bring on Vol. 2!" No sooner said than now done and well worth waiting for. With 16 pages of full color, including 56 color profiles and 60 color squadron insignias, plus over 200 black and white photos and drawings, with tables showing unit codes, this book is a compact and informative reference on the subject. It is clearly the result of extensive and original research, not just a rehash of previously published material. The popular notion that the U.S. standard color schemes used in WW II were fairly limited in number and variety is thoroughly shot down. And even an expert student of the subject will find some intriguing subjects. Have you ever heard, for example, of "Haze Paint?" Ever see a B-17 that came from the factory part bare metal and part camouflaged? How about a glossy, all-black B-24? Did you know that aircraft in the African campaign were done in the same Corps of Engineer's paints used on tanks and trucks? Just how much speed did removing the paint and returning to natural metal add? What were the Air Force anti-submarine color schemes? The answers to these puzzles are there, and much more. As in Vol. 1, a chart of colors matched to the Federal Standards FS-595a color chip book is included. Vol. 3, covering the period 1945-47, is in the research phase and I'll sign up for a copy right now.

Fighters of World War II — Vol. 1. 8½" x 11", 120 pages, soft cover. Published by Squadron/Signal, available from aviation book dealers — $9.95.

A series of monographs by Aerodata Publications has been published for several years in England that are candidates for the big blank space left in reference sources by the demise of Profile Publications. The 20

to page 126

The original Hercules on its famous flight.

Hercules leaving Pier E drydock for maiden flight, Nov. 2, 1947.

Hercules leaving Pier E drydock, Oct. 29, 1980.

THE HUGHES H4 HERCULES

A BIT OF HISTORY

"I put the sweat of my life into this thing. I have my reputation rolled up in it, and I have stated that if it was a failure I probably will leave this country and never come back, and I mean it."

Howard Robard Hughes
Testimony before the Special Senate Committee investigating the National Defense Program, August 7, 1947.

It may have made the shortest flight since the Wright brothers flew at Kitty Hawk. It cost over $20 million, took five years to design and build, caused a rash of congressional investigations, and was obsolete by the time it was completed.

But it flew!

On November 2, 1947, Howard Hughes took control of his wooden leviathan and, without official clearance, lifted it 70 feet off the surface of Long Beach, California Harbor and flew it for a little over a mile.

In that brief moment he transformed the often-ridiculed "Spruce Goose" into a majestic, if somewhat low-flying, seabird. To this day the Hughes Flying Boat remains one of the most awesome accomplishments in the history of aviation. Like Old Ironsides, the Spirit of St. Louis, and Friendship VII, the unique craft has become a symbol of American ingenuity.

Thirty-three years later this engineering marvel has been saved from destruction by the Aero Club of Southern California and the Wrather Corporation. It will be permanently housed at Long Beach on a site adjacent to the liner Queen Mary, itself a major tourist attraction. A vast exhibit will be erected there to house and display the world-famous machine. Present plans are to have the Hughes Flying Boat on public display by mid-summer 1981. The cost of the move and construction of the exhibit is expected to exceed $12 million.

The rescue of this native American giant is yet another remarkable event in the history of the Spruce Goose. The preservation effort is a unique cooperative venture between a major California company, Wrather Corporation, and a non-profit organization that fosters the advancement of aviation, the Aero Club of Southern California.

On July 28, 1980, the Summa Corporation, then owner of the Hughes Flying Boat, announced it would donate the aircraft to the Aero Club so that the plane could remain intact and available for

John Elliot, pilot, and Darrell Meyer, flight engineer, flew the Hercules replica first flight on Dec. 6, 1980.

viewing by the public. The Aero Club entered into a management agreement with Wrather Corporation, under which Wrather will be responsible for moving the boat, and building and operating the exhibit.

Until this agreement was reached, the only other alternative had been for Summa to disassemble the plane and distribute pieces of it to the Smithsonian Institute and eight other public museums, in compliance with a prior contract with the Smithsonian. This action was not one which Summa wished to take, but it appeared necessary because of expiration of the lease of the present hangar site.

The efforts of the Aero Club and the Wrather Corporation have made possible the continued existence of the Hughes Flying Boat as a single massive piece of historic technology. □

THE SPRUCE GOOSE DOES IT AGAIN

An R/C Model of the Hughes H-4 Hercules

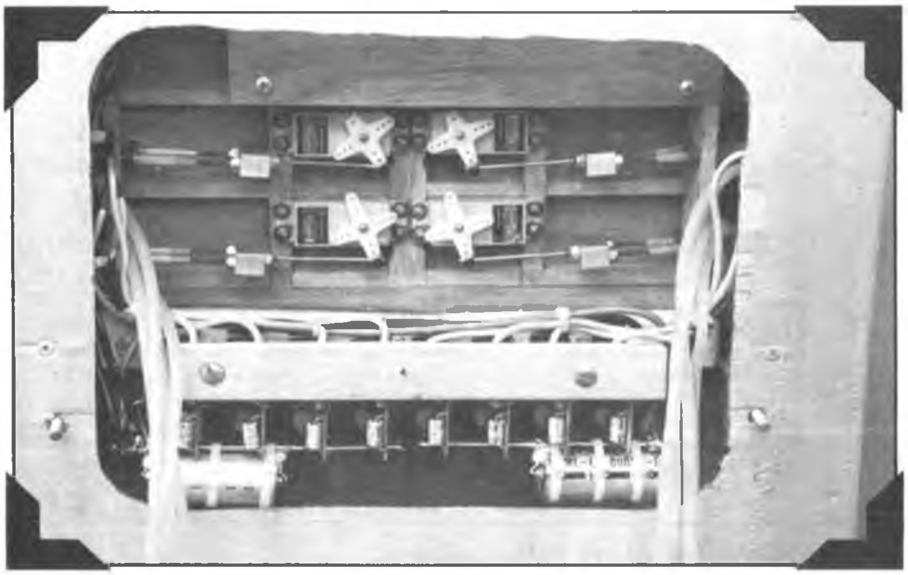
By Dick Tichenor

Wherever he is, Howard Hughes was most certainly showing an enigmatic smile recently. After a few taxi tests, full power was applied which was followed shortly by a lift-off and the Hercules made a one quarter mile flight at about a 20' altitude before a gentle touch-down. It was almost like experiencing a live re-enactment of the film clips of Howard Hughes' historic flight. Approximately 80 spectators screamed, whistled, and applauded as the majestic model taxied back to shore.

For the Meyer brothers, Darrell and Merle, this was the culmination of almost a year of full time effort in designing and building an accurate 1/20 scale, 16' wingspan, 78 pound replica of the Hughes H-4 flying boat, the Hercules. Since that momentous hop on an afternoon in December, 1980, the Hercules has made several successful and thrilling flights but

Team Hercules after first flight: (L to R) Jim Rau, Darrell Meyer, John Elliot, Dave New, Merle Meyer, and Royal Chase.

Full power from eight K & B .61 engines kicks up quite a spray.



Wing center section. Each servo controls two engine throttles. Glow plug driver system and fuel lines for the eight K & B engines are shown.

The Futaba transmitter on the left had been modified for engine operations and transmitter on right was used for flight controls.

none can match the emotional excitement generated by the roar of eight K & B .61 engines raising the flying boat into the sky for the very first time.

Darrell and Merle Meyer, both in their early 40's, built models in their younger years and after raising families and establishing a very successful real estate development business, were bitten by the modeling bug again. Following a couple of years in R/C, flying the usual sport type models, they decided that they should do something spectacular. As they discussed various aircraft possibilities, most of which had already been reproduced in R/C model form, they zeroed-in on the Hughes' Hercules. Their engineering expertise dictated that the model should be a highly sophisticated complex project. In order to accurately depict the Hercules they had to obtain detailed authentic documentation which was a challenging exercise in itself.

Darrell started his search with a phone call to the Summa Corporation headquarters in Las Vegas, Nevada. Each person that he spoke with referred him to another department and about a dozen calls later someone suggested an office in California. A succession of California phone calls concluded with a Mr. Bill Berry who has indeed been in charge of the Hercules over the years since its only flight. Mr. Berry was the flight engineer who stood on the flight deck behind Howard Hughes on that memorable November day in 1947. A brief conversation led to an appointment for a visit with Mr. Berry which occurred a couple of days later. At that time the Meyer brothers described their ideas for the sophisticated, authentic project and solicited Mr Berry's assistance in obtaining engineering drawings. The response wasn't too encouraging as the aerospace industry just can't afford to get involved with the vast number of requests for information for model use, but he did advise that he would consider their request and get in touch with them in a few days.

Sure enough, they received a call about a week later advising that the material they needed was available for them. Because of Hughes Aircraft Company's concern over a worthwhile representation of the Hercules, an investigation was made into the Meyer brothers' soundness and capabilities to accomplish the undertaking. When the guys went over to pick up the package, which contained more data than they had dreamed of, they were treated to a special consideration, a tour through the original one and only gigantic Hercules.

Construction of the model faithfully reproduced the scale size and shape of the original and, in many cases, the structural design. Since the original was an all wood structure, the design was applicable to the model in several instances.

For power, the Meyer brothers selected the K & B .61 engines equipped with Perry pumps and carburetors. A one gallon can was installed in the fuselage at the leading edge of the wing to serve as a fuel tank to

feed all eight engines. Even though the outboard engines each have about a seven foot long fuel line between the pump and the tank, the engines have performed flawlessly. In anticipation of the instant cooling effect of the water spray during taxiing, C & D Enterprises, Huntington Beach, California, was asked to provide a glow plug ignition system which is installed in the center section of the wing and connected to each engine. Electrical energy for this electronic unit is provided by a 6 volt motorcycle battery mounted in the nose of the fuselage. It is really a mind blower to see that heavy battery practically lost inside the hull.

Two Futaba radios are used for flight operations. One radio operates the flight controls and utilizes the normal throttle control to operate the wing flaps. Each control surface has its individual servo. The second radio system operates the throttles. Each of the four servos control two engines which are grouped as two left outboard, two left inboard, two right inboard, and two right outboard. The transmitter for engine control was modified by Futaba by replacing the control sticks with linear slide pots which can be coupled with a bar to operate four engines on each side. Four trim knobs are installed to fine tune each pair of engines.

As the model was nearing completion, an important question was being considered. Who was going to fly the Hercules? Darrell and Merle realized that as much as they each would like to be at the controls for the first lift off, they could not risk the success of this complex project on their R/C flying experience. A gentleman was recommended who has a lengthy and fantastic reputation of being able to fly all sorts of unusual projects, and he lived close to the Meyers' offices. After a few discussions, John Elliot was selected to be the pilot with Darrell Meyer acting as the flight engineer to operate the engine controls. This selection proved to be a wise choice as excellent rapport was quickly established and the flights have been highly successful.

Many interesting incidents have occurred during this project. One of which took place in late October 1980, when Mr. Berry and officials from the city of Long Beach wanted the Meyer brothers to accelerate the completion of the Hercules in order to make its first flight from the Long Beach channel on November 2. That was the same place & the anniversary date of Howard Hughes' historic flight. Unfortunately, the time element did not permit the flight to occur. Such a flight would have been on nationwide TV and would have been a tremendous boost for our radio control activity.

R/C Modeler Magazine congratulates Darrell and Merle Meyer on the success of their outstanding project that has gained worthwhile recognition from an influencial segment of our society which, in turn, enhances the status of our sport/hobby. □

Engine starting procedure and tachometer checks went smoothly for first flight. Six turning and two to go at this point.

Motorcycle battery provided on-board energy for glow plug driver ignition system. Removable flight deck carried models of the original crew.

Is there any doubt that it really flew?

ENGINE CLINIC

Clarence Lee

This past month I received a sample of lubricating oil from a modeler in Washington. This was another of the penetrating type oils intended to prevent rust and corrosion, displace water, protect metals, etc., similar to many other lubricants of this type on the market such as WD-40, LPS, etc. The name of this particular lubricant is "Break-Free." However, Break-Free differs from most of the others in that it also contains Teflon. There are many Teflon additives on the market intended for addition to the motor oil in your car, etc. I have received quite a few letters in the past from fellows inquiring about using these Teflon based additives in model fuel due to their claim of reduced friction, increased mileage, and longer engine life when used in automotive type engines. Most of you are probably already aware of the many Teflon coated cooking appliances on the market. So Teflon has proven itself to be a very useful material when used in its intended applications. Even in model engines it has proven to be an excellent material for use as wrist pin pads.

However, there is one problem when using Teflon in a two cycle engine and that is it was never intended to be burned in the combustion chamber of an engine. When you add a Teflon based oil to the crankcase of your automobile engine, some naturally reaches the combustion chamber but this is the function of the oil ring on an automobile engine, to scrape excess oil off the cylinder wall and return it to the crankcase keeping it from burning in the combustion chamber. In the case of a two cycle engine, if mixed with the oil in the fuel, it is subject to combustion.

Herein arises what I feel might be a problem that few modelers are aware of. The past few years I have read many articles in trade publications warning of the dangers involved if the fumes given off by burning Teflon are inhaled. This can happen during machining of the material, during molding, etc. Many companies utilizing Teflon were experiencing a higher than normal absentee rate due to workers out with "flu-like" symptoms. Investigation proved the breathing of Teflon fumes, during machining operations, etc., to be the cause. Most companies involved with working with Teflon were sent warnings about the dangers of overheating Teflon during machining operations and the resultant inhaling of its fumes. A toxic poisoning can result that has all the symptoms of the flu — sore throat, headache, etc. So far I have not read any reports of the fumes being carcinogenic, but who knows what may turn up in years to come. Little did we know the dangers of asbestos just a few years ago.

So, although I have read no reports on the dangers of burning Teflon bearing oils and additives in two cycle engines, I imagine this is only because it has not been brought to the attention of those publishing the reports. It would seem only logical to me that if the fumes given off by overheated or burning Teflon are toxic, then you would not want to pour a Teflon bearing oil down the intake of your model engine while it is running, or use one of the additives in your fuel. Although the amount involved is rather small and would probably cause no problems when an engine is run out of doors, I sure would not run an engine in a garage, etc., where higher concentrations occur. Of course you should **not** be doing this even with fuel that does not contain a Teflon additive. One report I read recommended those who smoke to turn their packages of cigarettes upside down in their pockets when machining Teflon so that no machining dust could get on the cigarettes which would, in turn, be inhaled as fumes during the smoking of the cigarette.

So, with the government publishing these types of warnings regarding Teflon fumes, and many fellows wanting to know if the addition of Teflon bearing additives to model fuels would be a good idea, I thought I best point out why I do not think it is a very good idea.

Now just using a Teflon bearing lubricant such as Break-Free as an after run oil will probably cause no problems due to the low amount of Teflon involved. What I am saying is **not** to pour it down the intake of the engine while running, thinking the extra Teflon coating will preserve the life of your engine, or use one of the automotive type oil additives (intended for automobile engines) in model fuels. You would then be subjecting yourself to considerably higher concentrations of the fumes and, although possibly extending the life of your engine very sightly, shortening your own!

★

In the July 1980 issue of Model Airplane News, Earl Haury did a product review on the Utopia pattern aircraft — an almost ready to fly model that needs only minor assembly and painting. In Earl's article he recommended removing the brass ring around the crankshaft of the Rossi engine he was using in the aircraft. As can be expected whenever someone makes a comment such as this I get many letters asking my opinion. I normally shy away from this type of thing if my opinion differs since, in the past, I have received indignant letters from magazine editors, etc. However, this time I am in complete agreement with Earl's recommendation. The purpose of the ring is to "pack" the crankcase — i.e., decrease the volume of the crankcase to aid in the pumping action, improve fuel draw, etc. The crankshaft has slots milled into the outer diameter creating a counter balance. A thin full circle disc is left on the front and back sides of the crankshaft counter balance. A brass ring, in the case of the Rossi and Super Tigre, is pressed over the discs covering the milled slots. These brass rings do have a tendency to break occasionally and when they do can completely total an engine. So removal of the ring is a good safety factor. It will not hurt the performance of the engine in any way. I have mentioned this several times in past "Engine Clinic" columns but many new readers have not seen the articles. K & B also uses this same type of counter balance on their 6.5's and 7.5's but use an aluminum ring. The aluminum ring has proven no problem with breakage so you fellows with K & B's with this type of crankshaft need not be concerned. It seems to be only the brass rings that let go occasionally.

John Kilsdonk, a well known competition U-control flier of many years (and more recently R/C) sent in a letter this month regarding screw sizes for Super Tigres. Many of you may have noticed John's testimonial in regards to the Como engine imported by Indy R/C Sales. If you can't find the proper screws for your S.T., John has an easy solution.

Dear Clarence:

Regarding your question and answer in the October 1980 RCM - - - as you stated, a lot of Super Tigre engines use the 1/8" BSW screws.

Please note that the 5-40NC and 1/8" BSW both are of .125" diameter and both have 40 threads per inch. There is a slight difference in thread profile between NC and BSW.

For many years now I have successfully substituted 5-40NC socket cap screws (Allen type) directly for the 1/8" BSW S.T. bolts in all of my S.T. engines using them. This is also true for the Como engines.

Going the other way, BSW for NC would require re-tapping to dress the threads — but I don't know why you'd want to do that anyway.

The S.T. pressure fitting (P/N 22210285) is also of 1/8" BSW thread and can be used as a muffler pressure tap with a 5-40 thread.

Dear Mr. Lee:

I have enjoyed reading your column in R/C Modeler for quite some time, and I have gained much knowledge about engines from your advice to others. Of course, I must date myself a bit by admitting I once owned a Feeney 4-cycle model engine.

But I'm not writing to blow my horn, but to possibly ask you if you would present the rationale of glow plugs in model engines.

For instance the why's of the following:

(1) Short plug — cold.

(2) Short plug — hot.

(3) Long plug — cold.

(4) Long plug — hot.

Thank you for your kind consideration of my suggestion and I hope you shall continue with your very interesting column.

Very truly,
Louis Skary
Hawthorne, Calif.

I did an in-depth article on glow plugs many years ago when first starting the "Engine Clinic" column which has since been reprinted in the RCM Anthology book "The R/C Engine" Volume I.

The glow plug seems to be a very puzzling item for many and is actually quite simple.

Whether you use a long or short reach glow plug is determined by the thickness of the head of the engine. Most small displacement engines have thinner heads and require short reach plugs. The larger engines have thicker heads so, in turn, use longer reach plugs. Naturally there are exceptions to the case. A manufacturer may decide to increase the displacement of an engine from .40 to .45 and do so by enlarging the bore and stroke slightly. This means the piston has to go higher into the combustion chamber and closer to the head, raising compression. So material is removed from the inside of the head to lower compression. The head, then having less material, requires a short reach plug. But the basic fact determining plug length is the thickness of the head. Most engine manufacturers specify the proper plug for their engine with the exception of some of the foreign imports. If in doubt, remove the head from the engine and check. You do not want to see any glow plug threads protrude into the combustion chamber. You can use a short reach plug in a head intended for a long reach plug but **never** a long reach plug in a head intended for a short reach. The plug might hit the top of the piston and destroy the engine.

As far as hot or cold — this is determined by the amount of nitro being used. With a pattern or sport engine which uses low nitro fuels in the 5%-15% range, a hot type plug is used to keep the fire going at idle. If, when fully peaked out, a slight frying egg sound is detected (detonation), you use a colder plug. With racing engines that utilize high nitro fuels, a cold plug is used to keep the plug from burning out — something that usually happens anyhow if the engine is set a little lean. Few racing engines are able to get more than one run per glow plug.

Some of the glow plug confusion is compounded by many foreign manufacturers offering glow plugs in many heat ranges — #1 through #6, etc. This is just a matter of finding the one that works best in your particular engine, i.e., good idle and maximum top end without pre-ignition or detonation. If you hear any cackling or frying egg sound at full throttle, the plug is too hot for the engine so one step colder should be tried until the sound is eliminated. Quite frankly the two best plugs on the market are the Fox and K & B. The use of either of these makes will handle just about every need. Fireball puts out a very good line of plugs that work best for U-control as they do not market an idle bar type plug. Although many engines will idle okay without an idle bar plug you will usually get best results with an idle bar plug. The Glo-Bee line works well also but I have just aways had better all around results using Fox and K & B's.

Regarding that Feeney you once owned — I intend to do an "old timer" article on the Feeney in an upcoming Engine Clinic. Most present day modelers think the O.S. Four Stroke was the first of the four stroke engines — and it was the first production glow four stroke — but the Feeney made in 1936 was actually the first four stroke model engine to be offered to the modeling public. But more on that at a later date.

Dear Mr. Lee:

Is an O.S. .60 FSR powerful enough for a 1/4 Scale Pitts Special weighing about 10 lbs.? The airplane is from Bob Holman, has a 52" span and a glass fuselage, cowl, belly pan, and wheel pants.

I hate to buy another engine for this airplane and would like to know if a Davis Diesel Conversion for the O.S. would be the answer? The plans say to use a 14/4 prop on a .61 engine.

Thanks a lot.

Bob Deyardino
St. David, Maine

An O.S. .60 would probably fly the 1/4 Scale Pitts but performance would sure be marginal. Most of the 1/3-1/4 Scale ships require a prop reduction unit if a .60 is to be used.

The Davis Diesel Conversion would help give the engine more lugging power with a large prop but I still have some reservations regarding converting the larger displacement engines to diesel operation. Loads are being imposed for which the engine was never designed. Diesel engines usually require more massive con rods and crankshafts to take the additional loading. Many of our present day engines are being pushed to their limits already as many fellows have found out after breaking crankshafts, rods, etc. The diesel conversions work very well on the smaller displacement engines that are not developing the horsepower that some of the larger displacement engines are. Although beefier parts are used, the strength of the metal itself does not increase with size as fast as the horsepower of the larger engines. So how diesel conversion of the larger displacement engines will work out remains to be seen. I do not know of anyone having run a .60 converted to diesel long enough to tell at this time. I would expect crank and rod problems to be encountered, especially with some of the engines already noted for weakness in these areas.

Dear Mr. Lee:

I am installing a K & B .35 engine in a Sig Kadet. All the literature I have read about installing the fuel tank in an RC model says — center of tank no lower than 1/2" below the needle valve.

*The literature which came with the engine says — **top** of fuel tank even with needle valve.*

Which is proper?

Can this engine be used with a muffler? If so, which one would be best? Also, will this engine work well with the fuel tank pressurized?

Many thanks,
Edward Skellenger
Lawrenceville, N.J.

There are a lot of kits on the market whose design will not allow for proper placement of the fuel tank. The designer gets carried away with the scale aspect and has little regard for proper engine operation. To mount the fuel tank with the top even with the center line of the needle valve means there will be a leaning out of the mixture as the fuel level in the tank drops. This, in turn, means setting the engine quite rich at the beginning of the flight to allow for going lean towards the end. The center line of the fuel tank should never be any lower than 1/2" below the center line of the needle valve for best results, and 1/4"-3/8" a more desirable figure. Of course, take this into consideration doing inverted maneuvers, etc. If the ship is always to be flown upright the tank position is not as critical although it will lean out if it's too low, which is not desirable.

So, if possible, the tank should be raised. If the design will not allow this, then a Robart pump/Auto Mix unit should be used. In lieu of a Robart pump, muffler pressure will be a necessity — the only type of tank pressurization you can use.

You can stick a muffler on any engine but, in turn, expect a decline in performance. Any muffler intended for the K & B .40 will fit the old .35 okay. Several muffler manufacturers offer mufflers for the K & B .40.

Dear Sir:

Having read most of the issues of RCM, I can't recall ever hearing the answer to this problem.

While using Perry carbs on assorted S.T. .56/.60's (small case), I've lost the needle valve and spring. I'm currently installing the .60 in an Aero Master which will fly, hopefully, in a team act our club is trying to put together.

to page 123

RCM PRODUCT REVIEW

Models West, Inc.
SKY JAMMER

SPECIFICATIONS

Name	SKY JAMMER
Aircraft Type	Sport and Formula 500 Racing
Manufactured By	Models West, Inc. Box 226 5 Spring Canyon Bisbee, Arizona 85603
Mfg. Suggested Retail Price	$46.99
Available From	Both Mfg. and Retail
Wing Span	50 Inches
Wing Chord	10 Inches
Total Wing Area	500 Square Inches
Fuselage Length	35½ Inches
Stabilizer Span	19 Inches
Total Stab Area	104 Square Inches
Mfg. Rec. Engine Range	.40
Recommended Fuel Tank Size	4-8 Ounce
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Balsa, Spruce and Ply
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (4 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Westport International Variant
Engine Make & Displacement	K & B #8011 .40 R/C Engine
Tank Size Used	4 Ounce
Weight, Ready to Fly	56 Ounces
Wing Loading	16.1 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

Machine cut parts, wood quality, parts fit and flying capabilities.

WE DIDN'T LIKE THE:

Very basic hardware package and soft dural aluminum landing gear.

The Sky Jammer is a dual purpose design that may be built for Formula 500 racing or for sport flying enjoyment. Conceived by Jerry Doss, the Sky Jammer is kitted by Models West Inc., Box 226, Bisbee, Arizona. It is available from the normal retail outlets and also directly from the manufacturer. The suggested retail list price is $46.99. An engine of .40 cubic inches of displacement is recommended by the manufacturer, as being the ideal power source.

The Sky Jammer is contained in a sturdy lid type, corrugated box which is 37" long, 5" wide and 3" high.

Models West has produced a rugged, well engineered design, that employs time proven construction methods and techniques and, excepting the beginner, any RC'er with minimal building skills or experience should not have any difficulty in assembling this kit.

All components are neatly packaged. In addition to a formed aluminum main landing gear, the hardware package consists of aileron torque rods with clevis couplers and brass tubing bushings, nylon control horns, an optional nose gear bracket, steering arm and gear leg, and a nylon tail wheel bracket. We would rate the hardware package as being average.

Construction:

The plans consist of two 36" x 44" rolled sheets along with four 8½" x 11" pages of written assembly instructions. Included also are two pages of construction photos. The assembly instructions are written in a "step by step" fashion or sequence and include suggested control surface travel limits.

All wood parts are nicely machine cut and the parts fit is very good.

The wing is a very clean semi-symmetrical design that is ideally suited for Formula 500 type racing. The wing rib airfoil is flat from the bottom main spar to the trailing edge, to allow a flat building board to be more easily used during assembly.

This bottom flat surface is marked by the manufacturer on the machine cut balsa ribs as an aid to the builder since, at first glance, the ribs have the appearance of being symmetrical. The wing is assembled in one piece and has no dihedral. The main spars are spruce, the center section braces are plywood, and all other wing component pieces are balsa. The wing is sheeted with 1/16" balsa from the leading edge to the main spars and full chord in the center section area. Balsa strip-type ailerons are used and the wing is attached to the fuselage with four nylon bolts, which are not included in the kit. All hinges must also be supplied by the builder. We found both the wood and machine cutting of all component parts to be of excellent quality. Equally good are the tail surface pieces which are pre-cut from sheet balsa.

The fuselage is of balsa and plywood construction. The sides are 1/8" sheet balsa and 1/64" plywood, which are laminated together. The 1/64" plywood sides were missing from our kit. We presume that the omitted plywood side pieces are machine cut to match the 1/8" balsa sides. We cut replacement 1/64" plywood side pieces,

to page 121

SWEEPINGS FROM THE balsa dust factory

ANEMOMETER

At Torrey Pines, just south of the flying site there used to be a small group of temporary buildings surrounded by a chain link fence. The buildings were there when we started flying years ago and just as mysteriously disappeared recently. They never were a hinderance and were of very little help except for the anemometer transmitter atop one of the buildings. It was torpedo shaped with a three bladed propeller on the front end. If the prop was turning, we flew, if not we sat and chatted until the wind came up as indicated by that ever present wind indicator. No one, to our knowledge, made any judgements based on the number of RPM's of that prop, it was just a go or no go device.

If you hunt through your model magazine library, you will find a few anemometers, some very simple, some using complicated electronics. Portable anemometers are available commercially from \$6.00 to as much as \$50.00.

As an indicator, a pendulum pushed by moving air is not new. We have been told by the big kids that the early DeHavilland Moths had a pendulum type airspeed indicator and, when landing, it was the duty of the man in the front seat to keep an eye on the air speed indicator to insure they did not drop below stall speed. More improved indicators proved the old pendulum models were not so inaccurate after all.

This pendulum type anemometer first appeared in a 1971 Scientific American article. All of the calibrations were carried out in a wind tunnel. Anemometers of this type calibrated by the speedometer of a moving automobile had errors as high as 30% due to turbulence and the inability of the driver or his passenger to read the device accurately while in motion.

The article contained a graph and a table for all speeds up to 30 MPH. Also the following mathmatical formula was included for those so inclined to calculate their own MPH:

$\mu = 19.59\ (\cot \alpha)^{1/2}$ or
$\mu = 19.59 \sqrt{(\cot \alpha)}$

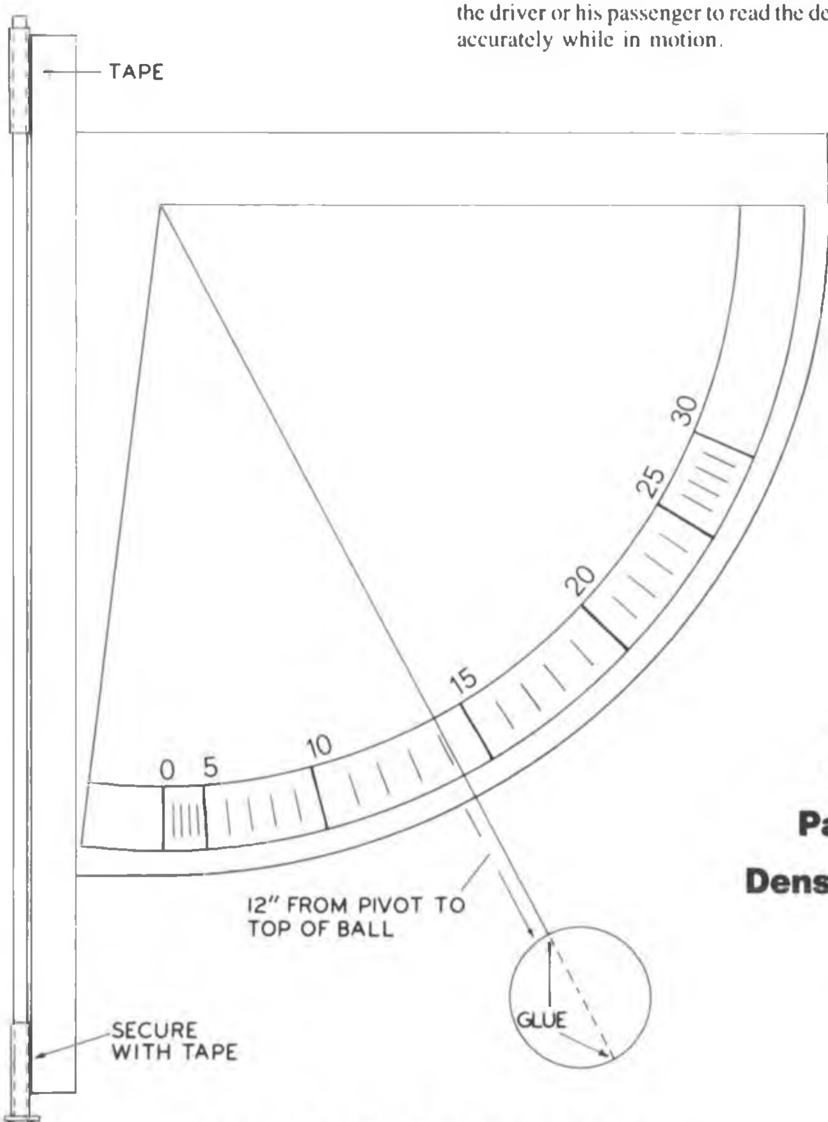
If my math doesn't fail me:

$$\cot \alpha = \frac{1}{\tan \alpha}$$

then the formula would be:

$$\mu = 19.59 \sqrt{\frac{1}{\tan \alpha}}$$

to page 119



DRAWING SHOWN ONE HALF SIZE

By
Paul
Denson

RCM PRODUCT REVIEW

Carl Goldberg Models
GENTLE LADY

SPECIFICATIONS

Name	GENTLE LADY
Aircraft Type	Two Meter Sailplane
Manufactured By	Carl Goldberg Models, Inc. 4734 Chicago Ave. Chicago, Illinois 60651
Mfg. Suggested Retail Price	$24.95
Available From	Both Mfg. & Retail
Wing Span	78¼ Inches
Wing Chord	9" Center — 7⅛" Tip
Total Wing Area	663 Square Inches
Fuselage Length	41 Inches
Stabilizer Span	20¾ Inches
Total Stab Area	96 Square Inches
Mfg. Rec. Engine Range	.049-.10 Or Electric
Recommended Fuel Tank Size	N.A.
Recommended No. of Channels	2
Rec. Control Functions	Rud., Elev.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (12 pages)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Kraft 2 Channel
Engine Make & Displacement	N.A.
Tank Size Used	N.A.
Weight, Ready to Fly	25 Ounces
Wing Loading	5.4 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Good instructions, plans, flying and price of kit.

WE DIDN'T LIKE THE:
Some of the wood varied in size.

Gentle Lady is a 2-meter sailplane designed and produced by Carl Goldberg. It was designed to be a gentle trainer for the beginning R/C modeler, yet possess competition capability in the hands of the experienced glider pilot. What you have just read is an almost exact quote from the opening paragraph of the 12 page instruction booklet that we found packed away with all the other goodies in Gentle Lady's kit box. Well, after reading Carl's article on this fine glider (R/C Modeler, Feb. 1980), we were anxious to see what kind of kit we had, and just how well it would go together. We weren't worried about performance, having seen the prototype do its stuff during an RCM photo session. The flying site had a very **slight** downslope and an equally slight flow of air upslope . . . and Gentle Lady put that combination together for an easy climb to approximately 500 feet from a hand launch! But enough of the appetizer, let's move on to the main course.

The packaging was well done, with all the small parts and hardware in a plastic bag. These accessories included: plastic pushrod exit, two horns, two rods and clevises, one tow hook, one wood screw, one length of 1/16" wire, and one strip of nylon tape (for wing center joint). The 1/8" square balsa had "hairs" that we had to sand off and, while this was no big problem, it did give us a momentary bad impression. The leading and trailing edge stock had some flashing that had to be trimmed. Again, this is no big deal, but it is extra time to the builder, and a beginner would have to be careful and not hack-up the main body of the stock while cleaning it up.

CONSTRUCTION

The plans were found to be excellent, with everything necessary shown on one sheet. The 12 page instruction booklet is outstanding, with a total of more than 40 black and white photos illustrating every important construction phase and step. Intermixed are detailed drawings that compliment the photos. The booklet is arranged in a series of building steps, each step having a small box at the beginning so that it may be checked off when that portion has been completed. Inside the first page is a complete drawing of all wood parts and serves as an immediate source of identification of these items - - - especially handy for a first timer.

Construction started with the tail assembly and, what with step-by-step written instructions accompanied by the aforementioned photos and drawings, no problems were encountered. We should mention right here that we used Goldberg's Super Jet Instant Glue all the way through and found it a fast, strong, lightweight way to go.

The wing is a flat bottom airfoil, and presented little difficulty. We did have to trim the center ribs at the trailing edge for the center sheeting. A word of caution about the leading edge sheeting: Be sure and cut from the 2½" stock. We also found some of the wood varies in size and thickness. A nice touch gives the builder the option of removable tips (which we decided to do for easier transport). The wing is polyhedral, and we were glad that both the dihedral and polyhedral angles were given in inches and not degrees - - - a practice we wish more designer/mfg. would follow.

to page 118

AIRPLANE WEIGHT AND CENTER OF GRAVITY ANALYSIS

By R.J. Tonneman

Methods for determining airplane Center of Gravity position are currently popular topics as evidenced by the number of articles appearing in model magazine. Although the methods suggested (suspension by wires, balancing on pegs or fingers) will work, they leave something to be desired when considering accuracy and the safety of the model, especially if the model is large.

The method described is basically the one used in the Aerospace industry to measure the Center of Gravity of prototype aircraft. Obviously it would be a little hairy to suspend a 100,000 pound aircraft from the hangar ceiling on wires, or balance it on two pegs to determine the Center of Gravity location.

The method presented is developed in three steps. The first step deals with determining the Empty Weight Center of Gravity of the airplane. The second step discusses how to position the airborne equipment in the airplane to achieve the required "All Up" airplane Center of Gravity. Step Three outlines a means of determining the minimum weight, at the optimum location, of ballast if it should be required.

DEFINITIONS:

Empty Weight (W_e): The weight of the finished airplane with the engine, propeller, spinner (if utilized), fuel tank and control rods installed. If the aircraft employs aileron and retract servos which must be placed in a specific location, these items should also be installed.

All Up Weight (W_a): The weight of the airplane ready to fly, less fuel.

$C.G._{lg}$: The Center of Gravity with reference to the main landing gear axle.

$C.G._{le}$: The Center of Gravity with reference to the wing leading edge.

$\overline{X}$: The distance from some reference axis to the C.G. of the airplane or airplane component.

Moment: A weight times a distance. Units must be consistent in specific calculations. For example: ounce-inches, gram-centimeters.

R: The reaction, or the scale reading, at the tail wheel (or nose wheel) when the airplane centerline is parallel to the measuring surface.

D: The distance from the main landing gear axle plane to the scale reaction point when the airplane centerline is parallel to the measuring surface.

L: The distance from the main gear axle plane to the wing leading edge.

AD: The distance between the center of the right and left main gear axle.

Tare: The weight of any blocks, etc., placed on the scale to level the airplane.

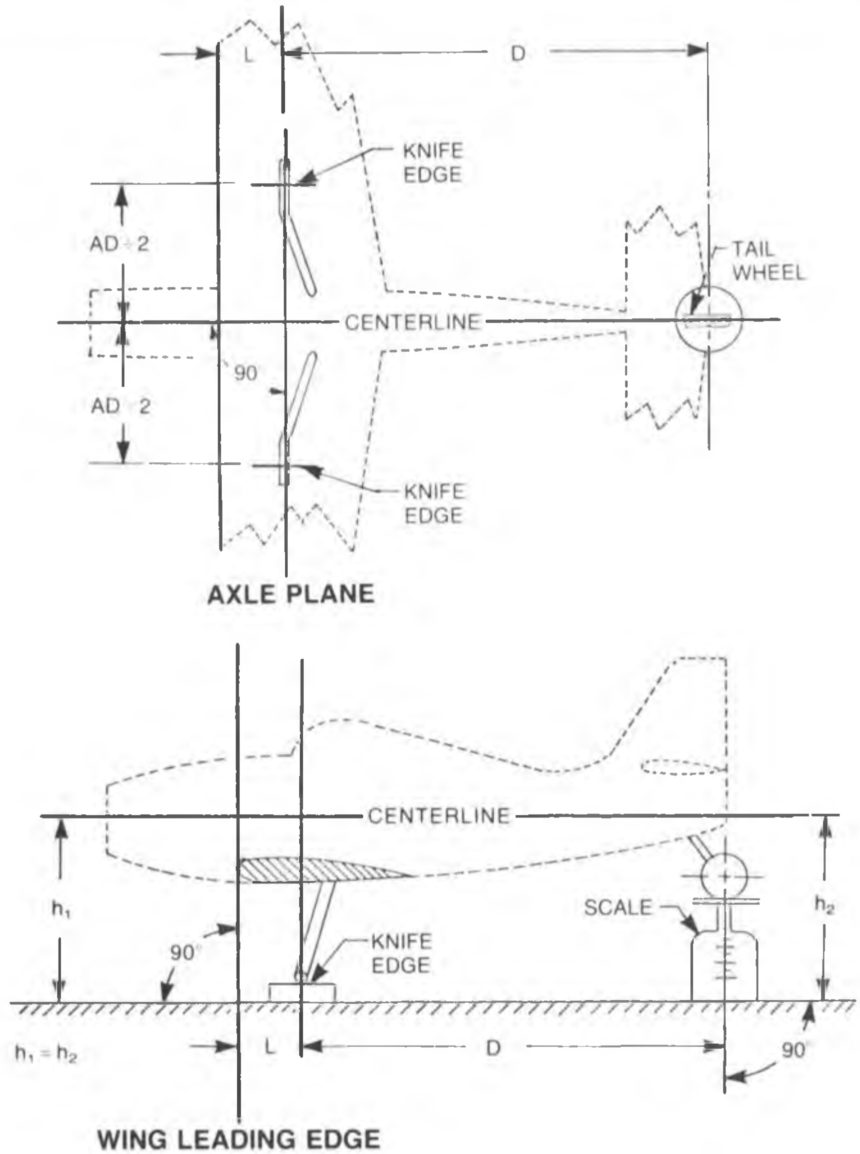


FIGURE 1

EQUIPMENT:

(a) Straight-edge and square.

(b) Two knife edges. (A piece of aluminum angle works well. A small notch in the middle simplifies locating the landing gear axles.)

(c) Measuring tape.

(d) Scale with the capacity to measure the "All Up" weight.

(e) Scale with the sensitivity to accurately measure "R". (A one pound capacity dietary scale which sells for about $3.00 works well for most airplanes through the .60 size.)

EMPTY WEIGHT AND C.G. MEASUREMENT (see Figure 1)

(1) Measure the Empty Weight of the airplane and record it.

(2) On a flat level surface, lay out a straight line representing the airplane centerline, as viewed from the top.

(3) Lay out a second line perpendicular to the centerline representing the main gear axle plane.

(4) Measure the dimension "AD" from the airplane main gear and lay out AD ÷ 2 on the axle line. Locate the knife edges at these two points.

(5) From the plans, determine the airplane centerline in the side view. The centerline usually runs through the prop shaft and is perpendicular to the firewall and bulkheads if they are not canted.

(6) Remove the main gear wheels and place the axles on the knife edges. Make sure the axles lay in the axle plane established in Step 3.

(7) Place a scale under the tail wheel (nose wheel if it is a tricycle gear) and level the airplane by placing the centerline parallel to the measuring surface.

(8) Record "R".

(9) Measure "D" and "L" and record.

(10) Calculate $C.G._{lg}$ as follows:

$$C.G._{lg} = \frac{(R - \text{Tare}) \times (D)}{W_e}$$

Note: weight units must be consistent for "R" and "W_e".

(12) The Center of Gravity with respect to the wing leading edge can now be determined.

(a) for a reaction at the tail wheel with the axle plane aft of the wing leading edge:

$$C.G._{le} = C.G._{lg} + L$$

(b) for a reaction at the tail wheel with the axle plane forward of the wing leading edge:

$$C.G._{le} = C.G._{lg} - L$$

(c) for a reaction at the nose wheel (tricycle gear):

$$C.G._{le} = L - C.G._{lg}$$

Note: if $C.G._{le}$ for a tricycle gear comes out negative, it is forward of the wing leading edge.

ALL UP WEIGHT AND C.G. ANALYSIS

Once the Empty Weight and C.G. have been calculated, the next step is to determine the optimum location for the receiver, servos and battery pack. The goal of this step is to correctly balance the airplane without the use of ballast.

The simplest way to explain this step is by an example. Assume that:

Elevator, Rudder and Engine Servos = 0.7 ounces each.

Receiver = 1.5 ounces.

Battery Pack = 3.0 ounces.

W_e = 34.0 ounces.

$C.G._{le}$ for Weight Empty = 3.25" aft of the wing leading edge.

Required "All Up" C.G. = 2.75" aft of the wing leading edge.

ANALYSIS:

(1) Set up a weight and balance form as shown on Figure 2.

(2) Assume the wing leading edge is the reference axis. $\overline{X}$ of the airplane and components will be measured forward or aft of the wing leading edge.

Important! An algebraic sign convention must be adopted for $\overline{X}$! In this example, positive (+) is aft of the leading edge and negative (−) is forward.

(3) Using the side view of the airplane shown on the plans, determine the optimum location for the servos and receiver.

(4) Measure $\overline{X}$ from the plans for each of the servos and receiver and record on the weight and balance form along with the Empty Weight and C.G.

Note: If the airplane has a tricycle gear and $C.G._{lg}$ comes out negative (−), the minus sign must be entered in the Weight and Balance Form. Therefore, $\overline{X}$ for Airplane Empty would be negative (−) and the corresponding moment would be negative.

(5) Multiply weight times $\overline{X}$ to develop the moments.

(6) Add the weight and moment columns to develop the sub-totals. Divide the sub-total moment by weight to get $\overline{X}$ which represents the "All Up" airplane C.G. **less** the battery pack.

(7) Enter the battery pack weight and add it to the sub-total weight to develop the "All Up" weight.

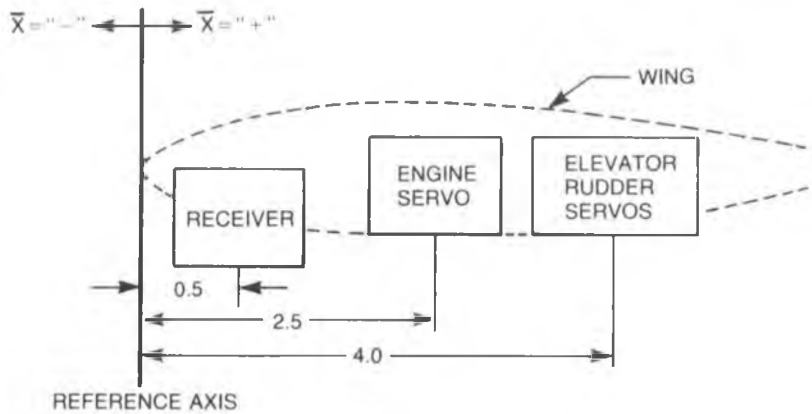
(8) Enter the required "All Up" C.G., as measured from the reference axis, and multiply it by the weight to get the moment.

(9) Determine the moment which must be added or subtracted from the sub-total moment by the battery pack to get the "All Up" moment. In the example 6.95 ounce-inches must be substracted (−6.95).

(10) Solve for $\overline{X}$ of the battery pack by dividing the moment by the weight. Note that the moment is negative which gives a negative value to $\overline{X}$. According to the sign convention adopted in Step 2, the battery pack should be located 2.32" **forward** of the wing leading edge.

This paper analysis may have to be performed more than once before an optimum servo, receiver and battery pack

to page 116



WEIGHT AND BALANCE FORM

COMPONENT	WEIGHT (OUNCES)	$\overline{X}$ (INCHES)	MOMENT |WEIGHT| x |$\overline{X}$| (OUNCE-INCHES)
AIRPLANE EMPTY	34.0	+3.25	+110.50
ELEVATOR SERVO	0.7	+4.00	+2.80
RUDDER SERVO	0.7	+4.00	+2.80
ENGINE SERVO	0.7	+2.50	+1.75
RECEIVER	1.5	+0.50	+0.75
SUB-TOTAL	37.6	+3.15	+118.60
BATTERY PACK	3.0	−2.32	−6.95
TOTAL — "ALL UP" AIRPLANE	40.6	+2.75	+111.65

BALLAST CALCULATION

BALLAST	1.35	−5.00	−6.75
TOTAL — "ALL UP" AIRPLANE PLUS BALLAST	41.95	+2.50	+104.90

FIGURE 2

HOW MUCH FLYING TIME?

How To Calculate and Increase Radio System Time

By Eloy Marez

Some of the large variety of airborne batteries available, all of which are good for different amounts of flying time.

It would be interesting to know how many times during a trade show season the various radio manufacturer's representatives are asked, "How much flying time is it good for on one charge?" It would be doubly interesting to know just how many of these times the modeler went away feeling that his question had been sidestepped or, at best, that he was given a vague and otherwise useless answer.

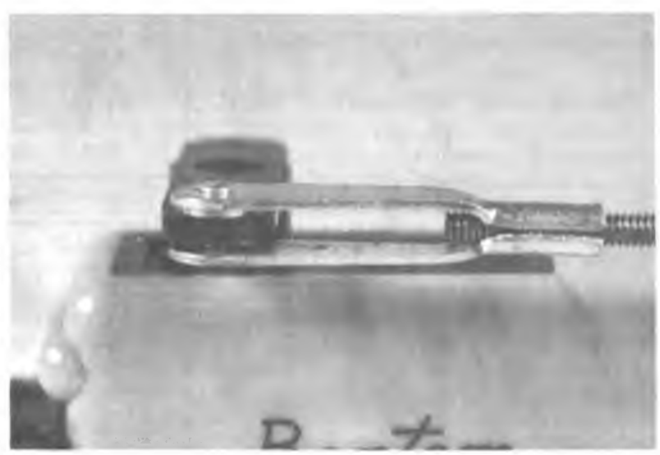
I can assure you that the person you talked to, regardless of what radio company he was with, was not being evasive, or doubtful of your ability to understand things technical. He would have given you the same type of answer had you asked, "How long is a piece of wire?" The fact is that it is almost an impossible question to answer, due to the many variables involved which are beyond the control of the manufacturer of the system. Read on, we will attempt to explain these variables, how you can determine for yourself just how long you can safely expect to keep that bird in the air before you run out of those magic electrons, and how to increase that time. If you are into some phase of the R/C hobby other than airplanes, the principles to be discussed still apply, simply read driving, sailing, moving, etc. for flying.

First, most systems have a longer transmitter time than airborne system operating time. That figure is constant, and can be obtained by simple arithmetic, your manufacturer can provide that for you. There is no attempt to design this feature in, it just works out this way with the electronics and the battery sizes in common use. Actually, the transmitter time is somewhat inmaterial if the airborne battery life is shorter. Therefore, what we have to look at closely is the airborne battery, and how we use and abuse it.

Generally, R/C system ni-cad batteries are capacity rated in ampere hours, or fractions thereof, based upon a discharge down to 1.1. volt per cell, at a one hour discharge time. Translated, this means that our commonly used 500 milliamp (1/2 amp) battery, in good health, is capable of producing that amount of current for one hour, or any multiple or submultiple thereof. In other words, it will operate a device at 250 mils for two hours, or one at 100 mils for 5 hours. It does not mean that 500 mils is the very maximum it can deliver at any one time. It can, in fact, deliver 1 amp (1000 mils) for half an hour, and so on and so forth.

The real world is seldom that clean cut, and it isn't here either. As the current drain on a cell increases, its apparent capacity decreases so, in the strictest sense of the word, the figures given do not always work out that exact. However, they are good for our purpose, especially since we never put

Use a "Power Pacer" or similar device to determine the exact operating time of a system under your own flying conditions.

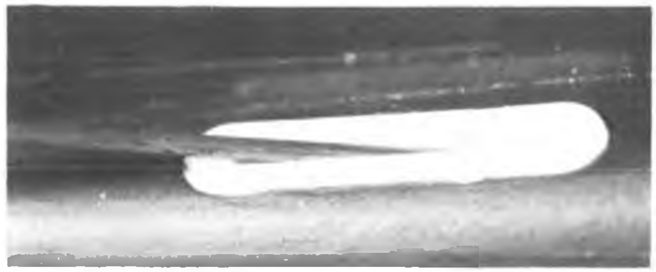


A clevis on the end of a pushrod where it connects to the servo arm is recommended for optimum alignment and operation.

Another inexpensive, but highly recommended, method of attaching the pushrod to the servo, a plastic push-on collar.

Called by any of a number of names, this device also secures the pushrod end, and permits perfect alignment while so doing.

For some installations, this type of connector is recommended; allows aligned free operation, plus length adjustment.



Molded plastic exit guides are recommended at the pushrod exit points, serves to minimize friction as well as for neatness.

On a meter shunted to read 2.5 times full scale, our servo checker shows amplifier current of a servo at rest.

A free running, unloaded servo shows an increase in current consumption, that of the motor running with no load.

A yet higher current is seen as the servo is called upon to do some work, such as moving a pushrod and control surface.

A completely stalled servo takes the meter off scale, and can consume as much as half an amp. Avoid at all costs.

such exhorbitant drains on our control system batteries.

This capacity business in a cell can be compared to the capacity of the fuel tank in your Mercedes 450SL. It can hold a certain number of gallons of that expensive Middle East brew, period. You can not cram more into it. Just how far you can barrel down the freeway depends on a number of things, such as the conditions of your car, and how heavy a foot you happen to have, amongst other of your driving habits.

Thus the actual amount of time your airborne system will operate before the battery rolls over and dies, taking your pride and joy with it, depends also upon the rate at which you use it up. Which brings up the reason for the vague sounding answer you got from your otherwise friendly radio man at the show, there are too many incalculables, one of which is you in this case also, as we will explain later.

Let us first look at what uses up the available current. In the actual flow of events, the first one is the receiver, which will draw and consume a certain amount, usually on the order of 20 to 30 mils. This is a constant value, and is not increased when a command is received or if more than one command is given simultaneously. It is about the same for two channel receivers as it is for those using eight channels of the same design and make.

The servos also draw a pre-determined amount of current, a very low amount which can be less than ten milliamps when the servo is at rest. This, too, is a design function and will vary very little during flight. You can say that for the transmitter, receiver, and servo amplifiers, one of the measures of their quality is the lowest possible current drain.

Now, we get into the real fly in this particular ointment, the current that the servo draws any time that it is called upon to do any work, i.e., when you move the stick and tell your airplane to do something. The current consumed at that time, drawn by the

motor, is the highest drain encountered and will be around 100 milliamps for an unloaded servo. Note that this is a momentary current drain, used only when the servo is going from one position to another, or returning to neutral. It does not draw this additional current when it is at an off-center position, only when it is traveling to and from there.

As stated, this is a no-load drain, which will increase as the servo is called upon to do more work, such as moving a control surface. This increase will be greater in the air than on the ground when the plane is not moving, due to the air pressure against the control surface. It will be greater when pulling out of a high speed dive with a certain degree of up elevator movement, than with the same degree of down elevator from straight and level flight. It will obviously be greater if two or more servos are moving simultaneously, as in some of our coordinated maneuvers.

It follows that the faster the consumption, the sooner you are going to run out. If you are a two flight, every other Sunday modeler, you can stop here and go back and stare at the cover some more, you don't really need what is to follow. But if you are active, and have ever felt that maybe you are pushing your airborne battery a little too close for comfort, or if you simply wish to know what is the maximum safe time you can expect, read on.

As with our Mercedes, in order to get the most mileage out of that tankful of high test, we've got to take the parking brake off. Therefore, the first step in saving battery drain in our R/C model is to eliminate all friction anywhere that it might be present in the control system. By so doing, there is generally another benefit to be gained by some of you, a tighter control system with less slop. Starting with the connection to the servo arm, the wire or pin going through it should fit snug, but be free to rotate. The arm should rotate on the pin with no drag or binding at all, but should not have a large enough hole in it that it will permit some servo rotation without any movement being passed on to the pushrod.

If the clevis or wire binds in the servo arm hole, the hole should be drilled out to the proper diameter. Note that we said **drilled**, which means just that, and does not mean hogged out with a No. 11 X-Acto or an ice pick. Neither provide for the type of precision that we are after. A drill press, even a small one like Dremel's is highly recommended. Since the variety of clevis and rod ends is almost endless, and the diameters vary greatly, we can not give you an exact drill dimension necessary, you'll have to determine this for yourself by trial and error. However, as a starter, you will need a number of drill bits in the No. 50 vicinity. Plastic drills in a funny way, depending on the thickness, drill rpm and sharpness, so you can not even "mike" the wire or pin and buy a bit accordingly. Start small on a hole that you don't plan to use, and keep increasing the drill bit size one number at a time until the best fit is obtained.

In addition to a perfect fit, you will also need perfect alignment; the pin has to go through the hole without any angle. This then eliminates the use of any so-called "Z" bends on the end of a wire pushrod, it is just not possible to make straight 90 degrees bends that close to each other on a piece of wire that has the stiffness we need. Even if you could make this type of bend, they have another point against them. Putting them through the hole in the arm requires enough force to distort the material around the hole, elongating it and resulting in some of that slop we initially set out to eliminate. Yes, "Z" bends are cheap, and they will do the job, after a fashion. However, remember that we are looking only for the best way to do the job.

A clevis is one of the recommended ways to go, preferably the ones with a metal pin if the mate is to be with a plastic arm. The fit and feel of metal to plastic is better, and the friction is greatly reduced. Conversely, use a plastic pin clevis when the other part is metal, such as a throttle arm or elevator horn.

A combination that is almost as cheap as a "Z" bend, yet works far better and is easier to put on and off is a simple 90 degree bend on a piece of 1/16" piano wire, locked in place with a push-on collar such as those made by Rocket City, Kraft Systems, and others.

Another recommended device, also designed to be used with a 90 degree bent wire is of the type called Snap-R Keeper by Goldberg, and various names by other makers such as Rocket City, Su-Pr-Line and Sterling. They all slip over the short leg of the bend and lock onto the long leg in such a way that prevents their inadvertant removal. They are all relatively inexpensive.

For some applications, fittings such as the Du-Bro E-Z Connector, and the similar Goldberg Pushrod Connector may be used. They are both similar, in that a pin goes straight through the hole in the arm, with a hole provided in the upper part for the wire pushrod, the latter hole being at perfect right angles to the pin, which is what we are looking for from the beginning. They provide perfect alignment of all the pieces to each other and, in the proper size hole, work with almost no friction. Note that I said these are recommended for **some** applications, which might be only a rash assumption on my part, as I have no valid reason for not saying **all** applications, except gut feeling. I have used, and have seen a lot of them used, with no in-flight failures, yet I am not going to trust one of my heavier fast flying models to one of these in the primary flight controls. For throttle, nose wheel steering, bomb dropping, etc., yes, but not on elevator or ailerons. The mistake could easily be my own, I could simply forget to properly tighten the locking screw, or it could be loosened by the vibration caused by my improperly balanced prop. Nonetheless, it would be a dumb and preventable way to lose an airplane and I, for one, don't care to see them go this way. I am not alone in this particular feeling, such fittings are not accepted on primary flight controls by the safety inspectors at any pylon race I ever attended.

Now, for the pushrod itself. They come in many sizes and shapes and are a subject in themselves. What they all have in common is that they should not cause friction. They should not rub against each other or against any fuselage framework. Friction should also be reduced or eliminated at the point of exit at the rear of the fuselage. For this, we recommend the use of the molded plastic exit guides available from a couple of our manufacturers. These little goodies not only make an otherwise ragged hole or slot look neater, they do provide a useful function by reducing the friction to the pushrod wire as it moves back and forth in the slot.

And last, but not least, we come to the connection at the control surface itself, which requires the same kind of treatment you gave to the pushrod/servo arm connection, with perfect 90 degree alignment and bind-free fits. At this end, we sometimes run into a different problem, that of a sweptback rudder hinge line. As the rudder moves off center, it also changes the angle of the pushrod to the control horn, enough to introduce serious binding in some cases. This is a heavy current eater, especially in rudder only airplanes, and a ball and socket fitting is definitely in order.

The throttle and steerable nose wheel controls require an extra caution: don't let them bottom. Naturally, this applies to all controls, but is most often seen where a throttle or nosewheel steering arm has reached the mechanical end of its travel before the pushrod travel has ended. The resultant stalled servo is then drawing around half an amp; guaranteed not to increase battery or airplane life. If you hear a servo buzzing at full travel, chances are that you are stalling it. Check for this condition with the trim at full travel in the same direction as stick travel.

The hinges are important, and you can't go wrong with the two piece pinned hinges available. More important than the brand is the need to keep them clean and free of adhesive during installation, and to provide the proper clearance for the control surfaces themselves. Review your installation and techniques, and if you find that things don't work quite as freely as you'd like, we ran a hinge installation article in February 1980 that might be of some help.

One more current and servo saving possibility, especially for large airplanes, is to balance the control surfaces so they require less muscle to move them. Full scale aircraft practices can be followed with counterweights installed either externally or internally in some manner.

And watch out for control surface flutter. It can put enough back pressure on the servo to move it off center, and it will be consuming some of those electrons while it is constantly trying to recenter itself.

Those then are some of the undesired

to page 98

GETTING IT ALL TOGETHER

By Bud Weber

A treatise on building straight, and proper trimming of a Pattern (or any) R/C plane.

About The Author

Carl "Bud" Weber is a native of Wisconsin. He was educated at the University of Wisconsin and the University of Chicago where he obtained a degree in Meteorology; then a BSME from Marquette University, Milwaukee.

He spent five years in the U.S. Air Force, and six more in the Air Force Reserve.

Bud has operated hotels and restaurants for about 20 years, then branched into real estate, construction and land development. He became interested in modeling while watching the Kuranz brothers fly their home-made escapement planes and is interested in all phases of the hobby, but particularly in pattern.

Bud entered his first pattern contest in 1969, then won first place at the Nas Nats Glenview in Expert in 1971 (then C-Novice). On the Masters Circuit since 1972 he has flown in the last three Masters FAI Team Selection Tournaments, and expects to compete in the Masters Contest in the spring of 1981.

Bud is married and the father of nine children. He presently owns and operates a partnership dba Weber Realtors as well as Bud's Hobbies. He is a charter member of the Lakeland R/C Club, a Charter Member and Treasurer of the Pebble Creek Flyers, Inc., and a member of the Milwaukee Flying Electrons.

Definition of "trimming" . . . to put in proper order, make neat, clip, cut, balance by shifting cargo, well proportioned, good condition, lined up straight and proper . . . (Webster)

Usually the final paragraph of the popular and frequent construction article appearing in the model press contains the phrase ". . . and gosh! . . . it flew right off the boards!" Perhaps those builders are exceptionally talented, or are satisfied with a ship that merely flies without crashing on the first flight. Now I know one guy who is a super builder and pilot who tells me it takes months to build and trim a really true plane . . . and then there is **no** such thing as a really **true** plane. (His initials are D.L.) I believe that! It takes me at least one full summer of flying to trim a pattern ship to the point where I'm fairly satisfied (that's my problem . . . they never **last** that long!) and, even then, nearly every practice flight is a trimming flight. So, if you suffer with the thought that because you are constantly "trimming" a plane in flight that it is a result of poor building, relax. Most top pilots experience this . . . watch next time at a serious contest . . . you'll see many good pilots make subtle changes between flight . . . nothing drastic, just small, minor adjustments to the flying surfaces, engine, prop, throws, even fuel. While the big changes had been made during practice, these subtle changes are gradually turning that rather "normal" flying machine into a highly tuned competitive machine, matched to the pilot's reactions. Each change brings the two together more, until confidence finally takes over, and the maneuvers are automatic.

Now to some specifics. There is a myriad of R/C pilots who would be better equipped than I to write this treatise on trimming; however, very few have had the courage to sit down and place on paper (for all the R/C world to see) some of his or her convictions, theories, and sometimes guesses, on just what makes that rare super flying plane. After some prodding by my local R/C club, I agreed to give a talk on "How to Trim a Pattern R/C Ship," knowing full well that much of what would be said had been said before, by many more capable than I.

Some background to give my theories credence . . . I am a wayward Mechanical Engineer with a Minor in Meteorology from Chicago University (good weather helps when trimming!), have been in R/C and models over 30 years, and have constructed and flown over 70 R/C ships of my own, plus flying scores of other planes whose owners trusted me to risk that first trim flight. I also designed and had published the "Sequel" pattern ship ('75 AAM Feb.-Mar.). I've since decided that **"design"** belongs to the strong of heart . . . leaving design to my older years, and meanwhile spending these competitive days building, trimming and flying a proven design.

I also visited often with Jim Kirkland before his untimely death . . . he was one of, if not the best in design and trim. He inspired me to keep on the competition trail, starting at the Glenview Nats. Other flyers have shared untold advice and ideas (not secrets) which I'd like to share now with you. As Ben Franklin said . . . "there's nothing new under the sun" . . . so here goes.

The very first step to accurate trimming begins when you start construction. Establish rigid standards, rules and discipline for your building. Form good habits, purchase high quality (not necessarily the most expensive) tools, a super flat building platform (or slate top pool table), and build the intricate parts and alignment only when you are rested and sharp! Learn how to trammel with non-stretch threads, triangulate, and build jigs for setting up thrust line, reference lines and incidence.

Inscribe these reference lines, center lines and incidence check points permanently in your fuselage sides, bottom and top. I drill small 1/16" holes so I can always re-strike a reference line in case I inadvertantly sand off the full lines. This holds true for the wing and stab as well . . . from the start of construction to the very finish . . . fill the reference holes very last before covering or painting.

One successful idea on building true sheeted core wings I'd like to share with you as presented here — see sketches.

These same ideas of using jigs and check points apply to stabilizer, rudder, and engine mounting. For mounting the engine, a handy check jig can be made from 1/4" plywood . . . cut a disc, 12" in diameter, drill a center hole to fit your engine shaft, mount on the engine . . . and voila! You have a super way to check for down and side thrust by measuring to your reference lines on the fuselage.

Remember, all these sound building habits and crutches revert back to the bottom line of constructing a **true** plane . . . an **absolutely flat, level, true** surface upon which to measure and build. Take the time to build one . . . or use your pool table as I do. Even a pool table needs checking upon occasion . . . use a good level and shim as necessary . . . even slate settles! Something to remember if you plan to construct a true table; if you use a variety of sizes, lengths, and types of wood and/or metal to build this platform, purchase **all** materials at least 30 days before construction begins. This gives all the materials (especially wood) a chance to "cure" by breathing the air in your shop . . . the wood may take on or lose moisture in different amounts. If you build before this tempering takes place, you may have a perfectly flat building board on the day of completion, but two weeks later it is warped because of the opposing stretching and shrinking caused by moisture changes in adjacent parts. Enough for generalities . . . now for the specifics.

When it comes to trimming specifics, I expect to hear plenty of feedback from the

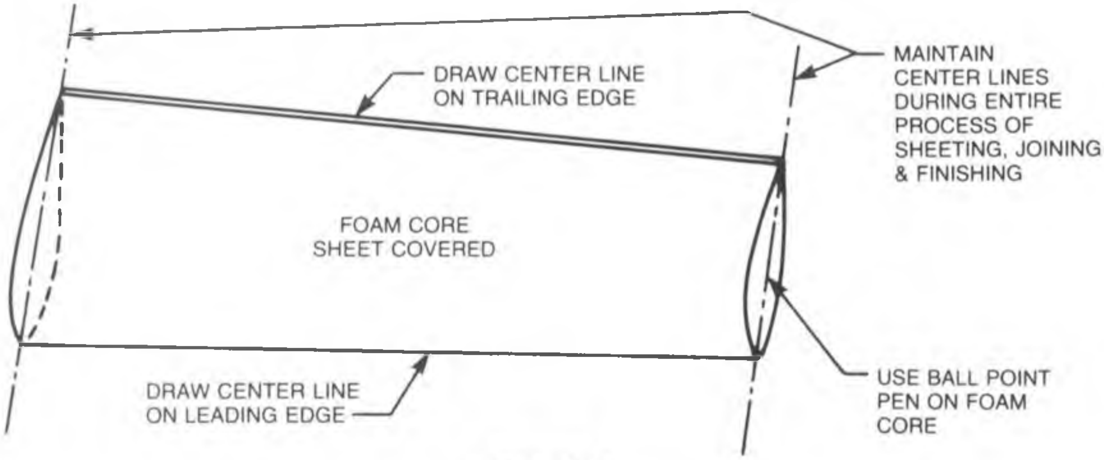


FIGURE A
MAINTAIN CENTER LINES ROOT & TIP

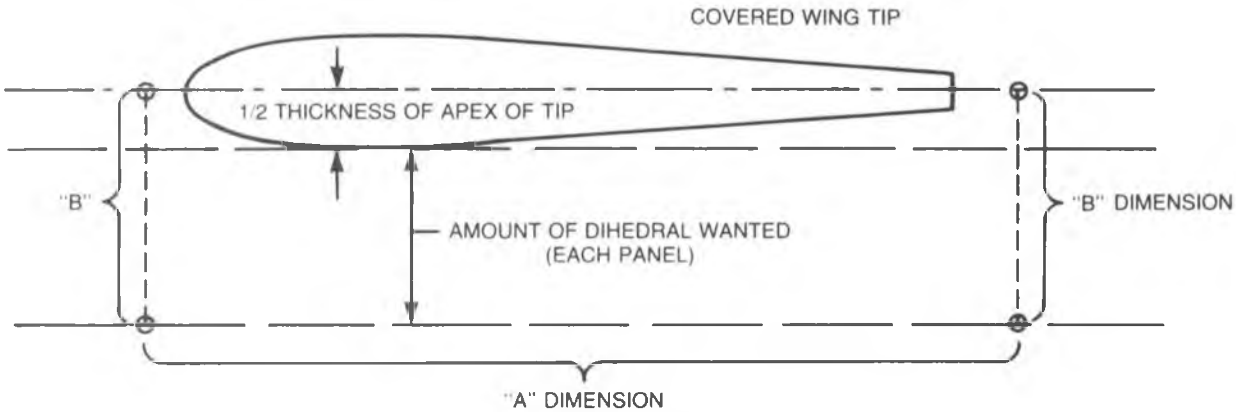


FIGURE B
CUT JIGS (SIDE VIEW)

CUT 2 PIECES RECTANGULAR BALSA 3/32" HARD WITH DIMENSIONS "A", CHORD OF TIP ± 1" OR 2", AND "B" EXACTLY 1/2 THICKNESS OF TIP AT THICKEST PART, PLUS 1/2 THE TOTAL DESIRED DIHEDRAL OF WING. EXAMPLE FOR TIPORARE, 1.5" + 1/2 THICKNESS OF TIP. THESE JIGS SHOULD BE CAREFULLY CUT SO THEY ARE EXACTLY RECTANGULAR & STRAIGHT. APPLY ONE JIG TO EACH PANEL TIP, WITH PINS (ABOUT 6 OR 8) PLUS 2 OR 3 SPOTS OF ALIPHATIC RESIN GLUE. LINE UP TO CENTER LINE. NOW LAY EACH PANEL ON FLAT PLANE TABLE (I.E., POOL TABLE) AND SAND CORRECT DIHEDRAL IN EACH PANEL. USE A SQUARE CUT 2 X 4 WITH #80 GRIT SANDPAPER TO GET DESIRED DIHEDRAL ANGLE AND CUT ON EACH PANEL (SEE DRAWING).

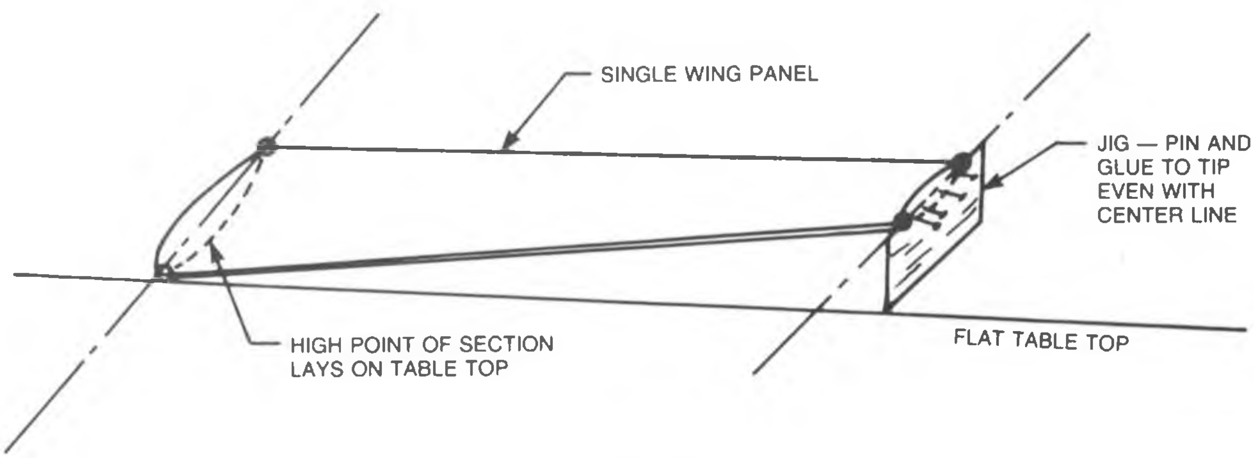


FIGURE C
APPLY JIGS TO EACH PANEL
AND CHECK FOR ACCURACY

IN THIS STATE, EACH FOUR POINTS SHOULD BE CHECK TO BE SURE CENTER LINES ARE PARALLEL (EXACTLY) WITH TABLE TOP. IF NOT, EITHER PANEL IS WARPED, TABLE TOP IS NOT LEVEL OR WARPED, OR JIG IS NOT CUT EXACTLY RECTANGULAR.

WHEN PANEL CHECKS OUT, NOW SAND DIHEDRAL ANGLE AS SHOWN:

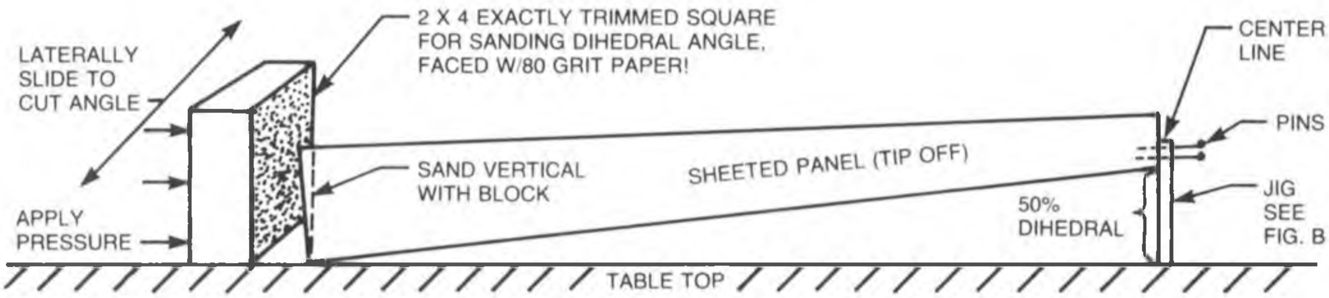


FIGURE D
SAND DIHEDRAL ANGLE

WITH JIGS STILL IN PLACE, TRIAL FIT 2 PANELS TOGETHER. CENTER JOINT SHOULD MATCH PERFECTLY W/WING AT CORRECT DIHEDRAL & EACH CHECK POINT PARALLEL TO PLANK OR BLDG. TABLE.

IF ALL CHECKS OUT, LAY PC. OF SARAN WRAP UNDER CENTER SECTION, APPLY 5-MIN. EPOXY TO BOTH SIDES OF PANEL CENTERS, SLIDE TOGETHER & PIN. IN 10 MIN. YOU HAVE A PERFECT WING.

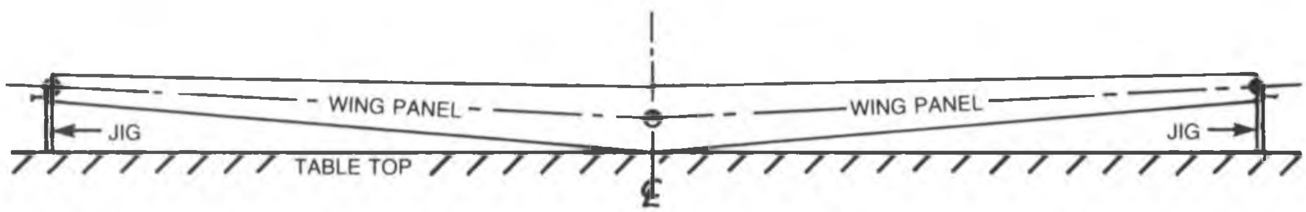


FIGURE E
JOIN THE TWO PANELS

experts . . . but what's the old saying? If you never make a mistake, it means you've never done or said anything. Frankly, in the interest of enhancing your pleasure in flying a well trimmed ship, I'll take that chance . . . and a message to the super-builder-flyers . . . hey you guys, if you know of a better way, or disagree with my theories or suggestions as herein set forth, please let me hear from you. If we keep trying, sooner or later we'll get it right.

Step By Step Final Trimming: (At Home)

You are ready to head for your flying field . . . **but**, before you go, assemble your plane completely. Get back to your building surface and do a static check.

(1) Set all movable surfaces to neutral on the plane, and match this with the trim tabs on the transmitter all neutral.

(2) On the flat surface, such as a pool table, double check the engine thrust line, wing and stab incidence, horizontal line up as necessary for a true ship. Make corrections **now**.

(3) Pull up the retracts and check the Center of Gravity. Move the equipment as necessary to obtain 25% to 30% of M.A.C., or exactly as shown on the designer's plan. Moving equipment is much superior to adding tail or nose weight, since you want your plane as light as possible!

(4) Balance the plane laterally with the L.G. retracted, tank full. Add weight to a light wing tip on the C.G. line until balanced. (I use various size nails with heads cut off . . . drill a small hole and drive in, partly exposed if you wish to make a later change.)

(5) Stand the model upright on the spinner . . . the plane should stand straight up, except when using large amounts of engine side or down-thrust.

Step By Step Trimming: (At The Field)

Double check your battery packs with a load meter. Get the proper frequency flag, let everyone at the field know that this is the first flight (ask for priority and time), range check, look at all the surfaces for correct movement, and reasonable amount of deflection. Get an expert to double check!

(6) Take-off upright and trim the ailerons and elevator for straight out flight, hands off.

(7) Fly inverted (as little wind as possible) . . . trim **only** the rudder if necessary, in the direction the plane wants to yaw., i.e., if left turn, feed in left rudder trim; if right turn, feed in right rudder, until plane flies in a straight line.

(8) Again fly upright; re-trim the elevator and ailerons for straight and level flight. Very often, the slight change in rudder trim in Step 7 will affect elevator trim, and usually requires slight aileron correction when up-right.

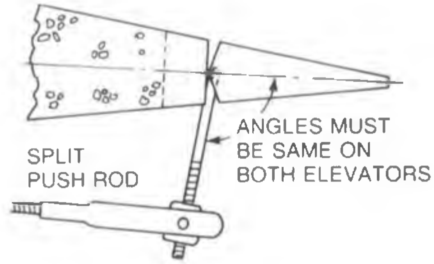
(9) Repeat Steps 7 and 8 until plane flies dead true hands-off for at least 200 yards up, and down-wind (takes 5 or 6 flights repeated).

(10) Now do one inside loop . . . if the same wing drops in successive loops at the bottom, that wing is heavy. Add a slight increment of weight to the opposite wing tip. Use modeler's clay until you finish this procedure, then weigh clay and replace with lead or nails as previously described.

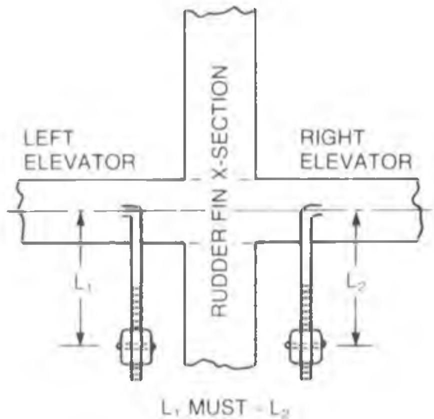
(11) Do an outside loop . . . if the same wing drops, you **may** need more weight on the light side. Do alternate insides and outsides until the plane does both insides and outsides well. If the plane will not loop on course for at least one full loop, look for other problems, such as warped wing, crooked fuselage, bad servo, crooked fin alignment. Especially note that elevators must be set up exactly the same, especially if split elevators are used. Make certain that both elevators have **identical** throw in **amount** and **differential** set-up. (See sketches.)

Remember that after each change, it is necessary to re-trim for straight and level flight using Steps 6-7-8.

(12) Correct the elevators for identical throw on the left and right sides, and for down as well as up direction. You may need differential throw on the elevators (more down than up), and here is cause for worry! Make certain they both have exactly the **same amount of differential**, otherwise your plane will cork-screw in loops. Also, make sure your gaps between fixed and movable surfaces are very small. Some guys insist on sealing gaps, at least the ailerons. By building straight and tight, you will not



SIDE VIEW ELEVATORS



REAR VIEW ELEVATORS (SPLIT TYPE)

need to seal these since the gaps are nearly nonexistent.

(13) Do three horizontal rolls on low rate . . . three rolls should take about 5 to 7 seconds. High rate about 3 to 5 seconds. Rolls should be "on a rail" . . . if not, you may need differential throw on the ailerons. This comes later. Set the linkage to give you the proper speed of roll at this time.

(14) Fly straight and level, full bore . . . chop your throttle, and observe the plane's reaction. If the nose dives abruptly, you need down thrust in the engine. If the nose climbs abruptly, take out some down thrust. (Check your C.G. on this also.) After any thrust alteration, re-trim elevators.

(15) Turn the plane into a steep bank and turn. If the plane wants to "drop out," then you may be nose heavy. Add tail weight, a little at a time. Or, better yet, reduce nose weight (how?) . . . it may be possible to move the battery pack to the rear. **Try not to add weight anywhere** if it is not absolutely the only possible solution!

(16) If you get this far, and your plane will not groove, check for dirty servo pots and worn wipers, dirty pots in your transmitter sticks, slight warps in any flying surface, sticky ailerons, flexing pushrods in pulling plus or minus G's, bent fuselage, loose linkages, sloppy fit of flying surfaces (seal if necessary). As a final remedy, re-build if nothing else works.

Remember, after each minor or major change to any part of your ship, it is necessary to repeat Steps 6, 7, and 8 again. This completes your basic trim procedures.

Advanced Fine Trimming of Plane

Your plane should now be flying quite well. From time to time, you may want to go through some of the Basic Steps procedure again, especially if changes are made, or repairs render slight changes of C.G. or incidence. Remember to attack trimming boldly at first . . . don't be afraid to try different ideas . . . try for Utopia . . . you may just find it! However, once you have a plane grooving fairly well, you are ready for the "fine tuning" . . . getting the ship ready for the next contest!

(1) Set each main gear wheel with 2 degrees of toe-in for good tracking on a hard runway. Use a paved surface for this . . . set for straight taxi . . . the plane should sit slightly positive (2 deg.) for smooth take-offs, with the C.G. just ahead of the mains on a trike set-up.

(2) Set the needle valve so the engine will not lean too much in loops or violent maneuvers . . . it's best to see a slight vapor trail in normal flight, leaning out when vertical. Use mixture control if possible, and always use either muffler, pipe, or pump pressure. Seal pressure fitting against any minor leaks!

(3) Set the engine idle so the plane will slow down properly (at center trim) for smooth, slow landing, and roll to a stop on low trim. Set the lowest trim for engine kill (if in trouble) and high trim so you have prop wash to help in stall turn maneuvers.

(4) If the plane does not track smoothly (in flight), especially in loops, try setting each aileron **up** two turns on the clevis. If it is worse, go the other way and try one turn down on each aileron.

(5) Climb vertically and chop the engine . . . the plane should not change vertical climb, but continue straight up for a reasonable time. If the plane noses **up** (on its back), reduce the engine down-thrust, or try 1 degree positive incidence in the wing. If the nose goes **down**, add some down-thrust to the engine, or try 1 degree negative incidence in the wing. The C.G. can also affect this, but change only one thing at a time. Raising or lowering ailerons can have an effect here too, as can the position of the pipe on a tuned pipe engine.

(6) Knife edge flight (both sides) . . . if the nose "climbs" laterally on side, add tail weight, or possibly add positive incidence to wing, or try a little down in each aileron. Alternate, move the position of the tuned pipe on the fuselage, closer or further away from the fuselage.

(7) Knife edge flight (both sides) . . . if the nose goes down laterally, add nose weight, or reduce wing incidence, or try a turn or two of up in each aileron (see 6). Change the pipe location. Experiment here . . . most planes fly well as a result of **arbitrary** trimming . . . change only a little at a time until it does **most** maneuvers well.

(8) If the plane wants to fall out of the sky on slow rolls, knife edge, or point maneuvers, try to increase engine output. Also, rudder throw might need to be increased. Most important, the C.G. may have to be moved to the rear! Be careful with rudder throw, since too much may cause the nose to pitch down in point rolls!

(9) Increase high elevator rate until the plane spins on the elevator and rudder alone. High rudder rate helps here, as does rearward Center of Gravity. Stubborn planes might require the addition of ailerons to spin, but only to start . . . release the ailerons after the spin starts, and the plane will pop out better when you have completed three turns.

(10) Split-S the plane . . . if the tail yaws in the **opposite** direction from the direction of roll (when flying away from the pilot) you then need differential in the ailerons, i.e., more **up** than **down**. If the tail yaws in the **same** direction as the roll, you need **less** differential in the ailerons, i.e., more **down** than **up**. On a low wing aircraft, the latter is never the case in my experience.

(11) In point rolls, when you hit the rudder, the plane should not tend to roll into, nor out of the point. If it tends to roll **with** the direction of the rudder, you have too much dihedral in wing. If an adverse roll takes place (against the direction of the rudder), you need more dihedral in the wing (for low wing pattern ships only).

(12) Anhedral in the stab is a fairly new subject . . . one that should be discussed with Hanno Prettner! However, if you do use anhedral in the stab, you'll probably need more dihedral in the wing. The position of the pipe is critical with anhedral. Raise and lower the pipe until knife edge flight is correct. If you build a ship designed for anhedral in the stab and leave it out (straight), then go back to less wing dihedral (as a starting point, use 1" ± under each tip if no anhedral, or 1½" ± under each tip if using anhedral). This rule of thumb is very broad, but holds true for the Tiporare, Compensator, or Bootlegger.

Note: These are basic "rules of thumb" . . . depending upon plane design, trimming changes can make a marked effect upon the flight characteristics you are after. At best, a good flying pattern ship is the result of absolutely straight and true flying surfaces, close to zero-zero settings on engine thrust, reference line, incidence of wing and stab, plus enough flights on the plane to balance out all the actions and reactions unique to that design. If the plane gets better as you work with it, you are trimming in the right direction; conversely, if it does not improve with subtle changes you think are needed, go through the whole trimming procedure once again from scratch. Now, if you don't feel **good** with this plane, perhaps you should consider a different type of design. Remember no two planes fly the same, even if the same design, built "identically the same" by the same person . . . so do not be afraid to try something new until your particular bird becomes a cinch to fly, capable of flying all 8, 9 and 10 maneuvers.

Conclusion

In summary, trimming is Quid Pro Quo . . . "one thing in return for another." As Don Lowe told it . . . "you give a little

to page 96

THE POOCH

By Wayne Knaust

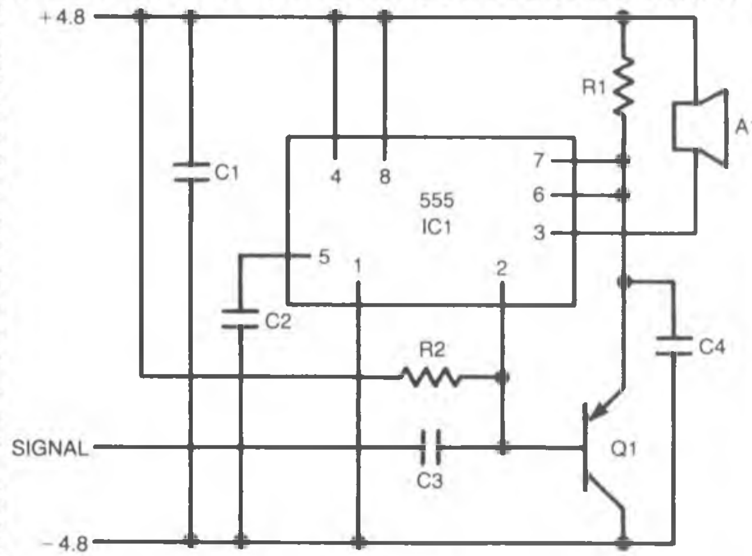


FIGURE 1
THE POOCH

Small in size and weight, the Pooch fits anywhere, is inexpensive and easy to assemble.

I have probably made as many or more goofs in R/C as other readers of RCM. For example, I have built two left sides for a Jr. Falcon, hand launched a GG Mini-Mambo with the Baby-Bee running backwards, tried to start my engine without connecting the battery to the glo plug (I actually started it once this way), and just recently I made my latest blooper. I left my plane's receiver switch on and ran my battery completely down. This was bad for two reasons: first, I wanted to go flying and my batteries didn't allow it; second, I've been told that you can ruin a nicad pack by fully discharging it. Fortunately I did no harm to my battery pack. I checked the pack with my Super-Cycle (an R/C modeler's best friend) and found the packs capacity to be as good as ever --- I was lucky.

This incident convinced me that I needed a surefire method to prevent me from leaving my receiver switch on after flying. Being interested in electronics and wanting something that was light, small, and inexpensive, I came up with an item which I call the Pooch. Why that name? Well, the item functions as a watch dog timer; I've never seen that name on a product, and I like dogs. The Pooch accomplishes its prime objective and yielded a few extras such as:

- It will assist you in locating a fly away plane assuming that the battery and servo connectors do not become disconnected.
- It allows you to range check your radio, receiving an audible signal when your transmitter is taken out of range.
- It keeps you from attempting to fly when other R/Cers are on your frequency, protecting your plane as well as the other flyers. I have observed that using clothespins, paddles, impounding, even all three, flyers still occasionally get shot down.
- It works with both positive and negative servo pulse systems.
- It works with three wire or four wire servos.

The Pooch plugs into an unused channel on your receiver exactly like a servo. If you have no extra channels you will have to construct buy a Y connector allowing two servos to be driven by one channel. The Pooch then plugs into one of the Y connector's outputs in parallel with one of the servos. Some manufacturers, e.g., Kraft and World Engines, sell a Y connector for this purpose. For other brands one would have to check the availability, or construct one.

The electronics portion of the Pooch is about 1'' square by 1/2'' high. It has a small buzzer attached by two leads and a servo connector attached by three leads. This size does not present any problems for normal R/C installations. The buzzer can be mounted on the exterior of the plane or inside the fuselage near a hole, to allow noise to escape. I prefer exterior mounting except on scale airplanes where the small buzzer may be considered unsightly.

POOCH CONSTRUCTION

The required parts for constructing the Pooch are all readily available (see parts list) with the possible exception of a servo connector for your particular set. Most manufacturers offer servo connectors and you should contact either the manufacturer of your set, or an R/C repair facility in order to purchase a connector. It is not obvious on

to page 93

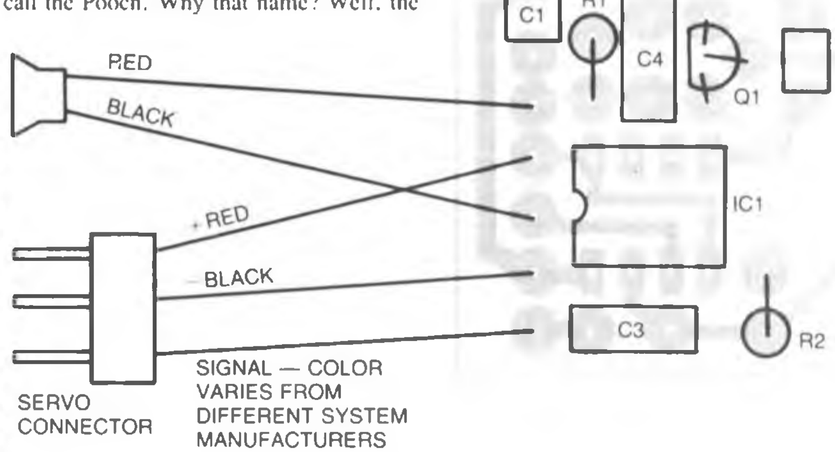
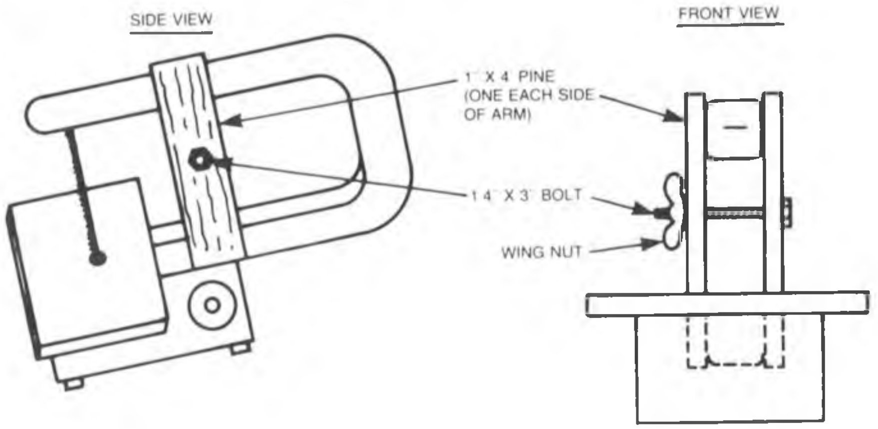


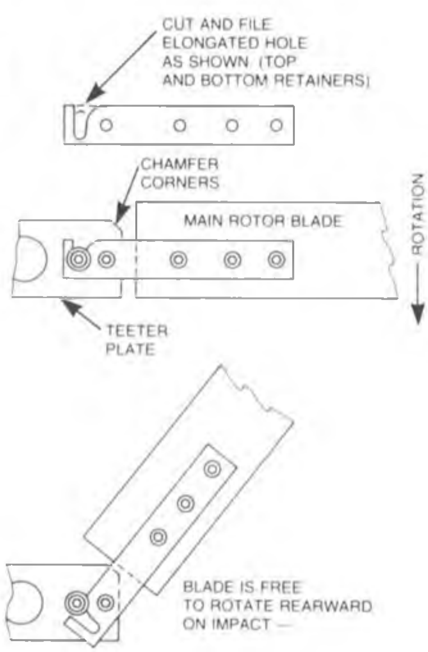
FIGURE 2
PRINTED CIRCUIT COMPONENT OVERLAY

PC BOARD SHOWN ACTUAL SIZE

FOR WHAT IT'S WORTH



W.L. Bynum of Fort Levenworth, Kansas, found that when cutting thick pieces on his Dremel saw, some rather strange tapers appeared. He eventually discovered that they were due to flexing of the saw's upper arm. To correct this problem, he devised a clamp from 1" x 4" pine boards. Since installation of this clamp, as shown in the sketch, he has been able to make perfectly straight cuts of pieces in thicknesses not possible without it.



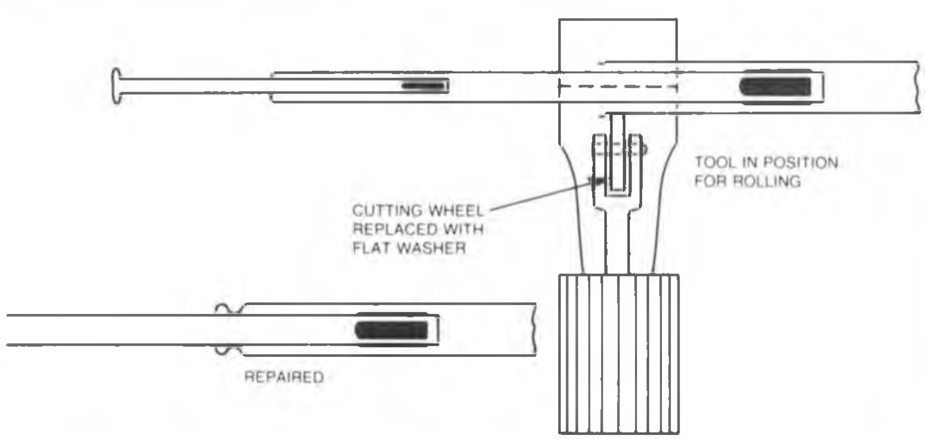
Here is a blade saving tip for chopper pilots, from Gary Avalear of Highland, New York. He found that on those helicopters on which the blades are attached to the teeter plate with two screws, a simple modification can be made that leaves the blade free to rotate forward on impact. The sketches are self-explanatory. Simply cut and file an elongated hole on the retainers, as shown. This will allow it to rotate rearward, slipping out from under the screw. Be sure to use a washer on top and bottom. This modification in no way lessens the holding power of the screw, or the alignment. Also, don't forget to chamfer the rear corners of the teeter plate to allow the root end of the blade to swing past.

Did you ever get in such a hurry to get in the air that you pulled the transmitter antenna apart as you extended it? If so, Dan Mauch of Santee, California, has devised a way for you to repair it. He first adapts a tool by replacing the cutting wheel of a small tubing cutter with a flat washer of an appropriate size. Then, re-assemble the antenna, and locate the washer on the tool about 1/16" to 1/32" from the end of the loose section. Tighten the tool's adjusting knob, and rotate it around the antenna, in the same manner as the tool is used for cutting. Repeat as necessary to form a light groove. Check by pulling out the antenna section as is normally done, adjust the crimp for smooth but secure operation. The sketches should help clarify the repair.

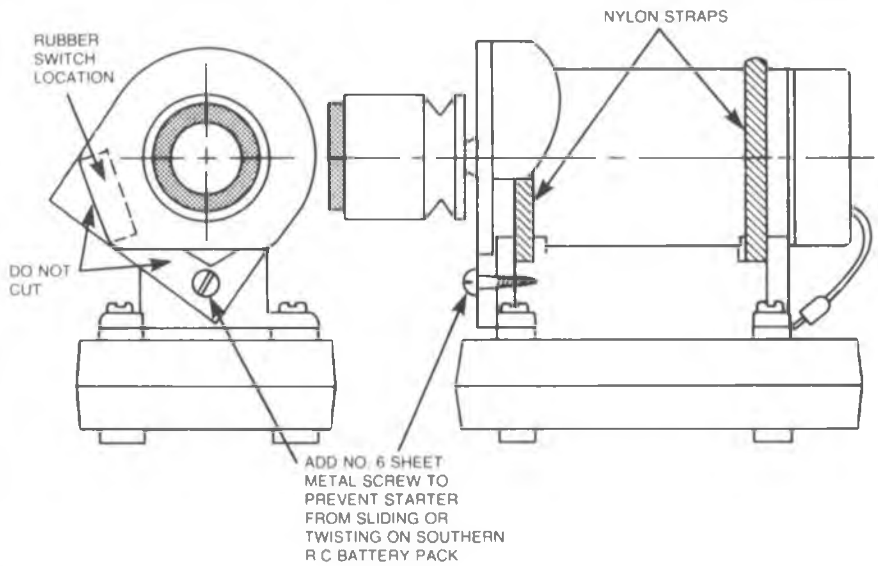
Living in a home with several small children, John C. Wilson, Stillwater, Oklahoma, found it difficult to keep his precious issues of RCM in one piece. By hanging each issue on a clothes hanger, they could be kept in their original condition, out of the reach of small hands, and in order for easy reference.

A handy shop aid is shared with us by Dan Cassel, San Francisco, California. Obtain from a good gun shop/sporting good shop that stocks reloading equipment and supplies, 3 or 4 five pound bags of chilled lead shot (used to reload shotshells). Dan uses #4 shot size as it's small in size. These bags are approximately 3" by 5" in size and make absolutely great weights since they conform to the shape of your work while letting glue dry, etc. Also good for supporting your work while sanding, i.e., after gluing on leading edge strip, place wing parallel to edge of bench with L.E. overhanging bench an inch or so. Place weights along wing and sand away — it won't budge. Dan's bags are a tough canvas-like material that is very durable. This is important. In a pinch the shot could also be used as ballast.

For those of us who find the 15 minute working time of Hobby Poxy #1 glue to be just the thing when neither the 5 minute nor several hour variety will do, Ralph Weiss, Carle Place, New York, has a suggestion to end the frustration of finding the tube's caps frozen on after extended periods of non-use. Simply apply a very thin film of mold release, Vaseline, parafin or whatever, onto the threads of the tube. You will find this much easier to do when the tubes are new and the metal seals have not yet been punctured.



FOR WHAT IT'S WORTH



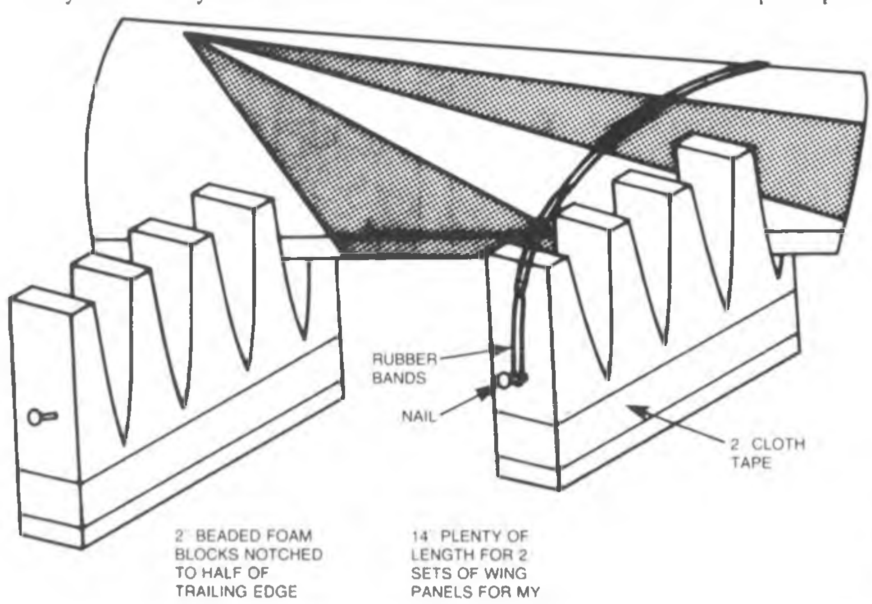
See the sketch for R.C. Allen's of Endicott, New York, solution to the problem of his Sullivan starter wanting to slide and turn within the holding straps on a Southern R/C battery box. He does not cut off the starter flange as suggested; instead, he drills a hole through it and secures it with a No. 6 sheet metal screw into the forward upright.

Transportation for our models is always a problem, especially now that they are getting bigger and bigger. See the sketch for one flyer's solution to carrying wings, in this case four panels for a Fleet Bipe. Kenneth E. Runestrand of Roseville, California, devised this holder made from 2" foam blocks, cut with a hot wire or a saw. They will hold your wings safely and securely on their way to the field.

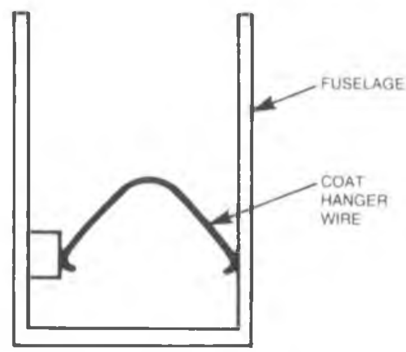
This neat hinge retaining method is suggested by Jack Harvey, Hixson, Tennessee. Every time Jack crashed a plane it seems like he always had to repair a hinge or two on the aileron or rudder or elevator. He **always** used toothpicks for the obvious reason. But digging those out of the balsa is almost as bad (worse really) as sawing them down to size and then trimming them off.

To solve both these problems he now uses the yellow inner Ny-Rod. Drill the hole smaller than the NyRod and you will be amazed how snugly these fit in the balsa, especially if a drop of Hot Stuff is used to harden the balsa first. The NyRod piece does not have to be glued in and, therefore, is easy to cut to size and trim off with a razor blade.

Jack puts these in after **everything** is covered. Then to hide them he puts a piece of MonoKote over a thin piece of cardboard (1/32") and punches out a hole with a paper punch. You are left with a neat little circle of MonoKote that goes over the NyRod hole. The whole thing is easy to do and, best of all, easy to service later. Jack peels the MonoKote circle off and pushes out the NyRod. The MonoKote holds the NyRod in of course.



It is a coat hangar to the rescue — again! Wendell Seward of Los Angeles, California, submitted his solution for holding servo rails, control guides, etc., inside the fuselage while the glue sets. Normally, the reach is too great for clothespins or any modeler's clamps. Wendell uses a curved piece of wire cut to the proper length. The pressure available is somewhat adjustable; the flatter the curve the greater it will be. See the accompanying sketch.



A suggestion for a cure for loose and wobbly wheels was submitted by Lee Otto, Norfolk, Nebraska. A friend gave Lee his worn out set of wheels, much too loose and wobbly for his plane, with his standard size axles.

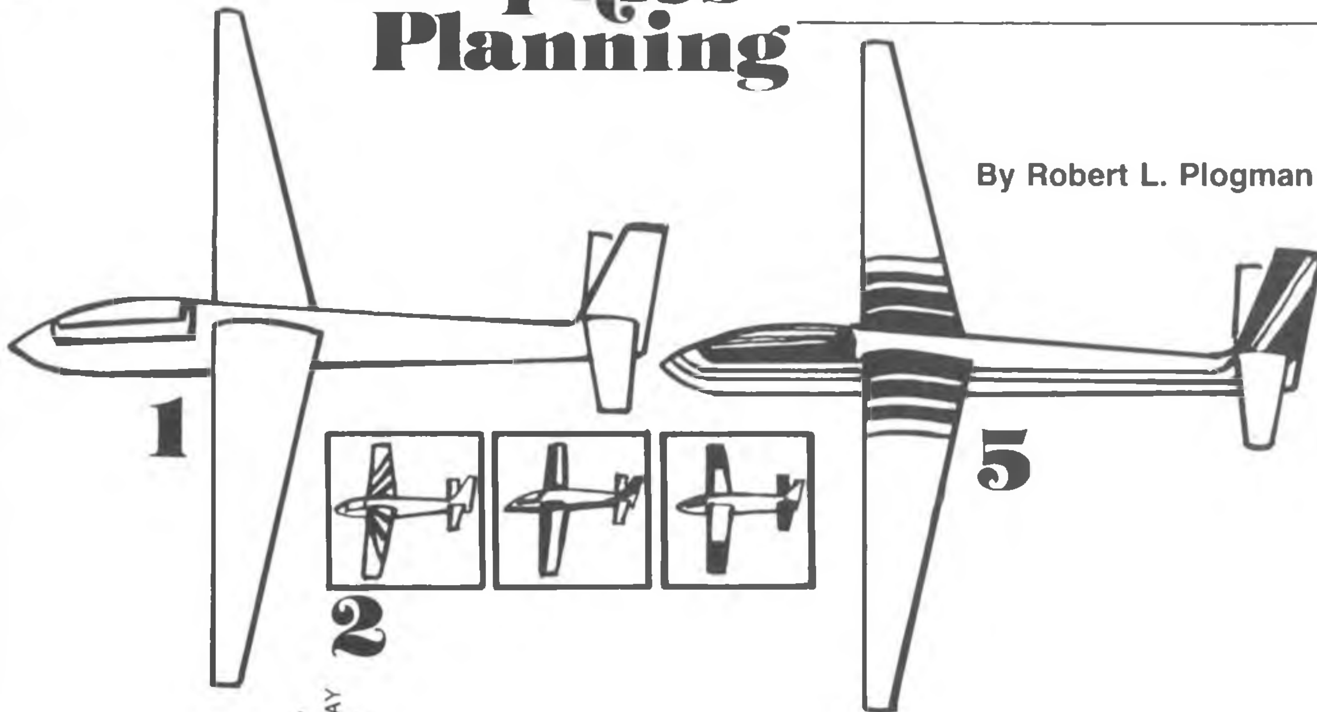
An inch or so of heat shrink tubing, available at most hobby shops or electronic outlets, pushed on the axle and then shrinked with a heat gun, cigarette lighter, or match, cured this wobble for a few cents, compared to $3 or $4 for new wheels.

This also works great, to protect your new wheels from the sharp threads for those who use bolts for axles. Bolts are slightly undersize and the tubing makes up the difference and gives you a smooth running wheel.

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.

Graphics Planning

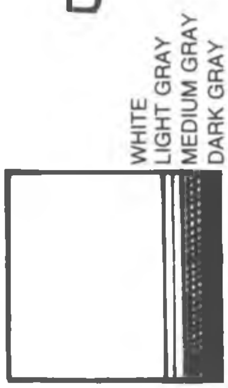
By Robert L. Plogman



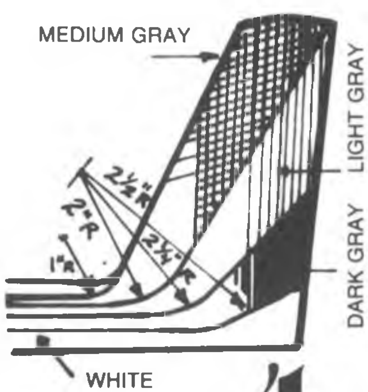
1

2

5



3



4

(1) Sketch a rough perspective view of the model. Note: Sometimes the kit plans or box lid will provide an excellent photo of the model.

(2) Using tracing paper, work directly over your sketch or photo of the model. Try several styles of lines, shapes or patterns on these experimental drawings. Refer to any possible source for inspiration and guidance for creating a unique design. Example; model or full scale aircraft photos, boats, racing cars, etc. Then adapt the graphic style that you like best for your project.

(3) Select several color schemes. A good approach is to make color swatches in the proportions that each color will be used on the model. This method shows more closely the effect of the chosen colors on the finished project. Example; 2 colors light and dark in equal proportions will appear quite different than a combination of 90% light and 10% dark.

(4) Refine the graphic design so as to be pleasing to your eye and yet practical to execute. Make a full size template on tracing or bond paper for each color and place these patterns on the model to see how the design works in full size. Now proceed with your choice of covering materials or paints, etc. remember to apply them as recommended by the manufacturer of that material.

(5) Take your time and carefully execute the graphic design that you have developed.

FOR ROPER LOVERS ONLY

By Dario Brisighella Sr.

I am convinced it was a very smart man who first said, "If you can't say anything good about something, then say nothing at all . . ." I really go along with this thought but, as an R/C modeler and being what we are, we tend to pass along most of the good information we come onto. This makes our hobby progress the way it does. Now I am not going to say anything bad about the Roper Engine but, on the other hand, I am not going to gild-a-lily either.

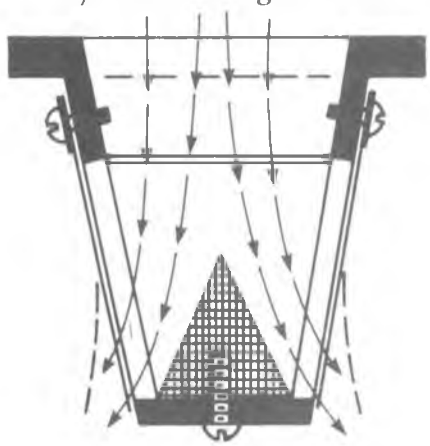
After playing around with this engine for sometime, I have found a few items which I think can stand some attention and I pass them along for what they are worth."**Attention Roper owners.**"

Right out of the box most of these engines start and run fairly well (now that is something good). They do shake a bit, in fact, quite a bit (that's something bad . . . right?), but that may well be expected, for the power impulses alone in a 3.7 C.I.D. industrial engine are going to pack a lot of wallop. It's to be expected from a single cylinder engine of this displacement. Basically it is a very well designed/engineered industrial engine and had the manufacturer known of the use we would put it to, they may have had nightmares over it.

Now without getting into my favorite subject of balancing and/or "Overbalancing," there are a few things which you may like to investigate (as an owner) for yourself. As most of you know, the majority of the industrial engines we use in large scale R/C are being operated just opposite from the way they were intended/designed. We do not hang the propeller on the power take-off end of the crankshaft. That's right, we use the wrong end! (It's not us who are backwards, it's the rest of the world.) So, be that as it may, and as the 3.7 Roper falls into this backwards category, we have, or we wind up with, the wrong bearing, or I should say the wrong type of bearing behind the propeller and flywheel.

Now there is nothing so terribly wrong with this roller-bearing on the (our) front end. The world is not going to stop spinning (pun), because of it. I have found though, that after some running time, the radial play between this roller-bearing and the crankshaft becomes excessive. On my own engine I had originally set the gap between the flywheel magnets and the ignition-coil at ten thousands. After a time the flywheel actually began to make contact with the coil. To me, that was excessive, and a little bit more!

After some discussion with the engine distributor, Mr. Gene Horner, he has advised me that he has undertaken an exchange program for the bearing-fix. The exchange price is twenty dollars, and for this Mr. Horner will provide a modified front end bearing retainer assembly on which he machines and installs a very husky ball bearing. For those with the equipment and know-how, this is not the most difficult or time consuming modification to undertake.



MODIFIED PYRAMID
REED ASSEMBLY

Another malady I found on my engine is that when the fins were machined-off the flywheel, the finishing face-cut was not made perpendicular to the crankshaft bore. This condition prevented the prop driver from seating squarely on the shaft and flywheel. When the engine is running, the center-bolt of the propeller scribes an orbital path, rather than running true. This condition further exaggerates and amplifies the vibrations, not to mention the power degradation. A machinist's dial-indicator can detect this condition and a bit of lathe work eliminates it completely. Mr. Horner has been advised of this and I am told that now all of the flywheels are being bore-mounted for this facing-off operation.

The engine performance increased dramatically after the drive-end was stabilized but I was not convinced that I had seen the total power output of this brute. I just happen to like reed-ported engines so the next place I looked into, was the Reed Pyramid Assembly. "One look is all it took" and I found the greatest culprit of them all. Hold this assembly up towards a light, and sight into the carb-end of the reed assembly. You, too, will see the "light"! There is only one small problem though; you should see nothing but dark! In order to have the engine function properly, the reeds must seat tight against the flats of the reed pyramid. For a die-casting, this pyramid has anything but flat seating surfaces! These surfaces must be lapped dead flat, so get some emery cloth and a good flat surface and finish the job that the factory failed to provide. When you're satisfied that the reeds seat properly, test your handiwork by pouring some water or thinner into the inverted pyramid. There should be no leakage. The reeds may need a little bending also, but be very careful as they can be easily broken.

While this reed assembly is out of the engine you may also consider a bit of induction-aerodynamics, file or grind away any portion of the reed retainer screws found projecting into the airstream of the reed assembly. Another little trick you may elect to entertain so as to improve the induction of air/fuel mixtures into the engine is to make and install a small aluminum pyramid into the reed assembly base. See the sketch for details. This little addition may take a few hours of filing but I think it's worth the effort. The flow pattern through the reeds is much cleaner and if we pack more of the air/fuel mixture into the engine it stands to reason that the engine will deliver that much more power, and I'm sure you will find this the case.

So now, if you've had any sort of starting problems with your 3.7 Roper, correcting the reed assembly ought to cure most of them. If you find a lot of radial-play in the crankshaft end, exchange the old front end with Mr. Horner, and I think overall you will be happily surprised with the total increased performance. Sort of, "Unleashing a Tiger," and far and above the engine you unpacked originally.

Now then, for all you non-Roper owners . . . who did not read this article . . . some of what is reported here, may just apply to your own brand of engines. As time and dollars permits I do hope to play around with all the popular engines now on the market and will report on whatever I find that will make them better suited for our use.

At this point in time, all of the larger gasoline engines currently in use for large scale R/C, are converted industrial engines --- designed for use in chainsaws, ice augers, leaf blowers and the like. There are bound to be some faults/problems in most of them, somewhere. Until such time that the engine manufacturers begins to build or redesign their engines specifically for our type of service, a bit of tinkering will be in order. To my knowledge the only manufacturer really making any sizable effort in this direction is Trail Mfg. Ltd., of Canada. They produce the Quadra Engines which keep me busy "overbalancing" flywheels. I would look for a totally new R/C engine from Trail in the not too distant future. □

nylon tubing clamps are included with each muffler. Catalog No. TT-40 for .29-.40 is $15.50. Catalog No. TT-60 for .45-.80 is $16.50. Specify engine and size when ordering. These mufflers are now available at most hobby shops or can be ordered direct from: Tatone Products Corp., 1209 Geneva Ave., San Francisco, Calif. 94112. If ordering direct, add $1.25 for postage and handling. California residents add 6%. □

THE POOCH

from page 78

all sets which leads are the +4.8, −4.8, and signal. If you are not sure about your set contact the local electronics wizard (every club has one).

Construction of the Pooch is straightforward and should take less than 1/2 hour. The following is a step-by-step procedure for building the Pooch. Remember, a small iron should be used and avoid bad (cold) solder joints. Refer to the printed circuit overlay, Figure 2, for parts placement on the PC board.

(1) In turn place the 555 chip, R1, and R2 in the PC board and solder.

(2) In turn place C1, C2, C3, and C4 in the PC board and solder.

(3) Insert Q1 in PC board making sure certain leads are configured as shown on the overlay and solder.

(4) In turn insert the black (−4.8), red (+4.8), and signal servo connector leads in the PC board and solder. Then insert the red and black alarm leads in the PC board and solder.

(5) Check all components and leads making certain the PC board agrees with the overlay. Your Pooch is now complete.

(6) To check out the Pooch, plug it into a

servo channel from the receiver. Turn the receiver switch on and the alarm should sound. Turning the transmitter on should silence the alarm. Certain buzzers will not operate reliably unless attached to a solid object. Use small screws in the two mounting holes of the buzzer attaching to outside or inside of fuselage as desired.

(7) Attach the circuit board to the inside of the fuselage using strips of servo tape; connect the servo connector to the channel desired and go fly.

USING THE POOCH

Determining If Frequency Is Clear

Before each flight follow all frequency control procedures for your field then turn the receiver switch on without the transmitter switch being on. If you do not hear an audible signal, your frequency is not clear — **do not fly**. If you do hear an audible alarm you know other transmitters are not operating on your frequency and it's safe to fly. Turning your transmitter on should cause the alarm to stop.

Locating A Fly Away

If your plane, heaven forbid, goes down and you have trouble locating it, turn the transmitter off as you approach what is your best guess as to the plane's location. You can hear the alarm for a distance of 50' to 100' depending on your ears sensitivity and the amount of background noise. All you need to do is home in on the alarm. The Pooch draws approximately 13 ma with alarm on and will sound for 5 hours or more under normal conditions. Hopefully any fly away can be located within this time frame.

Range Checking

For range checking, remove your transmitter's antenna after a fresh charge and start walking away from the plane. When the alarm sounds, you are out of range. If you make a mental note of this distance you can recheck periodically at the flying field. Any appreciable decrease in range should make you suspect weak batteries or a system malfunction. Keep in mind that a completely dead receiver battery will not sound alarm or operate the servos.

Battery Watch Dog

After you fly, turn off your transmitter switch. If you have not yet turned off your airborne switch, the Pooch will bark away until you either turn your transmitter switch back on or turn your airborne switch off.

GENERAL INFORMATION

The Pooch has gone through a fairly lengthy design phase. Some of my initial circuits used two transistors and proved to not operate reliably with certain decoders and servos. My World Engines Pylon Midget (1971) presented a rather unique situation. Most decoders have outputs that drop to the ground state when the transmitter is turned off. With the Pylon Midget the decoder outputs are sometimes left in a

to page 96

THE POOCH

from page 94/78

positive (+4.8 volt) state. For this reason I have designed the Pooch to work with the Pylon Midget as well as both positive and negative servo pulse systems. The Pooch also works with 3 wire or 4 wire servo systems.

The Pooch has been checked for proper operation at temperature extremes of 5°F to 125°F. In the idle condition it draws about 2 ma: with the alarm sounding the Pooch draws 13 ma.

PARTS LIST

Q1 — 2N3906 or equiv. Radio Shack
IC1 — 555 timer, Radio Shack
C1, C2 — 0.01uf
C3 — 0.0068uf
C4 — 0.068uf
R1 — 5.1M 1/4 watt (green-brown-green)
R2 — 39K 1/4 watt (orange-white-orange)
PC1 — printed circuit board — see note below
A1 — 6 volt buzzer, Jameco Electronics

Note — The Pooch is available in either kit form or built up (needing only your sets servo connector in either case) from Wayne's Hobby Shop, 1508 Watson St., St. Charles, MO. 63301. Kit — $10, Built-up — $12 postpaid in U.S. PC board $3.

Editor's Note:

Jameco Electronics, as referred to, is located at 1355 Shoreway Rd., Belmont, CA 94002. It has the 6 volt buzzer used, Model MB6, at $1.95. However, it also has a $10.00 minimum on mail orders. A free catalog is available, which is recommended to all electronics builders and experimenters, and which contains many items useable in R/C projects thus making the minimum order not at all hard to meet. ☐

GETTING IT ALL TOGETHER

from page 77/74

to get a little . . . Get a better loop, and lose a little rolling quality"; (don't hold me to an exact quote, Don). But, it is a matter of **trade-off**. Keep looking, flying and trimming . . . the search never ends for **perfection**, even with the same plane. Guess that is why the hobby never gets dull . . . always another brain to pick, another theory to be tested.

. . . now, back to my bench; maybe if I add just a "smitch" of negative wing incidence, it might just . . . tell you how it worked in the next article.

References

Don Lowe, Joe Bridi, Jim Oddino, Bill and Chuck Salkowski, Dave Brown, Steve Helms, Ron Chidgey.

Material References

Actual experience "on the circuit"; Bull sessions with some of the above; talks with Jim Kirkland before his untimely death; as well as ideas garnered from his own club members, and friends, such as Roger Olsen, John Barengo, Jim VanderWalker, Jim Grace, Marv Ingerson, Elmer Helfert and many others. ☐

HOW MUCH FLYING TIME?

from page 72/70

current eaters and what you can do to decrease their consumption. We still have one big source of current use to contend with --- **you**. Remember that the servos use more current when they are moving, therefore, the simple solution to saving battery time is to ask them to move less. No, I am not telling you to change your whole flying routine, or to let an airplane fly into the ground to save a few milliamps. I am still trying to explain some of the reasons why that radio man you talked to cannot give you a simple answer to "how much time?"

Remember that most airplanes, regardless of the number of channels installed, operate the highest percentage of the time on two controls, pitch and roll, or pitch and yaw, in the case of rudder for turn control. Obviously, the more you use these 2 controls, the higher your current consumption is. As hard as it might be to accept, your 1/2A flitting around your head requiring constant control movements is probably using current at a higher rate than a .60 pattern plane flying FAI maneuvers. The latter takes less movements to do what is expected of it. You are also using more current if you are nervous, and constantly moving the sticks, or if you are flying an out of trim airplane that constantly needs corrective inputs.

Now, we know that you probably aren't planning an assult on the world endurance record, so most of this might not be of real prime importance. However, it must be interesting to you to know just how many flights you can safely put in, otherwise you would not have asked your "how much flying time " question in the first place. Here is how to calculate it, exactly, for your combination of equipment, airplane, and flying habits.

First, make a capacity test of your airborne battery, using one of the battery dischargers such as the Ace Digi-Pace or L.R. Taylor & Co. Power Pacer. If you don't own one, borrow one. They will

to page 100

HOW MUCH FLYING TIME?

from page 98/70

give you the exact amount of current the battery is capable of, and you need only some simple arithmetic to calculate it. You will have to know the rate of discharge of the instrument, as noted in the instructions.

For example, the Ace unit discharges the battery at the rate of 300 milliamps per hour. Assuming that the time indicated after discharge is 90 minutes (1.5 hours), you multiply that by 300, for a battery capacity of 450 milliamps.

Now you go fly, carefully keeping track of the time your radio is turned on. Say you flew six flights of ten minutes duration each, for a total of 60 minutes. Now, without recharging, plug the battery pack back on the Digi-Pace, and take it down the rest of the way. Say you get a reading of 30 minutes (.5 hour) this time, which multiplied by the 300 discharge rate gives you 150 mils left.

Subtracting the 150 from the original 450 tells us that we used 300 mils during our hour's flight. Further calculations tell us that we used current at the rate of 50 mils for each or our six ten minute flights, and further that we are using it at 5 mils per minute. From this, you can calculate your available time in whatever manner is most useful to you; a total of 90 minutes, or if you prefer to think of it in terms of flights, nine flights. Though remember to give yourself some time at the end for safety, you can't be in the air when your battery runs completely out just to prove your arithmetic!

The use of the Taylor Power Pacer is somewhat similar except that the indications on the unit are MAH. A complete article on the Power Pacer was printed in the October 1978 issue of RCM.

The rate of consumption for that, and for other models remains the same, unless your flying habits change drastically. You can then adjust the battery size if necessary. For example, if you need more flying time,

to page 116

HOW MUCH FLYING TIME?

from page 100/70

go to a larger capacity battery, again using your basic consumption rate as a guide to determine total time. If, on the other hand, you can do with less time, like in a racing plane with its usual short in-flight time in one day, install a smaller battery and save carrying that excess weight.

Remember, that battery energy is vital, you can't glide in without it. You should find it comforting to know just how long you can safely fly without having to stop on those days when things are going so well, just because you don't know how long your batteries will last.

And isn't it somewhat comforting to know that the manufacturers of your radio wasn't putting you off after all, he does care. The answer you received was not evasive, just truthful, the question is hard to answer! □

AIRPLANE WEIGHT & C.G.

from page 69/68

relation is developed which will give the required "All Up" C.G.

Remember, if the C.G. for Empty Weight is forward of the required "All Up" C.G., initially lay out the locations for the servos and receiver as far aft in the equipment bay as possible. Likewise, if the Empty Weight C.G. is aft of the required "All Up" C.G., begin the paper analysis with the receiver and servos as far forward as possible.

HOW TO EFFICIENTLY LOCATE BALLAST IF REQUIRED

Sometimes due to the airplane configuration it is impossible to achieve the desired "All Up" C.G. by placement of the servos, receiver and battery pack alone. The only alternative is to use ballast. Once it is determined ballast is required, the optimum location for installation is at the maximum distance from the "All Up" C.G.

BALLAST ANALYSIS:

(1) Using the side view of the airplane shown on the plans, determine the location which can best accommodate ballast. If the "All Up" C.G. is to be moved aft, select the location which is farthest aft of the "All Up" C.G. If the "All Up" C.G. is to be moved forward, select the most forward location.

(2) Measure the distance from the reference axis (wing leading edge) to the ballast C.G. and use it as Ⓒ in the following formula:

$$\text{Ballast Weight} = \frac{Ⓐ - Ⓑ}{Ⓒ - Ⓓ}$$

where

Ⓐ = ("All Up" weight) x (required airplane C.G.)

Ⓑ = "All Up" moment from the weight and balance form

Ⓒ = X of ballast at optimum position measured from the reference axis (wing leading edge). to page 118

AIRPLANE WEIGHT & C.G.

from page 116/68

Important!: The same sign convention adopted in Step 2 under "All Up Weight and C.G. Analysis" must be used for $\bar{X}$ of the ballast

Ⓓ = required airplane C.G.

Example: Suppose the required C.G. for the example in Figure 2 is 2.5" from the leading edge and the 2.75 position is the most forward C.G. possible by locating the servos, receiver and battery pack.

Assume the optimum ballast location is 5" forward of the wing leading edge. Then:

Ⓐ = (40.6 ounces) x (2.5") = 101.50 ounce-inches

Ⓑ = 111.65 ounce-inches

Ⓒ = − 5" (note the **minus** sign since $\bar{X}$ of the ballast is **forward** of the reference axis).

Ⓓ = 2.5"

Ballast Weight =

$$\frac{(101.50 - 111.65)}{(-5) - (2.5)} = \frac{-10.15}{-7.5} = 1.35 \text{ oz.}$$

Refer to the ballast calculation on Figure 2 to see if the ballast weight has the desired effect on the "All Up" C.G.

Once the airplane is complete and ready to fly, with all the airborne equipment plus any required ballast installed, it pays to check the C.G. to make sure it is located correctly. To do this, merely run the "All Up" airplane through the same procedure used to determine the Empty Weight C.G.

One remark in conclusion. Many aircraft have wings with tapered leading edges. To establish the dimension "L" choose the point on each wing where the Mean Aerodynamic Chord (MAC) intersects the leading edge and project these two points perpendicular to the measuring surface. Since C.G. is usually given in percent of MAC, use the line joining the two points as the reference axis for "L" and when calculating the servo, receiver and battery pack locations in Step 2 under the "All Up Weight and C.G. Analysis" section. □

GENTLE LADY

from page 67

The fuselage is balsa with ply doublers and is, essentially, a box with enough stock at the corners to allow sanding a slight rounding. The finished result was very pleasing. We told you that the instructions were very complete, and Step 9 on Fuselage Construction proves it, for there (should you choose to opt for it) are the photos and instructions for engine installation. If you don't want a full time nose mounted engine, the plans show how and where to install a power pod mounting. As we say, we chose to stick with the "pure" wind power version, as Gentle Lady was originally intended.

Covering:

We covered the wing, tail assembly, and fuselage with Super MonoKote. The color scheme chosen was yellow for the fuselage and center section of the wing, with transparent orange for the outboard sections, and the tail assembly. Covering was covered (no pun intended) in detail in Section IV of the instructions, and even included truing the wing and setting washout. Once again we must remark on the value of these instructions - - - not only for the novice, but for the modeler who builds only occasionally.

Radio:

The installation of our Kraft 2 channel radio proceeded with no problems. Carl has devoted an entire page, complete with a detailed drawing, of just how to go about getting battery, receiver, two servos, and switch and charging jack installed and working. Ours was completed as per the plans using the same model of the Kraft radio.

Flying:

Now, at long last, comes the best part. You would expect that a sailplane with a name like Gentle Lady would be something special, wouldn't you? And, when it's designed by someone whose background for record breaking aircraft goes back to the mid-1930's . . . well, it just has to be great, right? I'm not going to disappoint you, because Gentle Lady lived up to our every expectation — and then some.

After balancing, and a radio check, we were ready to go. A hand launch indicated that all was in readiness and, so, away we went, our hi-start pulling strongly and our glider tracking true. We used only slight corrections on the climb up, and found on later flights she did a better job if we kept our hands off. She came off the hi-start cleanly, and from there on things just got better. With a 5.4 ounce per square foot wing loading, she can slow down and just loaf around almost as though she'd never come down — but a touch of down trim and the Lady becomes a fast one. Turns are made with no tendency to fall off and complete control was experienced easily throughout the flight.

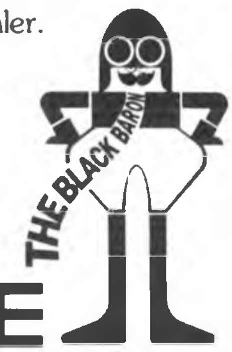
Conclusion:

At the start we quoted from the booklet furnished with the kit. It stated that this glider was designed to be a gentle trainer for the beginning R/C modeler, yet possess competition capability in the hands of the experienced glider pilot. Having built and flown this great sailplane, we see no reason to change Carl's statement, and can only add to it by saying that Gentle Lady is, truly, a most gentle lady, designed by a gentle man, and a gentleman. ☐

ANEMOMETER

from page 66

which can be worked out on any small hand calculator with trig functions.



μ's is mph. Lα is the angle with the horizontal, and 19.59 is a constant.

Actually, with a small hand calculator and a few minutes of time, the calculations are within the ability of most. If you are not so inclined, use this table:

5 MPH	86°
10 MPH	75°
15 MPH	59°
20 MPH	43.5°
25 MPH	31°
30 MPH	23°

The only tools necessary are a compass, protractor and ruler. On heavy white cardboard, lay out your pivot point near the top left hand corner. Scribe your circles leaving room for the ball to hang vertically. Seven to eight inch circles are appropriate. The degrees are measured from the horizontal.

The lines on the MPH scale between units of five are equally spaced which leads to a small error. The error is corrected each five MPH or, using the formula, you can calculate the number of degrees for each MPH then you can have the single MPH's correctly spaced between the units of five.

The calibrations made in the wind tunnel were done with the distance from the pivot point to the top of the ball being exactly 12" (30 cm.); this is the only exact measurement. The manufacturers of ping-pong balls must keep them to certain tolerances, they will not vary enough in size to make any difference. Try and buy just one ping-pong ball — we have 5 left from our package. Anyone for ping-pong?

The spline to hold the wind meter vertical may be obtained at any school supply counter; it is used by students to hold a term paper into a unit. When you have finished your drawing, cut the cardboard in such a way that there is an inch or so to spare at each end of the spline. The mast is a 36" piece of 5/32" piano wire. Two pieces of 5/32" I.D. brass tubing are taped to each end of the spline. Then the anemometer will slide down until it hits the stop washer soldered to the mast. The anemometer can now pivot freely and act as a wind vane.

The line which holds the ping-pong ball is nylon, .1mm to .2mm in diameter. We used the nylon line which is used for stringing pearls or beads which is probably 8 lb. test fishing line. Nylon monofilament sewing thread was also recommended. Borrow a long slender sewing needle from your wife to get the monofilament through the ball. Cement the line on top and bottom of the ball.

We placed the anemometer far enough above the top of our frequency pin holder to avoid any turbulence; even so, the ball bounces around a little bit. A few minutes of observation will enable you to make fairly accurate readings.

If the ball and line are blown into the blank space above 30 mph, or even horizontally, you could do one of two things: Ballast the ball or, even better, reconsider your decision about flying today. □

from page 64

using the balsa sides as a pattern. The fuselage bottom piece from the 1/4" plywood firewall, aft to the trailing edge area of the wing, is pre-cut 3/32" plywood. The remainder of the bottom sheeting and all top sheeting is pre-cut balsa. When assembled, the basic fuselage is a very rugged unit that is also light in weight.

The Sky Jammer may be built either as a tail dragger or in a tricycle landing gear configuration. The builder who intends to use the Sky Jammer for Formula 500 racing will undoubtably opt for the tail dragger arrangement as we did, while the sport flyer will probably choose the tricycle gear layout. The preformed aluminum l.g. is used in either landing gear installation and the necessary nose gear hardware and tail wheel bracket are included. Our kit was short the nose gear leg. However, the manufacturer had included a notice that explained that due to unexpected shipping delays the nose gear legs were not received when the kits were produced. The notice indicated that the nose gear leg would be sent free of charge to any Sky Jammer builder who requested one. The fuselage parts, with regard to cutting, fit, and quality, matched the wing and tail surface pieces, by being excellent. Our test aircraft was assembled with Fast Bond cyanoacrylate glue being used for all construction phases except for the firewall and wing attachment area of the fuselage, where Quick Bond epoxy was employed.

Covering:

The wing of our Sky Jammer was covered with Hobby Lobby's Superkote heat shrinkable film-type covering material. The fuselage and tail surfaces were finished with K & B Super Poxy primer and gloss enamel. While film type covering could be easily used on the fuselage and tail surfaces (and would also hasten the finishing process) we much prefer the appearance and durability of an epoxy finish.

Engine:

A K & B (#8011) .40 R/C engine was installed along with a four ounce Sullivan SS-4 fuel tank, as our Sky Jammer was being built to be raced. The Formula 500 racing rules vary slightly from one part of the country to another. In this reviewer's area, a stock K & B (#8011) .40 R/C engine is the only engine allowed. However, even in those parts of the country where any .40 size engine is allowed, the K & B .40 is still the dominant engine choice. (The K & B engine is readily available, inexpensive, dependable and, since it is manufactured in the USA, its parts availability is also second to none.)

If the Sky Jammer is to be used for sport flying purposes only, a larger fuel tank would be preferable.

to page 123

SKY JAMMER

from page 121/64

Radio:

Our test aircraft was equipped with a Westport International Variant radio system and a 100 mah battery pack.

Flying:

Ready to fly (less fuel) our Sky Jammer weighed in at exactly 54 ounces, which is two ounces under the legal racing limit. Our test model was brought up to the legal weight of 3½ lbs. with the addition of two ounces of lead.

The first flight of our Sky Jammer quickly revealed that it was going to be a fine flying aircraft. A slight amount of down elevator and right rudder trim were required to obtain "hands off" straight and level flight at full throttle. The elevator travel was reduced from the suggested travel limit by about 25%, to produce a groovy flying racer that went exactly where it was pointed. The Sky Jammer is fast, turns well and should be winning its share of future Formula 500 races. If the Sky Jammer is built as a sport aircraft, it will undoubtably prove to be equally good for that purpose. Landings are easily accomplished with no nasty tendencies being in evidence. The Sky Jammer is fully aerobatic and with its relatively thin wing, it is a faster flying aircraft than most other sport designs. It is not a beginner type kit, however, any RC'er with a reasonable amount of four control function experience will have no difficulty in building and flying the Sky Jammer.

Conclusion:

The sport flyer who enjoys "Hot Dogging" about the sky, with a docile, yet high performance type design, will be delighted with this aircraft.

In summary, the Sky Jammer is a fine quality kit, reasonably priced, that is easy to assemble, and one that flies very well. If we were to fault this kit in any area it would be in regard to its rather "spartan" hardware package. □

ENGINE CLINIC

from page 63/62

It would really be embarassing to have the needle fall out in flight during an air show.

Can you please advise. Thanks for your patience and help.

Tally ho
Harry Braunlich
Victor, N.Y.

To start with, if you have trouble with the needle valve backing out on a Perry carburetor, it is due to far too much vibration. If you are backing out needles you are also shaking the motors in your servos, etc., apart as well. Better check your method of engine mounting, prop for balance, out of balance spinner, etc.

to page 126

ENGINE CLINIC

from page 123/62

I do not know if you have the older type Perry carburetor with the spring retaining the needing valve or the new "O" ring type. If it is the older type, bending the ends of the spring 90° so they bite in will usually solve the problem. Stretching the spring to increase tension will also help. As a last resort, mashing the threads slightly with pliers will work but I do not approve of this method myself.

If you have the later style Perry carburetor with the "O" ring needle valve, a short length of heavy wall fuel line slipped over the spray bar neck between the needle valve and idle mixture disc will increase tension much the same as the spring on the older style. But, as mentioned earlier, get rid of your vibration and you will not have any problems with the needle valve backing out to begin with. Sometimes nothing more than a spinner with the back plate hole off center will be the cause of excess vibration. If using a spinner that mounts to the front face of the prop, be sure and check it for wobble. Many makes of propellers will have a hub which does not have the front and back faces square with each other. This, in turn, can cock the prop or spinner at an angle causing all sorts of problems. This is why all props should have the tips checked for tracking as well as checking for balance. You will be surprised how few really track true with many having tip run-out in excess of 1/8" and as much as 1/4" with props in the 11" diameter range. □

SCALE VIEWS

from page 57/56

page Aerodata Publications, pretty much following the Profile format, have not achieved wide distribution in this country but with the beginning of this collected series, that should change. Six aircraft are featured: FW-190A, Spitfire Mk. I and II, P-51D, BF-109E, Hurricane Mk. I and P-47D. Each has two color pages --- a color

to page 128

The Flying Sparks, Inc.
ANNUAL ARNOT MALL SHOW
April 25, 1981

Sponsored by the Elmira Flying Sparks, Inc., the show is strictly a Static display contest and is open to all. All categories of R/C will be represented.

Prizes will be awarded courtesy of local merchants, magazine, and kit manufacturers. Contest Directors are Michael Hable and Thomas Magno.

The Contest is AMA Sanctioned and will run from 10:00 am until 9:00 pm.

For further info, contact:
Thomas A. Magno, 1244 W. Second St., Elmira, New York 14905

SCALE VIEWS

from page 126/56

Inside "Air Force Colors" --- Color profiles, including tail markings of 49th BW B-24's with whom Scale Views spent 1½ years in Italy.

4-view and assorted profiles with alternate marking schemes. Two pages of fine-line 1/72 scale 4-view B & W drawings and a full page of cockpit layouts provide all the data necessary for a fully detailed model. The quality of these plans (by A. Granger) is good and I was particularly impressed by the coverage of the torpedo, bomb and drop tank under-wing stores and mountings, material that is often hard to find in usual reference sources.

Some reviewers or super-specialists on a single aircraft type might comb this book for something to nit-pick but my feeling is it would be hard to find any serious fault. The sooner more volumes of this level of excellence are issued, the sooner scale judging presentations used at contests will improve. Incidentally, should you wish to keep the book intact, the individual monographs may be obtained from Historic Aviation or Milbooks, among others, for $4.95. This per-airplane price indicates what a considerable bargain the collected series will be.

Scale Circus

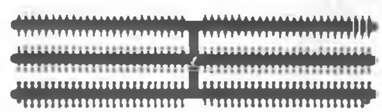
The previously mentioned I.M. Products line being made available by Circus Hobbies includes other good items for the scale builder. The accompanying photo that looks like a piece of costume jewelry or a curry comb is actually a molded "sprue" of

to page 132

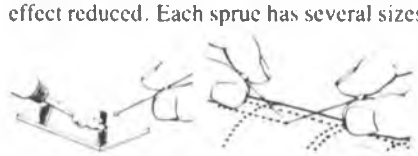
SCALE VIEWS

from page 128/56

scale rivets. They are flat on the back and are installed with a novel approach using cyanoacrylate adhesive. A drop of super glue is placed on waxpaper. Individual rivets are removed from the sprue and picked up with a needle or pin. Dip the back of the rivet in the glue drop just enough to coat the back. With the aid of a second pin to help steer the rivet, it is placed on the model. After a few seconds the pin can be removed and the rivet will stay in place. My experience with rivet jobs leads me to suggest that the model should be nearly



completely finished when the rivets are applied so that only the final coat or two of color is put on the rivets. Otherwise there is a build-up of paint around the rivet and the effect reduced. Each sprue has several sizes



of rivets, 300 per sprue, a total of 1200 in each IM 45000 package, which goes for $3.45.

Two instrument sets are available with printed faces and 24 molded plastic frames. The frames are provided in two sizes per package and several styles --- round, square and semi-square --- to cover a variety of panel installation requirements. The IM 21001 Small Instrument set has faces about 1/4" and 5/16" diameter. The IM 21002 Large Instrument set faces measure approximately 3/8" and 1/2". Price is the same for either size --- $3.95, quite reasonable for the large number of instruments in the kits.

to page 134

SCALE VIEWS

from page 132/56

Harry's Handy Handbook

Some scale builders have an unfortunate tendency to spend more time in the workshop than at the flying field. When placed under the strain of competition their thin veneer of piloting expertise is liable to crack. Another pressure induced problem --- engine trouble --- may be more easily avoided, but shows up all too often anyway. At the 1980 Nats, I was one of several whose engines misbehaved. Nobody would believe the things that happened in my case — I didn't, so I won't try to come up with excuses. The bottom line was lack of preparation, no matter what contributory

factors were involved. What all of us fumble-thumbs need to do is go back to basics, spend more time running engines, adjusting throttles, starting cowled motors, etc. A good way to get some valuable background is to read "Harry's Handbook for Miniature Engines." He covers the subject from A to Z, even including some repair and hop-up instructions. Photo illustrated, it sells for $9.95 at your hobby shop or direct from Harry Higley and Sons, Inc., 433 Arquilla Dr., Glenwood, Illinois 60425. □

C-40

from page 55

nose gear and attaching the wheel, we cut off the excess axle. The axle is left slightly long for those who may wish to use a different wheel than the one included.

Covering:

The C-40 comes to you already covered with white Super MonoKote. We added our trim using red and blue MonoKote trim sheets. This was the most frustrating part of the whole assembly — trying to decide how to trim our white beauty.

Engine:

Installing the new K & B .40 with muffler was the next step. The engine was set in place with the C.B. spinner mounted on the engine. After everything was lined up correctly, the mounting holes were marked using Vortac Mfg. Company's precision steel hole centers. These hole centers give you a perfect set of punch marks to drill your mount. When taking out the Kraft mount to drill the engine holes, we felt the four bolts holding the mount to the firewall were slightly long and protruded through the firewall too far. When reinstalling the engine mount we replaced these four bolts with shorter ones that were flush on the inside of the firewall. With the blind nuts this way, there was no way a bolt could puncture the already installed Sullivan 8 oz. tank. The engine mount was reinstalled along with the nose gear, engine and spinner.

Radio:

Since all the pushrods had already been installed, all that was left to install was our Airtronics 4 channel radio. The rudder and elevator pushrods at the servo end had not been attached. This is the final hook-up after your servo rails and servos have been installed. It calls for a flat battery pack to be placed up front under the fuel tank with the receiver being placed in the forward part of the wing saddle area.

The servos were located as far forward as possible. The instructions state that if this procedure is followed, the aircraft will balance without adding any additional weight. We found this to be correct. The C.G. came out right on the exact spot. We checked this out using Carl Goldberg's new balancing stand which, by the way, is an item everyone should have in their shop. It

to page 138

DID YOU KNOW...

that a simple way of extending a needle valve, and changing the direction of adjustment, is by the use of a short length of silicone fuel tube? Use a one to one and a half inch length of tube fitted over the needle valve knob at one end, and over a length of 1/16" wire at the other to make a flexible "universal" joint. The wire will need a small loop bent in the end that's to fit into the tube, and both fittings should be secured in place with a silicone seal, such as the GE type, being sure that the metal parts are *clean*. Those building quarter scale might try this one to get needle valve adjustments away from that big nasty prop. And *please*, take a buddy along when going out to fly a ¼ scale. They are too big for any one man to hold safely.

And did you know that Devel-Hide is great for things other than covering foam wings? This chemically bonded wood fibre product has all the strength of 1/64" ply, but is far easier to finish than either ply or balsa. Great for covering built-up surfaces such as the vertical or horizontal stab, turtle-decks, etc., and best of all, it costs less than ply or balsa. $4.00 for a 26" x 32" sheet, .010" or .015". (Min. order, 4 sheets). Postpaid in the U.S., or at your dealers. Idea Development, P.O. Box 7399, Newark, Delaware 19711

C-40

from page 135/55

works great and can be used for almost any type of aircraft or boat.

The new Airtronics radio comes equipped with switches on the transmitter to reverse your servo direction. Wouldn't you know it — this is one of the only times we have made a radio installation and didn't have to change one servo. With all that nice added attraction, we didn't get to take advantage of it.

Flying:

After we had completed the C-40, we stepped back and took a long look. We could have told you right then that we had a winner. It just looks right. All controls were set-up per the recommended throws; the engine was fired up and checked; then it was off to the flying field. We found no bad traits in this bird. Take-off is fast and easy, with excellent control response. It flies inverted as well as it does right side up - - - which is to say, Great! It can be slowed down beautifully on landing approach and, as always, gave excellent control response. In short, the C-40 will perform any maneuver you care to throw at it, and do it well. We flew several flights at half throttle and along with stretching out our fuel supply it still moves out very well.

Conclusion:

It goes without saying that the C-40 is not for the beginner pilot, however, just about anyone who has managed 4 channel controls will have no problems here. This plane is not only well designed, well built, and a great flyer, but will be a source of pride for the lucky owner.

Considering materials used, workmanship, completeness of the "kit" and performance, Continental RPV's C-40 is an outstanding buy at $179.00. □

TRAIN-AIR .40

from page 54

. . . mounted on the rear of the firewall using the mounting block supplied. If this method is used, we suggest the removable hatch option, otherwise the nose gear is very difficult to remove if replacement is required. The alternative we used was to drill a 5/32" hole in the rear of the suggested Kraft KM-40 engine mount and use it as the nose gear support thus moving the gear to the front of the firewall. Both methods work equally well and the choice is a matter of personal preference.

Final alignment was easily accomplished with no major sanding required to square things up. We didn't care for the small 10 x 32 wing bolts supplied and preferred to use 1/4 x 20 bolts more commonly used on aircraft of this size. We also found that the hold-down block needed to be notched to provide adequate clearance for the aileron

horns; this is much easier before gluing the block in place, so try a dry fit first.

Covering:

We covered the Train-Air using Top Flite MonoKote for the basic color and the decorative trim. Here, again, the instruction booklet gives some useful tips. The windows were cut from trim sheet following the templates on the plan sheet. On any dark colors of trim sheet, it is a good idea to seal the edges with clear paint to prevent bleeding.

Engine:

For the motive force, the manufacturer recommends any non-Schnuerle .40 size engine. We picked the newest edition of K & B's .40 with the bolt-on muffler and Irvine carb. It has plenty of power and slips right into the engine compartment. Muffler pressure was used and the fuel tank sits up into the hatch bulge at just the right height. A Master Airscrew prop and a Goldberg 2¼" spinner completed this end of the airplane.

Radio:

The instruction booklet even gives helpful hints on this process and our Futaba 6 fit right in with room to spare. There is even room to add special features such as bomb drops. The actual locations came out very close to those shown on the plans.

Flying:

For the first flights, we set the C.G. in the middle of the range suggested and the control throws at the levels recommended for training. Ground handling was great with a clean take-off and in the air the turns were gentle with little, if any, correction needed. Power off results in a gentle glide that can be brought to a very slow speed before stall at which point it simply drops the nose and starts flying again. The stability was tested by accident or actually lack of one when one of the test pilots developed an indescribable itch while the Train-Air was on final, fortunately the itch was satisfied in time to put his hands back on the transmitter and flare for touchdown.

We later doubled the aileron and elevator throws and proceeded to try out the manufacturer's claims for aerobatics. Great fun that turned into a session of "Can I try it next?" Knife edge takes a bit of doing and snap rolls have to be forced but just about anything else is fair game.

Conclusion:

The Train-Air was obviously designed by someone who remembers that first airplane and wanted to do it right. In construction, it was straightforward and required little more than the ability to read and follow instructions. As for flying, it has very good stability and with the control throws set at minimum the beginner should be able to handle it after a short period of instruction. There is a lot of durability built in and a nice feature is that as the experience level increases, so can the aircraft's capability. As a trainer it does the job and is certainly usable in learning a skill. At a suggested price of $58.95, it is a good value and is well recommended both as a first kit and as a fun fly aircraft. □

POWER BOATING

from page 50/49

equation predicts that:

$$^{\Delta V}mph = \frac{P}{1056}\Delta rpm \qquad (6)$$

Where Δ V is the speed change caused by the change in revs Δrpm. If the pitch is 3 inches we find:

$$V = 2.8\ (rpm \times 1000) \qquad (7)$$

or that every 1000 rpm increase will result in a 2.8 mph speed increase. Similarly if we hold the rpm constant the speed relationship predicts that:

$$\Delta V = \frac{rpm}{1056}\Delta P \qquad (8)$$

where ΔP is the change in pitch. If we take the case of rpm = 20,000 we find that:

$$\Delta V = 18.9\ \Delta P$$

This result predicts a 19 mph change in boat speed if the prop pitch can be increased by 1". In this case it would take an increase of 6750 rpm to produce the same speed increase produced by a one inch pitch change. The message is clear. If you want to go fast you must use high pitch since engine rpm is limited.

Let us now turn to finding out what pitch is required to break a current straightaway record of 60 mph. By rearranging the speed equation we find that:

$$P = \frac{1056\ ^{V}mph}{rpm\ (1 - S/100)} \qquad (10)$$

If we could turn our engines 21,000 rpm the pitch required to equal the record speed at 20% slippage would be 3.75". Only props with greater pitch have a chance of breaking the record at this rpm. If we could turn the engine 24,000 rpm the required pitch drops to 3.3. These two cases predict the minimum pitch required to break the existing record speed. You must now find a prop with the required pitch that your motor will turn the required rpm. Remember also that this prop must produce a thrust that is equal to the drag of the boat at this condition. This latter condition is the missing element in the screw analogy result.

Next month we will continue this

to page 146

POWER BOATING

from page 144/49

propeller discussion. Send your questions, comments and boating information to me at 766 Broadway, Seaside, California 93955. □

SD-500 MKII

from page 44/41

for the wing T.E., cut to a length of 25"; the remaining scrap will be used for planking and capstrips later. Strip the two 4" sheets down the middle using a long straight-edge as a guide; mark the sheets and the edges. In this way, you can use the matching split sheets on the same wing panel.

If you have a table saw, rip two pieces of T.E. fill from a 3/16" sheet by setting the table saw arbor at 7°. Otherwise, use 3/16" square sticks and dress to shape later. Glue 3/16" T.E. fill to the straight edge of one sheet from each matched pair of 1/16" T.E. sheets. Build your wing panel on the plan in the conventional manner but start by installing 3/32" ribs from the wing tip to the center with felt pen marks up — **very important.**

Glue the 1/8" dihedral web in place noting dihedral angle direction, then the 1/8" center rib; then remaining parts such as the other 1/4" spar; 3/32" L.E. strip are glued in place followed by the matching 1/16" T.E. sheeting. Plank the L.E. and glue capstrips to ribs before removing from the building board. The other wing panel is built directly over the drawing as previously in the same sequence. **Important** — install all ribs with felt pen marks down, and reverse the angle of your dihedral web in relation to the other panel. After completing the panel, carefully align, glue together using clamps, etc., and let dry. Now you will notice all ribs have the felt pen marks on the same surface of the wing and the wing has the proper dihedral. I find this method of rib marking aids in accuracy as any minute irregularities in rib cutting and notching are all positioned on the same surface and line up when joining the wing halves. Complete

the wing by adding 3/16" leading edge, ailerons, aileron torque rods and wing tips; shape and sand lightly. Glue the 1/8" plywood wing hold-down plate to T.E. of wing as shown on the drawing.

Fuselage construction is so simple it is hardly worth writing about, so I will keep it to the minimum. Glue the 1/32" plywood doubler to the fuselage sides making a left and a right side. Also cross-laminate the 1/8" plywood to make all 1/4" plywood parts, cutting them to shape when dry. Likewise, glue F1 and F2 together; when dry, lay out mounting holes for the radial engine mount using 6/32" bolts and blind mounting nuts so the engine will be canted. Fuselage sides and bulkheads are assembled with the fuselage bottom on a flat board; alignment and squareness are checked before letting glue joints dry.

Upon removal from the building board, install the 1/4" landing gear plywood, the rear wing hold-down plate and add the 1/2" triangle stock as shown. The nose bulkhead gets the 1" T.E. treatment followed with 1/4" nose bottom block, finishing with planking the fuselage bottom with 3/32" sheet balsa. Tack 3/16" sheet balsa to the rear upper fuselage; trim, sand and remove from fuselage.

If you are an experienced builder you have already glued the material for the stabilizer, elevator fin and rudder out of proper sheet balsa. Align and glue the stabilizer to the fuselage after cutting to shape and sanding. The 1/4" dowel that is used for a tail wheel guide is installed through the stabilizer and the fuselage bottom after the dowel has been drilled for the tailwheel wire. This is a good time to install all pushrods for the elevator and rudder, and to check for possible clearance.

Trim the 3/16" fuselage top for the stabilizer, making cutout for fin; glue in place and sand. Bend the 1/16" music wire for lower part of tailwheel assembly, slip through the 1/4" dowel from bottom, bend and cut upper portion of music wire for the rudder. The fin can now be aligned and glued in place.

to page 160

SD-500 MKII

from page 147/41

Any landing gear made of 3/32" dural which will give minimum clearance of 4" between fuselage and ground with a wheel tread of 10" is desirable. Use two 6/32" bolts and blind mounting nuts to fasten to 1/4" plywood fuselage bottom. Bend the landing gear to give the wheels tow-in for proper tracking. Trim the L.E. center section of wing to mate with fuselage and fiberglass 1/2" beyond each fuselage side. Make sure the 1/4" dowel fits into the wing L.E. snuggly.

Now cut a piece of 9/32" O.D. brass tubing about 3/8" long. This slips over the protruding dowel and "Hot Stuff" is used to hold it in place. I found this prevented the 1/4" dowel from getting a groove cut into its surface by bulkhead F3A after many flights.

Take extra care in fitting the wing to the fuselage; that extra large hole in bulkhead F3 allows movement for proper alignment. Slip F3A over the 9/32" brass tubing on the wing dowel, glue to F3, being sure to keep the dowel free of glue. When dry, drill through both the 1/8" and 1/4" plywood wing hold down plates with a #7 drill; tap through everything for 1/4" 20 nylon bolt, doing all this with the wing in place. Open the hole in the wing later, after removal from the fuselage so that the 1/4" nylon bolt slips through.

Before gluing the 1/4" balsa block to top of the fuselage nose, install the throttle cable assembly and drill the nose bulkhead for the fuel lines. Scrap balsa should be added to the top leading edge of the wing and shaped, and a final sanding given to the model.

Cover the model with your favorite plastic iron-on film; trim for visibility.

Check the C.G. after all R/C equipment, fuel tank and engine complete with propeller, spinner, muffler, have been installed.

Since the engine and muffler are canted at 60° to the right, it is very important to balance the model laterally. I balanced mine

by using a piece of 3/32" welding rod sharpened at one end which passed through the left wing L.E. as close to the inside of the tip rib as possible. The sharpened end was imbedded in the scrap already glued into the T.E. planking, removed and cut to length. The model was then placed assembled with prop shaft resting on table and pin driven into the tail as a final pivot on my fingertip. With a welding rod on the wing tip, balance by over-adding a strip of solder, trimming the solder until the model balances. This solder is coiled tightly around the blunt end of the welding rod, soldering each end secure.

Open a hole in the L.E. of the wing to now take the increased diameter, give the sharpened end a coat of epoxy, slip in and tap it firmly in place and epoxy the other end to the wing's L.E.

MATERIALS LIST

Balsa:
6 — 1/16" x 4" x 36"
3 — 3/32" x 4" x 36"
2 — 1/8" x 4" x 36"
1 — 3/16" x 4" x 36"
2 — 1/4" x 4" x 36"
2 — 3/32" x 3/8" x 36"
2 — 3/16" x 1/2" x 36"
2 — 3/16" x 3/16" x 36"
4 — 1/4" x 1/4" x 36"
2 — 3/8" x 1" x 24"
1 — 1/2" x 18" triangle stock
1 — 1" x 1/4" x 6" T.E. stock

Plywood:
2 — 1/32" x 4" x 17"
1 — 1/8" x 6" x 18"
6" of 1/4" dowel

Hardware:
1 — motor mount
6 — 6/32" bolts and T-nuts
2 — control horns
1 — set aileron torque rods
1 — 1/4-20 nylon wing bolt
1 — set of wheels 2¼"D.
1 — tail wheel 1" D.
12" — 1/16" music wire
— hinges
1 — dural L.G.
— fiberglass cloth
1 — 6 oz. fuel tank

□

CUNNINGHAM ON R/C

from page 39

gear or tail dragger type. Since we're going the custom route, let's make it a trike gear fun-type bipe. Naturally, a biplane needs to have two wings, so our first consideration is in building the second wing. Our next consideration is in locating the second wing. No matter what kit you decide to modify into a bipe, you're faced with building a second wing. If the kit has a built-up wing, then simply duplicate the construction by slicing up another set of wing ribs and build two wings. If, as in the case of the Skooter II, the wing is of foam construction, then write to the manufacturer and order another wing. Some kit manufacturers cannot supply spare parts due to the method by which their kits are produced, while some do have spare parts. The easiest way is to write and ask.

Since you're consuming a shut-in weekend with your customizing project, you're going to have to cut some balsa and build your own extra wing. You can add ailerons to the top wing, or leave them just on the bottom wing. It is easier with ailerons only on the bottom, but if you choose to have ailerons on both wings, a simple hook-up can be made between the two sets of ailerons with extra control horns and Kwik-Links. Something that you do need to consider if using two sets of ailerons is that both sets of wings should be bolted to the fuselage so that no shifting can happen, either on the ground when putting the wings on the fuselage, or in the air with wings that shift around. Any shifting will cause a misalignment of the aileron linkage, with a resulting trim change.

Back to our Skooter project. A bipe's wings should be at least a chord length apart, measured at the wing chord line. In the case of the Skooter, it has a 10" chord, so the top wing mean chord line must be at least 10" above the bottom wing. Draw this in on your plans: scoot the top wing leading edge about 2" ahead of the lower wing, design a simple wing saddle of either wire or 1/4" plywood, that can be glued either to the inside or, if you really want to be crude, to the outside of the fuselage, and you're just about in business. Except for the tail. An R/C model flies better with a tail area that is designed in relation to the wing area of the aircraft. You could keep the same size horizontal stab for the Skooter, but it would not fly as well as a properly designed aircraft would. So, we must enlarge it a bit. Take the total area generated by the two wings, multiply by 17% and you will have the area needed for the horizontal stab. Figure the area of the existing stab, add the area needed to it by making the elevator a bit wider and adding pieces to the leading edge of the horizontal stab. These additions can be easily made with Hot Stuff, and will be as strong as the original wood. (If you're designing a monoplane, keep the area of the horizontal stab at least 22% of the total wing area.)

The Center of Gravity of the aircraft will change with the addition of the top wing. If you moved it 2" forward of the lower wing, you now have a total wing chord of 12". The balance point should be between 25% and 33% back from the leading edge of the top wing. At the 25% for early flights, move rearward if you desire a bit more aerobatics, and rapid elevator action. The basic aircraft is just about done. Looks kind of ugly doesn't it? The wing looks too high on the fuselage, and the engine sticking out in the breeze looks less than pretty. So, what the heck, add a cockpit, or a canopy and, again, stick on an aluminum cowl, and you've got a pretty snappy looking aircraft. The standard Skooter flies very well with a .40, but with all of the drag that we have added with a top wing, cowl, etc., stick a .60 in the nose, and hang on, you're going to have fun with this modification.

Another change that can be made to the standard kit, and one that has been featured several times in RCM, is to make a twin engine aircraft from a standard single engine design. How about selecting an old stand-by for this modification. Let's use a Bridi RCM Trainer .60 size. A very easy kit to build, and a very easy design to modify. First, select the engines that you want to use. I would suggest a couple of .30 to .35 engines. Forties could be used, but twin forties are a lot of power, and the addition of an extra engine really adds a lot to the speed of an aircraft. Two .30's equal the output of a .60 and you will be a bit happier with this size. The only modification to the fuselage is to put a block of balsa in the snoot where the engine was, sand it to a nice pretty shape, and get on to the wing.

The standard Bridi aircraft has a butt joined wing, with no dihedral braces in it. It works, and works very well, but I'll be darned if I know why. But, since we're going to add an engine to each wing panel, be a bit cautious and add a dihedral brace of 1/4" plywood, full depth of the wing, epoxied to the main wing spars and at least 12" overall length. I would also suggest webbing the spars with 3/16" balsa at least half way out on each wing panel. This all adds strength as well as mass to absorb the vibration of the engines. Simple engine nacelles can be constructed of 3/16" sheet balsa with 3/16" ply firewalls. Allow room in the nacelles for an eight ounce fuel tank in each one. You will probably be using 9" props on the .30 engines, so locate the nacelles so that there is about 1" clearance between the prop and the side of the fuselage. Build in some down thrust to the engines, and start off with the thrust line of each engine either straight ahead, or with a bit of out thrust in each engine. It's a strange thing about twins, each aircraft reacts differently to side thrust settings. The closer you keep the engines to the fuselage, the best chance that you have for little reaction to a dead engine. The live engine tends to pivot the aircraft around its central axis if one engine is dead and the other running. If

to page 170

from page 167/39

the right engine is angled away from the fuselage a bit (right thrust) it will tend to pull the aircraft in more of a straight line. But if the left engine is angled away, then the left thrust added to the left turning action of torque may pull it more out of line to the left. In any case, start out with engines at near to zero, with your throttle linkage set to kill both engines at the full idle position. Then, and until you can learn the reaction of your aircraft with one dead engine, you can kill either engine if the light goes out on one.

The last modification that I'm going to suggest is one that will really be different at the flying field. How about taking a standard aircraft and making a tail first, or canard, design from it. Why? To be different, that's why. You can modify a Falcon 56 in this way and, I assure you, you won't find another like it at your flying field, or for many miles around. This mod is going to require some careful consideration. Again, keep the wing and stab settings in the same relation to each other. You're going to turn the entire fuselage around, putting the wing and engine in the rear, using a pusher prop, naturally. The main gear must be located at the rear of the aircraft, the nose gear about 1/3 back from the new nose of the aircraft. Make sure that the leading edge of the horizontal stab faces forward. The vertical stab will go in front, or you can position it at the aft end of the fuselage with a small stationary fin at the front of the fuselage. Okay, how about controls and balance point? Good question, and I'm not sure of the answer. Try this, build a scale glider of your proposed canard. Put the horizontal stab in front, the wing at the rear, a small forward fin, and the normal vertical stab at the rear. Equip each with trim tabs and then use modeling clay for balance. Make a few test glides to see where the balance point is. This may be too rough for the balance of an R/C aircraft, but you can get pretty close. Next, begin adjusting the trim tabs. The ailerons will work the same, the rudder, if at the rear, will work the same --- but how about the elevator? It will work backwards. To give up, you must increase the lift of the forward elevator, by a downward deflection of the surface. To give down, you dump the lift by an upward deflection of the elevator. How much? Another good question. I've never built a canard, nor have I ever seen one, so anything that I pass on is pure speculation.

If you're interested in trying this modification, then do it and share your results with all of us. This is really the fun of R/C, sharing thoughts with each other, investigating new ideas, working out answers to problems, finding a new way to solve an old problem, dreaming on a bad weather weekend, modifying, customizing,

to page 172

CUNNINGHAM ON R/C

from page 170/39

or inventing something entirely new and different.

If you make any of the modifications that I've suggested, or try your hand at customizing, send in a black and white (not Polaroid) picture of your creation, and we can share your idea with the rest of the gang. Good luck and go chop balsa. □

BIG IS BEAUTIFUL

from page 38

with the appropriate sum and he'll do the rest. (1032 W. Manitowoc Ave., Oak Creek, Wisconsin 53154.)

For the benefit of all you biplane fans who like modern bipes, Dario has just finished with one of the nicest plans I have seen in a while. (It should be pointed out that I, too, am a biplane fan and that I get pretty enthusiastic about two winged airplanes. This one is the very best plan I have seen.)

It's a Starduster Too, and there are already several under construction, including one by Paul Caulkett of Fairbanks, Alaska. Dario brought a plan to Las Vegas last fall for me, and Paul fell in love with it, wanting to duplicate a full scale Starduster Too in Fairbanks. He is a pretty convincing talker as he sweet-talked me out of my set in order to begin building as soon as he returned to the frozen north.

Scale of this pretty bird is 3¼" to the foot (28% of full size); finished weight is expected to be 18 pounds for a wing loading of 25 oz., which is quite low for such a large bird. Gear legs are individually sprung, which should be a welcome relief to those of us who fly off grass strips. The cabane struts are removable which is a good deal for those of us who like to cover using a sleeve of material so as to cover in one piece. Span is 80" which is a nice convenient size to pack around, even in a smaller car.

Dario has designed the model for the guy who has never scratch-built before and he has two 'kit builders' working on the model in Milwaukee; to date they claim they have had no problems and that a manual is not necessary for anyone who has built anything previously.

The plan is 78 square feet on three sheets and the detailing is more than generous. Several variations are shown on the plan sheet and the set I saw were enough to start you for your workshop immediately.

T & D Fibreglass will be making the cowl and the wheel pants for the model and they are being made from Dario's original parts, so will be a good fit. If biplanes are your thing, see this one before you build another Pitts! The plan is $30.00 postpaid and worth every cent of it, just to look at them!

●

Now, some more good news. You may recall a picture here some time ago of a 'bare

Waco YKS-6 by E. Quick of Bellmore, New York. Model is 2.5" Scale and flies on Quadra at 18 lbs. Hard to tell from full scale. Sorry, no plan available, and that's a shame!

bones' Waco cabin job by Eric Quick of Bellmore, N.Y. Many of you wrote asking if there was a plan for the Waco and I finally contacted Eric only to find that he had built the model to see if he was interested in the larger models and so only made what drawings he required. Not enough for the average modeler to build from and certainly in anything but usable form.

Norm Rosenstock shows off his Waco HKS-7 now available in kit form (see text). Waco cabin biplanes were popular civil aircraft of the 1930's. Many examples still fly regularly and Waco built some of the prettiest biplanes in the world.

In the interest of finding something that might suit (remember me, I'm also a biplane nut and I've liked the Waco ever since I built an ARE some years ago), I kept trying and recently discovered that Norm Rosenstock, who flew his HKS-7 at the STARS Rally in Olean, New York, last summer has arranged to have this particular cabin Waco kitted by Orlando Aircraft Mfg. Co. (111 Bedford Ave., Bellmore, N.Y. 11710).

The span is 99.75 (top wing), 18.25 square feet of wing area, a weight of 32 pounds for a wing loading of 28 oz./sq. ft. Norm says the Super Hustler he has in the big Waco does a creditable job of hauling it around the sky. Loops from level flight are claimed and that is certainly good performance considering the weight of the model. I suspect it is a bit beyond the present Quadra and would be inclined to fit a Kawasaki or a Kioritz for some pretty snappy performance from the model.

Drop Orlando a line for further information on this most impressive looking Quarter Scale model of a 'Golden Oldie.'

Waco's designation for their aircraft after 1930 was a real exercise in specifics. The first letter denotes the engine used, the second letter tells which set of plans were used and, therefore, which wing is on the plane, and the third letter denotes the overall

design of the airplane. In the model detailed above, the "H" indicates a 300 HP Lycoming R-680-E3, the K denotes a four place cabin model and the S denotes (after 1935) a Standard cabin model. The "-7" says that it is the seventh model improved over the original. In other words, seven minor changes were made during the production life of the airplane. No wonder it looks as if no two Wacos were ever exactly the same!

My favorite is the ARE and if you ever hear of a quarter sized model of this sleek beauty, please let me know. It's about the prettiest biplane out of the Golden Age as far as I am concerned, but I respect opinions to the contrary!

●

I had a letter recently from Frank Kellerman who is stationed in West Germany with the Army. Frank is a member of a five man R/C club there and has recently completed a Nosen Big Stik which is powered with an Evra 190 engine. Frank's project for the coming months is to re-work the Stik and power it with two Evras and he is interested in correspondence with anyone having built a large engined twin, with a view to sharing experiences, and possibly avoiding some of the pitfalls of this sort of project. Anyone who has had a large twin in the air and wishes to help Frank and his buddies can contact him at: HHC 1/13 Inf., APO 09034. I'm sure Frank will appreciate any assistance we can offer him, and I'd like to hear of your experience as well.

•

All you guys out there with a first class postage stamp and a desire to see a specific airplane kitted as a Quarter Scale (or whatever) model, sit down right now and drop a note to: Bob Haley, Chancellor of the Union Stadt Zeppelin Works, P.O. Box 467, Union City, California 94587, and let him know what you you'd like to see kitted. Bob (who must have a great sense of humor, naming his company like that) is currently kitting a Quarter Scale Aeronca (on which I'll tell you more of in a future issue) and has a Fairchild 24, a Waco RNF and a Weddell Williams Racer in the works. Bob is looking for more input from modelers on what they

to page 177

The Central Ontario Glider Group
7th ANNUAL SNOW-FLY
February 28, 1981 - 10:00 a.m.

Location: The Nottawasaga Inn, Hwy. #89, Alliston, Ontario.
Awards: To 3rd Place, Best Junior Flyer, and Best Flight of the Day.
Dinner: At 7:00 p.m. at the Nottawasaga Inn.
Fees: Dinner $10.00 per person, $3.00 Flight fee for Seniors, no Flight fee for Juniors.
Contact: Stanley A. Shaw, Secretary, 16 Aylesbury Rd., Islington, Ontario, Canada M9A 2M5

BIG IS BEAUTIFUL

from page 174/38

would like to see in kit form. I'd like to hear him complain that he was inundated with mail due to this request, so help me prove to him that Big Is Beautiful is as widely read as I claim it is! It is also a rare opportunity to have some influence on the manufacturers of kits, so please take advantage of the chance. He says he is considering kitting a Zeppelin in quarter scale, but since it is 207.5 feet long, he is having trouble finding boxes big enough to ship it in! Anyway, drop him a note. ☐

WARBIRDS RISE AGAIN

from page 37

got zeros in some of the racing heats, finishing fourth overall.

The Focke Wulf Racing Team of Doug Fuller and Don Babbitt flew their Kraft .61 pumper powered Platt FW190D-9 to fifth place. Mechanical problems brought them zeros for two of the four required heats but they performed very well when they did fly.

Don Allen teamed up with this writer to fly his scratch-built Martin Baker MB-5. The 500 square inch MB-5 is powered by a K & B 7.5 pumper. It flies well and is very fast when everything is working right. Several engine problems, and my unfamiliarity with the flying characteristics of the seven pound bird, led to some rather abusive landings. In the interest of safety, we scratched due to cracks in the wings after scoring zeros in two heats. Fourth place static points brought the Martin Baker Team to sixth place overall.

AMA Vice President Horace Cain came down from Chicago with Chuck Smith and flew another House of Balsa P-51 powered by a K & B 6.5 engine. Unfortunately, he crashed in the first heat doing enough damage that he had to scratch. Static points placed him seventh overall.

Art Biehl teamed up with Paul O'Tolle Sr. to fly the prototype for the Scale Propeller Craft Messerschmitt ME-109E

to page 180

WARBIRDS RISE AGAIN

from page 177/37

kit. Unfortunately, they crashed it two days before the contest and worked around the clock to rebuild it. They managed to qualify on Saturday but failed to start in the first heat Sunday. In the second heat they crashed again, totally destroying the plane.

Wayne Knaust and Bert Biermann entered a Top Flite P-40 but crashed and destroyed it while attempting to qualify on Saturday.

Because of field problems, the Spirits held the Warbirds Unlimited Event for 1980 at the St. Peters Prop Nuts Field in St. Peters, Missouri. The St. Peters flying field is an active private airstrip which was closed for the weekend's activities. During the lunch break on Sunday Bill Stien and Ed Bucholz, two members of the Warbirds of America, put on an airshow with a full scale SNJ and an At-6. Then they landed so that everyone could see and photograph the birds close up. The Spirits wish to express their gratitude to these gentlemen and to the Prop Nuts for the use of their field and for their assistance in putting on the event.

Contest Director Don Hoelting, Event Director Westy Westhoff (Scale) and Joe Lunt (Racing), and all of the others who worked so hard to make this event a success did an excellent job in spite of many obstacles. The prizes and trophies were fantastic and the Spirits want to thank all of the sponsors for their support.

All who have competed and most who have otherwise been involved in the Warbirds Unlimited Races are impressed with the concept. The Spirits will probably make minor changes to the rules in 1981 to require mufflers and to include kits that don't quite have enough wing area for their ideal engine sizes. The entry list at this year's Warbirds Unlimited was small but people experienced in these matters tell us that the third year is usually the one where a new event shows considerable growth. We'll be there and we hope you are too.☐

FOKKER D.XXI

from page 35/32

Stage One Assembly:

Select very hard 1/8" x 1/4" balsa for the main top keel that runs from F-2 all the way aft, and the aft bottom keel that runs from F-6 all the way aft to the end of the fuselage. Also use very hard 1/8" x 1/2" balsa for the sub-keels that run along the fuselage sides from F-2 to F-7.

Using a jig to insure accurate alignment, assemble the fuselage formers F-2 through F-9 around these four main keel pieces. To this basic structure add the vertical aft 1/8" x 1/4" balsa rudder post at the end of the fuselage; all the 1/8" square balsa stringers that run from F-2 to F-6; the two 1/8" square stringers that run along the outer bottom between F-6 and F-7; and finally the two 1/16" x 1/8" stringers that run along the outer top between F-6 and F-9.

Next, add the triangular 1/8" sheet balsa fairings that form the fuselage bottom aft of former F-9, as well as the vertical gusset (also from 1/8" balsa) behind F-9. The 2" x 3" **soft** balsa block that forms the aft turtle deck can be tack-glued in at this time. Due to the double-compound curves in this area, it was decided that it would be far simpler to use a balsa block rather than lofting the turtle deck in with a series of sub-formers, stringers, sheeting, and fillets.

Finally, epoxy in the 1/8" plywood firewall (F-1), and carve the aft turtle deck to shape using templates, as illustrated on the plans, above formers F-7, F-8 and F-9. When the turtle deck is shaped to the correct outline, remove and hollow out to an approximate 3/32" wall thickness, and then permanently glue it back in position. This completes the Stage One Assembly.

Stage Two Assembly:

Using 1/16" hard sheet balsa, sheet over the forward fuselage sides as shown on the plans. Add the cockpit flooring (note cross-grain), the fuselage forward top decking, and then the bottom sheeting between formers F-6 and F-7. The last sheeting to be applied is the area between former F-9 and the aft end of the fuselage.

With all the sheeting completed, add the 1/16" x 1/8" balsa stringers that run along the fuselage sides and bottom. Note that the center bottom stringer between F-7 and F-9 is actually of 1/16" square balsa since it is situated directly along the bottom keel. This completes the Stage Two Assembly.

Wing Assembly:

Start by fabricating the ribs, W-1 and W-2 from 3/32" sheet balsa, and W-3 through W-7 from 1/16" sheet balsa. Make two of each. Build directly over the plans or use a wing jig for correct alignment. The

to page 186

****

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

****

FOKKER D.XXI

from page 182/32

wing spars are of hard 3/16" x 1/4" balsa (bottom spar) and hard 3/16" x 1/8" balsa top spar. Use soft 3/8" x 1/2" balsa leading edge stock, and 1/2" balsa trailing edge stock. Note that both ribs W-1 are canted slightly outward to facilitate dihedral assembly of the two panels.

The landing gear mounts are of 1/8" plywood. Laminate a double thickness between W-1 and W-2. Also, fill-in along the trailing edge between W-1 and W-2 with scrap 1/4" balsa to serve as butt-blocks for the wing mounting bolts. Add 1/8" sheet gussets at W-4, and wing tips from soft balsa blocks.

Join both wing panels with epoxy the entire length of the 1/8" plywood dihedral brace. There is 1⅛" dihedral beneath **each** wing (measure below W-7). Finally, sheet the completed wing assembly with 1/16" sheet balsa.

Empennage:

Both the vertical fin and horizontal stabilizer are cut from 1/8" sheet balsa. The rudder and elevator are of built-up construction as illustrated on the plans.

Airframe Final Assembly:

Mate the completed wing assembly to the fuselage and secure with the traditional wing dowel/wing mounting bolts of your personal preference. Next add the wing fillets, which are carved from soft balsa blocks, to form a smooth wing/fuselage junction.

After careful inspection to insure an accurate alignment (imperative!), the tail surfaces can now be glued permanently in place. Add the 1/8" x 1/4" hard balsa struts (sanded to an airfoil section) that serve to brace the stabilizer.

Build the canopy frame from 3/32" square balsa. Use hardwood (spruce or pine) for the radio mast which, when hollowed out, serves as a scale functional item.

The engine cowlings on the prototype series of models were made from plastic

formings (ala Formicator). If this manufacturing process is not available, the cowls can also be fabricated from balsa blocks.

The wheel pants were fabricated from 1/4" sheet balsa laminations. Note that the Danish variant omitted the fairing on the upper strut (Ref: Air Warfare, page 82). This is a functional application for model use from grass strips. In fact, during spring rains when muddy fields clogged the wheel pants, it became common practice to remove them altogether on aircraft so equipped. Also, during winter operations, the Finnish simply replaced the wheeled undercarriage with skiis. Use Williams Brothers 1⅞" diameter "Golden Age" wheels.

Finishing:

After sanding and prepping the airframe with Epoxolite, as required, apply two coats of clear dope, sanding lightly after each coat. Then silk the fuselage, wings, rudder and elevator. Finish doping with three coats of thinned clear dope, again sanding after each.

The final camouflage pattern was sprayed in with an air brush. Not only does this achieve the realism of the original aircraft, it also is amazingly frugal in the actual amount of dope used, with a resultant savings in weight.

For insignia and markings, use Super MonoKote. Again, this has been proven to be the easiest solution for fabricating unique "one-off" aircraft markings.

The prototype models were fitted with a modified Cannon 3 channel radio systems installation for aileron, elevator and throttle control. Engines used ranged from .049 to .09 size, with the latter recommended for lively performance. Keep weight to a minimum.

The cavernous fuselage will accept any suitable lightweight R/C system, including four channel. The thick airfoil center root section easily accommodates the aileron servo mounted just behind the spar and, utilizing torque-rod linkages, it provides a fully enclosed aileron control.

to page 190

FOKKER D.XII

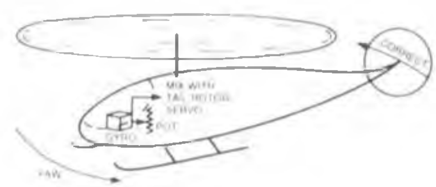
from page 187/32

Since most small models of this type do not fly well off of grass fields anyway, a hand-launch procedure should be employed, releasing the model in a level flight attitude. Allow it to accelerate briefly to preclude the inevitable departure stall/half-snap roll-in so often witnessed with small high-performance models such as these.

Wearing the colorful livery of either of the three nations that operated it, the Fokker D. XXI certainly makes an interesting and attractive model. With its significant contribution to the ultimate outcome of World Wat II, it is indeed a most unique model of unusual historic merit! □

GIVE IT A WHIRL

from page 28/26



any axis for that matter. Recently a number of radio manufacturers started to offer gyros with their radios and we will discuss these systems and their use next month. Meanwhile, those of you without gyros, keep those tail rotor inputs goin'. □

DUREX V

from page 23/16

be moved forward 1/2" and that the more forward C.G. setting be used. In any event, first flights should be launched conservatively.

Launch with mid trim and, when well settled on the tow, ease in full up trim. Watch the amount of bending in the wings. If excessive, either ease off the winch tension or put in a little down trim.

Durex, or any other glider, should be flown with as little movement of the control surfaces as possible. Deflected control surfaces cause drag which, in turn, increase sink rate, and reduce speed. This effect was observed and measured while flying two identical Durex. One plane was assigned to follow the other. Regardless of which plane or which pilot was the leader, the follower always came down first. This is because the follower had to use more rudder and elevator motion than the leader.

It's always windy on contest days, it seems. Ballast should be added depending

upon the wind velocity. No ballast at all is needed for wind speeds of up to ten or twelve miles per hour. After that, one or two ounces of weight should be wedged between the battery and the first servo to move the C.G. forward. Any additonal weight should be added at the C.G. To penetrate strong wind, or to increase speed for the speed and distance events, up to two pounds of lead weight bolted to the fuselage floor around and ahead of the towhook may be added. Note the shape of the weights in the pictures.

Although Durex was designed for competition, its inherent stability and smooth control response, as well as its sturdy construction, make it an excellent choice for the sport flyer as well. Whatever the context of your flying, this high performance sailplane is fun to fly. We hope you have many high, long and thoroughly enjoyable flights. □

PIT STOP

from page 14

Enduro races.

Which brings us to today. With the increasing popularity of the 1/12 electric cars, sooner or later, Enduros were inevitable. A group of racers in England decided to hold an Enduro for electrics. Rather than bother with something so simple as a 9 hour or 12 hour Enduro, everyone felt that if gas cars can run 24 hours, so can the electrics. And so it started. But would they ever be able to find enough drivers willing to run 24 hours? It was easier than expected. They ended up with 15 teams competing.

The location for this history making event, was Birmingham, England. Located in Birmingham is the British Motor National Exposition Center. At this Exposition Center is an annual car show which lasts 2 weeks long. The sponsors of the show decided this 24 hour electric car race would add some extra excitement to the proceedings and agreed to sponsor it. All of the Exposition halls were used for the car show, but in the center of Birmingham in front of the library was a large cement outdoor plaza. The surface would be okay to race on, but in England, in November, a roof would definitely be required. The city of Birmingham came to the rescue and erected a $10,000 canvas roof covering the plaza. The race was on.

Each of the 15 teams would consist of 6 drivers, 1 team manager and each team had to have 1 turn marshall on duty 24 hours. Each driver ran their own car. You can see this is necessary to give adequate battery charging time. It also ensures that each team will also have a car on the track racing at all times, heightening the closeness and excitement of the racing. All 6 of each team's cars would be identically painted and would use identical racing numbers.

The pre-race favorites had to be the

Hobby Spot Team, sponsored by Hobby Spot Hobby Shop in Warley, Westmidlands, England and Phil Greeno's Team, from London. The Hobby Spot Team, using Associated RC 12E cars, had won National 1/12 events, as well as the 1980 English 1/12 Championships. Phil Greeno's Team used Phil Greeno cars, which were basically modified Associated RC 12E cars. Both teams had the best 1/12 drivers available. Other teams were also busy lining up their best drivers, to fill their teams cars, such as Team Ripmax, Team Lectricar, Team Mardave and Team AVK, etc.

Meanwhile, Walt Bailey, the manager of Jim Davis Models, had heard of the race and thought it would be a lot of fun. But he didn't have a team. Walt attended our USA Nationals, competing quite successfully in both 1/8 and 1/12 scales. Walt decided, why not get a group of 1/8 racers together and see how they would do. Now Walt didn't run out and grab the first 1/8 racers he saw. He chose quite carefully and selected the best. How can you get much better than Phil Booth, the current World Champion in 1/8 scale? And Debbie Preston, who is unquestionably the best woman driver in the world, in any scale. And Debbie's father, Dave Preston, one of the top Expert Class drivers in England, who together with Phil Booth designed the incredibly successful English PB car. So why not ask the Assistant Manager of PB cars to drive, Paul Pagdin. And when Bill Burkinshaw, who is the Editor of England's largest R/C model magazine, Radio Control Models and Electronics heard about the race, he showed a definite interest. Bill has an Associated RC300 1/8 scale car and competes occasionally as an Amateur class driver. So Bill was naturally included. Like I said, Wally got the best. But getting the drivers was relatively easy. Where do you get a Team Manager, whose main function is to sit in one spot on a cold cement floor for 24 hours and do nothing but give count downs every 9 to 10 minutes for driver changes? Believe it or not, Derek Kirsopp

to page 196

PIT STOP

from page 192/14

volunteered to be Team Manager! While we're at it, why not get a volunteer Turn Marshall who will volunteer to turn marshall for 24 straight hours! How many of you balk at turn marshalling for a mere 8 minutes? But David Hardy volunteered for the 24 hour turn marshalling assignment. All I can say is, Derek and David, you're incredible!

It looked now, like there would be 3 teams favored in this race, co-sponsored by Jim Davis Models. I don't know how many of you have ever raced indoors with electrics, but those of you that have, know how tight and tough racing is. At least you think you know. Have you ever raced with 15 cars at once? This track had to be continually loaded with cars. And add to this, there was an ingenious lap counting system. At the end of the straightaway, all the cars had to make a hard turn and drive through a 2 foot wide chute. There were 15 chutes and each chute was numbered, so each had to drive through their own numbered chute and it automatically counted the car. Naturally you had to make sure you drove through your chute to make sure you got your own laps. Can you imagine what it was like with 15 cars flying down the straightaway and all trying to get lined up for their own chute? **Wow!**

It did turn into a 3 team race, as expected. At 6 hours, Team Hobby Spot, Team Phil Greeno, and Team Associated — England, were equal. Racing at its best! The winner was surely going to come from one of these three. But then the Greeno Team started to inch ahead. By the 11th hour, Greeno's Team opened up a 23 lap lead. But then the Associated Team ran 108 laps in 1/2 hour, setting a new record. By the 13th hour, the Greeno and Associated teams were dead even. Incredible! Then the Associated Team continued to surge, opening up a 63 lap lead! The younger members of Greeno's Team were falling asleep at 3 a.m. while charging their batteries! Mistakes were being made.

About 3 a.m. it started to rain, and the wind was blowing some rain through the open sides of the plaza. As if this wasn't bad enough, it was also 38 degrees! They tried to keep the water off the track, but it was impossible to keep it all off. It soon became apparent that the rubber that Greeno's Team was using was a little better on this wet cement, than the other cars, and with this new found advantage Greeno's young warriors rose to the occasion and slowly started narrowing the gap. But the Associated Team had too big a lead and went on to win by 21 laps over Team Phil Greeno, with Team Hobby Spot in 3rd and Team Maindenhead 4th.

Team Associated completed 4,724 laps, equaling 279 actual miles. The combined 15 teams ran 61,658 laps for 3,040 actual miles! But one of the most amazing statistics was the reliability record of Team Associated. Of the 6 cars raced, the only mechanical problems they had were 2 "C" clips knocked off the front wheels and one set screw backed out of the differential axle. It takes this kind of reliability to win races, along with the immaculate car preparation and driving skill of these super 1/8, or should I now say, 1/12 drivers.

My congratulations and sincere respect for each and every one of the 90 drivers who competed in this historical event. □

SUNDAY FLIER

from page 6

anybody make misteaks, uh, mistrakes, uh --- errors any more? I just did it again the other day when flying the canard. "Just one more flight," I said, and hand launched the model. Oops --- forgot to extend the transmitter antenna. No problem; the model is trimmed and flies free flight. So, I held the transmitter in my left hand while extending the antenna with the right. Unknowingly, I was pulling up the antenna with my right hand while simultaneously pulling down on the transmitter box. No, I didn't pull the antenna out of the box; what I did was pull the box down until the control stick touched my belt. Then, as I pulled the box down, the stick was pushed forward into full down control! Instant response by the canard --- Dive! Oh, well, it's repairable. The moral? Don't try to fly your airplane with your bellybutton. Dum-dum! Also, mebbe you should lose a little weight?

★★★

Mention of Wally Rinker's Stolp Starlet brings to mind another of Stolp's beautiful designs, the Starduster. It is one of the most attractive biplanes ever to appear, and Dario Brisighella designed an 80" version that is breathtaking. Here's Dario, at the greater Chicago Expo 80, with his prototype, before he decorated it. Even in plain white it's gorgeous.

You can contact Dario at 1032 East Manitowoc Ave., Oak Creek, Wisconsin 53154, telephone (414) 762-7155. He has plans.

★★★

In some recent issues of RCM I've talked about 1/2A engines and their throttling capabilities. One that has impressed me is the .061 G-Mark which is being imported by Cannon Electronics. Mine works great, but

to page 200

SUNDAY FLIER

from page 196/6

some purchasers have complained about unreliable idle. Proper break-in was thought to be the answer, and was, in many cases; others still were balky. Recently, Bill Cannon took a trip to Japan and mentioned the problem to the manufacturers. They were aware of it, had investigated, and found that leakage was occurring in some engines around the retaining screws for the carburetor. The solution was to fit nylon washers to the retaining screws, so, if you have a G-Mark .061 that still doesn't idle well after break-in, write to Cannon Electronics, 13400-26 Saticoy St., N. Hollywood, California 91605, or call them at (213) 764-1488, and they'll send you a set of screws and nylon washers at no charge.

★★★

Bill Evans is probably better known for his tailless aircraft designs than any of his other achievements. However, in the course of developing a quiet running K & B 3.5cc engine, Bill designed a muffler with a double chamber which has highly unusual characteristics. Bill saw the Star Cobra design, which uses the K & B 3.5 engine, and asked me to run some checks on his muffler. Since the prop version of the Star Cobra used a 7" diameter, 6" pitch Super M prop, I asked Dave Bridges to run comparative tests on Bill's muffler compared to the stock K & B. Dave ran the engine with Sheldon's 5% nitro fuel. With no muffler, the engine turned 19,000 rpms. With the stock K & B, the rpms were 18,200. Then, with the Evans muffler, the rpm drop was only 150, to 18,850 rpm. As for the noise level, Dave could only estimate the relative reduction, but for all practical purposes the quieting effects of the two mufflers were comparable. In all the tests, Dave tried for peak rpms, and that meant as close to leaned out as possible. Again, in both runs, there was no overheating. So, all things considered, I'd say that Bill has come up with a highly effective muffler design for the K & B 3.5cc engine.

★★★

Since resuming the Sunday Flier column, I have received many letters saying that the writers were glad to see me back "on the job." To all of you who have written, all I can say is, "Thanks very much, and I hope to be able to help all of you enjoy flying R/C for fun and sport, and to entertain you and amuse you as well. There is no way that I can say how much I appreciate your letters."

Keep them coming.

Ed. Note: Due to the volume of letters, please, if you want a personal reply, enclose a stamped and self addressed envelope. Those that are of general interest will also be published as time and space permit. □

FROM THE SHOP

from page 4

. . . . . lake like a sail boat. The tail of the plane was sitting in the water and very slowly sinking, as the plastic floats have small holes on the top side for expansion.

Kenny took off like a college rowing team and saved the sinking plane. Upon returning we found the pontoons had taken on some water. (Have you ever tried to get water to run out of those small holes?) As you may have guessed, we had to put another hole in each pontoon so the water could run out. We put plugs in the holes and started over again, but the engine flooded.

Kenny suggested pulling out the glow plug and using my starter to clear the engine. I did and it rained fuel all over us. I forgot to take off the fuel line.

We finally got everything ready (again). We started the engine, richened up the engine and got that blue bird in the water (again). I got back on the dock and poured the coal to it. Down the lake it went, into the air and the engine was too rich, but it was flying, not good, but it was flying.

It flew a lot like one of Warner Johnson's planes, I knew then it was tail heavy. Being my first landing on water I brought that dumb tail heavy goose in slow and plopped it in. I taxied it to shore and killed the engine. Instead of floating to shore, the tail dropped into the water and took off again down the lake like a sail boat.

Kenny jumped off his dock into the boat, lost his balance and fell into the lake. The boat sank and Kenny looked like a drowned rat. Brenda was yelling for Kenny to throw her his wallet, the plane was sailing down the lake and the neighbors were wondering what the hell was going on. I felt like one of the comedy team, Jerry Atkins and Bill Feight, when they first started in RC.

After Kenny brought the plane back, we put some weight in the nose and started all over again to get that ruptured duck in the air. Back on the dock, Kenny holding the tail, down the lake and a beautiful take-off. She flew great this time. Kenny flew that bird until it was running low on fuel. I decided to bring it in right in front of Kenny's dock. It was a little high so I gave it the gas to go around again — yep, it quit and I just missed the neighbor's dock by less than an inch.

We decided to call it a day as it was getting dark.

Now I know Kenny enjoyed this adventure although I don't understand southern sayings, as he said, "Y'all come back you porky dipstick." Also he feels other people should know about flying from water because I heard him telling Brenda, as I was driving away, "I think he should join another club."

Hang in there Don, we here at RCM can relate because all of have experienced days like that. In fact, it will probably be the next time we go flying.

See ya at the field. □