R/C MODELER

THE LEADING MAGAZINE FOR RADIO CONTROL • OCTOBER 1967 • 60¢

THE LI'L SWINGER
By Chuck Cunningham

DAS FLUGENGHOSTER
By Scott Christensen

ERIN'S LASS
By Don Dewey

PLUS ALL-NEW
BEGINNER'S SECTION

EXCLUSIVE PHOTOS: 1967 A.M.A. NATIONALS WINNERS

A few words about me.

I am Electronic Engineer and this is my day job.

From tender age two things attracted my interest and I managed to have them in my life.

The first was electricity and the second the bluesky.

I´ve found the model airplanes hobby in October 1973.

I love the wooden structures from scratch airplanes and boats also.

I started collecting plans, articles, books and anything else that could help the hobby of many years ago and have created a very large personal collection of them.

Since 2004 I became involved with the digitization and restoration of them and started to share the plans from public domain with my fellow modelers.

Now after all this experience I have decided to digitize, to clean and to re publish in digital edition and free of all issues RC Modeler magazine from 1963 to 2005 and others books and magazines.

Certainly this will be a very long, difficult and tedious task but I believe with the help of all of you I will finish it in a short time.

I apologize in advance because my English is poor.
It is not my mother language because I am Greek.
I wish all of you who choose to collect and read this my work good enjoyment and enjoy your buildings.

My name is Elijah Efthimiopoulos. (H.E)
My nickname Hlsat.

My country is Greece, and the my city is Xanthi.

Λίγα λόγια για μένα.

Είμαι Μηχανικός Ηλεκτρονικός και αυτό είναι το αληθινό μου επάγγελμα εργασίας.
Από μικρός δυο πράγματα μου κέντρισαν το ενδιαφέρον και ασχολήθηκα με αυτά.
Πρώτον ο ηλεκτρισμός και δεύτερον το απέραντο γαλάζιο του ουρανού και ο αέρας αυτού.
Το χόμπι του αερομοντελισμού το πρωτογνώρισα τον Οκτώβριο του 1973.
Μου αρέσουν οι ξύλινες κατασκευές αεροπλάνων και σκαφών από το μηδέν.
Ξεκίνησα να συλλέγω σχέδια, άρθρα, βιβλία και ότι άλλο μπορούσε να με βοηθήσει στο χόμπι από τα πολύ παλιά χρόνια.
Έχω δημιουργήσει μια πολύ μεγάλη προσωπική συλλογή από αυτά.
Από το 2004 άρχισα να ασχολούμαι με την ψηφιοποίησης τους, τον καθαρισμό τους αλλά και να τα μοιράζομαι μαζί σας αφού τα δημοσιοποιώ στο διαδίκτυο (όσα από αυτά επιτρέπεται λόγο των πνευματικών δικαιωμάτων τους).
Σήμερα μετά από όλη αυτήν την εμπειρία που έχω αποκτήσει, αποφάσισα να ψηφιοποιήσω, να καθαρίσω και να ξαναδημοσιεύσω σε ψηφιακή έκδοση και ελεύθερα όλα τα τεύχη του περιοδικού RC Modeler από το 1963 μέχρι το 2005 και κάποια άλλα βιβλία και περιοδικά.
Σίγουρα είναι μια πολύ μεγάλη, δύσκολη και επίπονη εργασία αλλά πιστεύω με την βοήθεια όλων σας να την τελειώσω σε ένα καλό αλλά μεγάλο χρονικό διάστημα.
Ζητώ συγγνώμη εκ των προτέρων γιατί τα Αγγλικά μου είναι φτωχά.
Δεν είναι η μητρική μου γλώσσα γιατί είμαι Έλληνας.
Εύχομαι σε όλους εσάς που θα επιλέξετε να τα συλλέξετε και να τα διαβάσετε αυτήν την εργασία μου καλή απόλαυση και καλές κατασκευές.
Το όνομα μου είναι Ηλίας Ευθυμιόπουλος.(Η.Ε)
Το ψευδώνυμο μου Hlsat.
Η χώρα μου η Ελλάδα και η πολη μου η Ξάνθη.

RCM Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) Plans building plane removed and hyperlinked.

3)Articles building plane removed and hyperlinked.

4)Pages reordered.

5)Topics list added.

Now you can read these great issues and find the plans and building articles on multiple sites on the internet.

All Plans can be found here:

Hlsat Blog RCModeler Free Plans and Articles.

http://www.rcgroups.com/forums/showthread.php?t=2354459

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

http://www.hippocketaeronautics.com/hpa_plans/index.php

James Hatton Blog Free Plans and Articles.

http://pulling-gz.blogspot.gr/?view=flipcard

Vintage & Old-Timer RCM Free Plans.

http://www.rcgroups.com/forums/showthread.php?t=2233857

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CTOBER 1967 VOLUME 4 NO. 10

features

COMING NEXT MONTH!

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departments

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EDITOR'S MEMO

The RCM 4th Anniversary Staff dinner held during Nationals week.

THIS issue marks the fourth anniversary of R/C Modeler Magazine. During those four years we have tried our best to bring you the type of material you have wanted to see in RCM. In thus attempting to keep pace with this rapidly growing aspect of model aviation we have made periodic changes in the format of the magazine. Following the phenomenal response to our Reader Interest Survey of a few months ago, we are, once again, in the process of adding new features while deleting some of the less popular material. Starting with the September issue, several changes have been made, as requested by the majority of our readers. We hope they are to your liking, and that if we unintentionally miss a certain subject, or a particular facet of interest, you won't wait for another Reader's Survey to tell us about it. It only takes a letter — and even though the volume of mail makes it impossible to personally answer each and every piece of correspondence, I guarantee you they are all read.

While we're on the subject of the Reader Interest Survey, I'd like to mention that the 1967 Nationals, being held almost in our own back yard this month, prompted the first RCM Editorial Staff dinner — the first time that the entire staff of the magazine has assembled together under one roof. During that dinner, I was proud to present the RCM Reader's Award to the individual columnist selected by you, the readers, as number one on the Interest Survey. The honors went to Chuck Cunningham for his department, Cunningham On R/C.

The second award for the most popular single feature to be presented in RCM was made to Ed Thompson for the Digitrio proportional system. This was the all-time favorite as indicated on the survey.

●

In case you haven't already heard, three new FAI R/C records have been broken. In the Duration, Piston, category, William Bertrand (U.S.A.) broke Maynard Hill's (U.S.A.) old record by almost three hours with a new mark of 11 hours, 17 minutes, and 47 seconds on May 13th.

In the Speed, Glider category, the team of Hahn and Strong (U.S.A.) clocked an official 58.11 mph to beat R. W. Hahn's (U.S.A.) former record of 29.5 mph. This new record was established on June 3rd.

Frank Clover's (U.S.A.) former record of 43.55 miles in the Distance, Glider category was superseded by the team of Donelson and Gresham (U.S.A.) on May 20th with a new distance of 51.8 miles.

Congratulations to the new F.A.I. world record holders.

●

Dr. Robert Lien of New Orleans was the recipient of a rather dubious award recently. Dr. Edward Phillips of the Lake Charles R/C Club presented Dr. Lien with a large gothic cross suspended by a blue and white ribbon and titled "The Blue Max." The citation on this badge of valor and esteem was inscribed "For His Service to the Fatherland for Having Destroyed Over 20 Aircraft." No mention was made of the fact that all the aircraft were being flown by him at the time they were destroyed.

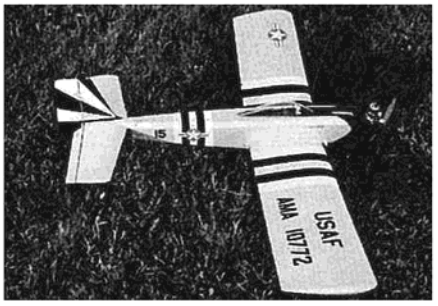
In the more serious view Dr. Lien received the "Duke Fox Achievement Award" for his efforts in the field of Model Aviation. This award was bestowed on him by the Crescent City R/C Club. Doc is one of those often forgotten men of our sport. One of those, who in addition to being a good flyer, does the hard thankless work; like writing the newsletters, keeping the records on the monthly club content, cooking breakfast for our duration record attempts (three successive failures), putting up the money to get the club out of a temporary jam, arranging the judging, sponsors, trophies, necessary forms, information boards, etc., for our annual contest, and like jobs. To remember this forgotten man the Crescent City R/C Club presented to Doctor Robert Lien the Duke Fox Achievement Award.

●

Women in R/C? You better believe it! As an example, when the Des Moines Modelaires R/C Club held their annual election of officers, they elected Hazel Sigafoose, wife of the president of Sig Manufacturing Co., as their president! Perhaps the first lady president of an R/C club, Hazel started flying R/C in 1966 and has made rapid progress. No doubt the fact that she has well over a thousand hours in full scale aircraft has had some influence. After obtaining her commercial and instructor's rating, she is now working on her multi engine rating with an instrument ticket her next goal.

●

Joe Ziomek, 32619 Oakley, Livonia, Michigan 48154, a member of the Livonia Rib Crackers Model Airplane Club, sent in the photo of his .40 powered Galloping Ghost aircraft. Starting with a C. G. Model's Skylark kit, Joe widened the fuselage ¾", increased the dihedral by ½", added a break-away motor mount and an externally removable 4 oz. clunk tank. The rudder surface was increased and the hinge line is vertical. Equipment used is a Min-X 1200 receiver and transmitter, Rand LR-3 actuator, and four nickel cadmium cells for actuator power. Performance is very much like a full proportional ship as opposed to the usual GG machine, which goes to prove what is possible with a Ghost setup and a .40 class engine.



"Doc" Martin, member of the Houston R/C Club, has been working with DynaJet engines since 1962, starting with control line, and working up to R/C. The photo shows his F-111-B R/C model which is powered by two DynaJets, weighing 13 pounds and carrying 18 ounces of fuel. The forward section of the craft is of molded fiberglass and houses the radio, servos, etc. The balance of the model is metal. Controls used are ailerons and flying stab with elevons.

Take-off run of Doc's ship took about 150 feet, followed by a steady climb to 500 feet where it picked up to a level flight speed of 170-180 mph. The model lands well, but extremely fast, the stall speed being approximately 65 mph! Doc is working on a new set of wings with a drooped leading edge and flaps in order to decrease the landing speed. The model pictured is a test bed for a full scale F-111 which will include retractable gear as well as a movable sweep in the wings ala full scale! We'll keep you posted on this one.

See you next month.

Probably is missing page from the scan.

CUNNINGHAM ON R/C

AS we stated last month, this column is going to try and be helpful to the beginning R/C builder and flier as well as the more experienced pilot. Elsewhere in this issue is the Lil Swinger, a ship designed to provide a lot of fun at very little expense. To complement this ship let's take a look at equipment that is available and that can be used in this, and other small ships such as the Top Dawg.

For openers, the Rand system that I have been using for over a year is a good rig. It isn't really fair to call it a Rand system since only the actuator is put out by Rand, while the transmitter and receiver are by Min-X. The basic system uses at least seven batteries, which is a bunch, but by switching to the newer Rand GG Pak and modifying the receiver plug to the Min-X receiver you can get the same type flying with only three batteries. This system not only provides lighter weight, but the throttle action does not cause quite as much lurch. Another good outfit for this size ship is the Controlaire rig. Although I have not personally flown or operated it, I have seen several rigs in use and they appear to be of excellent quality and operation.

The little Airtrol unit will also do nicely in the Lil Swinger and has the advantage of no interaction between the control surfaces. As mentioned in the Lil Swinger article, the Uni-tronics Mustang is an excellent rig, and has just now come on the market. Ace Radio Control is currently putting out several pulse and gg sets that are perfect for this type flying and size ship. If you want to get a lot of fun from flying on a lesser scale than full house proportional, then for an expenditure of about 120 to 150 dollars you can go this route.

As you can see from Don's radio installation, you can put a full house proportional in a ship of this size and though you've got a lot of money tied up in radio gear, the ship is small and inexpensive and so is the engine. Fuel consumption is nothing compared to the .60 engines, so don't overlook this bet. The new 12 ounce Bonner rig is great for small ships, but then so are older rigs such as the PCS which only weighs in at 19 ounces with a standard battery pack.

Don't let the small size of the Lil Swinger fool you, with strip ailerons the wing area is a sizeable 400 square inches, just 50 square inches less than the Goodyear Racers with a .40 engine. With a .15 this size ship fits into the third category for Midwest-RCM Air racers. This does provide a lot of fun in your flying without the need of a lot of practice. With the advent of smaller and smaller proportional gear, as well as better and better single channel radio equipment, the small ship does offer a great many advantages. Give one a try and I think that you'll come back for more.

Flying these small aircraft, especially one equipped with a gg system is really pretty easy. It is a good way to get your young son or daughter interested in going out to the flying field with you. Perhaps you might even get your wife on the controls. Since I've been keeping up with my reading, it seems that a number of the gals are beginning to take to the sport. If they really do get hooked, watch out; not only will we have to keep on our toes as pilots, but also the girls will force not only a clean up in the language at the flying field, but also in the manner of dress!

A lot has been written on flying, but, and not to repeat what is said in the Swinger column, let's look some more at just what this R/C is all about. The purpose of all of the radio gear and all of the time spent building and painting our birds is to get them into the air and down again all in one piece. The best way to do this is to be doubly sure that everything is functioning perfectly on the ground before you take off. Always check all of your controls with the engine running. Make sure that everything works perfectly on the ground and don't settle for anything half way! If it doesn't work right all of the time, don't fly! If you plan to fly some of the ships such as the Falcon 56 with galloping ghost, or for that matter with any control that uses elevator, I suggest that you discard the rubber bands on the elevator and glue this entire tail assembly to the fuselage. This will keep it from shifting either in flight, or from the hands of a well-meaning helper. Any shift at the tail just as you are taking off will make for a lot of trouble in the air.

If you are sure that all systems are go in both your aircraft and in your transmitter than make sure that the aircraft itself is ready for the air. Don't skimp on the rubber bands that hold down the wing. If these are loose, or you don't have enough this will allow the wing to shift during

RCM's Editor, Don Dewey, presenting Chuck Cunningham with the RCM Reader's Award for the most outstanding column.

flight, or if you make a quick and violent movement the wing may lift off of the fuselage giving you all kinds of headaches.

Once your ship is in the air there are several rather important considerations that you should make. With any kind of small ship, the best place to fly is up wind. If you let it get down wind, and it's been trimmed to climb naturally, your going to have a heck of a time flying it back. Always stay upwind until you are experienced enough to know how to cope with the wind. With a gg ship you can trim in a little down elevator to help penetrate the wind.

If you are flying a ship that simply won't dig into the wind, and you do get downwind, then the best course is to keep turning the ship from side to side into the wind, like a sailboat tacking into the wind. If you find that with each tack you get higher and higher, then let one tack go into a spiral dive until you pull out going into the wind again, don't let it zoom into a loop, but break up the loop with a roll in the opposite direction. If you are unsuccessful in this, and the ship keeps drifting farther and farther down wind, then toss in the towel and spiral it into the ground. I know it takes a lot of guts to deliberately wreck your ship, but it is better to go down and pick up the pieces than it is to watch it float off into the wild blue yonder, with only little hope of recovering it!

Another thing to remember in flying small ships is to protect the receiver. I've seen lots of kits and plans that simply strap the receiver to a piece of plywood with a rubber band and then slide this into the fuselage. In the event of a crash, something usually slams into the receiver and you've got a repair bill! This is nonsense. You should protect your receiver more than any other piece of equipment. The best and easiest way to care for it is to cut two pieces of 3/32" plywood just a little larger than the receiver case and strap to each side of it with masking tape or plastic tape. Then build a foam box of ½" foam rubber and slip the plywood protected receiver into it. Make sure that the antenna is routed out the back side of the foam box and not out by the receiver plug. This is true on any set. Keep the antenna away from the battery, the power wires or any metal pushrods.

When you stick the antenna thru the side of the fuselage, slip a piece of fuel tube over it and into the hole to give it a nice soft neoprene bumper. Fasten the antenna loosely at the tail of your ship, so that in the event of a crash the antenna will be free to go with the receiver. A rigid fastening will not only cause your tail assembly to break but also may cause the antenna wire itself to break. Its a good idea to inspect the antenna wire often to check for any breaks or hair line crack in the insulation. This is one receiver repair that you can make yourself and one that is all too often overlooked. Remember, when replacing the antenna wire, always make sure that the new wire is exactly the same length as the old. Don't just stick on a new piece of wire of any length.

Each month I'll try and throw in some hints and help on flying, and how to avoid many of the pitfalls. In upcoming months we will be presenting more ships designed for the sport flier. The next one to come along is as yet un-named, I've been toying with the idea of calling it the "23 Skidoo" since it will be reminiscent of full scale craft of the 1920 period. It has a parasol wing, open cockpit and round cowl, and it sized for a .19 to .23 engine. If you don't know what "23 Skidoo" means look up one of the old grey headed fliers at your field and ask him. Further down the line will be a ship for .35 to .40 engines, which is really a great size for sport flying. These engines throttle well, have a lot of power, and yet are very economical on fuel. The design for this one hasn't jelled yet, but will be in the trend of cute ships rather than a contest type machine.

It's time to get into the question and answer portion of the column for this month. If you have any questions you would like us to answer, write to me, Chuck Cunningham, C/O R/C Modeler Magazine, 5333 Wooten Dr., Fort Worth, Texas, 76133 and we will try and fill the bill. If you want a quick and personal answer send along a stamped self addressed envelope, otherwise, if your question has general reader interest it will find its way into print.

Q. "Why does my full house stunt ship snap roll at the bottom of an outside loop? This happens each time I try an outside loop."

A. This can be caused by a number of things, or a combination of many. You may have too much down elevator movement, or too much elevator area. You may be trying to outside loop too sharply for the wing loading, and/or the power of your engine, and stalling out at the bottom. You may have the cg too far forward, or too far backward, or you may not have enough rubber bands on the wing and it is lifting off of the fuselage. Check all of these causes and I'll bet that one of them cures this problem.

Q. "I'm somewhat lost on all of the kinds of glues that are used nowadays. What's wrong with the old standby model airplane cement?"

A. In words of one syllable, "it ain't strong enough!" Not only isn't it strong enough for the load put on it by R/C, but it hardens and turns brittle with age, and it is too expensive. On the plus side, it does dry rapidly and in some places, like cap strips, can be used effectively, but for overall use, save it for your free flight or ukie. I use a combination of adhesives and feel that most modelers do. For all doublers I use contact cement. You can buy it in large cans from Sears or Wards or your lumber yard, and find numerous uses for it. Use epoxy at the firewall and build the balance of the ship with either white glue or Tite-Bond. I like Tite-Bond better than white since it does sand, and is stronger when it dries. Glue on all tail surfaces with epoxy. You can make fillets at the tail with epoxy too.

Q. "I want to build a Goldberg Skylane 62" multi ship and use galloping ghost for control. Would this be OK? What rig should I use?"

A. I don't think that any gg system is suitable for a large ship such as the Skylane, or any other aircraft of this size and power requirement. The actuators used on gg systems simply do not have the muscle needed to move the surfaces of a large ship moving at a high rate of speed. I have heard of a number of fliers using .35 on galloping ghost and one who is flying up a storm with an Instructor with a .35 on gg. Frankly I feel that for best results in gg stick to ships with an engine of .19 or less. If you want big ships, then go for big radio.

Q. "What do you think is the best way to get started in R/C? Should I buy small rigs or spend four hundred bucks plus and go all the way?"

A. This has to be strictly up to the individual. You have to decide for yourself just how much interest you have and how far your pocket book can stretch. If you can possibly swing it then a full house proportional rig is the best buy. It will fly any size ship, do it reliably, and provide you with the best possible control. If this is more than you want, and if you can find a good used 10 channel reed rig buy it. There is a lot of good flying to be had with reeds and just because the local pros are flying propo doesn't mean that you can't have a lot of fun with a good reed set. If your budget is limited as well as your interest level, and you want to keep things on an even plane, then by all means try galloping ghost. Don't ever let me mislead you tho, the first choice if you can afford it has to be full house proportional.

There you have the Q and A for this month, send in your problem and we'll try and find the answer. For this month's Tip From The Top — we have to credit performance. If you are a serious contest flier, then take a leaf from the book of success as shown by Phil Kraft. Phil has taken one design, his Kwik-Fli, and stuck with it. He has learned all of the pros and cons of this ship and knows it inside out. This has to be in big help in competition. Get a design that you like, stick with it, and you'll be ahead of the game when it comes to trophy time.

Davenport R/C Society of Rock Island, Illinois, with a variety of popular ships.

GETTING STARTED IN R/C?
SEND YOUR QUESTIONS TO

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5333 WOOTEN DRIVE
FORT WORTH, TEXAS 76133

CHUCK CUNNINGHAM'S

LI'L SWINGER

40 inches of swingin' machine for .09 to .19. Designed for the Bonner 4RS or Galloping Ghost systems.

THE Li'l Swinger was designed with only one basic thought in the author's mind — to design a ship that would be highly suitable as a trainer for Galloping Ghost type of flying.

And, the Li'l Swinger is that, alright. But I had forgotten, for the moment at least, about our Editor and Fearless Leader! After shipping him the plans, what was to be a GG trainer turned out as a full-house, Class III for the new miniature Bonner 4RS digital system!

So, you can pay your money and take your choice. As a by-product, it is sturdy because it was meant to be. It is cute, 'cause almost any little ship is cute. And, it is a ball to fly, because it is simple with no extra frills.

For best results on Galloping Ghost, use an Enya .099 or Max .10 R/C. My prototype used the former which is a handful of power. I borrowed a little hint from my Enya .60 and opened up the throttle venturi by turning out the needle valve seat one turn. This really added some rpm!

For the Bonner 4RS version, Don used a Max. .19. Although the nose was designed for a two-ounce plastic bottle tank, one of the newer 4-ounce rectangular bottle clunk tanks fitted perfectly with nary a hair to spare!

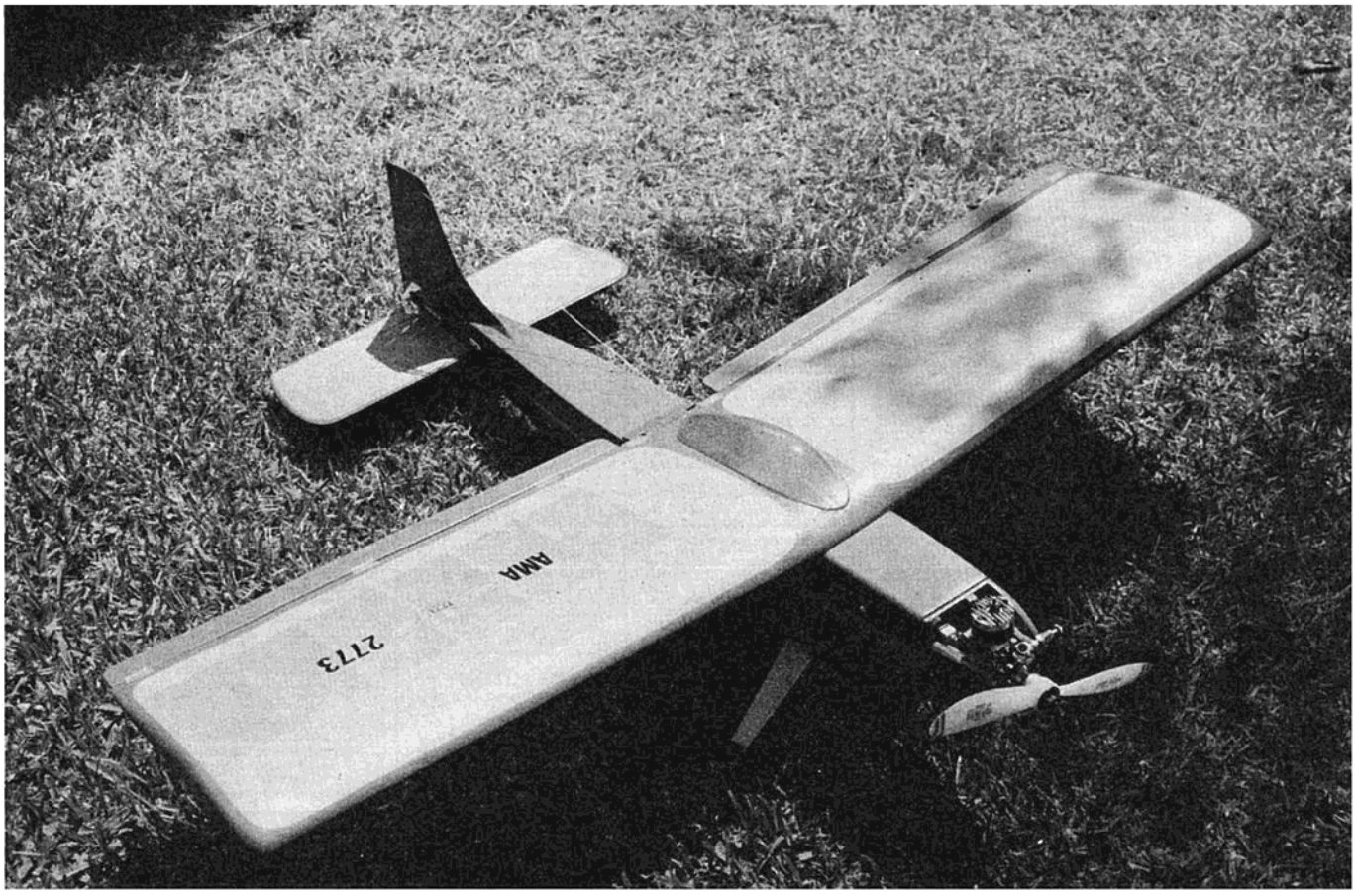
The fuselage is beefed up enough to take the whacks of many, many bad landings, and the rudder is large enough to give good precise control at almost any speed and position.

You will note on the plans that the hinges are shown made from tape, and used in a figure eight manner. I was working on this idea when "Big Daddy" Ken Willard mentioned the same thought in his write up of the Top Dawg. I have used them on several ships and have experienced no trouble at all. Use 3M decorator tape in the small width. Cut pieces about one-and-one-quarter inch long. Match sticky side to sticky side and lap about one fourth of an inch. Place them on the surface to be hinged in the same manner as figure eight type cloth hinges, press firmly into position, and you're done. It's cheap, simple, and has the advantage of giving you a very free hinge movement, a must for galloping ghost.

The name for the Li'l Swinger is kinda obvious, it's a swinging ship, and it gets its control from all of that stuff on the back end swinging back and forth. Back in the old days, before the modern GG gear such as the Rand GG Pak used in this ship, we had to hang a mass of wire on the tail surfaces to get the job done. If this ship had come along then, keeping the naming idea in mind, it could have been called the Plumber's Friend!

The real test of any aircraft is in the flying, and since that is really the ultimate goal here, let's get into flying not only the Li'l Swinger, but in flying galloping ghost in general.

On any GG ship the important thing to watch for is that both of the control surfaces are pulsing around neutral, and that when you give an up, you get up, and when you give a right you get a right. If you don't, then go no farther, but dig into the controls and see what is wrong. Set up the control movement so that you have a maximum of ¾" deflection of the rudder on either side of neutral and about ⅛" maxi-



mum of down elevator. Let the up elevator take care of itself. With the control pulsing merrily away check the throttle control (if you are using one) to see if low engine is really low engine. If everything looks good, then check very carefully to see that the trim levers are set in the middle position and that the surfaces are pulsing about neutral. If not, turn off all switches and adjust the Kwik-Links until everything is just right. Move away about ten steps with the transmitter and check again. For best results with any GG ship, full down should be a rapid flutter in down elevator with not too much deflection. You're not going to do outside loops, but you do want to penetrate the wind, and also to feed in a little down elevator in a roll. So resist the urge, save that movement for the other side of neutral, up.

Be sure and check the balance point. Do not balance the Li'l Swinger any farther forward of the point shown on the plans. You may balance it as much as ½" further aft if you desire, but the cg as shown has proven just about right.

For test flying go out and find a nice field with lots of nice tall soft weeds, the kind that will give you lots of comfort if something happens on the first few flights. Don't weaken to that old urge to test glide the ship. It won't do it. I don't care how many free flights you may have checked out, or how much your flying buddy insist that you test glide it, don't! Any GG ship with the actuator at rest will be in down elevator position, and if you dash off to heave it into the wild blue for a test glide your bird will promptly gobble up a beak full of dirt. And, don't turn on the actuator to check it out as this ship isn't a floater. Just resist the urge, please!

Make sure that everything works with the engine running, that your transmitter is functioning properly, that the battery is in good shape, and that the receiver battery is charged. With all systems go, grab the Li'l Swinger just behind the landing gear, be sure that the switches are turned on in both the transmitter and receiver, lean the engine out until it just breaks into a two cycle, put your heart back in your chest, and check everything one more time. If you're fully satisfied (remember, your tank is good for at least 10 minutes, so don't hurry), then let's get airborne. Check the wind direction, and with the transmitter held in your left hand and the aircraft in the right, at shoulder height, run into the wind. Keep running until the ship begins to feel light, then push it straight ahead. Don't wind up and throw it, and don't toss it either up or down, just straight ahead.

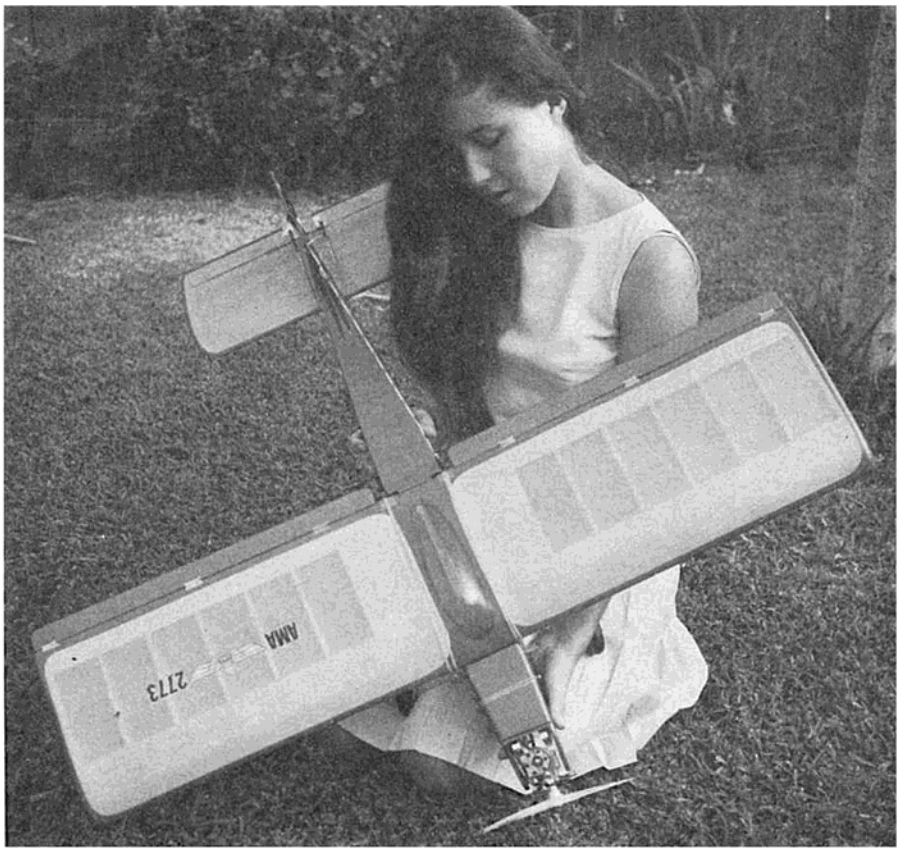
If everything is working right the aircraft should start flying right off the portable launching pad (that's you) with a slight climb. Do not make any corrections, or attempt any turns, until about 50 feet of altitude has been gained. Of course, if it has a violent turn, then correct for this with the transmitter, but the safest course is to let the Li'l Swinger fly itself. When you have reached a safe altitude make a wide, slight turn to the right or left. Don't rack the stick all the way over to turn, just move it gently in the direction that you want to go. Watch the aircraft, and fly it, not the joy stick on the transmitter.

Make turns in both directions. Note if the nose is down or up. If it is down, trim in a little up trim, not a lot, just a little at a time. Your best flying attitude is with the nose just about level, then you can hold in a little up elevator to keep it up in a turn. To make a tighter turn feed in a little left rudder, when the ship yaws to the left pull in a little up elevator and she will come right around. With experience you will be able to make this type of turn very tight and right on the deck. But don't rush it, learn what the ship will do up high where you have time to make a correction if something goes wrong.

When the engine quits on the Li'l Swinger, roll in all of the up trim and then let the ship settle down to the ground. The way that this ship is trimmed and balanced, when the engine cuts it will start a shallow dive toward the ground, but with up trim you can change this dive to a nice, non-floating glide that, with practice, you can terminate right on the spot of your choosing. The trim has purposely been set up on this ship to keep it out of the floater class as this type of flying is not needed with galloping ghost. I'd much rather have a ship that will penetrate a good breeze, loop at will, and make straight true turns, than a floater that makes for a constant battle with ballooning into the wind.

One word of caution, don't let the adeptness of handling of this ship go to your head, I did, and I should know better. On the second flight, after making a series of low passes for my wife who was taking pictures, I was gliding in for a dead stick landing and decided that it was so responsive at low glide speed that I'd put it right in my lap and catch the ship just as it got to me. I did, and you guessed it, it glides fast, and I very neatly removed the horizontal stab with my catch. Go on and say it, you're right!

I think that you'll have fun with the Li'l Swinger. It has proven to be just what the name implies, a real Swinger! When you paint it up, how about trimming it in WWI **Allied** colors for a change, with British Concordes instead of Maltese Crosses, then you can go out and do battle with all of the Wolfmeisters tearing up the sky!

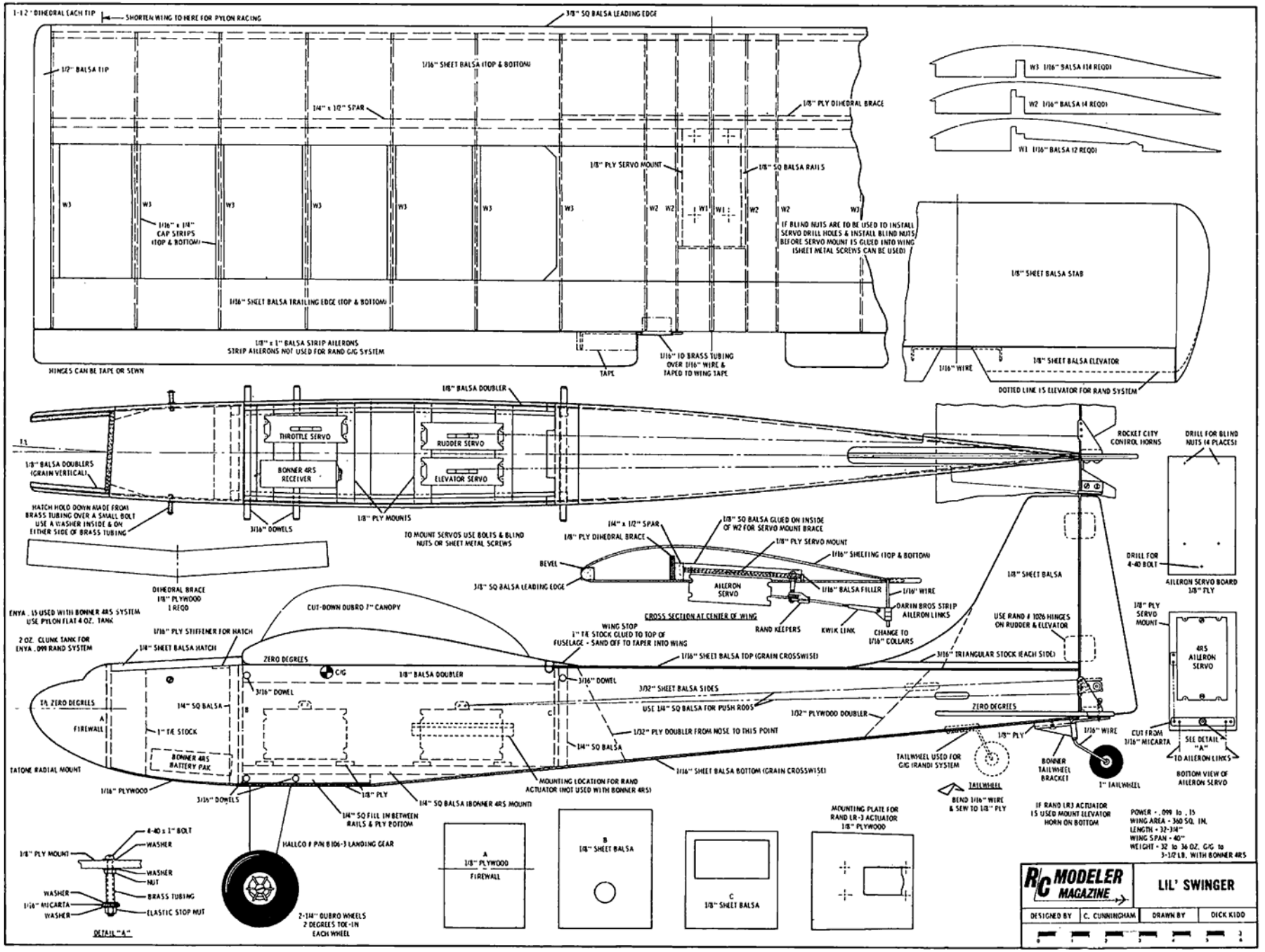


Julie Embree, RCM's "girl next door," poses with the Bonner version of the Li'l Swinger. She's also flown it.

Construction

Building the Li'l Swinger is easy, and if you have built a R/C ship before you should have no trouble with this one. If this is your first ship, then get someone to help you over the tough spots.

The wing is easy and strong. Cut out the eighteen ribs required from medium balsa and stack together in a bundle, pin the bundle into one piece and then sand the ribs to insure that they all have the same airfoil. Set this stack aside. Pin down the trailing edge sheeting, the leading edge sheeting, and the lower cap strips, and glue in place. I like to build both wing halves at the same time, then glue together at the proper dihedral angle to finish them off. Glue the ⅜" square leading edge on top of the leading edge sheeting. Before gluing it in place, sand the bevel on it as shown. This won't take long and it is easier to sand it now than later. Glue the spar to the sheet and before this has dried, glue the ribs in place. After the ribs are in place make sure that the dihedral brace will fit in both wing


1-1/2° DIHEDRAL EACH TIP
SHORTEN WING TO HERE FOR PYLON RACING
3/8" SQ BALSA LEADING EDGE
1/2" BALSA TIP
1/16" SHEET BALSA (TOP & BOTTOM)
1/4" x 1/2" SPAR
1/8" PLY DIHEDRAL BRACE
1/8" PLY SERVO MOUNT
1/8" SQ BALSA RAILS
W3 1/16" BALSA (14 REQD)
W2 1/16" BALSA (4 REQD)
W1 1/16" BALSA (2 REQD)
1/16" x 1/4" CAP STRIPS (TOP & BOTTOM)
IF BLIND NUTS ARE TO BE USED TO INSTALL SERVO DRILL HOLES & INSTALL BLIND NUTS BEFORE SERVO MOUNT IS GLUED INTO WING (SHEET METAL SCREWS CAN BE USED)
1/16" SHEET BALSA TRAILING EDGE (TOP & BOTTOM)
1/8" SHEET BALSA STAB
1/8" x 1" BALSA STRIP AILERONS
STRIP AILERONS NOT USED FOR RAND G/G SYSTEM
HINGES CAN BE TAPE OR SEWN
TAPE
1/16" ID BRASS TUBING OVER 1/16" WIRE & TAPED TO WING TAPE
1/16" WIRE
1/8" SHEET BALSA ELEVATOR
DOTTED LINE IS ELEVATOR FOR RAND SYSTEM
1/8" BALSA DOUBLER
THROTTLE SERVO
RUDDER SERVO
BONNER 4RS RECEIVER
ELEVATOR SERVO
1/8" BALSA DOUBLERS (GRAIN VERTICAL)
HATCH HOLD DOWN MADE FROM BRASS TUBING OVER A SMALL BOLT USE A WASHER INSIDE & ON EITHER SIDE OF BRASS TUBING
3/16" DOWELS
1/8" PLY MOUNTS
TO MOUNT SERVOS USE BOLTS & BLIND NUTS OR SHEET METAL SCREWS
DIHEDRAL BRACE 1/8" PLYWOOD 1 REQD
ROCKET CITY CONTROL HORNS
DRILL FOR BLIND NUTS (4 PLACES)
DRILL FOR 4-40 BOLT
AILERON SERVO BOARD 1/8" PLY
1/4" x 1/2" SPAR
1/8" SQ BALSA GLUED ON INSIDE OF W2 FOR SERVO MOUNT BRACE
1/8" PLY DIHEDRAL BRACE
1/8" PLY SERVO MOUNT
1/16" SHEETING (TOP & BOTTOM)
BEVEL
3/8" SQ BALSA LEADING EDGE
AILERON SERVO
1/16" BALSA FILLER
1/16" WIRE
DARIN BROS STRIP AILERON LINKS
RAND KEEPERS
KWIK LINK
CHANGE TO 1/16" COLLARS
CROSS SECTION AT CENTER OF WING
1/8" SHEET BALSA
1/8" PLY SERVO MOUNT
4RS AILERON SERVO
ENYA .15 USED WITH BONNER 4RS SYSTEM USE PYLON FLAT 4 OZ. TANK
2 OZ. CLUNK TANK FOR ENYA .09 RAND SYSTEM
CUT-DOWN DUBRO 7" CANOPY
1/16" PLY STIFFENER FOR HATCH
1/4" SHEET BALSA HATCH
WING STOP 1" F/E STOCK GLUED TO TOP OF FUSELAGE - SAND OFF TO TAPER INTO WING
1/16" SHEET BALSA TOP (GRAIN CROSSWISE)
3/16" TRIANGULAR STOCK (EACH SIDE)
USE RAND # 1026 HINGES ON RUDDER & ELEVATOR
ZERO DEGREES
C/G
1/8" BALSA DOUBLER
3/16" DOWEL
3/32" SHEET BALSA SIDES
USE 1/4" SQ BALSA FOR PUSH RODS
1/32" PLYWOOD DOUBLER
1/4" SQ BALSA
1/32" PLY DOUBLER FROM NOSE TO THIS POINT
1/16" SHEET BALSA BOTTOM (GRAIN CROSSWISE)
TO ZERO DEGREES
FIREWALL
1" F/E STOCK
BONNER 4RS BATTERY PAK
TATONE RADIAL MOUNT
1/16" PLYWOOD
3/16" DOWELS
1/8" PLY
1/4" SQ BALSA (BONNER 4RS MOUNT)
MOUNTING LOCATION FOR RAND ACTUATOR (NOT USED WITH BONNER 4RS)
1/4" SQ FILL IN BETWEEN RAILS & PLY BOTTOM
TAILWHEEL USED FOR G/G (RAND) SYSTEM
TAILWHEEL
BEND 1/16" WIRE & SEW TO 1/8" PLY
BONNER TAILWHEEL BRACKET
1" TAILWHEEL
1/16" WIRE
CUT FROM 1/16" MICARTA
SEE DETAIL "A" TO AILERON LINKS
BOTTOM VIEW OF AILERON SERVO
4-40 x 1" BOLT
WASHER
1/8" PLY MOUNT
WASHER
NUT
WASHER
1/16" MICARTA
WASHER
BRASS TUBING
ELASTIC STOP NUT
DETAIL "A"
HALLCO # PN 8106-3 LANDING GEAR
2-1/4" DUBRO WHEELS 2 DEGREES TOE-IN EACH WHEEL
A 1/8" PLYWOOD FIREWALL
B 1/8" SHEET BALSA
C 1/8" SHEET BALSA
MOUNTING PLATE FOR RAND LR-3 ACTUATOR 1/8" PLYWOOD
IF RAND LR3 ACTUATOR IS USED MOUNT ELEVATOR HORN ON BOTTOM
POWER = .099 to .15
WING AREA = 360 SQ. IN.
LENGTH = 32-3/4"
WING SPAN = 40"
WEIGHT = 32 to 36 OZ. G/G to 5-1/2 LB. WITH BONNER 4RS
RC MODELER MAGAZINE
LIL' SWINGER
DESIGNED BY
C. CUNNINGHAM
DRAWN BY
DICK KIDD

panels, and then glue it to one half of the wing. Install the top sheeting and cap strips and let all of it dry overnight. The next morning lift both halves from the building board, check that everything is ok and then glue the two wing halves together. Let this dry until the evening.

When the wing is dry sand it lightly with fine sand paper and glue on the tip blocks. Sand them to shape and then give the wing a coat of clear dope. Take a piece of old sheet (the kind that you sleep on) and cut a strip about four inches wide and long enough to wrap around the center section of the wing. Lightly coat this with white glue and then wrap it around the center section. When it is dry sand the edges lightly. You will have a wing that is strong and one that will not suffer from the pull of the tie-down rubber bands. Give the wing a coat of clear dope, sand again and you are ready to cover. You can cover with either silk, silkspan or MonoKote. On a ship of this size a double covering of silkspan will do a good job. I used MonoKote on the wing of the original. It's quick and easy.

The fuselage is very simple to construct, but you must remember that not only in this ship, but in all models, it is very important to have a straight alignment. To do this on the Swinger, draw a line with a pencil down the middle of your building board. We'll assemble the ship around this line. Cut the sides from hard 3/32" sheet and the doublers from 1/32" plywood. You may think that this is a bunch of extra weight for a little ship to carry. It is, maybe two ounces more weight, but the results are a terrifically strong fuselage, able to take lots of punishment and to come back for more. Glue the ply doublers to the balsa sides with contact cement. Cut out the formers and the plywood for the nose and the landing gear mount. Before joining the fuselage sides glue on the 1/4" square braces at former B and C and also glue on the 1" trailing edge stock to act as braces at the fire wall. Remember to offset them as shown on the plans to allow for side thrust. Also glue on the 1/4" square brace for the actuator support. It's easier now than later. Mark the locations of formers B and C and glue the two sides together only at these formers. Check that everything is square and set this aside to dry. While you were cutting out the firewall and the formers draw a line down the center of the formers to use in making a true fuselage. Now, with the main structure dry invert it over the line that you have drawn on your building board and glue in the firewall and bring the tail together and glue. Make sure that all centerlines are right over the line on the building board and that the tail falls right across this line. Set everything aside to dry again and while waiting, go on to the tail assembly. Cut the rudder and stab from medium hard balsa and just lightly sand. Don't worry about a knife edge on the leading and trailing edges, just round them. Dope on a coat of clear dope and set aside to dry.

The fuselage should be dry enough now for you to put on the top and bottom sheeting — be sure and cross grain it. When this has all dried sand the fuselage lightly and give it a coat of clear dope.

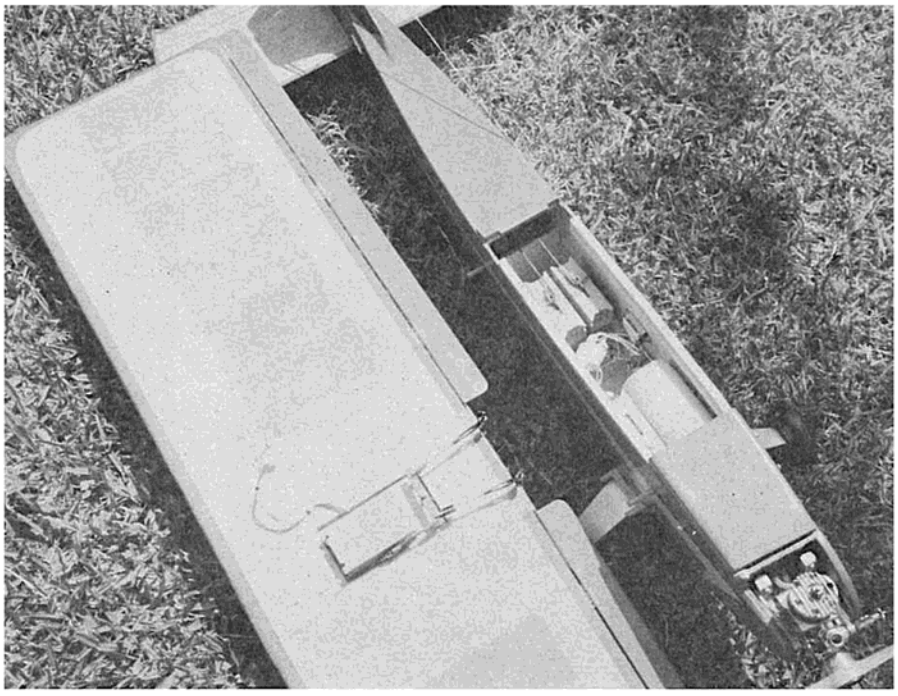
On small ships I like to cover the fuselage and tail group with silkspan. This gives it added strength and also makes for a smooth paint base. You can leave it uncovered if you so desire. When covering the sheet surfaces of the tail, with silkspan, do not wet the silkspan, just dope it on dry. This will help to prevent warps.

After covering glue the vertical and horizontal stabs in place and reinforce this joint with strips of "Celastic." This will go a long way toward making the aft section as strong as the nose. Paint the ship in whatever colors you wish, but remember, don't pile on the dope! This only adds weight, so stick with just a couple of coats.

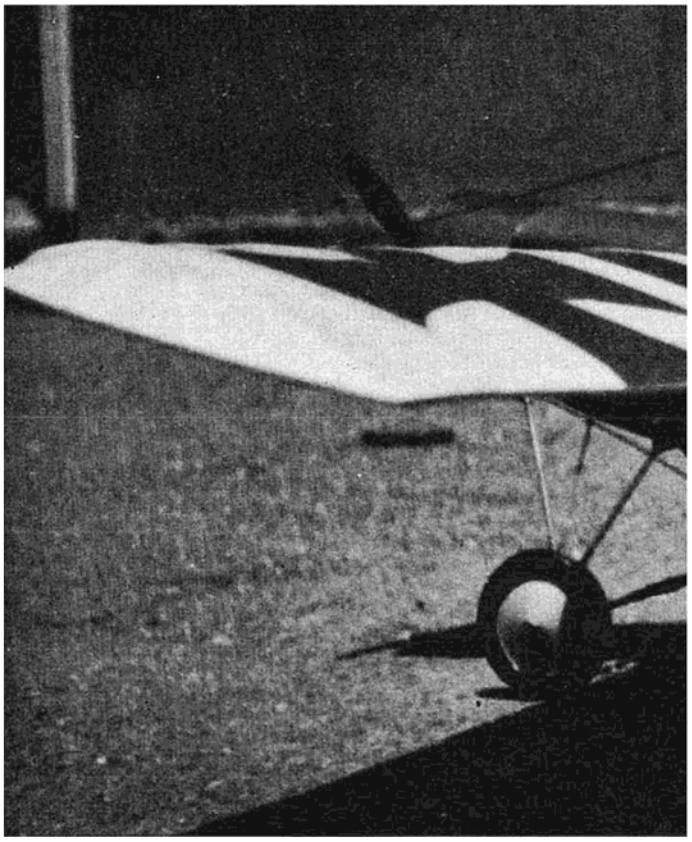
Hinge the tail surfaces by either the tape method that I discussed earlier, by sewing, or by plastic hinges such as the small Rand that have been designed to slip over the 1/8" sheet surface. Remember, the hinges must be free.

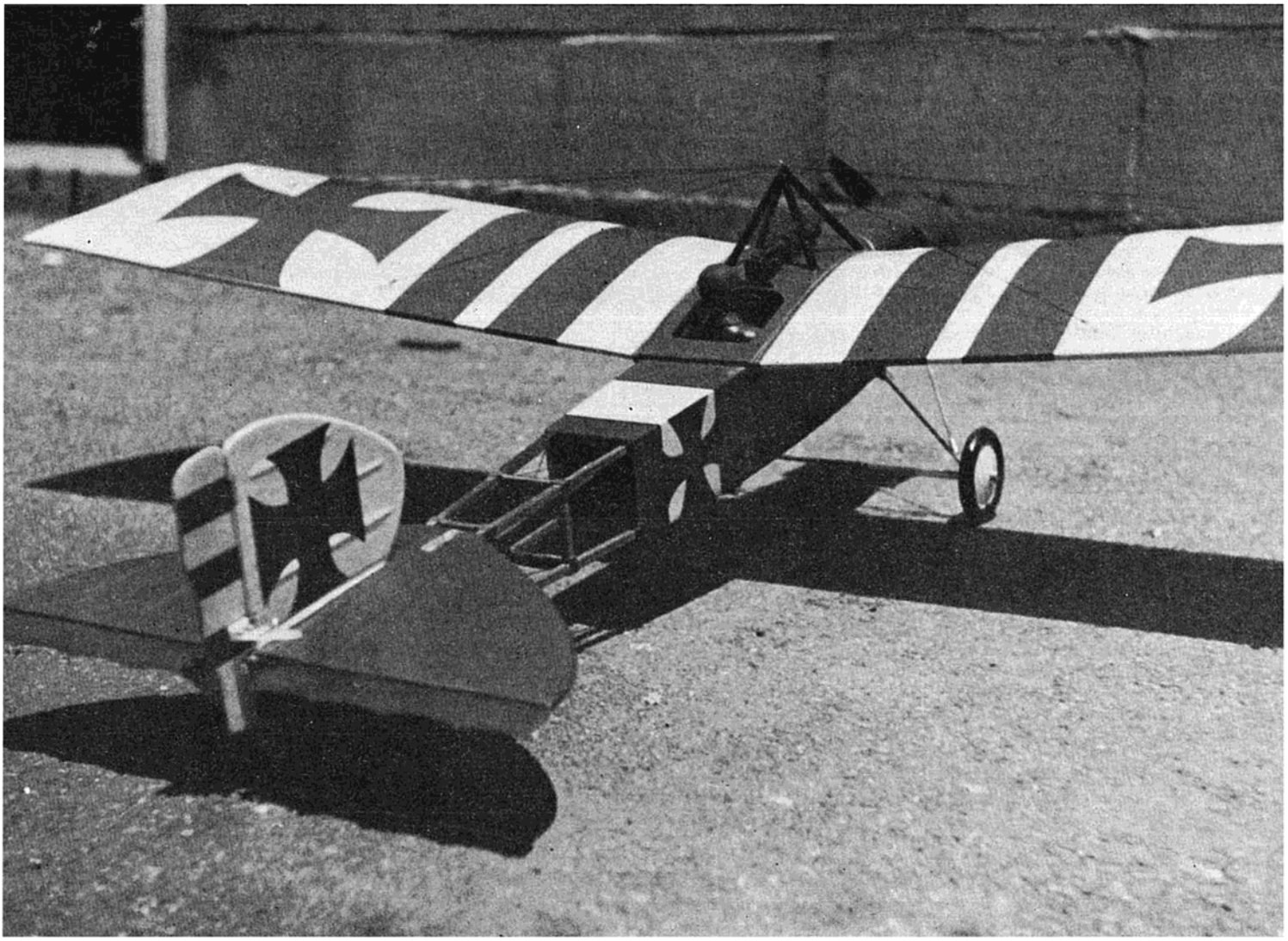
The tail wheel is fixed to the plywood bracket by sewing it to the plywood with small wire, or with nylon fishline. The tail wheel does not move, but you can taxi nicely with just the use of the rudder. On the Bonner 4RS version, a steerable tail wheel is used. Notice, also, that the elevator size has been increased. Sheet stock strip ailerons were used with 1/4" movement up

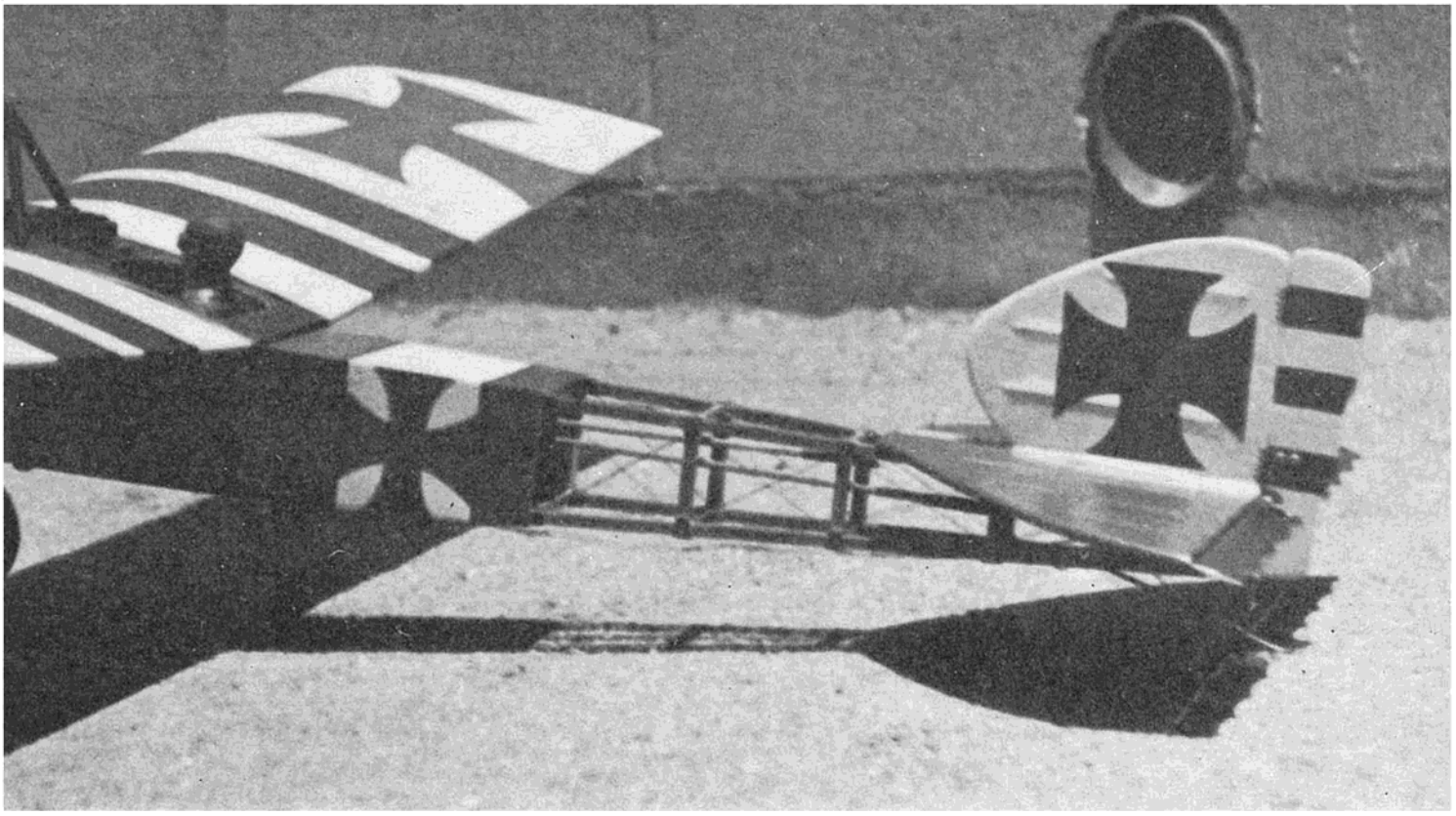
(Continued on Page 19)



Top: Bonner 4RS system installed in Li'l Swinger. Above: Chuck makes final adjustments prior to test flights from "Dewey's Hill." Dick Ludden looks on while RCM's Editor hunts for rubber bands in the G&K Field Box.







DAS FLUGENGHOSTER

The Red Baron strikes back! An excellent vintage type machine for .049 to .09.

BY SCOTT CHRISTENSEN

Every now and then I see the results of some Sunday flier's thoughts on design that are so unusual I want to share them with you. Whitey Pritchard's "Mantis" was one, for example. Of course, he's gone on to other great ideas, which you'll be seeing from time to time also.

Recently, however, in contrast to Whitey's ultra modern design, there has been a return to favor of the old time designs in the "Magnificent Men in Their Flying Machines" tempo, like Lou Proctor's "Antic" and such.

But they've all been too big — at least for my taste — until one day a few weeks ago my friend Scott Christensen called and said "Hey — you know that Rand G-G Pack we were flying in that old shoulder wing? Well, it worked so well that I thought I'd design an airplane around it. I've had an idea for a semi-scale old timer type I'd like to try."

"Go ahead," I encouraged him. "You'll never start designing any sooner. Just stick with the principles of basic layout, be sure the CG is where it should be, and with the G-G Pack you'll have plenty of control."

I'll never understand how he did it so fast, considering all the detail he cranked into it, but shortly after that first phone call Scott called again. "It's finished. I'll bring it out and we'll fly it this weekend." He did, and we did, and if you'd been there, I'm sure you would have enjoyed it as much as anything you've seen in Sunday flying activity. So, because I found it so much fun, I'm turning the Sunday Flier column over to Scott Christensen this month, and he'll tell you all about "Das FlugenGhoster, mitFloppenKontrol."

While Scott tells you about Das FlugenGhoster, I'll be trying to figure out a way to tell you, next month, how you can go about designing your own airplane by using some of the ready built accessories, components, and even major assemblies that can be purchased nowadays. Then, if you come up with something unusual, we'll share it with all the other Sunday fliers. Just one thing — it has to fly, and reasonably well.

Fair enough? Meanwhile, Achtung! Begrabben das sprucenbalsa und dopenglue geschticken und maken Das FlugenGhoster!

— Ken Willard

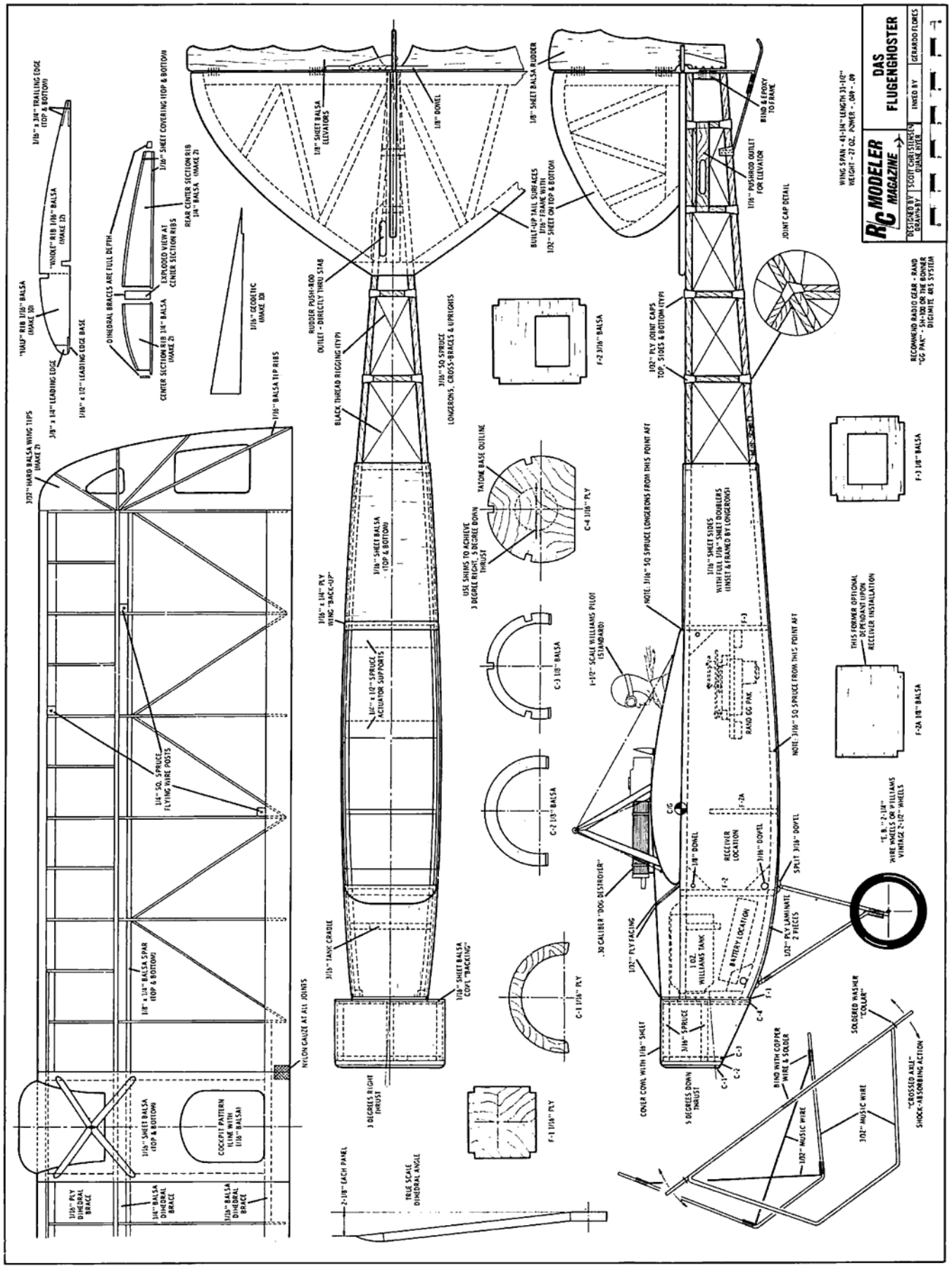
DAS Flugenghoster was not chosen as a subject, it became a subject after it was completed. By this I mean the airplane was designed as it was being built.

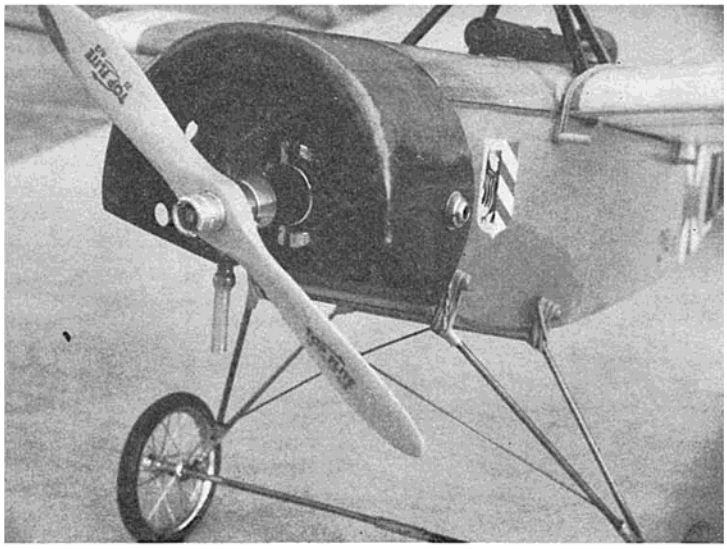
One evening, back in April, I took my wife to see "The Blue Max." This motion picture was one of the best of its type that I had ever seen, and "The Blue Max" planted the seed for Das Flugenghoster.

The following day, at work, I was on the phone and the party I was talking to put me on "HOLD." As is my custom, I started sketching an airplane on my scratch-pad. Within a few minutes, I had sketched what is now Das Flugenghoster.

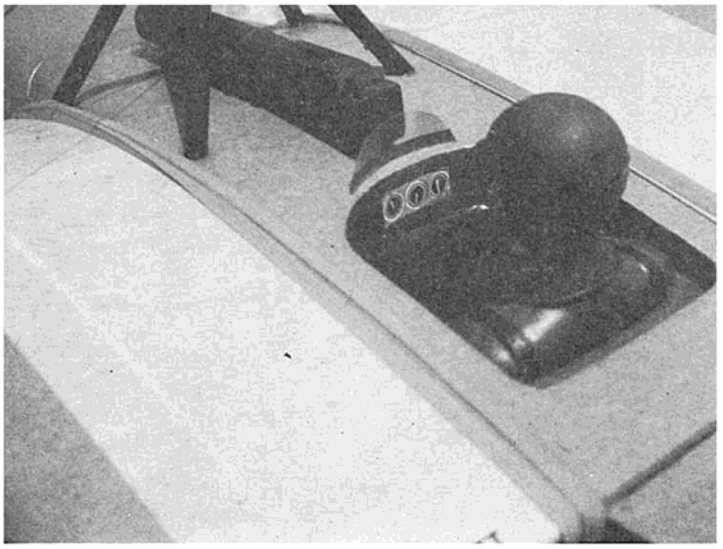
In building Das Flugenghoster, I've tried to incorporate most of the things that I find attractive in aircraft of this period. The wing, for instance, is a sort of semi-scale Eindecker type. The fuselage is somewhat Neiuportish, etc. . . . These things, separately, are what I like. But when put all together, they seem to make a very nice looking airplane that pleases just about everyone. You may also like the crossed-axle shock absorbers used in the landing gear — it really works!

Although the building of Das Flugenghoster was fast, simple, and fun, flying it soon became the highlight of this project. A new Rand G-G Pak was used for control and a Cox Medallion .049 was faking it as an Oberursel up front. The day finally arrived when it was "now or never." I made sure my radio gear was working properly, set the surfaces at neutral, and fired up my


DAS FLUGENGHOSTER
R/C MODELER MAGAZINE
DESIGNED BY | SCOTT CHRISTIANSEN
DRAWN BY | DUANE DUYER
INKED BY | GERARDO FLORES
WING SPAN - 43-1/4" LENGTH 31-1/2"
WEIGHT - 27 OZ. POWER - .049 - .09
RECOMMEND RADIO GEAR - RAND "GG PAK" - SH-101 OR THE BONNER DIGIMITE 4RS SYSTEM
1/16" x 3/8" TRAILING EDGE (TOP & BOTTOM)
"RIBBED" RIB 1/16" BALSA (MAKE 12)
"HALF" RIB 1/16" BALSA (MAKE 10)
3/8" x 1/4" LEADING EDGE
1/16" x 1/2" LEADING EDGE BASE
DIHEDRAL BRACES ARE FULL DEPTH
EXPLODED VIEW AT CENTER SECTION RIBS
1/16" SHEET COVERING (TOP & BOTTOM)
REAR CENTER SECTION RIB 1/4" BALSA (MAKE 2)
CENTER SECTION RIB 1/4" BALSA (MAKE 2)
1/16" GEODETIC (MAKE 10)
1/16" BALSA TIP RIBS
3/32" HARD BALSA WING TIPS (MAKE 2)
1/4" SQ. SPRUCE FLYING WIRE POSTS
1/8" x 1/4" BALSA SPAR (TOP & BOTTOM)
1/16" SHEET BALSA (TOP & BOTTOM)
COCKPIT PATTERN (LINE WITH 1/16" BALSA)
NYLON GAUZE AT ALL JOINTS
1/16" PLY DIHEDRAL BRACE
1/4" BALSA DIHEDRAL BRACE
1/16" BALSA DIHEDRAL BRACE
2-1/8" EACH PANEL
3 DEGREES RIGHT THRUST
TRUE SCALE DIHEDRAL ANGLE
1/8" SHEET BALSA ELEVATORS
1/8" DOWEL
1/8" SHEET BALSA RUDDER
RUDDER PUSH-ROD OUTLET - DIRECTLY THRU STAB
BLACK THREAD RIGGING (TYP)
BUILT-UP TAIL SURFACES 1/16" FRAME WITH 1/32" SHEET ON TOP & BOTTOM
1/16" PUSHROD OUTLET FOR ELEVATOR
BIND & EPOXY TO FRAME
JOINT CAP DETAIL
1/32" PLY JOINT CAPS TOP, SIDES & BOTTOM (TYP)
1/16" SQ SPRUCE LONGERONS, CROSS-BRACES & UPRIGHTS
F-2 3/16" BALSA
F-3 1/8" BALSA
TAIDNE BASE OUTLINE
USE SHIMS TO ACHIEVE 3 DEGREE RIGHT, 5 DEGREE DOWN THRUST
C-4 1/16" PLY
1/16" x 1/4" PLY WING "BACK-UP"
1/16" SHEET BALSA (TOP & BOTTOM)
1/16" SHEET SIDES WITH FULL 1/16" SHEET DOUBLERS (INSET & FRAMED BY LONGERONS)
NOTE: 1/16" SQ SPRUCE LONGERONS FROM THIS POINT AFT
1/4" x 1/2" SPRUCE ACTUATOR SUPPORTS
C-3 1/8" BALSA
1-1/2" SCALE WILLIAMS PILOT (STANDARD)
RAND GG PAK
THIS FORMER OPTIONAL DEPENDANT UPON RECEIVER INSTALLATION
NOTE: 1/16" SQ SPRUCE FROM THIS POINT AFT
F-2A 1/8" BALSA
3/16" TANK CRADLE
1/16" SHEET BALSA COVE "BACKING"
C-2 1/8" BALSA
.30 CALIBER "DOG DESTROYER"
1/32" PLY FACING
1/8" DOWEL
RECEIVER LOCATION
1/16" DOWEL
SPLIT 3/16" DOWEL
T.B.D. 2-1/8" WIRE WHEELS OR WILLIAMS VINTAGE 2-1/2" WHEELS
1/32" PLY LAMINATE 2 PIECES
1 OZ. WILLIAMS TANK
BATTERY LOCATION
C-1 1/16" PLY
F-1 1/16" PLY
COVER COWL WITH 1/16" SHEET
3/16" SPRUCE
5 DEGREES DOWN THRUST
BIND WITH COPPER WIRE & SOLDER
SOLDERED WASHER "COLLAR"
1/32" MUSIC WIRE
"CROSSED AXLE" SHOCK-ABSORBING ACTION



Cowl detail — note starting Jack and plastic tube extension to needle valve.



Cockpit detail — note pilot, instruments, and "Snoopy" gun. Dirty Red Baron!

engine. Another quick check was made to see if old-man vibration disliked German airplanes — everything was flapping just fine! So with the veins on my temple pulsing at the same rate as the Rand, I gave the nod to my launcher.

Not knowing what to expect out of an airplane I designed myself (know the feeling?), you can imagine my surprise as I watched Das Flugenghoster climb out beautifully with a very slight right turn! No command was given until the plane was about 30 feet up. Testing first a right turn, and then a lift, I next tried a little "up" elevator. This produced an immediate nose-up condition which I corrected with about ¾ "down" elevator. The plane merely leveled-off momentarily and resumed its initial climb-rate — **at ¾ Down elevator!!** Full "down," with full "down" trim, did nothing, the ship was still climbing! I maintained a lower altitude by spiraling down ala' rudder only. Unfortunately, the Cox .049 swinging a 7/3 prop was running better than it ever had! Finally the engine quit and the plane immediately began a hair-raising nose dive — **I was still holding full "down" elevator!** Returning the stick to neutral produced a beautiful slow, flat glide which made for a memorable scale-like landing!

Having deduced that lack of sufficient down thrust was my "hang-up," an additional 3° was added to the original 2°. The second flight was a dream come true! Das Flugenghoster performed beyond my wildest expectations! Violent stick movements produced the desired reaction promptly, **without a trace of gallop**, even full "up" elevator at the bottom of a dive!

To date, this plane has done loops, high-speed dives, snap rolls, low-level fly-bys, and flown inverted! It is capable of most of the standard maneuvers and a few there aren't names for yet (i.e., "The inverted side-slip stall"). This plane's speed is extremely scale-like with the Medallion .049. But speed and penetration can be improved using the Cox Tee-Dee .049. I have gone to the use of a Tee-Dee myself primarily because of the local wind conditions.

As far as the detailing of this ship goes, I would prefer to leave this aspect of construction to the individual. I like an airplane to look like an airplane, so I added the small extras to achieve this end. Here are some of the things I did with regard to detail.

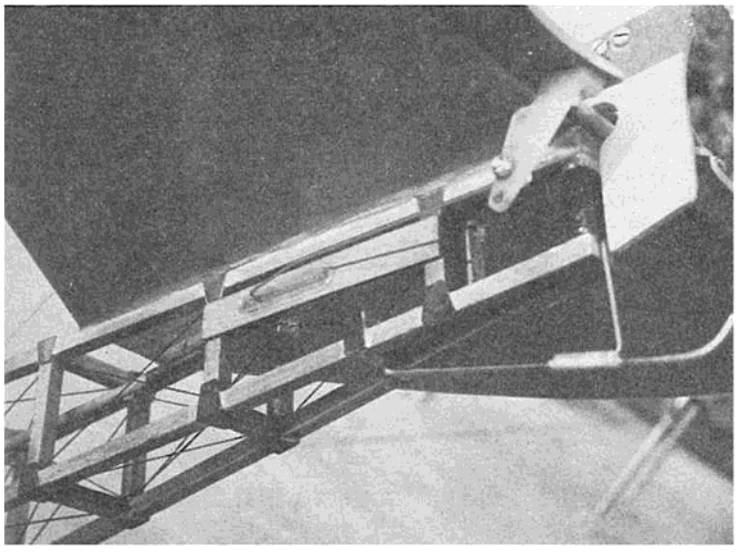
First and probably foremost, there is the "mock" wire bracing in the open part of the fuselage. This is accomplished by drilling 1/32" holes in each of the spruce uprights and cross braces. I used a 10" length of 1/32" music wire for a "drill" mounted in a Moto-tool. The button-thread "wire bracing" is merely wrapped and glued at the forward end of the spruce longeron and passed 'kitty-corner" to the next upright or cross-brace, pushed through the drilled 1/32" hole, brought around through the same hole again, drawn tight, and continued to the next hole, etc. . . . The thread used throughout is "Coats & Clarks" extra strong button & carpet thread, available at any dime store.

A realistic wood like finish can be obtained on the exposed spruce longerons by giving them a coat of maple wood stain. To protect this finish, let the stain dry for 72 hours and coat lightly with 50/50 clear dope. When this dries it should give you an antique look that is very effective.

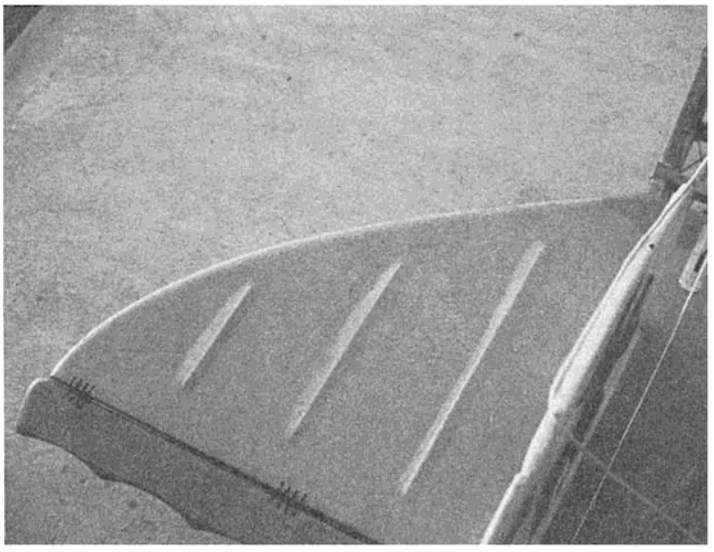
The machine gun is constructed in much the same way as Don Srull's was for his beautiful Fokker E III Eindecker (RCM Nov. 66).

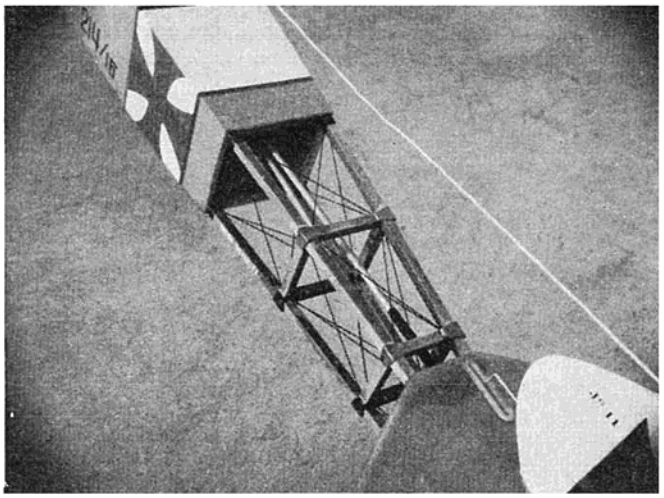
Ribs on the tail surfaces can be simulated by using 1/32" square spruce. These can be glued directly to the surfaces before cov-

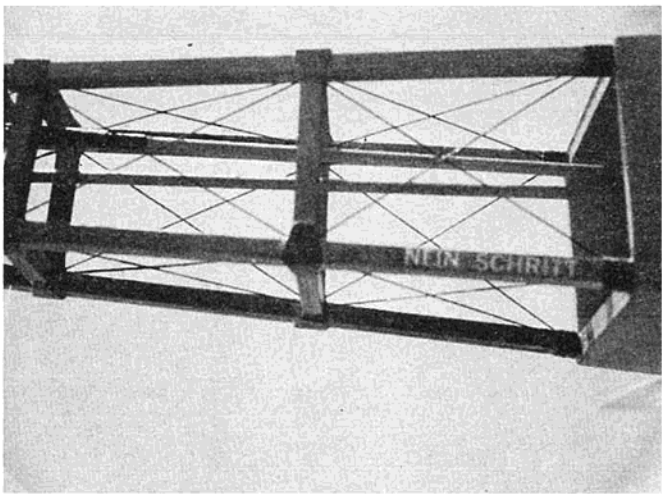
Detail of elevator pushrod exit guide. Note tail skid.



Simulated ribs on stab made from 1/32" sq. spruce and covered with tissue.







Above, left: Aft fuselage structure. Above, right: Oil well? Nope, open framework of the after fuselage section of "Das Flugenghoster."

ering.

With the aforementioned detailing, a reliable control system such as the "Rand G-G Pak," and a good Half-A engine, you should have yourself an extremely realistic, reliable airplane. Let's build it!

WING

The wing is built in 3 basic pieces, the 2 wing panels and the center section. Build directly over the plans using the leading edge, bottom spar, and the bottom trailing edge sheet for reference. Glue the "whole" ribs in place, add the top spar, and wingtips. Be sure to leave at least 2" of extra length to the "center section" end of the wing spars. Now glue the "half-ribs" and geodetics in place.

The center section is built on 1/16" sheet balsa. Glue the leading edge section in place. Locate and glue the 3 dihedral braces in place. Add the 1/4" balsa ribs which have been trimmed 1/16" overall to accommodate the top and bottom sheeting. Now glue top sheeting in place. When dry, fit the two wing panels to the center section using the protruding ends of the dihedral braces for reference. Glue panels to center section, block-up each panel to 2 1/8", and let dry overnight. When dry, add a strip of nylon gauze to each joint.

Cut out cockpit from the top sheeting and line with 1/16" balsa sheet. After sanding to shape, glue the balsa filler block in place and cap bevel with 1/32" ply. Sand entire structure lightly and set aside for covering.

FUSELAGE

Layout fuselage sides and frame with 3/16" sq. spruce and balsa longerons. Glue the spruce uprights into position shown on plans. Be sure to note the breaklines on the plans where the 3/16" sq. balsa ends and the spruce begins. Next, glue the 1/16" sheet balsa full length doublers in place, noting that they fit inside the longerons.

Join fuselage sides with formiers F-2 and F-3 using a triangle to square the structure. When dry, epoxy F-1 in place and clamp or rubberband to hold curvature. Check to make sure curvature is equal on both sides of the fuselage. If it isn't, then put in a temporary diagonal brace just long enough to force the sides to an equal curvature. Let this assembly dry thoroughly.

Pull together and epoxy the fuselage ends and add the 3/16" sq. spruce cross braces. Epoxy and bind in place the tail skid. The bottom-forward portion of the fuselage is beefed up by sheeting it with a laminate of 1/32" sheet ply, two pieces one over the other. Cover the remaining open areas on the top and bottom of the fuselage with 1/16" sheet balsa, cross-grained.

The cowl is a separate structure that is epoxied directly to F-1 when completed. A soft balsa block is used to fill the gap between the wing-filler block and the cowl. After this block is cut and sanded to shape, it should be capped fore and aft with 1/32" sheet ply and hollowed out to accommodate a 1 oz. William's tank.

The "joint-caps" on the spruce cross braces and uprights are 1/32" sheet plywood cut to shape with scissors. These are epoxied in place and sanded lightly to give a one piece "L clamp" look. Later these are to be covered with Black Japanese tissue.

TAIL SURFACES

Both the fin and the stab are built using a 1/16" sheet balsa frame covered on both sides with 1/32" sheet balsa. This seems to make an extremely strong, light, and warp free structure. The rudder and elevator are both cut from 1/8" sheet balsa. Sand these assemblies lightly and set aside for assembly.

ASSEMBLY

Checking carefully for alignment, epoxy the stab directly to the fuselage. The fin is then epoxied to the stab, again checking for alignment. The 1/4" x 1/2" spruce supports for the actuator mounting plate can now be glued in place. In fact if you wish to install the actuator at this time, be my guest!

The landing gear should be made and located as closely as possible to the position shown on the plans. This configuration gives beautiful R.O.G.'s and great landing characteristics. The strap-on landing gear may not be the prettiest, but it saves a lot rebuilding time for those of us who occasionally forget to flare! Split, 3/16" dowels, epoxied in place are used for L.G. alignment.

Add 1/16" ply dowel braces to the inside of the fuselage for the wing and landing gear dowels. These dowels are installed and doped after airplane is covered.

When finishing and covering, try to keep the weight of the airplane down. My model weighs 27 oz. and I build heavy, so you shouldn't have too much of a problem. However, in the interest of lightness, I covered my Flugenghoster with Japanese tissue on the fuselage and tail surfaces. The wing is covered with medium silkspan and trimmed with colored Japanese tissue. My color scheme was a red fuselage and stab, a black cowl, white wings with red tissue stripes and blacktissue iron crosses. My fin is white tissue with black iron crosses.

The only color paint that I used was HobbyPoxy black for the Cabane and the inside of the cowl. A William's 1½" scale standard pilot fits perfectly.

Prepare entire structure for covering with 2 coats of unthinned dope, sanding lightly between coats. Cover fuselage and tail surfaces with tissue using a 50/50 dope, thinner mixture. Cover wing next using Silkspan. Cover the cowl with 2 layers of black tissue, this will give it an irridescent "metal" sheen. Next, trim model in your preference of W.W. I nationalities. Finally give model 4 more coats of 50/50 clear dope. Add the wing and L.G. dowels and if you desire, detail as mentioned earlier.

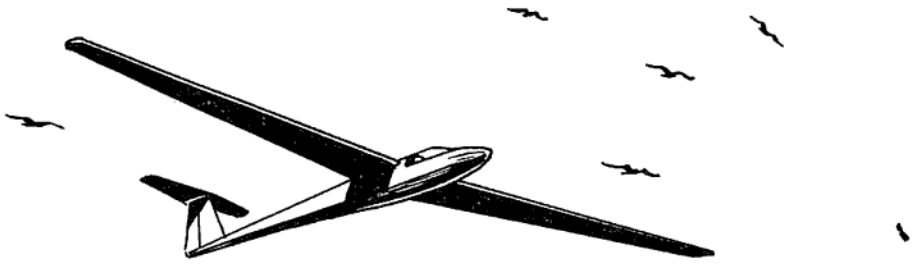
The Cox .049 was secured to a Tatone engine mount and the mount was bolted to the firewall, using blind mounting nuts to facilitate removal. To make engine starting less Tee-Dee-ious (ahem), I installed a starting jack to the side of the cowl, this is really a timesaver!

Radio installation is a breeze, as Das Flugenghoster has more than enough room for almost any type of gear. Just keep the center of gravity from moving any further aft from what is shown on the plan!!

FLYING

After checking closely for balance, surface alignment, warps, and radio operation, you should be set to fly. If your plane is without throttle, as mine is, double check the above! I would recommend a hand-launch for the initial flight. Be sure to "peak" the engine to the best of your ability before launching. I feel you will be genuinely gratified by Das Flugenghoster's performance and particularly its looks, as you make your first low level overhead pass!

Now to find that stupid dog!! Good luck.



SOARING

THIS month, Soaring presents Don Dewey's 70" sport glider, "Erin's Lass." Designed for use with the new decoded pulse proportional systems such as the Uni-Tronics Mustang 200 or the Min-X 1200 with twin Rand actuators, this machine is an excellent sloper. An optional power pod for a Tee Dee .020 is shown for those without access to a suitable slope soaring site.

Erin's Lass was constructed for the pulse proportional systems to prove that a proper design could overcome the drag created by the large flapping surfaces. In fact, this glider penetrates extremely well, is quite fast, and has been flown in winds from 0-20 knots. Both of the aforementioned decoded systems proved to be extremely reliable, although we did prefer the Uni-Tronics system which utilizes the fast pulse rate for up-elevator. Both systems used Rand actuators.

CONSTRUCTION

Begin construction of Erin's Lass with the wing. The ribs are made from medium 1/10" sheet balsa. The split trailing edge, top leading edge sheeting, and center section sheeting is 1/10" sheet stock. Spars are 3/16" sq. spruce. Be sure to include the 1/16" sheet webbing between spars as shown on plan. Leading edge is 3/8" square balsa. If you desire a permanent power pod, it can be constructed of a 3/32" plywood core with a lamination of 3/16" soft balsa on either side. The pod is built up of two soft balsa blocks with a 1/8" ply firewall. The base of the pod's plywood core can be slotted to fit over the spars, and the entire assembly sandwiched between the two wing panels when the panels are joined. Be sure to check for proper dihedral. After sanding the wing, cover the center section with a 3" wide band of fiberglass tape and two layers of resin. Celastic may be used, if desired. Cover the wing with colored silk. Dope and add trim, as desired. Engine, of course, is the Cox Tee Dee .020 with 3 1/8" dia. 2 1/2" pitch, 3 bladed Thimble Drome prop.

The tail assembly is of built-up construction and should offer no difficulty. Note the lightening holes in the sheet elevators.

The fuselage sides are constructed from 3/32" balsa with 3/16" square uprights and longerons. 3/16" sheet balsa doublers are used in the cabin area. Glue the bulkheads to the 3/16" balsa floor, add the sides and top sheeting. Sandwich the plywood skid between blocks. Add nose and top nose block and sand to shape. Add dowels and tailskid. The celluloid canopy is held in place with small self-tapping screws.

The battery pack (600 MAH cells) are stored as far forward as possible, while the receiver is foam-wrapped in the cockpit area. The Rand actuators are mounted on 3/32" plywood platforms in a staggered configuration, the rudder servo being farthest forward. Pushrods used were 3/16" dowel with 1/16" wire ends.

FLYING

Be sure model balances as shown on plan. Add ballast into nose block if necessary. Hand glide the model on a calm day by disconnecting the pushrods and blocking control surfaces in neutral. Add lead shot, as necessary, to achieve proper glide. Make absolutely certain there are no warps! After it is trimmed, try your slope, or use the power pod. Erin's Lass is fast and penetrates well.

And don't be too surprised at flights of 45 minutes or more!

●

We'll close off this month's column with a short piece by Dale Willoughby, written at 35,000 feet on the way back from Corsica and the 1967 Internats:

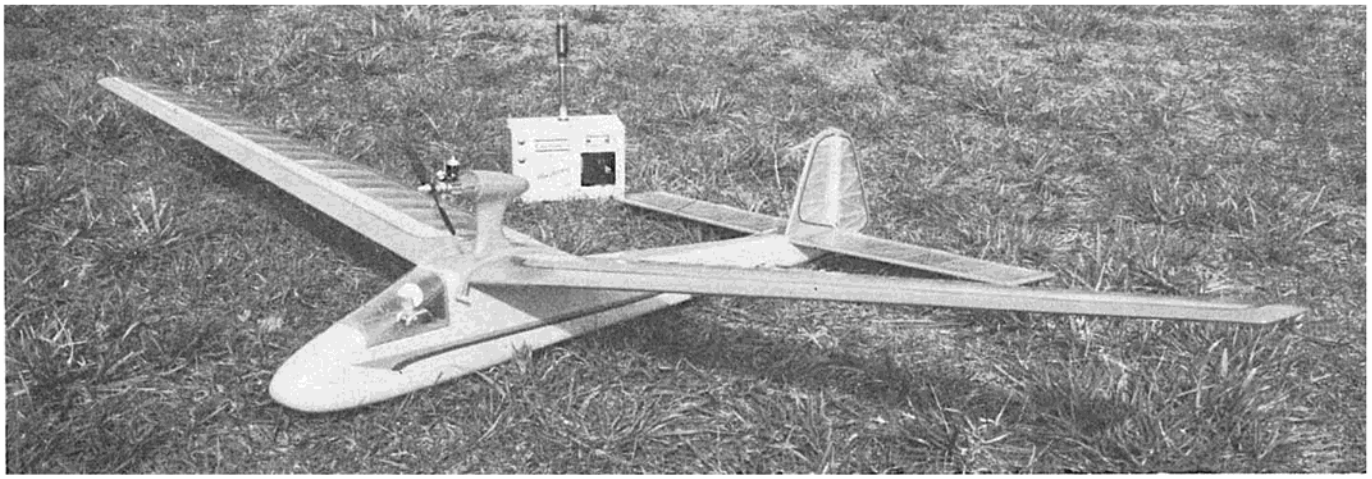
DER ZLOPEZOARER

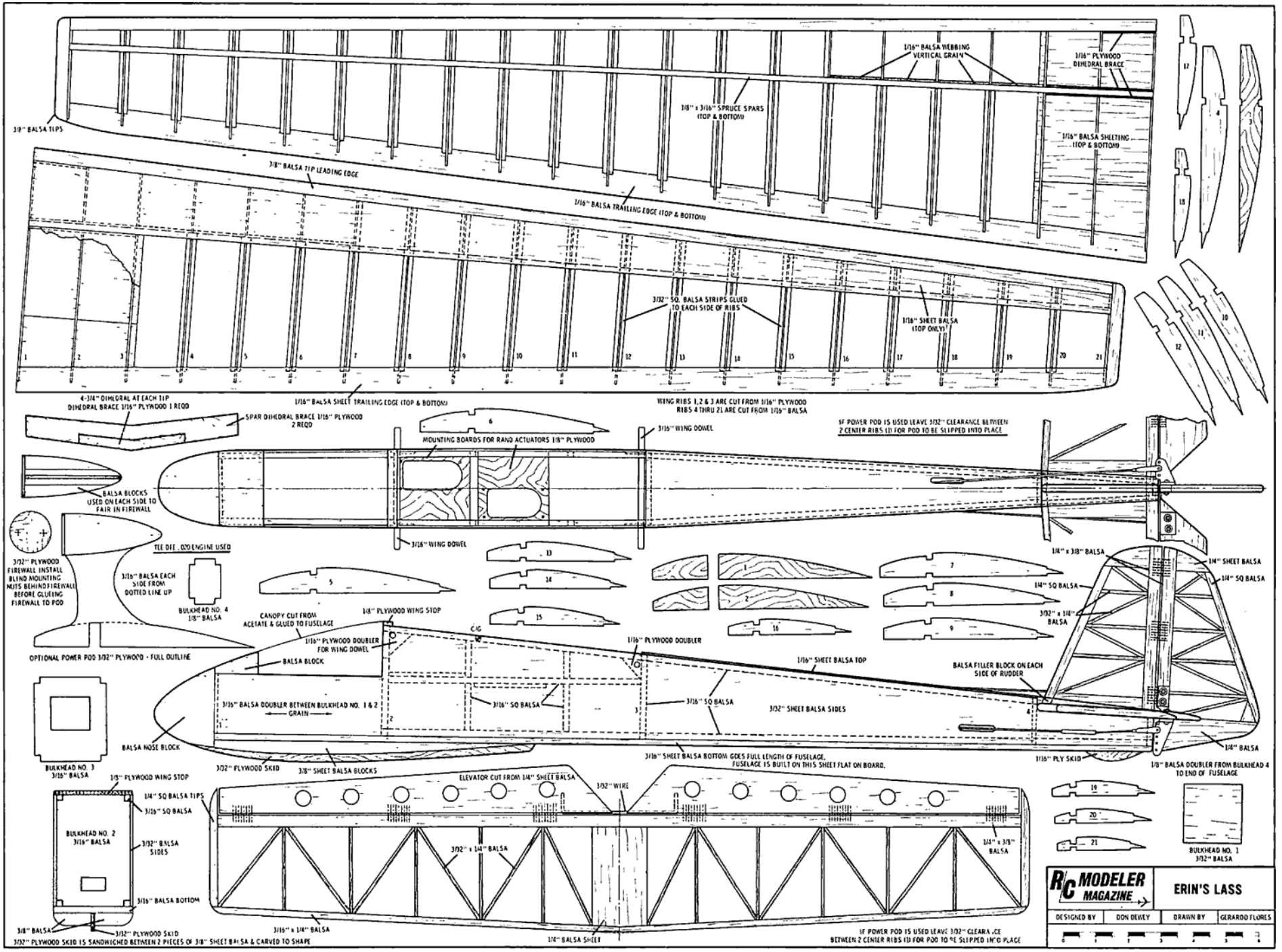
Zie Zlopezoarer ist gefinished und looken smart on zie worken table. Mit der breezenshaken der leafen und der sun sparklink der wasser, offen ve tripped to der zlope. Mit der zlopezoarer gestucken under der arm namen und der gezender ve huffen-und-puffen up der zlope and katchen der breathen mit friendly greetings.

Ve testum zie wind mit der gewet finger und ist gute! Mit gummygand ve fixen dem flugel and checken dem rudder twitchen und hindwing geflappen mit der gezender ist A - OK.

Mit gross hearten palpitation untwitchen der thumbs, de zlopezoarer ist flungen into

(Continued on Page 19)




1/16" BALSA WEBBING VERTICAL GRAIN
1/16" PLYWOOD DIHEDRAL BRACE
3/8" BALSA TIPS
3/8" x 3/16" SPRUCE SPARS (TOP & BOTTOM)
1/16" BALSA SHEETING (TOP & BOTTOM)
3/8" BALSA TIP LEADING EDGE
1/16" BALSA TRAILING EDGE (TOP & BOTTOM)
3/32" SQ. BALSA STRIPS GLUED TO EACH SIDE OF RIBS
1/16" SHEET BALSA (TOP ONLY)
4-3/4" DIHEDRAL AT EACH TIP
DIHEDRAL BRACE 3/16" PLYWOOD 1 REQD
1/16" BALSA SHEET TRAILING EDGE (TOP & BOTTOM)
WING RIBS 1, 2 & 3 ARE CUT FROM 1/16" PLYWOOD
RIBS 4 THRU 21 ARE CUT FROM 1/16" BALSA
SPAR DIHEDRAL BRACE 1/16" PLYWOOD 2 REQD
MOUNTING BOARDS FOR RAND ACTUATORS 1/8" PLYWOOD
3/16" WING DOWEL
IF POWER POD IS USED LEAVE 3/32" CLEARANCE BETWEEN 2 CENTER RIBS (3) FOR POD TO BE SLIPPED INTO PLACE
BALSA BLOCKS USED ON EACH SIDE TO FAIR IN FIREWALL
3/32" PLYWOOD FIREWALL INSTALL BLIND MOUNTING NUTS BEHIND FIREWALL BEFORE GLUEING FIREWALL TO POD
TEE DEE .020 ENGINE USED
3/16" BALSA EACH SIDE FROM DOTTED LINE UP
BULKHEAD NO. 4 1/8" BALSA
1/4" x 3/8" BALSA
1/4" SHEET BALSA
1/4" SQ BALSA
3/32" x 1/4" BALSA
CANOPY CUT FROM ACETATE & GLUED TO FUSELAGE
1/8" PLYWOOD WING STOP
1/16" PLYWOOD DOUBLER FOR WING DOWEL
1/16" PLYWOOD DOUBLER
OPTIONAL POWER POD 3/32" PLYWOOD - FULL OUTLINE
BALSA BLOCK
1/16" SHEET BALSA TOP
BALSA FILLER BLOCK ON EACH SIDE OF RUDDER
3/16" BALSA DOUBLER BETWEEN BULKHEAD NO. 1 & 2
GRAIN
3/16" SQ BALSA
3/32" SHEET BALSA SIDES
BALSA NOSE BLOCK
3/16" SHEET BALSA BOTTOM GOES FULL LENGTH OF FUSELAGE. FUSELAGE IS BUILT ON THIS SHEET FLAT ON BOARD.
1/16" PLY SKID
1/8" BALSA DOUBLER FROM BULKHEAD 4 TO END OF FUSELAGE
BULKHEAD NO. 3 3/16" BALSA
3/32" PLYWOOD SKID
3/8" SHEET BALSA BLOCKS
1/8" PLYWOOD WING STOP
ELEVATOR CUT FROM 1/4" SHEET BALSA
3/32" WIRE
1/4" SQ BALSA TIPS
3/16" SQ BALSA
BULKHEAD NO. 2 3/16" BALSA
3/32" BALSA SIDES
3/32" x 1/4" BALSA
1/4" x 3/8" BALSA
3/16" BALSA BOTTOM
3/8" BALSA
3/32" PLYWOOD SKID
3/32" PLYWOOD SKID IS SANDWICHED BETWEEN 2 PIECES OF 3/8" SHEET BALSA & CARVED TO SHAPE
3/16" x 1/4" BALSA
1/4" BALSA SHEET
IF POWER POD IS USED LEAVE 3/32" CLEARANCE BETWEEN 2 CENTER RIBS (3) FOR POD TO BE SLIPPED INTO PLACE
BULKHEAD NO. 1 3/32" BALSA
RC MODELER MAGAZINE
ERIN'S LASS
DESIGNED BY
DON DEWEY
DRAWN BY
GERARDO FLORES

SOARING

(Continued from Page 17)

der space! Mit eaglesamen flying, der zlopezoarer ist kloudklimben. Ist wunderbar! Klammy hands ist kaput!

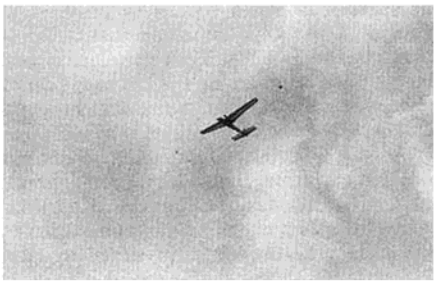
Der zlopezoarer ist eyeballen der fisheatum birds mit louden skreechen in eine gaggle und ist wingflying mit dem. Mit follow-der-leader circlink and thermikturning is klimben und klimben. Der zlopezoarer ist gesailing in der breitenshining sun, under der wasser in der eyes ist streaming, und der nose ist geticklink — und ACHOO — mit double ACHOO. Meiner friend ist zaying GEZUNDTEIT!

Mit der raggen ist gesoppen der eyes und stuffen der raggen in der pocket, und looken und looken . . . DER ZLOPEZOARER ist NICHT!! Und skysweepen der space und der ZLOPEZOARER IS NICHT!!

Mit der throaten dustensame und zwallowen und zwallen und sicken in der heartен und still der ZLOPEZOARER IS NICHT! Mit der twitchen der gezender box mit down-und-right, und UP-und-LEFT und checkun ONE fisheatum birds mit shining wings . . . IST MEIN ZLOPEZOARER und ist Stallen-und-loopings!!!!!

Mit der relief und sighen, ist flyen der zlopezoarer in der traffikpattern und landen. Mit der gezender box switchen off, ist gekrappenouten und der ground und ist satisfaction mit der gute zlopezoarer.

— Dale Willoughby



LI'L SWINGER

(Continued from Page 11)

and down. If you desire a canopy, a DuBro 7½" canopy can be trimmed to fit.

After the Lil' Swinger had been test flown numerous times with the Rand GG Pak system we decided to try out some other forms of control to see how they worked. Don Dewey and Bill O'Brien had been testing a prototype of a new single channel system called a Uni-tronics Mustang, so they shipped this off to Texas while Don set about putting the new Bonner full house propo unit in his Swinger.

The Mustang is a single channel proportional setup that utilizes two Rand actuators, one working elevator and the other on rudder and engine. There is no interaction between the surfaces, and a throttle signal causes only the rudder to cycle, not both rudder and elevator, as in GG. This system was tried in the Lil' Swinger and proved to be a very precise and positive control system. The elevator has an especially good "feel" as up elevator is on fast pulse, while the seldom used down elevator is on slow.

I suggest that if you are going to use either this type of system or a full house proportional system that you add ⅜" to the width of the elevator. The elevator on a gg ship should be kept rather narrow to reduce the "brake" effect, but with a nonpulsing system a larger elevator can be used for much cleaner control.

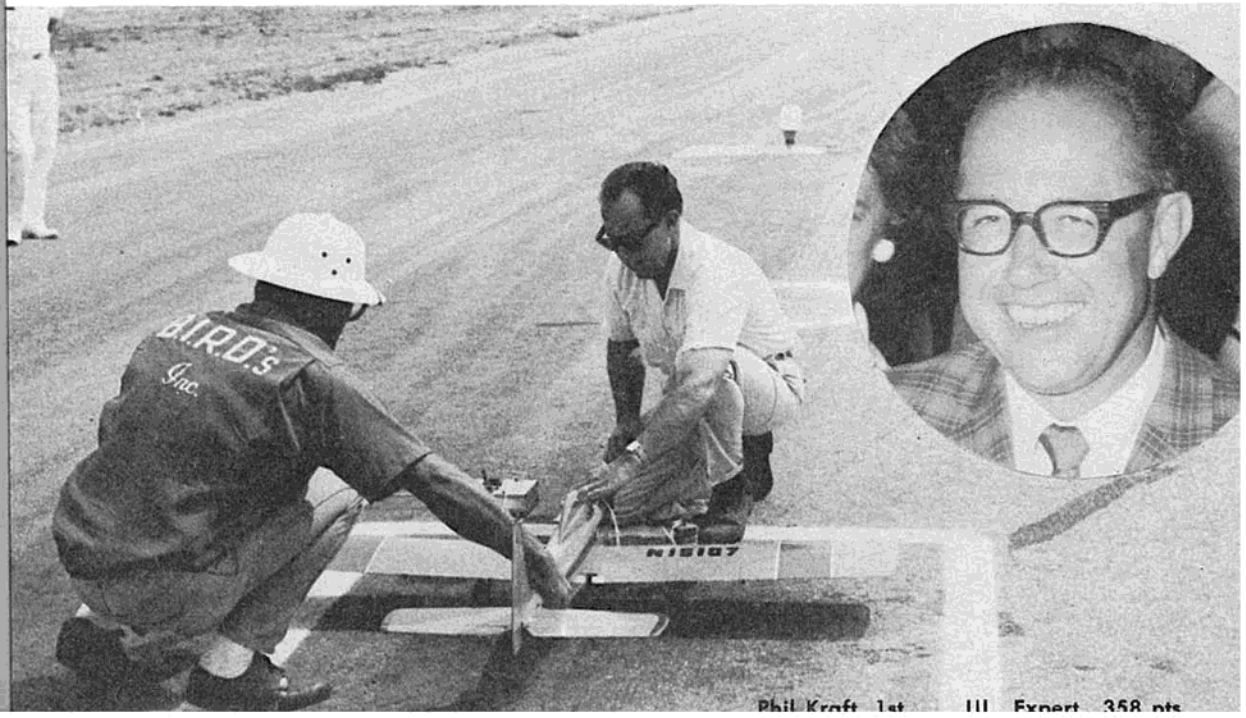
This type of system will lend itself very well to a small ship incorporating ailerons and elevator and a design for it is rolling around in the back of my head, so if this works out will be presenting this in the near future.

1967 NATIONALS

PHIL KRAFT ADDS 1967 NAT'S WIN TO RECENT INTERNAT'S VICTORY

Gardner, Thomas first in Class I and II at Nationals.

Lou Proctor, Nieuport, win Scale with reeds against all proportional field.



Phil Kraft 1st III Expert 358 pts

Rod Chidgey, 2nd Cl. III Expert. 354½ pts.

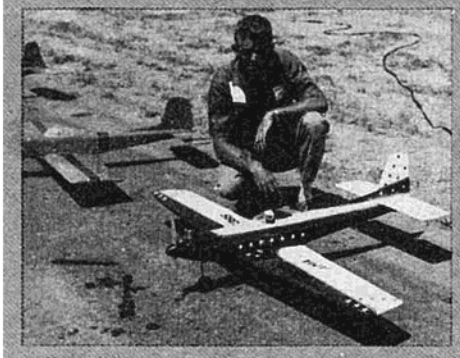
Bud Atkinson, 2nd Cl. III Novice. 283½ pts.

William Thomas, 1st Cl. II. 309 pts.

Ted White, 3rd Cl. III Expert. 354 pts.

Roger Hooper, 3rd Cl. III Novice. 259½ pts.

Bror Faber, 2nd Cl. II. 246 pts.



Jim Kirkland, 4th Cl. III Expert. 348 pts.

Joe Vartanian, 4th Cl. III Novice, 255 pts.

Richard Pence, 17, 3rd Cl. II. 232⅔ pts.

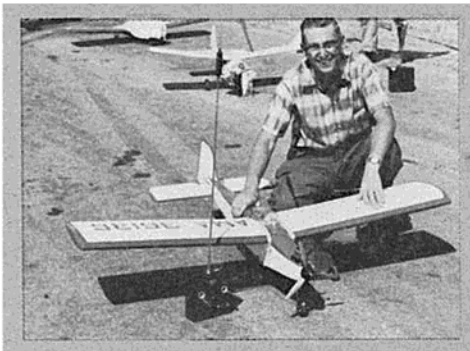
Larry Leonard, 5th Cl. Expert. 345⅔ pts.

Gil Horstman, 4th Cl. II. 168⅔ pts.

Mike Bridges, 1st Cl. III Novice. 314½ pts.

Joe Stream, 5th Cl. III Novice. 248½ pts.

Jackie Gardner, 1st Cl. I. 215½ pts.



Lynton Younger, 2nd Cl. I. 115⅓ pts.

Cliff Weirick, Midget Mustang. 2nd Goodyear.

H. S. Auerham, Great Lakes 2T-1A. 3rd Scale. 5207.69 pts.

Mike Ritter, 1st Cl. I. Jr-Sr. 145 pts.

Lou Proctor, Nieuport II. 1st Scale. 7248.38 pts.

Frank Capan, OV-10A. 4th Scale. 5078.25 pts.

Ken Duncan, 2nd Cl. I Jr-Sr. 116⅔ pts.

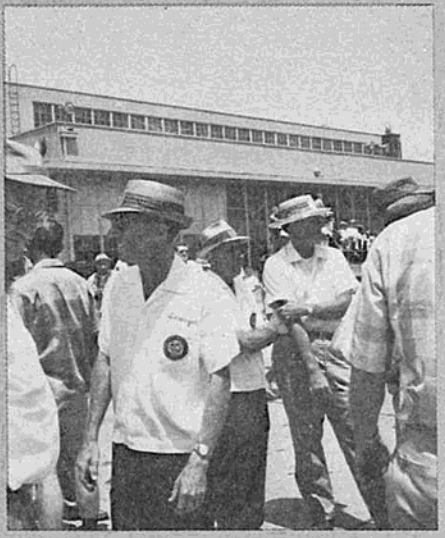
Maxey Hester, Pt.-19. 2nd Scale. 6682.50 pts.

Bud Atkinson, T-34 Mentor. 5th Scale. 4841.81 pts.

Start of a Goodyear heat.

Joe Foster and Rivets. 1st Goodyear.

Judging — the hardest job of all.

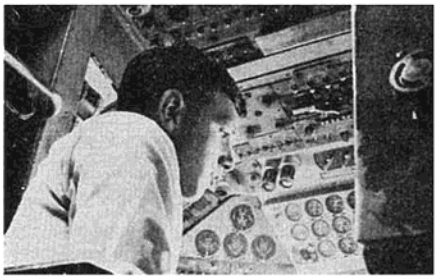


Part of the 1967 Nat's crowd.

USS Lexington CVS-16, Host Ship for the 1967 HIAA cruise for the Jr. winners of the '67 NAT'S. Official U. S. Navy Photo.

NAVY, HIAA, HOST NATS JUNIOR WINNERS ABOARD U.S.S. LEXINGTON CVS-16.

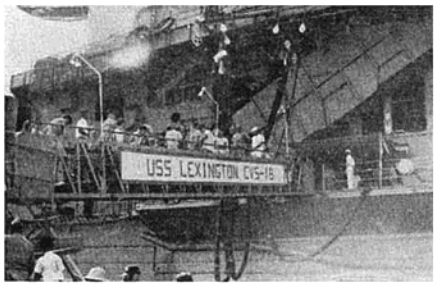
By Doug Tucker



Mike Ritter, Class I Jr. Sr. Champ, in cockpit of Navy C118 enroute to Pensacola, Florida.

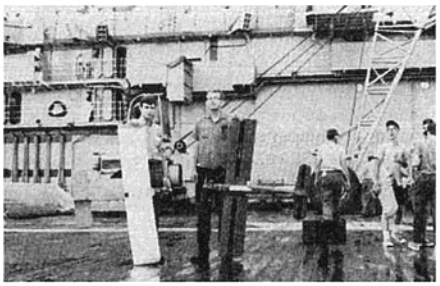
Members of flight crew which flew the Jr. winners and officials to Pensacola de-plane at Sherman Field.

Pensacola N.A.S. Band plays as Jr. Nats winners head for bus and tour of the Pensacola facility.



Los Alamitos Nats party board the USS Lexington CVS-16.

U. S. Navy jet prepares to take off from deck of the USS Lexington. Official U. S. Navy Photo.

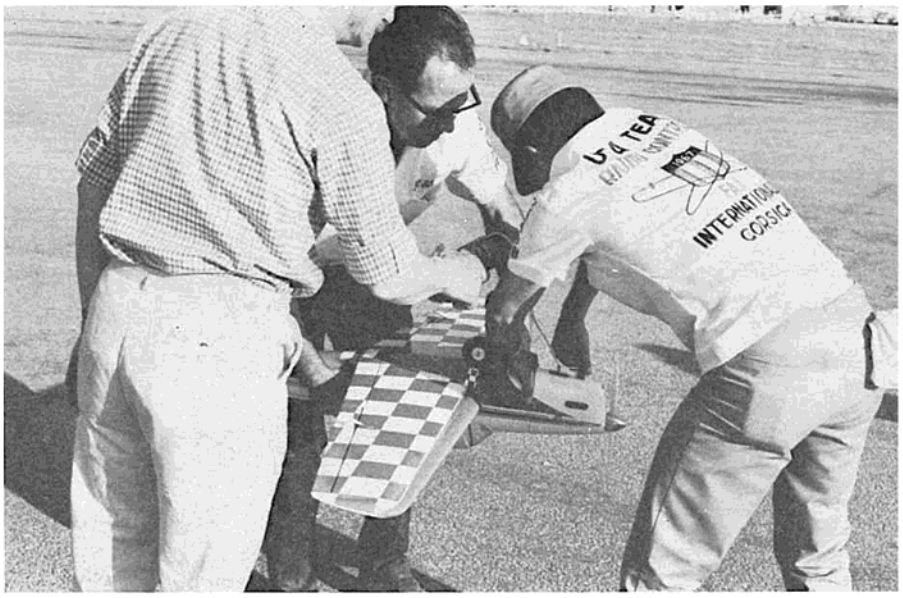


Mike Ritter with his "Original Knight" and Jerry Nelson with a "Kwik Fli" stand in the rain on the flight deck of the USS Lexington.

Mike Ritter Jr.-Sr. R/C Champ ready for take off from the deck of the USS Lexington. Assisting is Jerry Nelson, while Lt. Haas, U.S.N., looks on.

Jerry Nelson prepares for take off from flight deck of the USS Lexington.

The Stars and Stripes fly proudly from the fantail of the USS Lexington CVS-16 overlooking the Pensacola NAS.



Kraft and Weirick starting Chipmunk.

5TH R/C WORLD CHAMPIONSHIPS

U.S. Victory at Corsica, France

Part II by Jim Martin

THE Fifth World Championship for Radio Controlled Models: June 21 through June 26, 1967: Corsica, France: Reporter — Jim Martin.

Corsica is located about 100 miles south of the coast of France. The island is about 100 miles long and 50 miles wide. Along the west coast the scenery is replete with mountains and deep bays. The island was alternately Roman, Goth, Saracen, Genoese, French, British, French, British, and French. Truly a site well qualified for an international competition. The island of Corsica is the home of the vendetta — the blood revenge. The Germans had a full scale vendetta planned, but due to some bad luck and possible overtraining, their vendetta failed, as Phil Kraft flew three very consistent flights to become the new World Champion. His cumulative score of 16,496 was well ahead of the second place Pierre Marrot of France. Third place went to Bauerheim, the lone wolf of the German team, who was conspicuously out of step with the massive effort launched by the Simprop (German digital propo manufacturers) team of Fritz Bosch and Walter Schmitz. Fourth place was taken by Doug Spreng of the U. S. in a close race with Bauerheim. Cliff Weirick, hampered somewhat by the Chipmunk, took tenth place. The national teams finished with the United States first, Germany second, France third, and South Africa fourth.

The first day of competition produced some surprises. A very pleasant surprise was Wolgang Matt of Liechtenstein, a 19 year old boy who has flown R/C for a little more than a year. Matt was the first flyer to position his pattern where the judges could judge it. Throughout the contest the positioning of maneuvers generally ranged from bad to poor. Another general fault was that entries and exits to maneuvers were rarely even bothered with. Kraft probably added a thousand points to his overall score by consistenting entering and finishing maneuvers with a bit of straight and level flight.

The major surprise of the first day was a bit of bad luck that may have cost Fritz Bosch the championship. He had ideal conditions in the calm early morning air. The flight progressed extremely well until after his rolling circle his plane started showing severe rudder glitches. At that moment the field monitoring equipment picked up strong interference on Bosch's frequency. The remainder of the day was plagued by interference on 26.995 and 27.095. The interference aborted Bosch's flight and put him at the end of the flying order for his make-up flight. Then, early in his make-up flight Bosch's engine sagged out and quit, removing any possibility of winning. (All three flights count in the score. There is no chance for a contestant who has one bad flight.)

In the heat of competition there were some ill-founded comments about the interference problems. The inference was being made that the Germans were faking interference for some imagined benefit. The French Government was to have provided field monitoring equipment. This failed to show up and the German Simprop monitor (a magnificent piece of radio equipment in its own station wagon) was pressed into service. The readings on interference obtained by the Simprop crew were then verified by a member of the FAI jury, as some contestants were not inclined to accept the word of the Germans on interference.

The first American flight of the first day was by Doug Spreng. Doug's display of the maneuvers looked better than it had in practice, although he put his spin unnecessarily behind the judges' backs, and placed his horizontal eight and Cuban eight too much overhead of the judges. It was a good flight however, which put him in fourth place which Doug maintained to the finish.

The Italian Guglielminetti (he looks like Eddie Arcaro) put his tail slide directly over the judges, and directly in the sun. I noticed that one of the judges did not even look up at the maneuver.

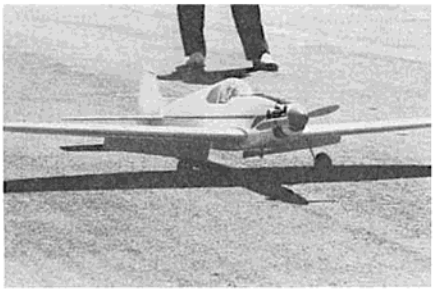
Michalovic of Czechoslovakia is remembered as the fellow who had a home made engine at the '65 Internats. He was getting fine engine runs from the Fox 59 that he received from Ralph Brooke two years ago.

Although he placed only 19th, Poju (pronounced "Po you") Stephansen of Norway was of particular interest. He holds his transmitter at eye level and uses his throttle to shape his vertical plane maneuvers. However, the airplane he had this year — an unusual high stab, swept wing design — was unsuited for this sort of competition.

The contest aircraft lines up for the press.

Geoff Franklin, team manager for Great Britain with Pete Waters.

The Mustfire of Von Segebaden — flaps down.



Walter Schmitz of Germany flew beautiful patterns with generously sized maneuvers which look unusual to the American eye. On the way upwind to position a maneuver, Schmitz occasionally executes a knife edge flight lasting about five seconds. This bit of gamesmanship always got a nice reaction from the spectators.

During the first day one contestant took off nearly clipping some spectators, then placed his maneuvers directly over the crowd scaring the daylights out of us. Happily enough, his engine quit early in the flight. Had someone told me before I saw it that such shaky flying would take place at such a highly touted competition, I wouldn't have believed him. There were flights that actually verged on being totally out of control. The range of flying skills exhibited here compared with most large American contests. Of course, the better flyers were unusually good, but the poorer ones were worse than we'd see in a Class III Novice event.

Cliff Weirick flew during the afternoon. His Chipmunks were certainly the most photographed of the aircraft at the contest. Cliff won a special award for the workmanship and appearance of the plane. But, the airplane was unimpressive in competition flight. It seemed to require a great deal of "flying" through the vertical maneuvers. It's a fast airplane and Cliff flew big maneuvers, but the plane was too small for me (and presumably, the judges) to follow it well at the high altitudes required by it. Weirick flew very respectably, but would have placed higher with his Candy.

Shortly after Cliff's flight I made the following notes about a contestant whose flight seemed to include all of the most commonly made mistakes. "Erratic take off. Seems to be nervous. Completely missed double stall turn. Positions his inside loops directly over judges' heads — one judge is visibly frightened. Outside loops in novel position — displayed end-on. Inverted flight done behind judges' backs. Inverted eight proves excellent range of Simprop digital propo." Etc., etc.

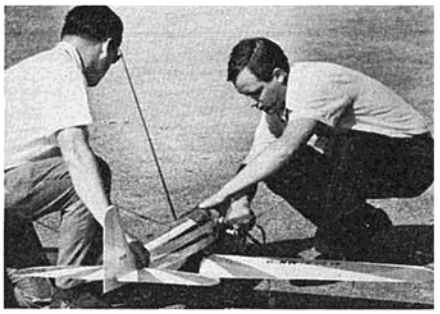
Cousson of France performed well with a shoulder wing airplane. Marrot, with a similar plane, later proved that a shoulder wing plane is at no disadvantage in a Class III contest.

During the first afternoon a moment of indecision cost the Norwegian, Rapstad, his airplane. Having muffed the first wingover of the double stall turn, he decided to abort the maneuver. While heading vertically down he changed his mind and tucked it under to try to complete the stunt. At this point Rapstad ran out of ideas and airspace simultaneously! When his "Maximum 7" hit the ground the swept wing continued flying rather nicely, sans fuselage!

21-year-old Giezendanner of Switzerland turned in a nice 4,296 first flight. On the final day he turned in the best score of the contest. He, along with Matt of Liechtenstein, will be tough competitors in the future.

Dennis Hammant of Great Britain crashed on his initial flight. His airplane "King Specter" is the longest model I've ever seen — 71" long. It flew very well, quite like the Super Delphins flown by the Germans and Swiss.

Chris Olsen, flying his original "Upset" performed well although he has been flying



Germany's Walter Schmitz starting engine of original "Happy."

Giezendanner, Switzerland, adjusting needle valve.

Stephansen, Norway, and Von Segebaden, Sweden.

Bertemes, Luxembourg, with original "Berno."

Van Vliet of the Netherlands.

Gloor, Switzerland, with "Super Delphin."

Rasmussen, Denmark, with swept-wing "Crusader."

"Uncle Miltie" Doug Spreng holding "Twister" as Jerry Nelson wipes.

Pierre Marrot, France, 2nd place, with wife and children.

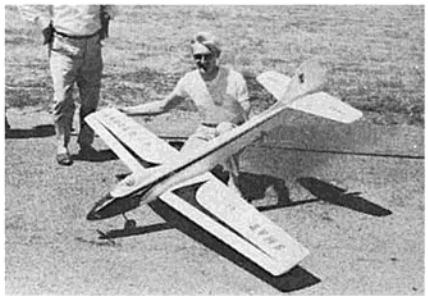
Phil Kraft with winning Kwik-Fli.

South Africa's Sweatman with "Condor."

Bauerheim, Germany, with "Kompromise."

Walt Schroeder, MAN, and Cliff Weirick with Chipmunk.

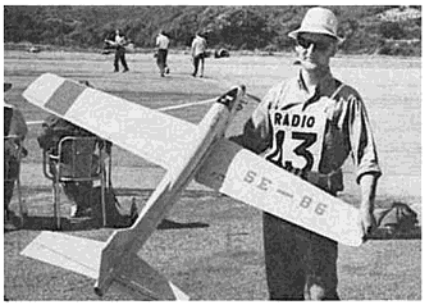
Franklin, Chris Olsen, Great Britain, and "Upset" taking off.



Dennis Hammant, Great Britain, with huge "King Spectre."

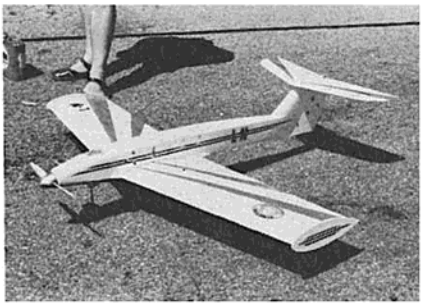
Pete Waters, Great Britain, after flight, Pallbearer, Jerry Nelson.

Cousson of France with "Lucifer."



Oldenburg, Norway, with swept-wing "Crusader."

Giezendanner landing his "Marabu" originc



Rapstad's "Maximum-7."

proportional for just three months. The "Upset" appeared to be the best flying airplane in the contest. It's rather similar to a taper wing Citron in appearance, but seems to fly better than the Citrons. The Upset will be featured in RCM.

Enter Phil Kraft at this point. Phil could only have lost points on his double stall turn into the sun, tailslide, and a tiny bounce on landing. His presentation of maneuvers, entries and exits, were perfect. I noticed that after his first flight the presentations of the other contestants improved considerably. There was quite a bit of discussion about the compactness of his maneuvers, and the lower altitudes at which Kraft flew. The European approach to pattern flying is the "Grand Manner" — huge vertical maneuvers, and high altitudes. They were generally surprised at Kraft's solution to pattern flying. In defense of the more compact pattern I would say that there is less chance to make mistakes. Some of the oversized attempts at outside loops were almost comical. If your maneuver is oversized you've got more opportunity to mess up the maneuver.

Kraft's later flights were nearly carbon copies of the first. He is so consistent that time could be saved in future contests by just showing a movie of Phil's first flight instead of having him fly three times!

The French provided some comic relief during the afternoon of the first day by flying a wheelbarrow. It **did** fly! I wanted to get a particular photo of the flight and asked Robert Lestourneaud if he would coach the pilot into a certain position. The reply I got was an agitated "Please!! Not now — we air too nairvous!" I cleared out, and sure enough, they gronked it.

The Italian Reda turned in good flights with a fine flying kit airplane called the Laser.

Rich Brand of South Africa made the first presentation of the day that avoided making the judges look into the sun. They rewarded him with a good score.

Marrot of France, the manufacturer of the popular Radio Pilote line of R/C equipment came up with an excellent flight despite a wind shift that made presentation very tough.

Bauerheim finished in second place the first day, and it wasn't until Marrot came up with his excellent second round flight that Bauerheim got bumped into the third slot.

The first day finished with Kraft in the lead, followed by Bauerheim, Schmitz, Spreng, and Marrot. Fritz Bosch's bad luck with his engine had thrown cold water on his expected dogfight with Kraft.

As I mentioned in relation to Phil Kraft, it takes consistency to win this contest. Of the top ten finalists it is interesting to note that none of them was ever more than three places away from his finishing slot, comparing their cumulative scores. So, after the excitement of the first day the rest was anticlimatic.

Having watched this contest closely for three days I concluded that both the FAI and the AMA pattern get darned boring to watch after about a day. Sooner or later we will have to inject a "free style" portion into both patterns. The FAI pattern is a better flying test than the AMA pattern.

(Continued on Page 27)

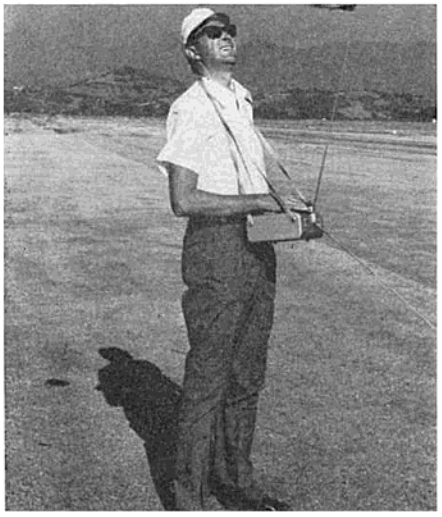
(Continued from Page 26)

The double stall turn, the slow roll, and the rolling circle are good tests of coordination. The touch and go should be added to the FAI pattern and the inverted straight flight left out.

COMMENTS AT RANDOM

. . . The extent of the German effort to win was staggering. They reminded me of Gert

Dettlebacher, Austria.



Frobe in "The Magnificent Men and their Flying Machines." I think that the pressure on Bosch and Schmitz must have been intense.

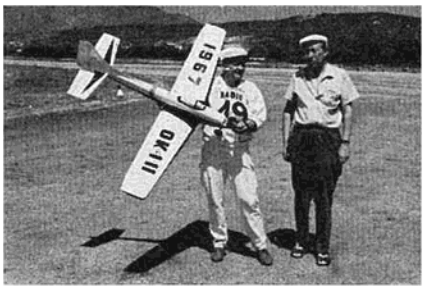
. . . Von Segebaden (Sweden) had the most sophisticated airplane, a Mustfire with flaps and mixture control. His Micronic Digital proportional impressed me very much. This is a Swedish made outfft that incorporates some clever circuitry to obtain fail safe as well as simplicity. Von Segebaden used double push rods to elevator and rudder from the wheel outputs of the Orbit servos. He had engine trouble, so we never got a real good look at how his plane performed.

. . . Leif Thelin, the designer of the "Spiggen," was one of the Swedish contestants. He had a brand new untrimmed airplane (I wished he had brought the Spiggen) so he didn't fly quite as well as he'd hoped to. The Swedes must have had excellent English language instruction as they speak the language as well as most Americans.

. . . I really wondered what the function of team managers was. The way some flyers placed their maneuvers the team managers couldn't have been coaching their teams in this respect!

. . . Chris Olsen's "Upset" was covered (beautifully) with yellow and black MonoKote. A total of nine contestants covered with MonoKote, and others used MonoKote for trim.

. . . Graupner displayed a Wankel engine of about .25 cubic inch displacement. (How the heck do you figure displacement of a Wankel engine?) It is made in the shape of a cowling and ought to have some interesting possibilities for scale modelers. They flew the engine later and it started easily



Mihalovic, Czechoslovakia, Schindle team manager.

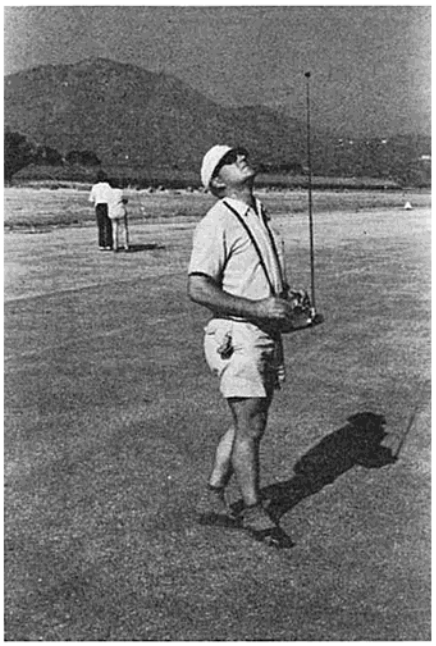
and ran well.

. . . Every time Walt Schroeder of Model Airplane News takes a picture of a Frenchman Walt hollers "Fromage" at him. (Dig up your French-English dictionary.)

. . . Most of the Europeans used mufflers. After watching the engine performance they are getting I don't think we can make a good case for lack of performance with a muffler. In addition, the "contrail" that is left when a muffler is used is a real flashy bonus, and, provided the exhaust trail doesn't advertise a mistake, it really shows off a good maneuver.

. . . Sometimes our interest in "toy airplanes" can make you feel pretty foolish. I arrived at the Cote D'Azur (Nice) airport and tried to find the contest information booth that the FAI-supplied instructions said was there. At the booth I am to be briefed on how to get to Corsica. No booth. However, there was a sign over one booth that said, simply "Corse" (Corsica). I asked the girl at that booth a question that I THOUGHT meant "Where can I get information about the contest of Radio Controlled Models in Corsica?" She smiled at me and took me to meet a friend of hers. Her friend spoke English very well. I asked the friend about the R/C contest. The friend said "You come to Nice to fly little model airplanes?" Her expression indicated that she thought I was crazy, or perhaps queer. I explained that I was perfectly sane, and I made the usual apologies for being interested in model airplanes, and explained that there was a contest of international interest taking place in Corsica, and did she know where the damned information booth was. She didn't. I decided to forget the contest. After all, I'd seen R/C models flying plenty of times, and I hadn't seen Nice. If I didn't send Don Dewey an article on the Internats he might be even more interested in some spectacular beach photos and a little book of pictures that I bought at a novelty shop behind the hotel.

The wreckage of Dennis Hammant's first ship. Roger Hargraves leading funeral procession.



Wallner, Austria. Note antenna position.

This new approach was beginning to make sense when I saw the contest information booth hidden in a corner. Damn!

. . . The French are pretty big on speeches. We heard from the Vice Mayor of Nice, the mayor of Ajaccio, and several other Important types. The contest was to have had two official languages — French and English, but too often it lapsed into straight French which about one third of us understood. At the conclusion of some of these French speeches there would be wild applause (mainly from the non-French-speaking contingent) and the dignitary would take his seat feeling very pleased with himself.

. . . The "continental breakfast" left the Americans and South Africans, cold. When we got back to Nice, Leif Thelin, Rich Brand, and I ordered a bacon and egg breakfast. The waiter showed up with a cheese sandwich. Something always gets lost in the translation!

. . . Judging is as much a problem at this contest as it is for lesser contests. One tail slide got scored (four judges) 2, 0, 0, and 9. The scores of the individual maneuvers were not disclosed to the contestants. This seems a shame as the contestant has no opportunity to change his style as he doesn't know if he's pleasing the judges on a particular maneuver.

RCM reporter Jim Martin with Mrs. Bosch, Fritz Bosch.

R/C INTERNATS

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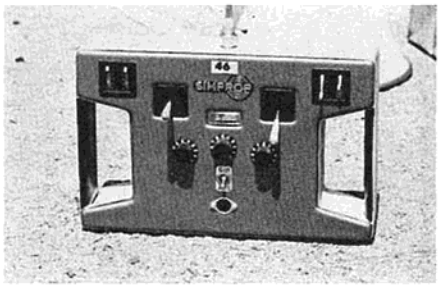
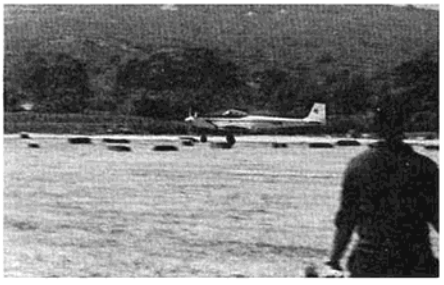


The popular "Simprop" Digital propo.

. . . The entire group of contestants, "presse," etc., visited what I guess was Napoleon's birth place. I wasn't too clear on whether it was his house, or a museum, or the city hall of Ajaccio. Anyway, incomprehensible speeches, apertif, milling around, endless waiting — the whole bit. Speaking of Napoleon, Jerry Nelson, team manager, American team, helped assure an American victory by being well supplied with pills that prevent the occurrence of an uncomfortable malady caused by drinking the local water, and known to all as "Napoleon's Revenge"!

. . . The group stayed at a resort called "Marina Viva." The rooms were somewhat larger than the interior of a Gemini capsule, and the food was almost as good as K rations. A great deal of horseplay took place at dinner. (It just struck me that when one eats horses, one indulges in horseplay.) I'm sure that the fact that you had to drink wine and beer instead of the local water helped keep things stirred up.

The "Upset" coming in for a landing.



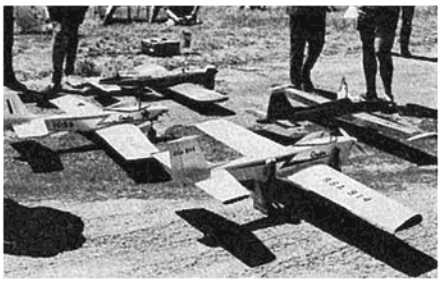
Franz Kavan, the carburetor manufacturer. Rapstad of Norway on right.

. . . After flying from New York to Nice and experiencing the depression (not just a lack of sleep, but a mental depression) that comes from crossing too many time zones, I would strongly recommend that when the U. S. sends a team to a competition of this sort that the team arrive in Europe a minimum of three days before the contest so that they can physically and mentally get back to normal.

. . . The variety of model airplanes at the contest was fascinating. A definite trend is the use of nearly scale wing sections. I'd guess that most chord thicknesses were about 15% with sharp leading edges. I look for 12% chords to be the rage within a year. Dihedral seems to be going out of style. In fact, some of the French organizers had reverse dihedral airplanes that flew very well.

. . . The flying conditions were perfect throughout the contest. The mornings and evenings were calm, and the wind rarely caused any trouble with anybody's flight.

The airplanes of the South African team.



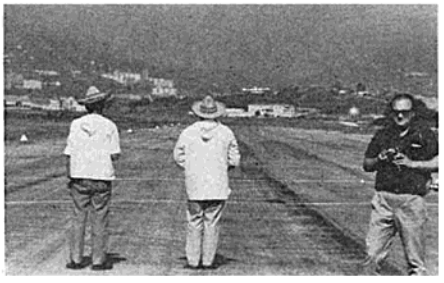
As the runway got hotter during the day some flyers had trouble wtih small updrafts during landing, but this was a very minor problem.

. . . A couple of equipment surprises were the rather wide use of Enya glow plugs, which are not seen too much in the U. S., and the wide use of Kavan carburetors, which gave truly fantastic engine performance!

. . . The Nice-Corsica flight was in an Air France Caravelle — stewardess about 20 years old. The return flight was in an Air France C-54 — stewardess about 35 years old. Formula to compute the stewardess' age is to add 17 to the age of the airplane.

. . . About an hour and a half after the final flight the prizes were awarded with a great Gallic flourish. The local police did not endear themselves to me by shoving me away from a spot where a good RCM cover picture could have been taken. But, I must confess to a very patriotic emotion and pride as a band played the Star Spangled Banner, the American flag was raised, and two French Air Force Jets roared by at low altitude as Phil Kraft was presented the grand prize trophy.

It was a fine moment.

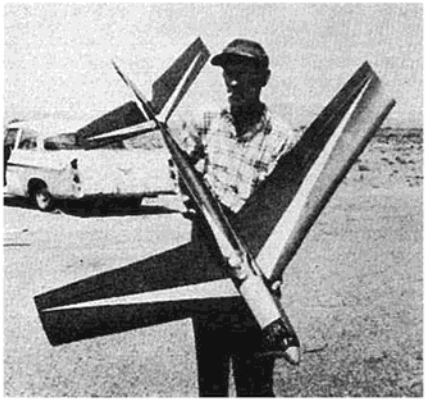


PRECISION PATTERN AIRCRAFT DESIGN

part VI

A study in Class III Aerodynamics by

BEN HERMAN
JACK CAPEHART



Maneuverability, Part II

THE last time we were discussing the roll axis and pointed out that, for obvious reasons, we wanted the roll axis to go as nearly through the centerline of the fuselage as possible. We pointed out that one way to achieve this was through speed, which allows the wing to fly at a smaller angle of attack. Another factor which allows the wing to fly at a smaller angle of attack is a light wing loading. Presumably this should help the rolls. On the other hand, a heavier airplane may do better rolls because it will be less affected by the drag forces which tend to slow the airplane in the rolls. Only experimentation will determine which is best, although we have some first hand experience about the drawbacks of a light plane under turbulent, gusty conditions. And when we say experience we ain't kidding! Those of you familiar with the southwest desert region in summer know what we are speaking about. Anyway, under these conditions, a light plane is definitely more difficult to fly through the pattern, in spite of its obvious advantages in other respects.

Well, on to adverse yaw. Although technically, adverse yaw is defined as yaw opposite to the direction of the roll, any yaw during the rolling maneuver is adverse for our purposes. Let's take a look at how adverse yaw occurs. Assume that we have deflected our ailerons for a right roll, as shown in Fig. 34.

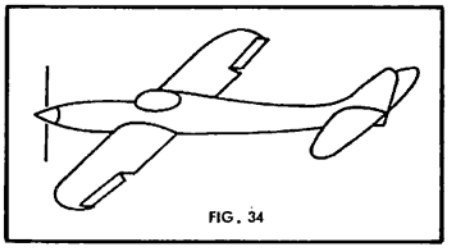


FIG. 34

Let's now look at the forces on each wing separately. First consider the right wing. For right roll, the right aileron will, of course, be deflected upward as indicated in Fig. 35.

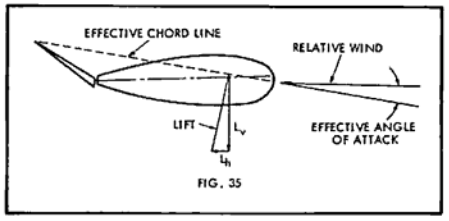


FIG. 35

In Fig. 35 we show a symmetrical wing flying at its normal positive angle of attack with aileron deflected upwards. This aileron deflection causes the **effective** chord *line of the wing* to be raised at the trailing edge and lowered on the leading edge (this effect has been exaggerated in the drawing for clarity). Thus, the effective angle of attack of the wing will be less positive, or even negative (as is indicated in Fig. 35) than before the aileron was deflected.

In Fig. 36 we show the left wing.

In this case, with the aileron deflected, we effectively increase the angle of attack, thus increasing the lift on the left wing.

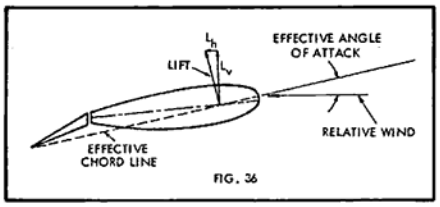


FIG. 36

Since we started the roll from a positive angle of attack, the lifting force on the left wing, after the aileron deflection, will be greater than that on the right wing. This can be seen by a simple example. Suppose at straight and level flight, the wing is flying at a 2° angle of attack. Assume that the aileron deflection causes the effective angle of attack to change 1° positive on the left wing and 1° negative on the right wing. We are thus left with a 3° angle of attack on the left wing and a 1° angle on the right wing. The higher angle of attack on the left wing causes it to have a greater lifting force than the right wing. If the ailerons were to cause a 3° change of angle of attack, this would leave the left wing at +5° and the right wing at -1°. We would thus have a large lift on the left wing and a small negative lift on the right wing. This latter example is the situation depicted in Figs. 35 and 36. In these figures the lifting force which is perpendicular to the effective chord line has been broken up into its vertical *l*v and horizontal *l*h components.

Let us consider the horizontal components only. These are depicted in Fig. 37 as seen from above.

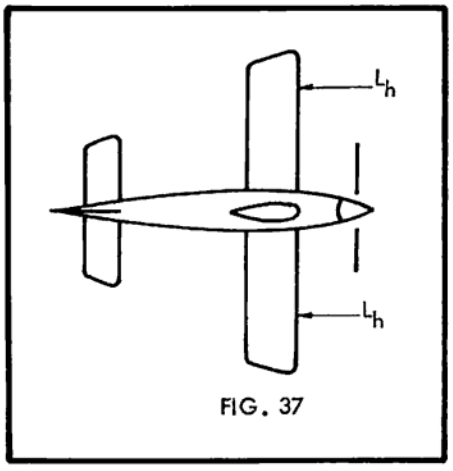


FIG. 37

As we have just noted, since the lifting force is greater on the left wing for a right roll, the horizontal component will also be greater. This is indicated by the longer arrow indicating *l*h on the left wing. The different magnitudes of these horizontal, or drag forces, cause a yawing torque to the left. Since this torque is opposite in direction to the right roll, it is termed adverse yaw by the aerodynamicists.

Of course, this is not favorable for the performance of axial rolls. It has become quite customary practice to try and correct for this by aileron differential in various forms, the idea being to equalize the drag forces on each wing. This practice is

(Continued on Page 67)

Walt Schultz of TRCC with original "Swift-Wing." A further refinement in a series of swept-wing designs by certain TRCC members.

quite common in full-size aircraft, as their primary objective is to achieve better **turns**. We're not so sure (would you believe, almost positive), however, that this practice, although widespread, is beneficial for **rolling** maneuvers. As we have shown above, the lifting wing panel (i.e., the left wing panel in a right roll) exerts a greater drag force than the other (right) panel. With differential throw, we correct for this by deflecting the right aileron more than the left aileron. As long as the plane is upright this is fine. But consider the situation during the inverted portion of the roll. Let's look at the right wing panel. It is now lifting and its aileron is down. But we gave it more throw than the other aileron to compensate for adverse yaw during the upright portion of the roll. However, instead of correcting for adverse yaw it now is lifting and therefore, with the differential, magnifies the adverse yaw beyond what it would be without differential.

To briefly summarize the above, we can state that with differential aileron throw, we get little or no adverse yaw during the upright half of the roll, and considerable adverse yaw during the inverted portion. Without differential, we get some adverse yaw during the entire roll. It has been our experience (with 2 Kwik-Flies) that the latter (no differential) situation is preferable as the rolls appear smoother. We might add that there is considerable advantage to no differential on certain other rolling where the roll is started from an inverted position and usually at a slower than normal flying speed (Immelman, last part of rolling 8, and to a lesser degree, the Cuban 8). For these maneuvers, differential throw would give large amounts of adverse yaw because the rolls are commenced inverted and the plane is traveling slow enough for the adverse yaw to be readily seen. For those of you trying to get smoother rolls from your Kwik-Fli II's, try rehinging the ailerons at the center instead of at the top. Incidentally, the differential on the Kwik-Fli comes about, not through differential movement of the ailerons, but through different amounts of exposed area of the ailerons. With top hinging, the upward aileron (right aileron for right roll) has more area exposed to the air stream than the downward deflected aileron. This differential area gives differential drag which counteracts adverse yaw upright, but augments it inverted, exactly as does differential throw. On two local Kwik-Flies (Ernie Metzer's and Jack Capehart's), the switch to center hinging produced a truly remarkable improvement in the rolls. As another incidental, at the Ted White "Wing Ding" (that is, the 2nd Annual Cactus Festival, the 3rd Annual is coming up Nov. 5, 6, and thanks for the plug, Don). Ted was flying an El Gringo with differential. We suggested, at that time, eliminating the differential as it appeared to us that Ted had some deficiencies in his Immelmans with that particular plane. Surprisingly, Ted took our advice, eliminated the differential, and at Buckeye last February, his Immelman appeared to be considerably improved. Ted told us that he attributed the improvement to the elimination of the differential (thanks for allowing us to quote you, Ted).

While on the subject of rolls, there are a few other minor, but relatively important points to consider. The typical, lazy proportional flyer will normally add right rudder trim to achieve a straight flight in a climb for such maneuvers as the wing-over and the tail-slide, and to some extent, the looping maneuvers. This right rudder is required to counteract the increased effect of torque and slip-stream as the airplane slows down. Once again we have the dilemma of the correction working for you while the plane is upright, and against you inverted. For, when inverted, right rudder yaws left acting with the adverse yaw (if you're rolling right), thus further deteriorating the inverted half of the rolls. If you happen to roll left, the right rudder acts adversely during the upright half of the roll. Thus, if your plane requires the normal right rudder trim, there is a distinct advantage to performing the rolls to the left in such maneuvers as the Immelman, Cuban 8, and the 2nd half of the rolling 8.

Let's have a brief look at dihedral effects in rolling maneuvers now. As has been discussed in previous sections, when one wing lowers, as in the beginning of a roll, a certain amount of sideslip is inevitable. With the sideslip, a relative wind occurs which opposes the roll, that is, it tends to raise the lowered wing panel back up, as was shown in the discussion of roll stability. This situation is shown in Fig. 38.

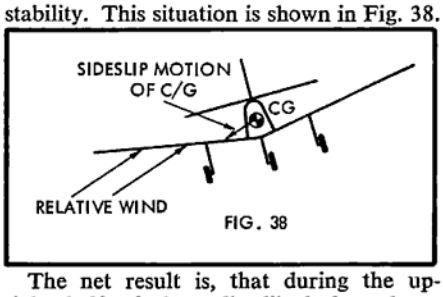


FIG. 38

The net result is, that during the upright half of the roll, dihedral tends to slow down the roll rate. It is easy to see that, during the inverted half of the roll, dihedral has an opposite effect; that is, the sideslip produces a relative wind which acts with the rolling torque, thus tending to speed up the roll rate. The net result is that the roll rate varies during the course of one complete roll, contrary to specifications in the judges' guide which demands equal roll rate. As Don Lowe has already mentioned, sweepback does not have the above disadvantage.

We may finally note that certain adverse effects in rolling maneuvers may result from a vertical fin placement which is not symmetrical with respect to the thrust line. These effects will be discussed in more detail at a later time.

Let's turn now to pitch control. Pitch control is required in almost every maneuver we are called upon to perform. Thus, pitch control initiates the wing-over, tail slide, and spin, and is required continuously during looping maneuvers, and is, of course, essential in landing maneuvers (or crashes as the case may be). Also, pitch control is perhaps the most complicated of the 3 primary axes of control as a proper discussion of it involves wing loading, power loading, center of pressure travel, location of CG, speed changes, decalage, angle of attack, moments, and probably many other factors which you may think of.

We may, perhaps, begin this discussion, as is frequently done, by considering what we are really after in pitch control. First and foremost, we want our planes to track through loops. For maneuvers such as the tail slide and wing-over, we want the plane to stay in the nose up attitude in which it is placed. We need smooth enough pitch control to make our landings graceful, yet enough sensitivity so as not to require excessive elevator deflection in performing rolls. We also want a force arrangement which doesn't require excessive trim changes from upright to inverted flight, and from high speed to low speed, as we have enough of a job keeping the wings level without worrying about pitch control on top of it. Finally, we don't want any tendency to tip stall, or snap roll during the excessive up-trim, near stall condition of the final approach.

We're not sure we can give the final answers for all of the above requirements, nor will we attempt to cover them all at this time. However, there are a few general statements which we can make which apply to most of our present contest airplanes. Let's start by examining those factors which govern the rate of response, or "sensitivity" to elevator control. As we shall see, there are many factors which determine sensitivity, and it is probably safe to state that the optimum is a matter of personal preference. Thus, while the beginner may feel that a given plane is overly sensitive on elevators, the contest flyer may feel that the same plane has optimal response.

Well, what factors do govern the pitch sensitivity? One, which has already been covered, is the location o fthe CG with respect to the center of lift. It was pointed out (in our discussion on pitch stability) that the farther the CG was placed ahead of the center of pressure, the more stable and also the less sensitive was the aircraft, with respect to the pitch axis. Varying the location of the CG is probably the easiest way to adjust pitch sensitivity in an already constructed plane. But remember, altering the CG location also alters pitch stability, so don't get that CG too far back!

Two other fairly obvious factors are wing loading and aircraft speed. All other things being equal, the plane with the higher wing loading will be less sensitive to pitch, simply because of the larger moment of inertia which must be overcome. Also, the faster the plane, the more sensitive it will be to pitch control, because the faster the plane is moving, the more the deflecting force with a given elevator deflection. The latter factor, however, is not the proper way to achieve ample sensitivity, because sooner or later the plane must be slowed down for landing, and the insensitive, fast plane may prove to have inadequate sensitivity for this most important of maneuvers. We may note that under the present AMA rules, a fairly sensitive plane is required (with a trike gear set up, at least) in order to touch down on the main wheels first. Another obvious factor is size of elevator and amount of deflection. We need not go into any further detail on this.

Finally, let's consider the tail and nose moment arms. A widespread rule of thumb has been that, the longer the tail moment arm, the less sensitive is the airplane. This statement is only partially true, the complete picture being somewhat more com-

plicated. Let's examine the situation in somewhat more detail.

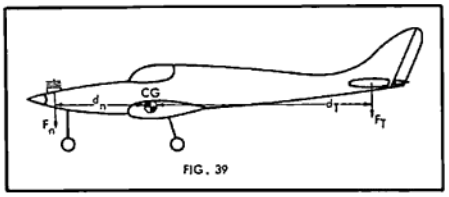


FIG. 39

In Fig. 39 we show a typical setup where dn and dT represent the nose and tail moment arms, respectively; and Fn and FT are the downward forces due to the weight of the nose arm and tail arm. For simplicity, we are assuming that the entire mass of the nose arm effectively acts very near the engine location, while the mass of the tail arm effectively acts near the midpoint of the empennage.

Now, in order for the plane to balance at the indicated CG, the torques due to the 2 indicated masses must exactly balance, or

$$F_n \times d_n = F_T \times d_T \qquad (4)$$

Now, if we remember (eq. 3) that the rate of response, or angular acceleration of the plane with a given elevator deflection is given by

$$MI \times AA = T \qquad (3)$$

or

$$AA = \frac{T}{MI}$$

which says that the angular acceleration (in this case about the pitch axis) equals the torque divided by the moment of inertia. Now, in the first of this series of articles we stated that we wouldn't go into the intricacies of moments of inertia, which we won't. We will simply state that, with the assumption of all the mass of both moment arms being concentrated at the engine and empennage, the moments of inertia about the CG of the nose arm will be approximately

$$(MI)_n = F_n \times (d_n)^2$$

while the moment of inertia of the tail arm will be about

$$(MI)_T = F_T \times (d_T)^2$$

Therefore, the angular acceleration will be

$$AA = \frac{T}{MI} = \frac{F \times d_T}{F_n \times d_n^2 + F_T \times d_T^2} \qquad (5)$$

where F is the upward or downward force on the tail due to the deflected elevator, and therefore the torque is this force times the tail moment arm.

Now let's increase the tail arm by some amount, so that the new tail moment arm is *d*T', while we keep the nose arm exactly the same as before. Our new airplane with longer tail will experience an angular acceleration the same as given by Eg. (5), except we will substitute *d*n' for *d*n. Thus, assuming the force F to be the same in both situations, we have

$$AA' = \frac{F \times d_T'}{F_n \times d_n^2 + F_T \times (d_T')^2} \qquad (6)$$

We now wish to see which plane has the greatest response, or angular acceleration. To do this, we must bring in one additional factor. When we increased the tail arm, without changing the nose arm, the plane will no longer balance at the CG because the mass of the tail, presumably the same, has a longer moment arm, and thus a greater torque about the CG. With exactly the same nose arm, we must therefore lighten the tail weight to secure a balance at the CG. In fact, we must lighten it so that the new torque exactly equals the original torque. Thus, the condition must exist that

$$F_T' d_T'' = F_T d_T \qquad (7)$$

where F_T' is the new force due to the weight of the lighter tail.
Thus, our new angular acceleration becomes

$$AA' = \frac{F \times d_T'}{F_n d_n^2 + F_T' (d_T')^2}$$

$$= \frac{F \times d_T'}{F_n d_n^2 + (F_T d_T) d_T'} \qquad (8)$$

by virtue of Eq. (7). Comparing to our original angular acceleration, (Eq. 5) which we'll rewrite as

$$AA = \frac{F \times d_T}{F_n \times d_n^2 + (F_T \times d_T) \times d_T}$$

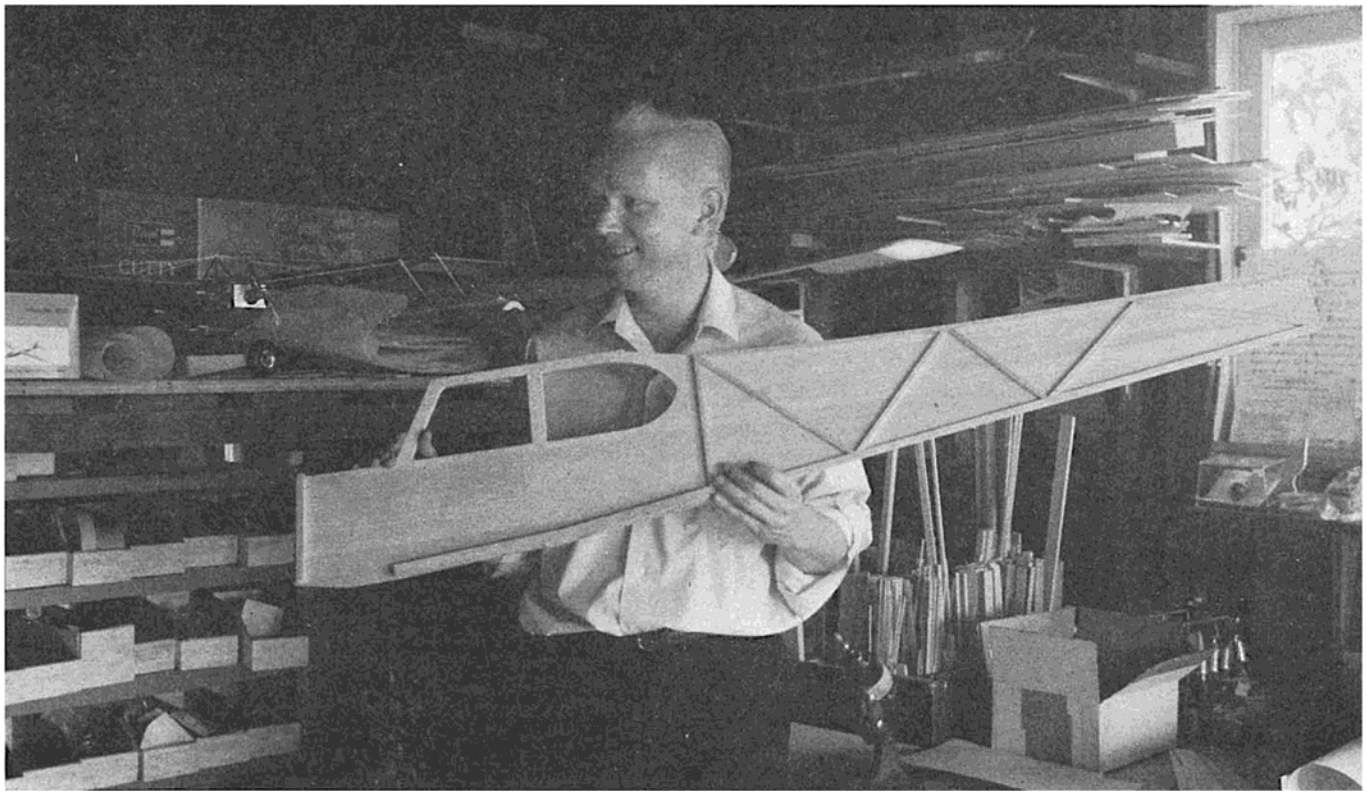
we see that, since the new dT' is larger than the old dT, AA' is greater than AA. (For those who don't see this, put numbers into Eq. 5 and 8 to prove it to yourself.) We thus conclude that, keeping the nose arm the same (same mass and length) and lengthening the tail arm (which necessitates lightening its mass to keep the balance the same) results in a more responsive plane instead of a less responsive one (to elevators, that is). A good example of this effect was the Taurus. Kasmirski went to a longer tail arm while keeping the nose arm the same in order to have less sensitive elevators (Ed called it smoother). If you were fortunate enough to build the tail light enough so as not to require additional nose weight, what you ended up with was a plane quite sensitive to elevators. If on the other hand, you ended up adding lead to the nose to get the darn thing to balance, then the reduced sensitivity was accomplished, as intended (although we don't think Ed intended to have nose weight added; and therefore, his lengthened and lightened tail arm actually accomplishd the opposite of what he intended).

To summarize briefly the above:

1. Increasing the tail moment arm without changing the nose moment arm or weight necessitates lightening the tail to achieve a balance. For this case we have shown that we actually get **increased** elevator response.
2. Increasing the tail moment arm without lightening it, requires additional nose weight to achieve proper balance. For this case, an analysis similar to the one performed here shows that decreased elevator sensitivity will result.

If you didn't follow through with the course, assumed, throughout, that the shape, size, and deflection of the horizontal stabilizer and elevator were the same for all examples, so that the only variables were weights and lengths of moment arms.

If you didn't follow through with the mathematical analysis given, we hope that the brief summary given above will help clarify some of the mystery which seems to obscure the meaning and physical significance of moment arms. Next time we'll consider looping maneuvers in a little more detail.



SHOP & FIELD

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Editor

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FUNDAMENTALS OF R/C • PRODUCT REPORTS • HINTS AND KINKS

LAST month, in the first installment of Shop & Field, we discussed the shop and basic tools for R/C modeling. This month our discussion will center around the basic materials used in model building.

Balsa wood is, without question, the most common and most widely used basic staple of the model hobbyist. Balsa is the softest and the lightest commercial wood in the entire world, weighing only 4 to 24 lbs. per cubic foot, and averaging 9 lbs. per cubic foot. Despite its weight however, pound for pound it is stronger in some respects than pine, hickory, or oak. For its weight it is one of the strongest woods in the world, particularly in tension. One of its most desirable characteristics is its resiliency, with high compressibility and recovery. Balsa is also buoyant, with one cubic foot of the material capable of carrying over 50 lbs. in water. Its high electrostatic qualities make it an excellent insulator against electricity with an insulation value equal to cork. Balsa has excellent shock absorption qualities and withstands vibration well.

A common misconception about balsa is that it is the lightest of all woods. What is, in fact, true is that balsa is only about the fourth or fifth lightest wood known to man but has the highest strength to weight ratio of all the lighter materials. As we mentioned in the preceding paragraph, the actual density of balsa varies from 4 to 24 lbs. per cubic foot. One of the lightest native woods is spruce which weighs 23 lbs. per cubic foot. Most of the balsa wood commercially available for modeling purposes falls in the 6 to 16 lb. per cubic foot density range, with the average being 9 lbs. per cubic foot. The strength properties of balsa are proportionate to the density. In other words the heavier balsa grades are also the strongest.

For general classification balsa can be classified as soft, medium or hard, with soft being in the 6 to 8 lbs. per cubic foot range; medium grade in the 9 to 12 lbs. per cubic foot category, and hard in the 12-16 pound range. This, of course, is a rather broad description, and can be further broken down into categories such as soft, medium soft, etc.

As we mentioned, balsa is used due to its weight-commensurate-with-strength factor. Logically, then, one would select the strongest, or heavier, grades of balsa for the "stress" areas of a model, e.g., wing spars, doublers, longerons, etc., while using the lighter grades for lightly stressed areas such as wing-tip blocks, sheet wing covering, etc. A glance at the balsa density tables, reprinted through the courtesy of Sig Manufacturing Co., will give an indication of the weights of some of the common sizes of sheet, block, and strip material we normally use. It isn't difficult to see that as balsa in heavier density ranges are used, the weight factor goes up considerably.

With this factor in mind, let's take a look at a simple ½A R/C wing. Assuming a 40" span, 5" chord, with ¼" x ⅜" leading edge, single ½" x 3/16" main spar, 1/16" sheet balsa ribs, a ½" x 3/16" tapered trailing edge, ¾" x ¾" x 5" tip blocks, and no capstripping or top and bottom sheeting, you would find that, once the wing had been sanded, ready for covering, the ribs would account for 22% of the total airframe weight: the spar 26%, the trailing edge 13%, the leading edge 17% and the tips 22%. (Data figures from Solarbo Balsa, Great Britain).

Now, keeping in mind that, as mentioned, the wing tips are areas of light stress, we would normally use a very soft grade, or light density balsa stock. Glancing at our strip balsa density chart, you will notice that a 36" length of ¾" x ¾" material (which we used for the tips) weighs 1.125 pounds in the 6 lb. density, while the 16 lb. density stock weighs 3.000 lbs. for the same material! It isn't difficult to see that the overall weight of the model can go up quite rapidly if improper material selection is made. On our hypothetical ½A wing, the tips can be of very soft material, while the spars and trailing edge should be of rigid, straight stock in the higher density range. The leading edge can be softer material.

The weight, or density, of the wood is not the sole factor in selecting a certain piece of balsa for a given usage. The cut of the material is also a determining factor in its strength. For example, the illustrations indicate a quarter grain, tangent cut, and random cut from a balsa log. The table of recommended applications illustrates the proper usage of these various cuts. As an example, the ribs in our imaginary ½A wing need rigidity, yet constitute 22% of the total wing weight. If we select matched sheets of 1/16" quarter grain balsa in the light to medium density range, we obtain our desired rigidity and strength without resorting to excessively heavy material that would increase the weight factor without appreciably increasing the strength of these structural members.

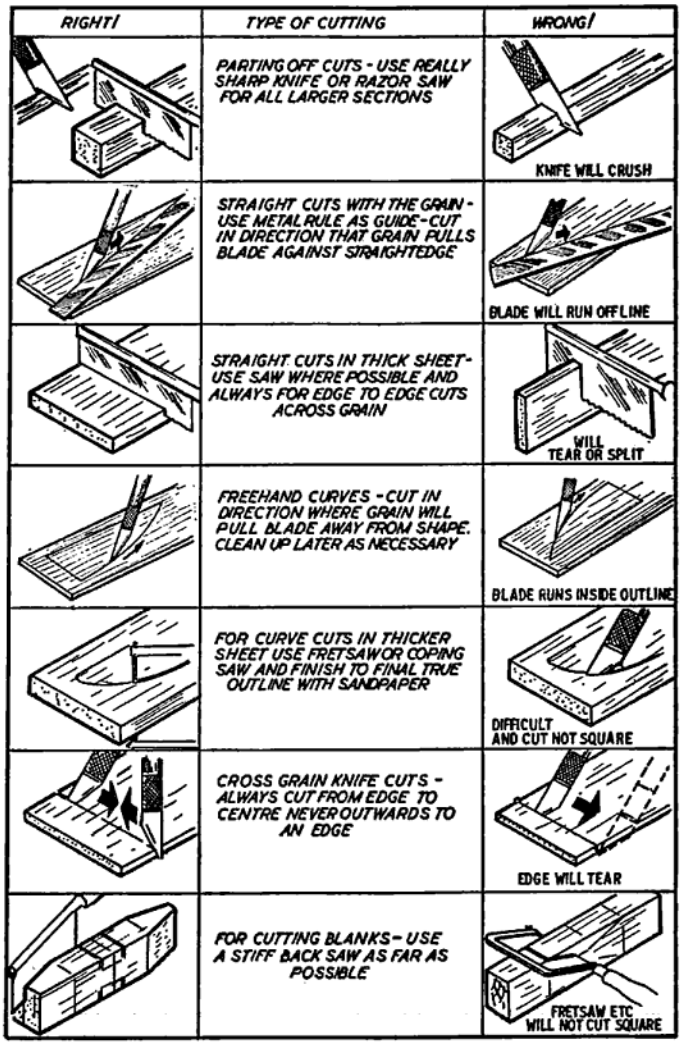
By the way, we mentioned selecting matched sheets of wood. Here's a tip from Frank Garcher of Midwest Products that we will pass on (forever endearing us to hobby dealers everywhere) to you. If you see an unopened "skin pack" of Midwest balsa, or a stack of Sig balsa that has just been placed in the dealer's bin, every **other** sheet will be nearly identical, since this is the way they come off the saw at the balsa plant. One of the easiest "rules of thumb" for purchasing matching sheets or strips (since we don't always carry a pharmacists' scale and/or micrometer around with us) is to hold the last inch or two of two or three sheets of balsa on the edge of a table or counter and see how evenly the extended ends line up. Two sheets that have approximately the same "droop" at the end of their 36" lengths will be fairly close in density.

In last month's discussion of shop tools, we mentioned the basic X-Acto tools as being indispensable tools. One factor that should be mentioned, at this point, is the proper tool, and method, for cutting the various types of wood. Rather than go into a detailed explanation, study the two diagrams on cutting balsa wood that accompany this month's discussion. These have been reprinted from a booklet originally printed and distributed by Sig Manufacturing Co., Inc.

There are many "specialty" cuts of balsa available to the RC'er, including various sizes of tapered trailing edges, preformed leading edge stock, triangular bracing stock, etc. These are "time savers" which eliminate much of the tedious work of forming such items yourself. As you progress, you will find that you can form a great deal of your own strips and specialty items on a table saw, thus effecting a "shop econo-

SHEET BALSA

SIZE	BALSA DENSITY POUNDS PER CUBIC FOOT					
36" x	6	8	10	12	14	16
SHEET						
1/32" x 2"	.125	.167	.271	.250	.291	.333
3"	.1875	.250	.3125	.375	.4375	.500
4"	.250	.333	.417	.500	.583	.667
1/16" x 2"	.250	.333	.417	.500	.583	.667
3"	.375	.500	.625	.750	.875	1.000
4"	.500	.667	.833	1.000	1.167	1.333
3/32" x 2"	.375	.500	.625	.750	.875	1.000
3"	.5625	.750	.9375	1.125	1.3125	1.500
4"	.750	1.000	1.250	1.500	1.750	2.000
1/8" x 2"	.500	.667	.833	1.000	1.167	1.333
3"	.750	1.000	1.250	1.500	1.750	2.000
4"	1.000	1.333	1.667	2.000	2.333	2.667
3/16" x 2"	.750	1.000	1.250	1.500	1.750	2.000
3"	1.125	1.500	1.875	2.250	2.625	3.000
4"	1.500	2.000	2.500	3.000	3.500	4.000
1/4" x 2"	1.000	1.333	1.667	2.000	2.333	2.667
3"	1.500	2.000	2.500	3.000	3.500	4.000
4"	2.000	2.667	3.333	4.000	4.667	5.333
3/8" x 2"	1.500	2.000	2.500	3.000	3.500	4.000
3"	2.250	3.000	3.750	4.500	5.250	6.000
4"	3.000	4.000	5.000	6.000	7.000	8.000
1/2" x 2"	2.000	2.667	3.333	4.000	4.667	5.333
3"	3.000	4.000	5.000	6.000	7.000	8.000
4"	4.000	5.333	6.667	8.000	9.333	10.667

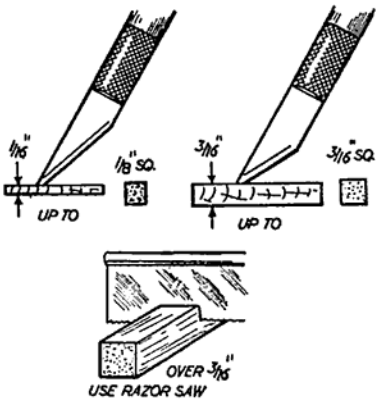


STRIP BALSA

SIZE 36" x	No. of Strips	BALSA DENSITY POUNDS PER CUBIC FOOT 6	8	10	12	14	16
1/16" x 1/16"	16	.125	.167	.208	.250	.292	.333
3/32"	16	.188	.250	.312	.375	.438	.500
1/8"	8	.125	.167	.208	.250	.292	.333
3/16"	8	.188	.250	.312	.375	.438	.500
1/4"	4	.125	.167	.208	.250	.292	.333
3/8"	4	.188	.250	.312	.375	.438	.500
1/2"	2	.125	.167	.208	.250	.292	.333
3/32" x 3/32"	8	.141	.188	.234	.281	.328	.375
1/8"	8	.188	.250	.312	.375	.438	.500
3/16"	4	.141	.188	.234	.281	.328	.375
1/4"	4	.188	.250	.312	.375	.438	.500
3/8"	2	.141	.188	.234	.281	.328	.375
1/2"	2	.188	.250	.312	.375	.438	.500
1/8" x 1/8"	4	.125	.167	.208	.250	.292	.333
3/16"	4	.188	.250	.312	.375	.438	.500
1/4"	4	.250	.333	.416	.500	.583	.667
3/8"	2	.188	.250	.312	.375	.438	.500
1/2"	1	.125	.167	.208	.250	.292	.333
3/16" x 3/16"	2	.141	.188	.234	.281	.328	.375
1/4"	2	.188	.250	.312	.375	.438	.500
3/8"	2	.281	.375	.469	.563	.656	.750
1/2"	1	.188	.250	.312	.375	.438	.500
3/4"	1	.281	.375	.469	.563	.656	.750
1"	1	.375	.500	.625	.750	.876	1.000
1/4" x 1/4"	1	.125	.167	.208	.250	.292	.333
3/8"	1	.188	.250	.312	.375	.438	.500
1/2"	1	.250	.333	.416	.500	.583	.667
3/4"	1	.375	.500	.625	.750	.876	1.000
1"	1	.500	.667	.832	1.000	1.166	1.333
3/8" x 3/8"	1	.281	.375	.469	.563	.656	.750
1/2"	1	.375	.500	.625	.750	.876	1.000
1/2" x 1/2"	1	.500	.667	.832	1.000	1.166	1.333
1"	1	1.000	1.333	1.666	2.000	2.333	2.667
3/4" x 3/4"	1	1.125	1.500	1.875	2.250	2.625	3.000

BLOCK BALSA

SIZE 36" x BLOCK	BALSA DENSITY POUNDS PER CUBIC FOOT 6	8	10	12	14	16
1" x 1"	2.0	2.667	3.333	4.0	4.667	5.333
1 1/2"	3.0	4.0	5.0	6.0	7.0	8.0
2"	4.0	5.333	6.667	8.0	9.333	10.667
2 1/2"	5.0	6.667	8.333	10.0	11.667	13.333
3"	6.0	8.0	10.0	12.0	14.0	16.0
1 1/2" x 1 1/2"	4.5	6.0	7.5	9.0	10.5	12.0
2"	6.0	8.0	10.0	12.0	14.0	16.0
2 1/2"	7.5	10.0	12.5	15.0	17.5	20.0
2" x 2"	8.0	10.667	13.333	16.0	18.667	21.333
2 1/2"	10.0	13.333	16.667	20.0	23.333	26.667
3"	12.0	16.0	20.0	24.0	28.0	32.0
2 1/2" x 2 1/2"	12.5	16.667	20.833	25.0	29.166	33.333
3"	15.0	20.0	25.0	30.0	35.0	40.0
3" x 3"	18.0	24.0	30.0	36.0	42.0	48.0
4"	24.0	32.0	40.0	48.0	56.0	64.0



my" if you are so inclined.

HARDWOOD

Although to a far less degree than balsa, various types of hardwood have found their way into the RC'ers shop. The most common items of course are plywood sheets for bulkheads & doublers; maple motor mount stock, and of course, birch doweling for wing, stab, and landing gear hold-down anchors.

Plywood sheets are available from most major hobby shops in thicknesses of 1/32", 1/16", 3/32", 1/8", 3/16", and 1/4" in sheet sizes of 6" x 12", 12" x 12", 24" x 12", and 48" x 12". The proper grade of plywood for R/C use is the best grade of 5-ply birch plywood. The thinner sheets are used for firewalls, bulkheads, and equipment mounts, while the 1/32" x 1/16" thick sheets are most generally used for fuselage doublers. 1/28" ply veneer is available.

Spruce strips are also available in almost every size in which strip balsa can be purchased. Spruce is most commonly used where heavy duty wing spars or longerons are required, such as in high aspect ratio glider wings, etc.

Other hardwood, such as bass wood, are available from major hobby shops, but have not found wide acceptance in general construction, and we will only deal with them should the necessity arrive for a given Shop & Field project.

ADHESIVES

Normally, we do not make specific recommendations as to a particular brand name, but in the case of adhesives we are going to make an exception. We recommend that you do not use regular model airplane cement for any general R/C construction as it will not provide the permanent bonding strength necessary for the average R/C aircraft. We, at RCM use Franklins Titebond glue, an aliphatic resin, for **all** general construction, with Sig Epoxy Model Airplane Glue being used for all areas where maximum strength is required. (Such as firewalls, hardwood structural members, etc.) Epoxybond Adhesive Putty is used for forming fillets, filling nicks, bonding of small metal parts, etc.

Weldwood Contact Cement is used for permanent bonding of fuselage doublers. Core-Grip contact cement is used for the same purpose on smaller aircraft, and always used exclusively for bonding sheet balsa to form wing and stab cores.

These adhesives have proved to be superior for their intended purposes. Whatever adhesives you decide upon, use them consistently, and don't change from type to type, or brand to brand.

SHOP & FIELD

MOST RC'ers have made their own balsa filler coat using such materials as balsa dust, chalk, and talc. Why not use the same substance that the commercial paint industry uses! Corn starch manufactured for food is recommended and is only 23c for a one pound package.

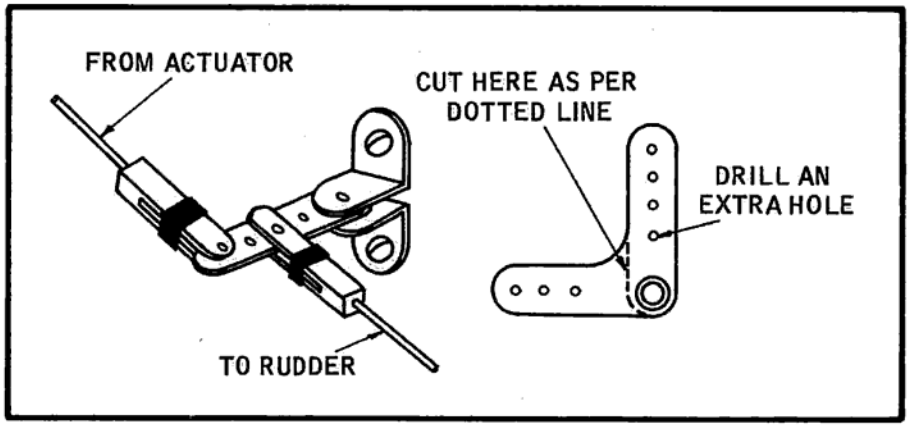
— Jed Kusik 'NAA Flightmasters'

Before you bend your wire gear on cabane strut, take a length of solder and shape it to size. The solder makes an excellent pattern to copy and saves making costly and time consuming mistakes on music wire.

— LVRC News Letter

Here's a device designed to increase or decrease the degree of travel on your rudder on elevator — a differential throw system made from components derived from the Midwest Accessory Kit C-5. To decrease the throw, use the Ny-Links as shown. To increase the throw, reverse the linkages.

— Soo Modelers R/C Club 'Glitch'

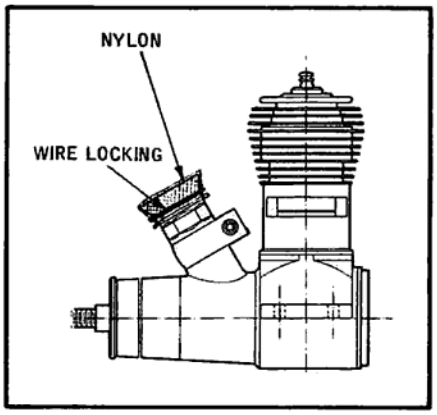


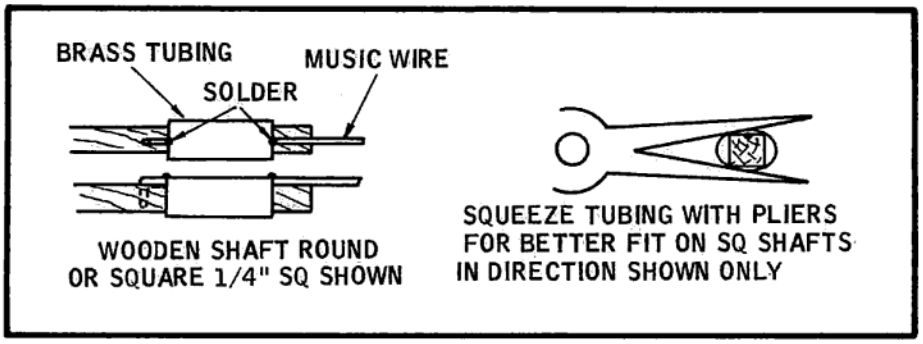
Instant fabric patch? Save the painted fabric from your old models. The next time you incur a puncture, cut a piece of old fabric of the same color to the size of the repair. Mark the size of the patch on the area to be repaired, then coat both it and the patch with contact cement. Touch up edges with fresh dope.

— St. Paul Model R/C Club 'Pulse'

How about covering the carburetor on your engine with a piece of nylon stocking to keep dirt out of the "works?" A wire lock strip secures it in place.

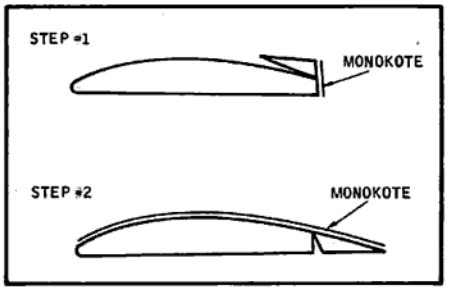
— Dwane Sales, 'Norair Modeler'





Still making pushrods by bending a 90° bend in a piece of wire and securing it to a balsa shaft with thread and glue? Try replacing the thread with a piece of brass tubing and solder. A piece of tubing about ½" long is placed over the wire and balsa shaft and soldered to the piece of music wire. One other advantage is that the tubing need not be soldered until the torque rod is fitted to the plane. Thus, in case of a mistake, the wire is easily removed and replaced.

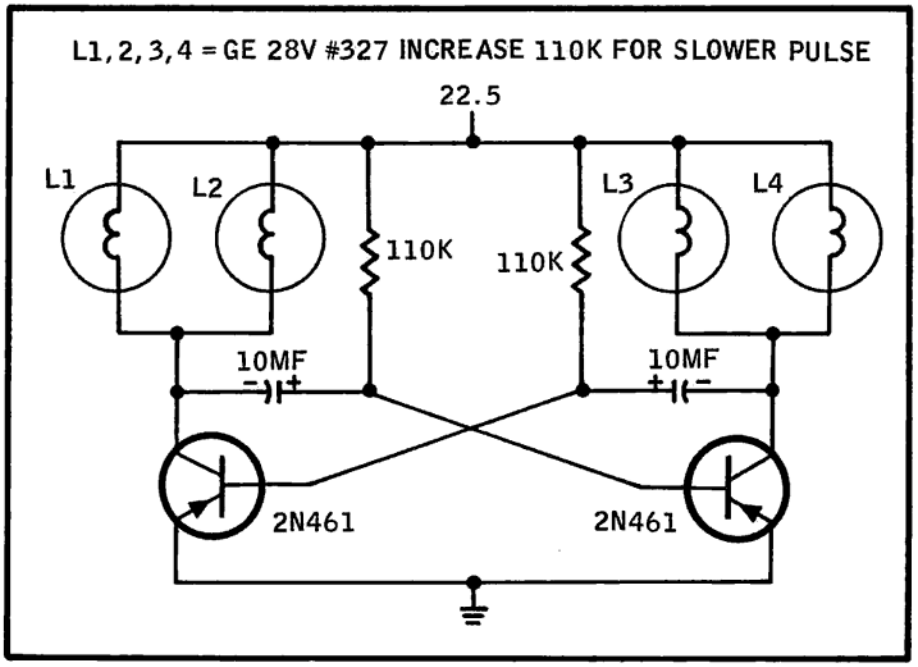
— Jay Stargel 'DC/RC Newsletter'



Chris Olsen's 'Upset,' an outstanding entry at the recent 1967 Internat's, used MonoKote for the hinges as well as the general covering. This technique worked extremely well, and the aileron hinging is shown in the drawings. This hinge is very free in operation, with little slop, and permits no aileron through the hinge line.

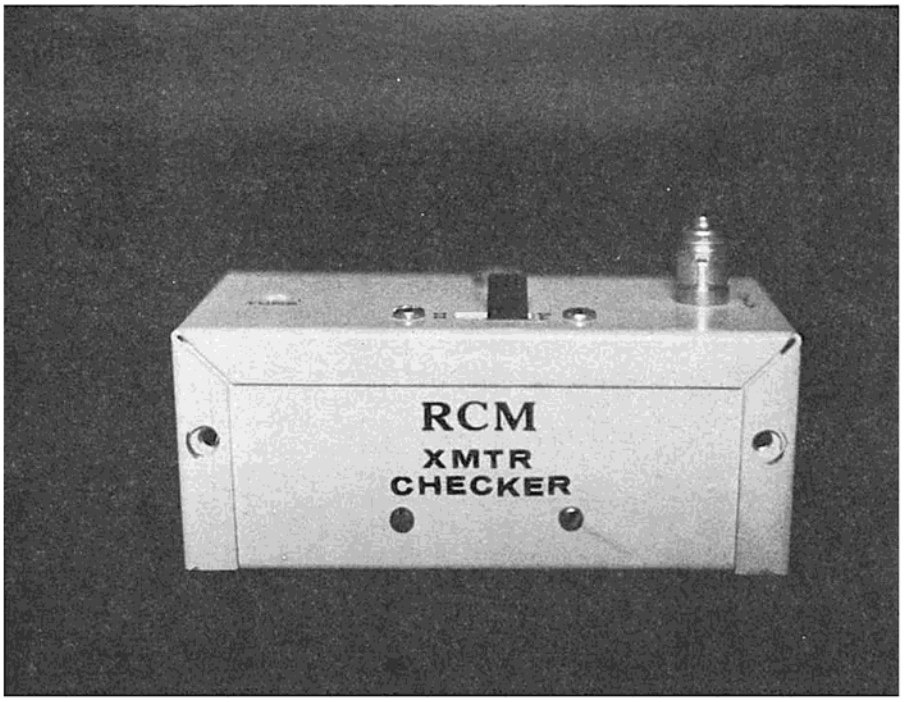
— Jim Martin

Have a Hint or Kink You'd Like to Share? Send it to RCM Shop & Field
P. O. Box 487
Sierra Madre, Calif. 91024



Want to try a little night flying? The diagram shows a method of setting up blinking, colored running lights that will let you know which way you're going.

— LVRC News Letter



YOU CAN BUILD RCM'S TRANSMITTER CHECKER

BY STEPHEN KREZNAR

TECH EDITOR'S NOTES:

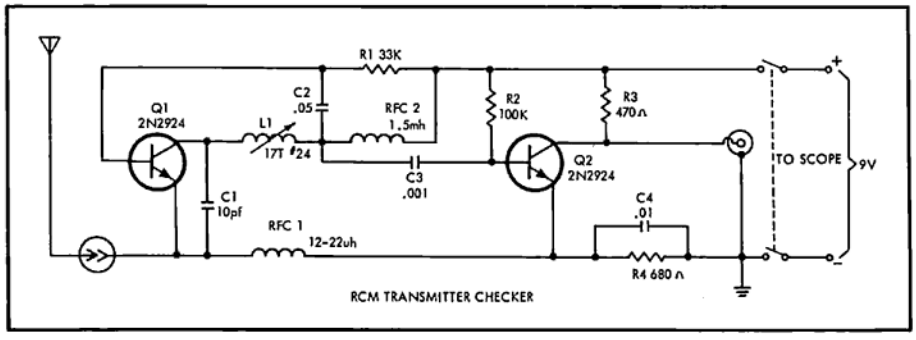
The RCM technical staff has used Steve's transmitter checker for over a year for design and testing purposes. We feel that it is an invaluable piece of test equipment for the inquisitive technician/modeler who wants to know more than what a multimeter can tell him about his equipment.

The RCM Transmitter Checker will provide technicians with answers that heretofore were approximations, and/or hoped-for results. It will unlock a new avenue of approach to transmitter trouble-shooting, providing, at a glance, and without physical connection, answers that formerly took hours to find. Its basic simplicity, both in construction and operation, belie its usefulness. Many versions of the checker have been built and the RCM staff would like to thank Jack Albrecht of Colorado Springs, Colo., for fabrication of the version presented here.

Although we have changed the checker physically, the circuitry is the same as Steve submitted over a year ago.

The checker works well on 50 mc without change, operating at ½ the desired frequency. Use on 72 mc may require 2 or 3 less turns on L1 for ½ frequency operation. With a little cut and try it will tune all 3 bands.

FEW things are more exasperating than the false indications of performance (if you get any at all) which often result from oscilloscope to low-powered transmitter coupling. The RCM Transmitter Checker avoids these side effects at moderate cost. It is a simple converter that converts the high frequency transmitter output to a lower frequency which can be accepted by the average economy-priced oscilloscope. It has one stage of amplification which also provides isolation between the mixer and scope. The sinusodial user will find the RCM Transmitter Checker a handy device to check modulation depth, wave shape, upward or downward modulation, etc. Digital types will find it invaluable for troubleshooting or designing transmitters. Whatever the modulation type of the transmitter it will provide more information for the dollar than you'll find elsewhere and with more painless-strainless-cussless effort on your part.



RCM TRANSMITTER CHECKER

CONSTRUCTION

First off, make the P.C. board. Since it is a simple board, this can be accomplished by the painting method if you desire. Model airplane dope works good if you "scrub" the board first with scouring powder and a toothbrush. Drill all holes with the appropriate size bit to fit the components.

As you can see in the photos, the antenna jack extends up through the board and requires a ¼" hole for clearance. The hole under the coil form should be 5/32" to allow insertion of a hex tuning wand for tuning.

P.C. BOARD

The construction overlay clearly shows component placement and the recommended assembly sequence is as follows:

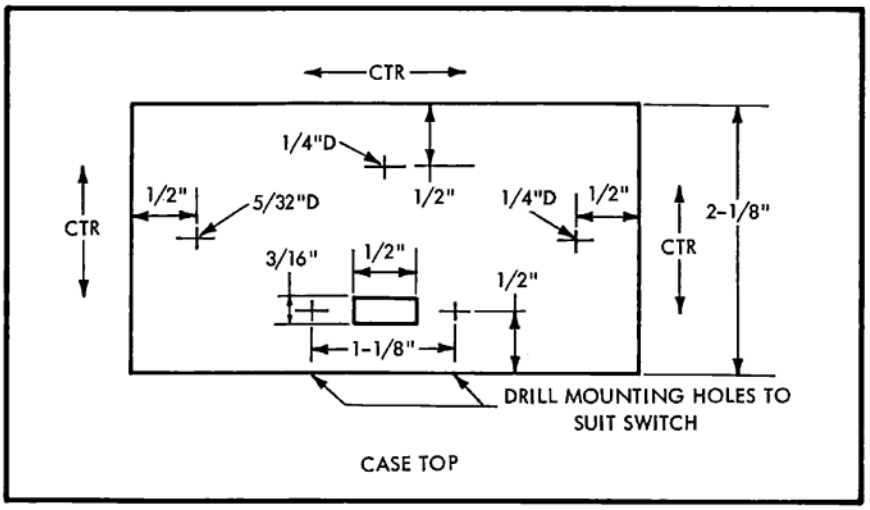
( ) Resistors — 4 ea.
( ) RFC's — 2 ea.
( ) Capacitors — 4 ea.
( ) Coil Form — 1 ea. (prewound)
( ) Battery Connector — 1 ea.
( ) Transistors — 2 ea. (observe proper placement on overlay)
( ) Switch — 1 ea. (there is not much clearance under the switch to solder but a small tip and patience make it easy).
( ) Solder — 3 ea. 1" pieces of bare wire at the points marked "Antenna" and "Scope." These wires should be inserted through the component side of the P.C. board.
( ) Wire the output plug with two 6" pieces of hook-up wire (red to center — black to shell).

CASE

Make the switch cutout and temporarily mount the P.C. board. Mark and drill holes for the tuning hole and connectors (remove P.C. board before drilling).

Mount the following:

( ) Antenna Connector — 1 ea.
( ) Phono Jack — 1 ea. (don't forget



the ground lug)

( ) Battery Clip — 1 ea. (this is mounted in bottom half of case with 2 ea. #2 sheet metal screws and was made from a piece of aluminum formed into a U-shape).

PRELIMINARY TEST

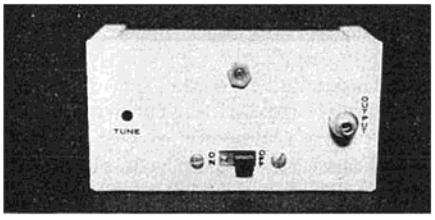
Observe polarity and measure the resistance between the battery leads with the switch in the "on" position. You should read approximately 2000 ohms.

ASSEMBLY

( ) Install P.C. board in case and secure with two screws into switch flange (see parts list note on switch).

( ) Solder the wire from the ANTENNA land to the pin jack.

( ) Solder the SCOPE wires to the output jack — the wire going to the collector of Q2 goes to the center terminal — the other to ground.



FINAL TESTING

Connect the battery to the snap connector so that only the negative terminal is connected. With the switch in the "on" position measure the current drain as follows:

With the meter set up to read 10 MA connect the red lead to the positive **battery terminal** and the black lead to the positive **battery connector terminal.** You should read approximately 8 MA. This will depend on the condition of the battery.

If everything is well, secure the two case halves together.

OPERATION

( ) Connect the red output wire to the scope input terminal and the black wire to the scope ground terminal. Use the AC input terminals or place the input selector to AC (if you have a choice).

( ) Install the antenna on the checker. This can be a length of 1/16" music wire inserted in the pin jack. A 1" sleeve made of 1/16" ID brass tubing and soldered to the end of the wire will provide a good fit. The shorter the antenna, the closer the transmitter will have to be for a given scope pattern amplitude — 12" will be about right for general use.

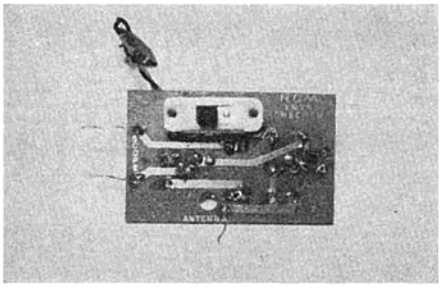
( ) Turn the transmitter checker on and adjust the scope controls for maximum sensitivity and position the traceline in the center of the screen.

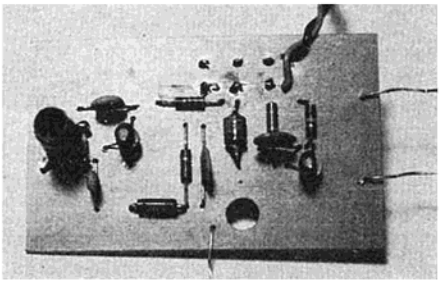
( ) Turn on your transmitter (with antenna installed but collapsed) and place it about 3' from the transmitter checker.

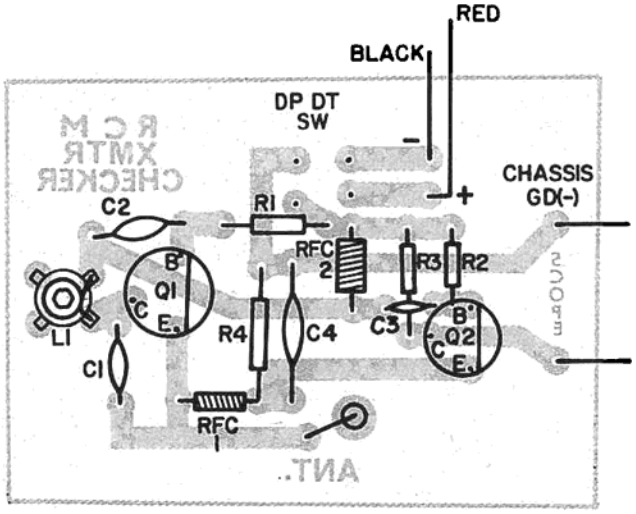
( ) Adjust the slug in the coil form of the transmitter checker to peak the signal on the scope (move transmitter closer if necessary).

( ) Adjust the vertical sensitivity and horizontal sweep frequency of your scope until a useable pattern is obtained. If you have provisions for "sync" adjust it for best stability.

From here on you're on your own. The length of antenna needed will depend on radiated RF from your transmitter and separation between the two units. If you have too much coupling between the two units distortion and regeneration may take place due to "overloading." It's best to operate the scope with high sensitivity and a short antenna on the checker.

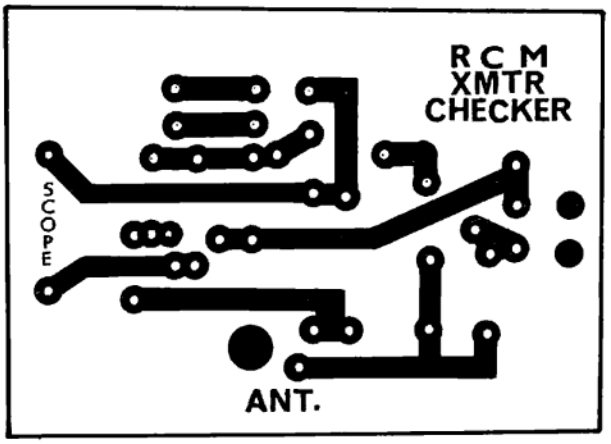


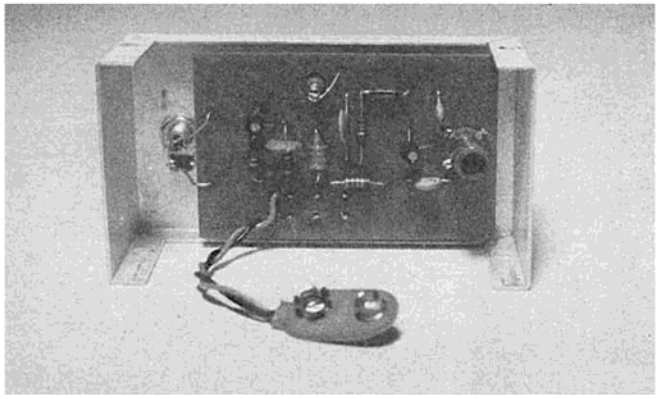


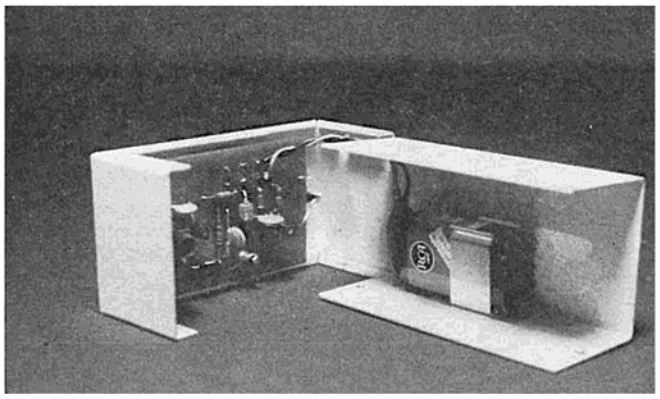


Q1 & Q2= 2N2924

Full Size Printed Circuit Board







PARTS LIST

Q1 & Q2	2N2924
C1	10 Pf Ceramic
C2	.05
C3	.001
C4	.01
R1	33K
R2	100K
R3	470 ohm
R4	680 ohm
RfC1	12-22 uh (Miller 70F225A1 or equivalent)
RfC2	1.5 MH (Miller 70F153A1 or equivalent)
L1	Coil separate wound (17½ T #24 en.) on CTC form 2173-3-3 (green core)
All Res. ¼ W. 10%	All caps in mfd. unless noted otherwise.

HARDWARE/MISCELLANEOUS

Case	LMB T-F774 2⅛" x 1⅝" x 4"
Switch	DPDT, slide with threaded mounting holes (try your hobby shop). If you can't find one with threaded mounting holes, thread them yourself or solder nuts to plate — the one used in version presented was made by Muter of Chicago but is not listed in Allied or Layfayette catalogs.
9-volt Battery	Transistor radio type 216, 2U6, VS323, etc.
Snap Connector for Battery	Layfayette #34 C 1003
Battery Holder	Fabricate from U-shaped piece of aluminum
Insulated Tip Jack	Amphenol 350-29175 or equivalent
Phono Jack	Switchcraft 3501FP
Phono Plug	Switchcraft 3501M
P.C. Board	Home fabricated

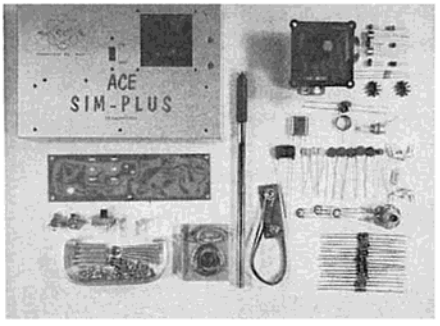
SHOP & FIELD

PRODUCT NEWS

Before we turn to the new R/C items that have found their way to the shop this month, we'd like to make a correction concerning two of last month's advertisers. **Model Plan Service, P.O. Box 824, Tustin, California, 92680,** was erroneously listed as Willoughby Enterprises. Model Plan Service is offering a set of full size plans for the F86D R/C, which includes building instructions and a Profile Publication covering the full-scale F86D. Price is $5.50 postpaid.

Our apologies to **Calgary Hobby Supply, 1225 11th Ave. S.W., Calgary, Alberta, Canada,** one of Canada's top mail order houses, whose address we misprinted in the last two issues. We hope all our Canadian friends will avail themselves of Calgary's quick and efficient service.

Unquestionably the most popular facet of R/C today, Galloping Ghost continues to gain new advocates each month. One of the newest entries in the pulse proportional field is the Ace Sim-Plus GG Transmitter Kit. This is a highly versatile unit which includes all of the adaptable features of the popular GG, Simplus, Simplex, and Simpro systems now on the market. The kit builder has complete control over audio CPS, rate,



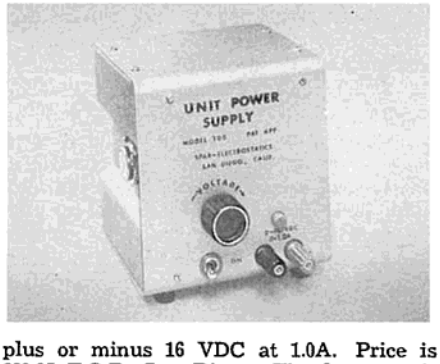
width, and linearity of both rate and width internally. Designed for a standard 9 volt battery, the 26-28 Mc version in kit form is $49.95 with a 6 meter version available at slightly higher prices. RCM's Shop and Field will be presenting a step-by-step assembly article on this unit in a forthcoming issue.

Noted designer, Jess Krieser, has started a plans service with some original designs that are destined to become quite popular. Jess's popular Sky Squire has been reduced down to two smaller sizes — one for ½A engines and a Jr. Version for .09 to .19 power. Also in the finalizing stage is the Skyhawk and Aero Commander which Jess unveiled at this year's Toledo Conference. Plan quality and detailing are excellent. **Jess Krieser Plan Service, 19024 Jonathan Lane, Homewood, Illinois 60430.**

It is always a pleasure to test a new product and find that it exceeds your own expectations as well as the manufacturers' specifications for it. Such was the case this month with the new G&K Flight Box, manufactured by **G&K Manufacturing Company, 354 Reservation Road, Marina, California 93933.** Retailing at $26.95 direct to the modeler, this is an assembled field box that has a high gloss, deep fuel proof finish over a beautiful dark wood stain. One of its major features is that it has **four** legs instead of the tripod arrangement used on some competitive units. The drop down front door can be used as a workbench and discloses a compartment for a gallon of fuel, plus a transmitter area, and 4 drawers, including one with numerous partitions for small items. The plane holders snap up and lock in place at table height for easy adjustment. The rear of the box sports a tall battery compartment complete with an access door which is slotted to allow passage of the starting battery wires.

Our only criticism of the unit was the fact that the foam stripping on the plane holders came off after a preliminary contact with exhausted fuel. All in all, this is the finest field and flight box we have seen, and is highly recommended to your consideration by RCM's Shop & Field.

For the RC'er desiring a regulated D.C. power supply, **Spar Electronics, 7969 Engineer Road, San Diego, California 92111,** IS manufacturing two such units. The first is their Model 100 single, which is adjustable

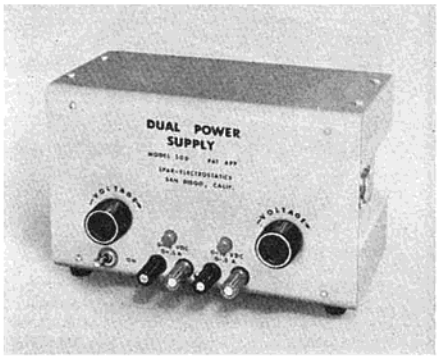


plus or minus 16 VDC at 1.0A. Price is $39.95 F.O.B. San Diego. The larger unit is a model 500 Dual which is adjustable plus or minus 16 VDC at 0.5A and is priced at $59.95. Both units incorporate solid state design, low ripple and noise, low warm-up drift, low output impedance, excellent regulation, short circuit and overload protection, flashing overload indicator, wide temperature operating range, and a one year warranty. RCM has not tested these units although Shop & Field is ordering a

(Continued on Page 39)

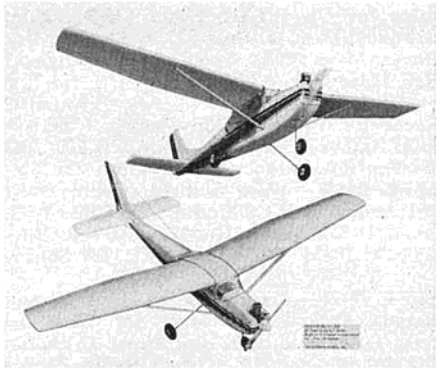
PRODUCT NEWS

(Continued from Page 38)



Model 500 for D.C. voltage supply usage with various radio equipment submitted for testing.

Carl Goldberg Models, Inc., 2541 W. Cermak Road, Chicago 8, Illinois, has released their long-awaited **Skylane 62** kit. Designed for .19 to 35 engines, the Skylane spans 62" with an overall length of 50" and a total wing area of 540 sq. in. Weight is 4½-5 pounds. Retail price is $21.95. Designed for single through 10 channels or proportional, the new kit preceived by Shop & Field looks as good as the finished aircraft. This is an all-out effort by C.G. Models and we can certainly recommend it



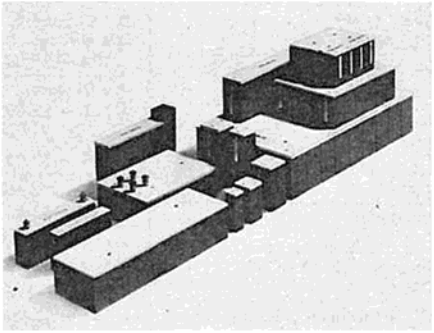
to you. Flight characteristics are excellent, and it will prove to be an excellent trainer for the newcomer to R/C as well as an all-around sport flier that has the added plus of looking like a full-scale aircraft.

Model Rectifier Corporation, 5300 21st Avenue, Brooklyn, New York 11204, has gone out on a limb! Better known to the RC'er as 'MRC-ENYA', Model Rectifier has recently imported the new Webra .61 to compete with their own popular Enya .60. We have received a production model of the new .61, which will retail for $59.50, and as a result of our own test observations, will predict that it will become one of the most sought-after and popular of the larger mills for competition flying. This is truly an exceptional engine, both from a standpoint of manufacturing excellence and calibre of powerful and reliable performance.

Citizen-Ship Radio Corporation, 810 East 64th Street, Indianapolis, Indiana 46220, now has available a student transmitter for their 5 channel full house digital proportional system. The student transmitter is furnished with inter-connecting cable to plug into the master transmitter. The only requirement is that both the student and master unit be on the same frequency. No modification to the master transmitter is needed as connection is made through the existing charging jack. The student transmitter, on the other hand, may be converted to a standard transmitter and used solo by relocating only two wires. Use of this new unit allows a student pilot to receive "dual instruction" very similar to that used in full size aircraft. When an emergency occurs the instructor merely turns on the master transmitter to assume control of the model and disable the student transmitter. Price of the student transmitter complete with connecting cable is $134.95 on 27 mc and $149.95 on 72 mc. Contact Citizen-Ship directly.

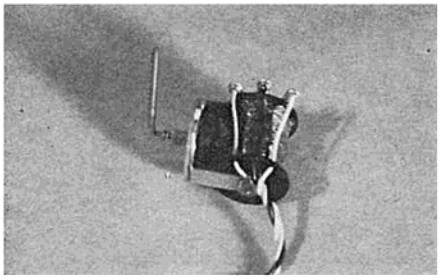
An added bonus for RC'ers in the addition of **Time-Flies Inc.,** to our industry. This new company is offering major proportional systems on a minimum-down, time payment basis. This will certainly alleviate the strained family relationships that occur when you casually mention at the dinner table that you're going to purchase a new $450 propo rig with funds from the family budget! RCM has talked with the principals of this company and commend their program to your consideration. For further details, see their ad in this issue. Cooperating manufacturers include, Kraft Systems, Micro-Avionics, and Orbit.

The Sonotone Corp., Elmsford, N. Y. is now packaging nickel-cadmium batteries in Module building blocks. First one Sonotone sealed, rechargeable nickel-cadmium battery cell is neatly housed in an individual, rugged polystyrene plastic container and completely insulated. This unit is joined by another and another until a battery package is formed to desired specs both in physical size and electrical performance. This procedure results in a neat Sonotone battery package that is called "module packaging." This packaging concept is fast and convenient for assembling nickel-cadmium batteries. Packaging time is just about zero . . . modules can be pulled from the shelf. Voltage tap-offs can be made from any position of the battery and many varieties of electrical contacts can be used. The Sonotone module packaging concept is flexible to any design requirement and ideally suited for large production runs as well as for prototype designs. Sonotone is presently packaging its AA, 19/32" x 1.92" (oversize AA), sub-C, C and D size rechargeable nickel-cadmium battery cells in modules. Other sizes such as Sonotone's ½C, CD, ½D and F are also packaged on special orders. A technical brochure is available which illustrates packaging and module cutaways. It lists



features and includes a chart giving complete physical and electrical characteristics of the Sonotone module package line. A copy may be obtained by writing: **Battery Division, Sonotone Corporation, Elmsford, New York 10523,** request Bulletin No. BA-131.

Adams Manufacturing Co., 2625 Ruger Ave., Janesville, Wisconsin 53545, sent Shop & Field a truly subminiature magnetic actuator for .010 and .020 aircraft. Used in conjunction with a unit such as Testor's relayless superhet, the entire airborne system requires only two .225 MaH button cells. All-up weight of such a system is approximately 3 ounces. Retail price is $6.95. Shop



& Field will present full size plans for a small beginner's airplane using this new actuator. Tested and recommended by RCM.

America's Hobby Center Inc., 146 West 22nd Street, New York 11, New York, has released a circular listing hundreds of model builders' bargains. This new tabloid type of publication is new to our field. Write AHC directly and include postage fee of 5c in stamp or coin. Ask for bulletin RCM-AB67.

The last item on our agenda this month is a 30-minute, 16 mm. sound film in Eastman Color, produced by **Top Flite Models Inc., 2635 S. Wabash Ave., Chicago. Illinois 60616,** entitled "The Finish." This film demonstrates, step-by-step how to completely cover a model plane with MonoKote. This film has been viewed by Shop & Field, and is truly excellent. Top Flite is making the motion picture available for club showings free of any charge except return postage. Our only criticism of this well-made film is that Sid Axelrod upstaged poor Mike Schlessinger during the entire footage! Oh, well — maybe we're going to have a whole new trend toward how-to-do-it movies. RCM promises an Arcee award for the best Actor and supporting Actress in a commercial drama by a manufacturer.

Air-to-air shot of KMPC Sky Watch helicopter Los Angeles County freeways. Aerial shot by Doug Tucker from KLAC Air Watch Piper PA-14.

HELICOPTER AERODYNAMICS

In 1968, Germany will host the first International R/C Helicopter Competition. Be ready for this new frontier in R/C by understanding how the whirlybirds work.

PART I BY JEAN ANDREWS

THE recent establishment of a word record class for radio controlled model helicopters by the Federation Aeronautique Internationale has prompted the writing of this article. We hope to outline here, for those of our readers who are interested in building and flying one of these machines, the aerodynamic characteristics of helicopters.

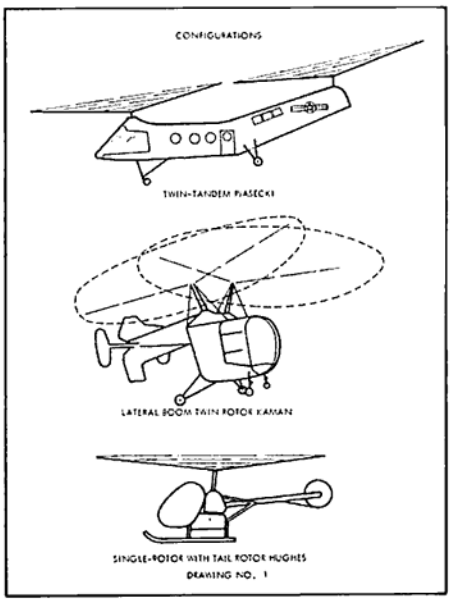
This is not meant to be a definitive article, since many people that fly helicopters, and, indeed, many people who design and build helicopters, do not have a 100 per cent sure definition of why certain things happen in a helicopter. Many forces on the helicopter's blade, while in forward flight, have not been fully explained as yet to the engineer's satisfaction, and research into various fundamental facets of the rotor system continues.

Helicopters are, basically, very inefficient. They waste a lot of energy both in the tremendous parasitic drag of their airframes, which are, in most cases, exposed to the slipstream, and also in the drive chain, such as the transmissions, universal joints, long drive shafts which must be supported by numerous bearings, and so forth. For this reason a helicoper, to be flyable, must be hopelessly overpowered by fixed-wing standards. For instance, although a fixed-wing Piper or Cessna will hoist four people easily on 125 horsepower, the Bell J-2 helicopter requires 240 horses to accomplish the same thing. However, their ability to fly slowly, or at zero airspeed, to fly rearwards and sidewards, to climb and descend vertically, and to land and take-off from very small areas, have overcome the objections listed above, and has made them virtually indispensable for many military and civilian applications.

Before we go too far into the discussion of why a helicopter flies, let's make sure that the definitions of a helicopter are firmly understood. The best way to do this is to compare a helicopter to an autogyro. An autogyro, first of all, is driven forwards through the air by a power unit to which a propeller is attached. As the machine is drawn forward a set of vanes on a mast above the machine is rotated by the force of the air passing up through them, and by their rotation, generate enough lift to fly the machine. The helicopter, on the other hand, derives both lift and thrust from a set of blades which can be compared to the wings of a fixed wing aircraft. They are driven in a circular path by the engine, and their lift, due to this speed in rotation, is sufficient to lift the helicopter in the same manner that a fixed-wing aircraft's propeller drags the wing of the aircraft forward fast enough to generate sufficient lift to overcome gravity. The rotor blade's lift is normally vertical, since the plane of rotation is parallel to the plane of the earth. This lifting force can be directed to an angle other than perpendicular to the earth by the tilting of the rotor disc. When this is done, a thrust vector and a lift vector become effective. The lift vector then serves to hold the aircraft aloft, and the thrust vector drives it forward.

At this point, a third type of rotary-winged aircraft should be mentioned. This is the gyrodyne, or compound helicopter. In this type of machine a rotor is used to fly the helicopter at slow speeds, and also to provide forward thrust at these slow speeds. However, as the machine gains speed, more and more of the responsibility for providing lift is shifted from the rotors to a set of stubby wings, which, while they are not large enough to support the machine at slow speeds, generate considerable lift at the higher-speed environment. The thrust of the rotor is also augmented by a separate power unit, either jet or reciprocating, and with this combination speeds considerably above those available to the pure helicopter are possible. It is this type of machine with which Lockheed Aircraft Corporation has recently established a new world record for rotary-winged aircraft of approximately 272 miles per hour.

There are two basic configurations of helicopter: the multiple rotor, and the single main rotor with tail-rotor. The multiple rotor is usually a twin-rotor system, in which the two rotors are driven in opposite directions to counteract the torque of the rotors. This is a very efficient configuration, and the tandem rotor design is used on such cargo helicopters as the Piasecki "Flying Banana," the Boeing "Vertol," and others. Unfortunately, the efficiency of this configuration is cancelled out by the extremely complex control arrangements which are required to provide positive control. Control about the vertical axis, for instance, requires both rotors to be tilted the same degree, but in opposite directions, in order to rotate the machine about its vertical axis.



Jean Andrews, author of this series on Helicopter Aerodynamics, is a professional helicopter pilot and instructor. His many assignments have included numerous TV and movie film credits, as well as aerial traffic patrol for Radio Station KLAC in Los Angeles. Jean is also an active modeler of many years standing.

The single-rotor-with-tail-rotor configuration, while it sacrifices much of the available engine power through the driving of the tail rotor, more than compensates for this disadvantage by the greatly simplified mechanical arrangements used for the controls. Since it is considerably simpler to build, it is this configuration which will receive the most attention in this article.

The helicopter is basically a very unstable piece of equipment. The pilot of a helicopter is required to "Fly" the machine at all times. There is no known way to design a helicopter at the present state of the art which has any sort of "Hands-Off" stability unless a gyroscopically-driven autopilot is incorporated in the control system. The helicopter is unstable both statically and dynamically, and if displaced will continue to displace itself further unless a corrective force is applied from outside the system by the pilot.

One of the problems which must be overcome by the helicopter designer who wishes to be successful is the provision of the ability to control the helicopter about each of its three axes, longitudinal (roll), lateral (pitch), and vertical (yaw). To do this the pilot in a full scale aircraft is provided with controls for both hands and both feet, and is constantly adjusting all of them simultaneously. The first of these is the cyclic stick, in the pilot's right hand. This control tilts the rotor disc in any direction from the horizontal, and is used for lateral and fore-and-aft control.

A problem immediately crops up, however. Gyroscopic precession is the first force which must be understood, and is the property of any rotating body which displaces an upsetting force 90 degrees further around in the direction of rotation before it becomes manifest or effective. This displacement occurs on any rotating body, whether it is a toy gyroscope, a spinning coin, a child's top, or a helicopter rotor. To tilt the rotor forward—therefore, to fly forward—the force must first be applied at 90 degrees to the helicopter's fuselage. Since this force will become manifest 90 degrees further around the plane of rotation, the rotor will tilt forward, the thrust vector will be inclined forward, and the helicopter will then fly forward.

Obviously, there is a measurable time lag between the application of a control correction and the machine's response to this correction, usually about one fourth of a second, and this lack of immediate response prompts most learning pilots to over-control the machine until this characteristic is understood. The collective pitch stick is controlled by the pilot's left hand, and the throttle, of the motorcycle twist grip type, is incorporated with this control. As the name implies, the collective pitch stick applies an increase or decrease of blade pitch to all blades in the system simultaneously, or "collectively." This pitch change mechanism is independent of the cyclic control system, although it may utilize the same pitch change links on the blades themselves. Therefore, collective pitch changes have no effect on the cyclic stick corrections set into the rotor by the cyclic stick. Beginning to get complicated, isn't it?

Since an application of pitch to the blades requires more power be developed by the engine in order to drive them at a constant r.p.m., the throttle is incorporated with this control so the pilot can more easily co-ordinate the two.

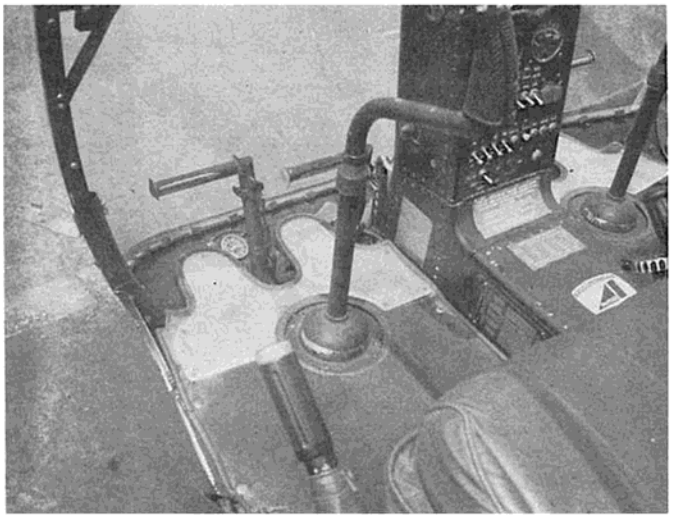
The anti-torque pedals, mounted on the floor of the helicopter, have much the same appearance as rudder pedals on a conventional aircraft. However, their use is entirely different. The rudder pedals in a conventional aircraft are used to overcome the differential drag created by the ailerons when the aircraft is banked into a turn. However, the helicopter has no ailerons, and hence no differential drag with which to contend. Instead, the pedals are used to maintain a desired heading, regardless of the power setting on the engine, changing the pitch on the tail rotor blades to increase or decrease its thrust. By increasing or decreasing the thrust of the tail rotor, virtually any power setting, and resulting torque, can be counteracted.

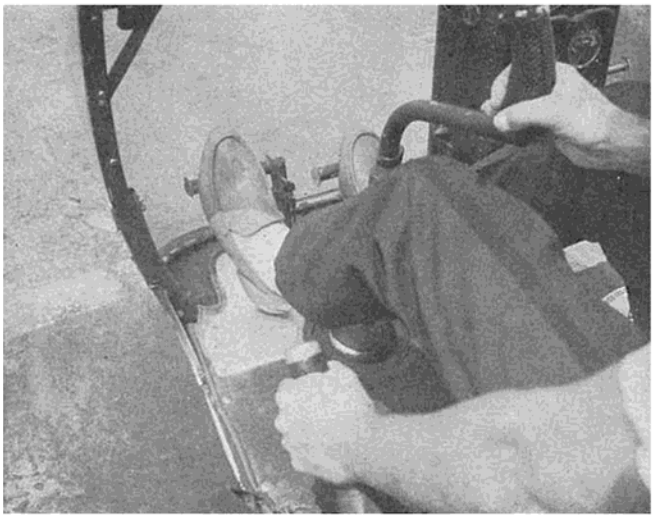
Since the pilot is constantly adjusting the throttle to maintain a desired r.p.m. on the main rotor, the torque is also fluctuating. Since torque also fluctuates the tail rotor must be adjusted to maintain a desired heading. The highest pitch angle is applied to these blades when the aircraft is hovering, since the engine is required to develop almost full power to maintain the helicopter at a hover, and the torque effect is most pronounced at the low airspeed ranges. As the helicopter increases its forward speed, however, less and less thrust is required from the tail rotor in order to maintain the desired heading, due to the slipstreaming of the fuselage, and the pilot adjusts the pitch of the tail rotor blades with these pedals.

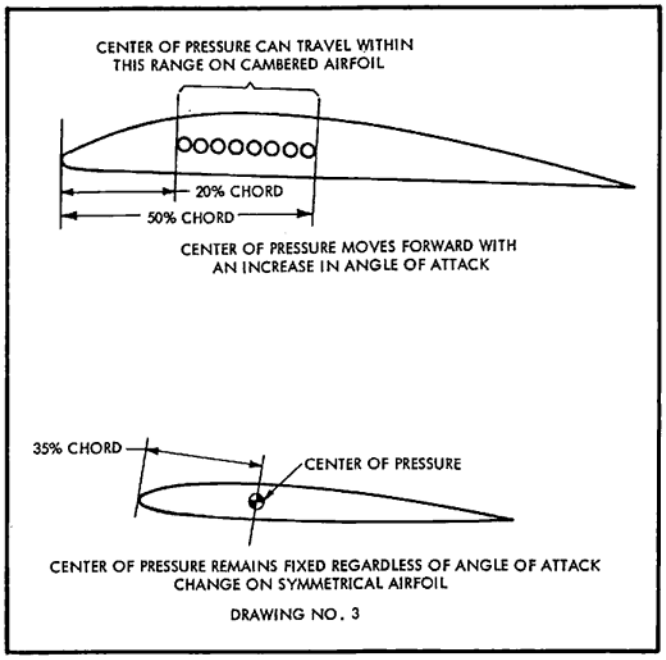
One of the most difficult things to teach the budding helicopter pilot is that these pedals do not have to be adjusted when the helicopter is turned. A normal sustaining-altitude turn requires no change in power setting. If the pilot, however, were to reduce power and also turn left, he would have to apply almost all right pedal while turning left to keep the helicopter's heading under control. Obviously, co-ordination plays an important part in the mastering of these machines. While not difficult to fly, they do require considerable practice, and the average person who would solo a fixed wing aircraft after only six to eight hours of dual instruction requires an average of 25 hours of dual instruction in a helicopter before his first solo flight.

Now that the preliminaries are out of the way, let's take a close, hard look at the aerodynamics of a helicopter. The airfoil on most helicopter blades is symmetrical, having the same camber on the top and the bottom of the blade. This eliminates any center of pressure travel and insures a blade with extremely stable characteristics. Cen-

In these two photos, the basic pilot controls are shown. The cylic stick is in the center of the photo, while the collective pitch stick is in the bottom center, 3 anti-torque pedals on the floor in the same position as rudder pedals on a fixed-wing aircraft.







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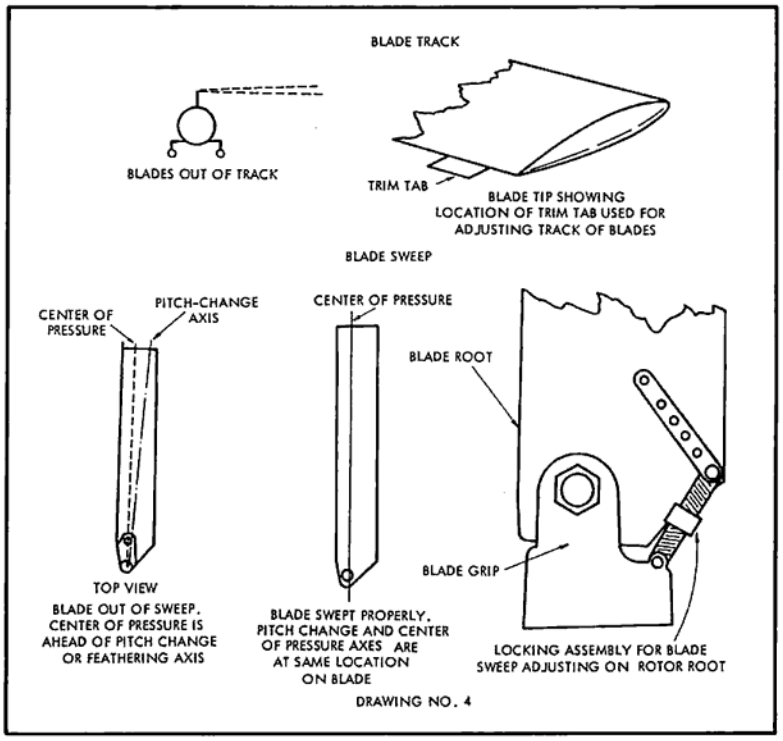


DRAWING NO. 4

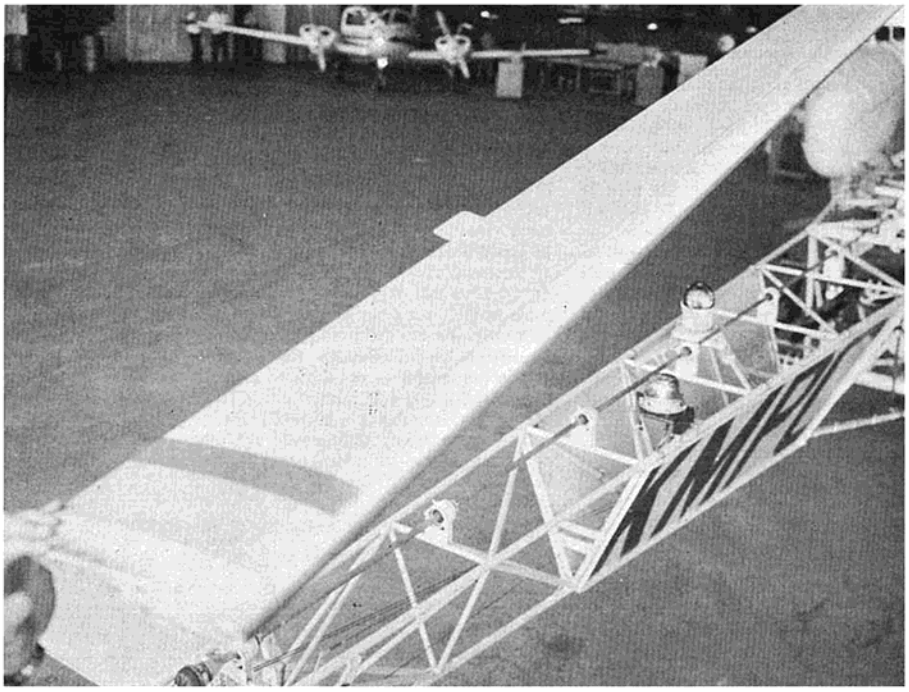
ter of pressure travel is a characteristic on any flat-bottomed or under-cambered airfoil. As the angle of attack of an airfoil of this type increases the center of pressure (that is, the point about which all lift is considered to be exerted), moves forward on the airfoil. This is fine for a fixed wing aircraft, where the center of pressure travel is desired to improve the stalling characteristics of the wing. However, the movement of the center of pressure on a helicopter blade must be kept to a minimum since the angle of attack of the blade changes constantly as it rotates, and a movement of the center of pressure as the blade rotates would generate undesirable twisting loads on the blades.

Another feature of the individual blades should be explained while the blades themselves are under scrutiny, and this is the three or four degree wash-out, or blade twist, from hub to tip which is incorporated in most helicopter blades. This is built in primarily to counteract, to some degree, the tremendous difference in blade airspeed between the root and the tip. While the root section of the blade may have negligible airspeed the tip speeds approach 300 and 400 miles per hour, depending on the individual design. Therefore, this twist is used to more nearly equalize the lift generated by various airspeeds which occur on the blade.

Two adjustments to the position of the blades relative to the rotor mast are primary in importance, in order to insure smooth, vibrationless operation of the blades. The first adjustment is to the elevation on the blades, to insure that they are flying in the same plane of rotation. This is known as "Tracking," and is usually adjusted on a full-size machine by fine adjustments to the angle of incidence of the blade relative to the mast, and also by the bending of a small metal trim tab which is located on the trailing edge of the blade somewhere near the tip. The second adjustment is sweep, and is the positioning of a blade relative to its pitch change axis. This pitch change axis runs the length of the blade, and is the one about which the blade rotates when its pitch is adjusted. Adjustments in a blade's sweep are made by turnbuckle type adjustments on a bracket located near the root of the blade; these move the blade forward or backward until the pitch change axis of the blade lies on the center of pressure of the blade, itself. In this manner the blade will remain in whatever pitch angle it is set, rather than attempting to increase its pitch angle, as it would if the center of pressure were located ahead of the pitch change axis, or to decrease its pitch angle, as it would do if the center of pressure were located behind the pitch change axis.

(To Be Continued)

RCM photo of a rotor blade on the KMPC helicopter illustrates the trim tab located on the trailing edge, hand in lower left corner holds blade tip.



JERRY KLEINBURG

Your columnist receiving RCM Snoopy Award at Annual Staff Banquet.

Gardner and Penetrator. Winning's a habit . . . 169 points at Dayton.

R/C CLUBS!

Don't forget to send a copy of your club newsletter each month to

TOP OUT
2512 W. Craig Pl.
San Antonio, Texas

RCM — HAPPY BIRTHDAY!

IT all started 46 issues ago and the RC world hasn't been the same since. Of course it would have changed in any case, but in moments such as this, privately dwelling for a moment upon RCM's role during the last 4 years may be labelled as part of the enthusiasm that springs up during memorable occasions. For a while I've suspected that the main reason for recognizing any annual milestone such as a birthday or anniversary is to acknowledge — with some relief, and amazement — the simple fact of survival. And in the magazine trade where existence has been known to be particularly tenuous, this is especially true. It's fairly certain then, that tonight there's joy in Sierra Madre (and surprise elsewhere) as this Volume 4 No. 10 is read denoting start of RCM's 5th year. It also follows without need for much elaboration, that the other main ingredient of an anniversary must be given equal recognition: re-dedication, through resolve to make the most of time and opportunity; and to strive to continue to merit respect from all. . . .

THE CONTEST CIRCUIT

There's a batch of all types to report this month, so we'll try to cover all from those who took time to send us information. Naturally, first recognition as well as congratulations, go to the U. S. Internats' team of Phil Kraft, Doug Spreng, and Cliff Weirick for sustaining the United States batting average at 1000 by taking top individual honors along with earning the no. 1 team spot. Kraft, in sweeping individual performance with his Kwik-Fli, was over 1200 points ahead of Marrot of the French team. Spreng took fourth with his Twister, a new small ship, and Weirick scored to 10th place with a new Chipmunk. This gave the U. S. team a 4219 point edge over the 2nd place German team of Bauerheim (3rd), Schmitz (5th), and Bosch (24). Bosch's engine problems most likely cost him as much as 5000 points and would have possibly give the U. S. pilots a hard time if he had overcome the difficulty. The South Africans did very well in heading the 4th place French team for a 3rd place team win. Most interesting entry was 19 year old Liechtenstein representative, Matt, who flew to an impressive 6th.

● **DAYTON.** A 96 contestant field showed up for the 5th Annual Wright Brothers Memorial Championship where Pappy deBolt was crowned Grand Champion by virtue of 2 firsts, and 2 second places in the 4 events he entered. Fifteen Class I pattern entries saw Jackie Gardner and Gary Villard duplicate their 1966 Chicago Nats battle with Jackie finally edging the Ohio flier 169 to 151 in the Open division. Larry Gerber was 3rd with 139 points. Among the 6 juniors, Bob Greer nosed out Mike Ritter 103.5 to 97 for the top spot in Jr.-Sr. Class I. Mike — who incidently scored better than his dad! — found added satisfaction in placing 2nd by beating Bob Williams who had previously edged him at the Chicago Nats. Bobby Woods, another veteran junior, placed 4th.

Class II went to Charley Reed who managed to stay ahead of Charley Williams and Bill Bertrand in the 7 man Class II field. This makes 4 trophies for Charley so far this year: firsts at Lincoln, Kansas City, and Dayton, with a second at Oklahoma City. He modestly claimed Bill Thomas being absent from Dayton made the last win possible.

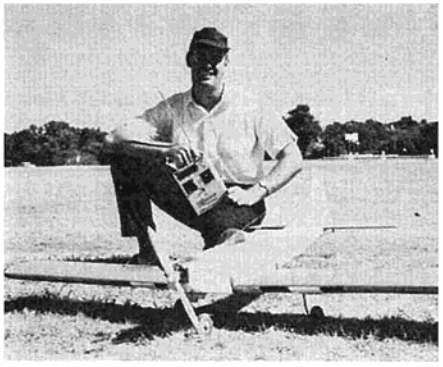
The big entry was in Class IIIN where 32 RCers competed. K. A. Finkenbiner, W. Kirkcannel, and Bill Denson were noted to take these honors among 'multi' beginners. Class IIIE had 24 entries in a close match where the corncob from Cheektowaga, N. Y., Harold "Pappy" deBolt, took first. Another New Yorker, Ed Izzo, took second followed by Ron Chidgey of Pensacola, Florida. Don Ballreich was the only 'local' expert to place, scoring 4th ahead of Jim "Daddy Rabbit" Whitley of Decator, Alabama, Tony Bonetti of Emerson, N. J., and Ron Chapman, of Norseman renown, from Ontario, Canada.

Open pylon also went to deBolt, while Hale Wallace of Endicott, N. Y. won Scale. Goodyear went to deBolt's team mate, Ed Keck, with Limbo and Combat being won by Izzo and Doug Garret, respectively.

This contest, as did the TORKS meet the previous month, featured a special Class III Expert pattern which was cooly received by some of the fliers. While the TORKS pattern was an abbreviated and rearranged

(Continued on Page 44)

Below: Joe Myles in familiar pose. Claimed 4 trophies at SARCS Capital City meet in Jackson, Miss. Mike Kleinpeter, Baton Rouge RC'er, does honors. Right: KCRC's Reed and new original Class II. Four wins, so far. . . .



Norm Rhodes and K-Fli, dominates east Texas contests.

TOP OUT

(Continued from Page 43)

AMA pattern, the Dayton contest featured one having a mix of AMA, FAI, and original maneuvers. The Dayton pattern did not receive the advance notice the TORKS pattern had, consequently a little more reaction occurred from the surprise. It might be noted that while change is sought it appears fliers want it in a way that allows chance for practice and orientation prior to committing to the concentration and pressure required in an important meet. It would seem the notion some hold that expert contest pilots are supposed to be able to fly any pattern right off doesn't allow for — believe it or not — the considerable physiological factors involved in contest flying. It makes sense that when RC pilots travel great distances — they came from as far away as Florida and Connecticut for this 2-day Dayton meet—and spend a good amount of time and money to compete, they need preparation in the form of flying practice so their performance may be predictable and top notch. We've pointed out here before that physical conditioning is a considerable factor in top performances. As in golf, conditioning, in combination with the mental concentration that's required, leaves no doubt as to the need for as much advance practice as possible. Pro golfers, as you know, take a couple days of practice before a tourney, despite almost constant playing, to 'settle' their technique.

It isn't intended to be at all critical of the conduct of the Dayton or TORKS meets. Both, in fact, reflected a strong desire to see an advance in the RC art and to make it interesting for the pilot. Criticism instead, we think, should be channelled into action to bring about timely contest rules changes so as to reflect the growing and altered need of contest men and the sport we're dealing with. Past blindness — or ineptness — has no place in the current picture if outstanding effort such as the Dayton contest are to be afforded a mutually accepted national pattern of contest operation.

Bobby Woods and admirers. Veteran Oke City Jr. placed 4th at Dayton.

- **McDONNEL SPRING RALLY.**
  Class I Chas. Yost, Terry Dickerson, Bill Eddy
  Class II Don Winter, Dail Stone, Fred Saunders
  Class III Jim House, Don Dickerson, Al Signorino

Irl Otte was CD for the Rally and commented via the June CARRIER WAVE, "Who said that class I was dead; we had as many entries in class I as in class III!"

- **CENTERVILLE CADETS MEET.**
  Class I Dallas Armstrong, Clarence Golightly
  Class II Al Signorino, Gill Lindquist, Dick Jamerson
  Class IIIN Bill Butters, Bob Owens, Glen Lovsey
  Class IIIE Guy Oliver — ?
  Scale Bill Weaver, Dallas Armstrong

- **SIGNAL CHASERS RC MEET.**
  Class I Dallas Armstrong, Travis McGinnis, Billy Sostman
  Class II Mac McClure, Al Signorino, Gill Lindquist
  Class III Guy Oliver, Jimm Bissel, Ken Stroh

- **OILY BIRDS TEXAS ANNUAL.**
  Class I Dick Dixon, Buddy Brammer, Bob Moore
  Class I Jr. Wayne Moore
  Class II Bill Fledschan, Wally Armand, Val Hutchinson
  Class IIIN Jack Devine, John Pagan, Gerry Meyers
  Class IIIE Norm Rhodes, Cal Scully, Jim Witt

- **MID-TENNESSEE**
  Class II D. M. Penry, K. K. McClure, B. Floyd
  Class IIIN Huffman, Austin, Johnson
  Class IIIE Jim Whitley, E. Dunn, Jim Edwards
  Open Pylon Jerry Krause, Jim Edwards, E. Dunn
  Goodyear Jerry Krause, Jim Whitley, Don Coleman

Note: 72 mc equipment apparently had TV interference.

- **10th ANNUAL RED RIVER CONTEST.**
  Class I Vic Dickson, Phil Roy, Chuck Winchester
  Class II J. D. Wingo, H. R. Dickson, John Gorski
  Class IIIN Dan Carey, Ed Carr, Harold Baker
  Class IIIE Jim Witt, Dave Elby, Bob Pearce
  Rat Race Jack Devine, Curt Brownlee, Dave Elby

Murry Frank, Dist. VIII Contest Coordinator was CD and kept things moving to make 8 rounds. The contest was sponsored by the Wichita Falls JayCees who sustain and improve an oustanding model park with funds raised from the meet. It was a 3-ring affair with UC and FF and saw 228 contestants sign up, making it one of the year's biggest.

- **FLYING BISONS FLY-IN.** Harold "Pappy" deBolt reports the Fly-In was used to make a serious try to clock flying speeds of various planes through use of an accurate 1/10th mile speed trap and making multiple runs during the day. Here's what Pap had to say: "The results were not only interesting but surprising to most modelers. It seems we **all** are flying faster than anyone would have guessed. It was also apparent that the better **maneuvering** models flew **faster** than others of similar type."

Here are some representative results, all flown with sport fuel, standard props, and stock engines:

Pilot	Aircraft	Engine	Upwind	Downwind
John Schmidt	Acrobat	OS 58	72	72
John Roth	Cobra	KB 40	105	105
Ralph Blenker	P-Shooter	OS 40	81	90
H. deBolt	Goodyear Spl.	KB 40	132	150
H. deBolt	Cobra	KB 40	90	120
Vern Krehbeil	Navajo	Merco 49	70	81
Don Ball	Cherokee	ST 51	69	72
Ralph Blenker	Taurus	ST 60	81	88

Harold concluded, "Many passes were made by all models and it is surprising to see how consistant the times can be. Also, how much difference in speed there can be with a rich engine as compared to a peaked one. We just had to find out! Interesting?" . . . Sure is, Hal. What about speed and mufflers?

- **BIRDS CLUB CONTEST.** In California, the big BIRDS club (200 members), like many clubs that encourage contest participation, keep tally of members' contest action, award 5 points for a win down to 1 point for 5th place. A point is also allowed for each contest entered. At the end of the competition year 1 Jan. - 1 Dec.) the winner receives the Paul Mantz Memorial Trophy which is awarded at the

BOMBS AWAY!!

Chicagoland RC'ers find bombing event exciting. Ed Wargo immortalizes poignant moment. . . . (From WINDY CITY Newsletter)

annual Christmas party. Last year Joe Bridi won the award and he remains tough to beat in 1967. Mid-season, here's how the top ten BIRDS line up:

Joe Bridi	54
Joe Stream	34
Bror Fabor	27
Harry Gould	25
Jim Colvin	24
Jerry Nelson	22
Dick Emerson	19
Hal Mayberry	19
Paul Bender	13
Al Schuback	12
Fred Sage	12
Bill Halpin	11

. . . This brings to mind the AMA standings that were once started. Wonder what happened to them?

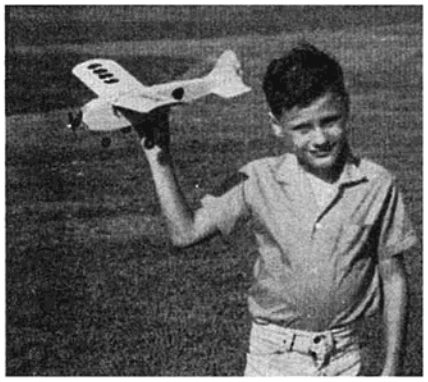
● **SANTA CRUZ SLOPE SOARING.** Sponsored by the Santa Cruz County R/C Bees, this was one of the first slope soaring contests.

Class II Jerry Fry, Dick Simons
Class IIIN Steve Kosby, Harry Gould, Joe Stream
Class IIIE Joe Foster, Jim Spurlock, Bill Dennis

● **KCRC ANNUAL.**

Class II Chas. Reed, Len McCoy, J. D. Wingo
Class IIIN Mark Vanzant, G. Struzenberg, Bill Knost
Class IIIE Bryan Lakin, M. Laboi, Maxey Hester
Scale Bud Atkinson, Maxey Hester, A. Bonnano

Special credits go to the Jacomo Park personnel who leveled the field, mowed the grass, provided picnic tables and portable accommodations. Many hobby industry firms donated merchandise prizes, and a separate bow to John Slater, Bill Scarboro, Jess Laboi, Herb Hines, Courtney Smith, Max Boal, Hubert Speer, Mark Vanzant,



Wayne Moore and first R/C. A 24" Oily Bird, placed 1st in first contest, Class I Jr. at Port Arthur, Tex.

and Bob Almes who all labored long mid heat and humidity as judges for the meet. . . .

● **CAPITAL CITY ANNUAL.**

Class I Miles Reed, Dick Garmhausen, Lynton Younger
Class II K. K. McClure, J. W. McClellan, J. D. Alexander
Class IIIN H. Roberts, E. Cowby, Al Wiltz
Class IIIE Jim Edwards, Don Coleman, Joe Myles
Scale C. Von Seutter, H. Waltman, Joe Myles
Goodyear Joe Myles
Pylon Jim Edwards
T & G Jim Edwards, Bob Woods, Joe Myles

This was the first contest of the newly formed SARCS — Southern Area Radio Control Senate — an association of R/C clubs from Florida to Louisiana. A supper-meeting was held during the Capital City meet at Jackson, Miss., where J. W. McClellan was honored with the "Mississippi Man of the Year" award. Al Wiltz was also honored with the "SARCS Man of the Year" award for his work in bringing the R/C Senate into being. Al is its first president and sparked formation of the association of club from Pensacola, New Orleans, Baton Rouge, Lake Charles, Jackson, New Iberia, and Mobile. Its aims and purposes include:

- Bring about better contest coordination
- Improve and increase communication
- Develop social activities
- Promote a winter trade show or symposium
- Create R/C as an adult sport
- Foster better news coverage

Meetings of 2 delegates from each club are on a quarterly basis. Their next contest is set for 30 Sep. - 1 Oct. at the CCRCC field in New Orleans.

● **2nd ANNUAL PEORIA CONTEST.**

Class IIIN Dennis Foley, Casey Zumba, Gene Barker
Class IIIE Marve Doucey, Jim Hoffer, Les Fruh
Goodyear Vern Springer, Aldon Annis, Bill Heger

● **CHICAGOLAND BOMB DROP.** Vying for prizes from Al's Hobby Shop ranging from an Enya 60 to a handful of props, Chicago fliers took their work seriously with these results:

Dave Burt — 4'-3"
Norm Page — 4'-9"
Elmer Helfert — 5'-3"

Here's how Joe Mungo reported the meet in WINDY CITY: "— our first club contest is over and to say it was an exciting event is to put it mildly! We had a total of 31 contestants and flew 3 rounds. The first round was routine except for Dave Burt's drop. (It proved to be the winning toss.) It was a picture to watch. He made an East-West pass across the field using his new Raider 10 at about 20 feet off the ground. (!) When he was 10 feet in front of the target he dipped the nose and almost scored a ringer! His bomb stopped 4'-3" from target.

"During the second round the boys really started to get their bombing eye and it was rare when someone missed the field. . . . By the 3rd round we had a hard time keeping not only spectators back, but also the contestants who were lining up along the edge of the field for a closer look at the drops. The important thing was that everyone seemed to have a good time. I know I enjoyed myself and that the phone calls and the running around were really worth the effort. There's that certain satisfaction of giving that some of our members will never understand for they are only takers. . . ."

There you are! Is your club's flying jaded? Then try a bomb drop, it ought to spark things. Of course, enthusiasm like Joe Mungo's will help too. . . .

THE NATIONAL SCENE

● **VIRGINIA.** Item from FEEDBACK: "Betsy Clem won second place in RCM's Model Wife Contest, and now has a supply of unmentionables from Stardust Lingerie. Ron got a subscription to RCM." Sudden thought: RC'ers are a sneaky bunch. What a way to get 2 prizes. . . .

● **CALIFORNIA.** The Larks staged an R/C demonstration for the 2-day Pomona Valley Air Races and Air Show at Bracket Field. A 15-member contingent including Dick Riggs, Don Menzminer, Jerry Nelson, Joe Martin, Granger Williams, and Bob Thomas (who provided details of the excursion in the LARKS newletter) enjoyed up-front seats for the show and filled in a couple in-between spots with some R/C whip-de-do. Dick Riggs used his neat biplane, while Don Menzminer had a "home brewed gray goose — the only R/C plane that can fly on its side just as good as right side up." Granger Williams had his "patented" Nieuport 28 and added a few maneuvers to the aerobatic art during his performance. Joe Martin's plastic job got homing pigeon-itis and flew off while an unnamed flier panicked with an Antic. Despite this and a misunderstanding with Robert Lansing of movie fame, who manned the mike on Sunday ("manned" is the right word, isn't it, Bob?), the crowd was pleased with the R/C show and the LARKS added another page to their memory book. . . .

From the Pioneer R/C Club Modulator: "The Carl Peters Memorial Trophy, awarded each year to the most valuable member of the club, was won again by Tillie Alvarado, who continues to be the recipient of everyone's appreciation for the tremendous job he has done on our flying field. We thought he did a great job last year, but this year Tillie even excelled last year's effort."

Also from the Modulator: "Considering the fact that contests for R/C slope soaring . . ." Bob, now we've heard them all. . . .

● **OREGON.** Someone — we're not necessarily asking who — with a wit to match that of Henry Morgan, pens the AERONAUTS CHATTER for the Eugene RC'ers. There's much humor in many newsletters but this brand is sorta sneaky — and besides, it's presented so straightfaced — that it's taken awhile to recognize what's being dealt. Since he deserves a broader audience, here are a few of his jabs and jibes — rendered in the spirit of convivial fraternity, an' all tha' sorta stuf' . . .

"The (meeting) time is 7 PM at the Santa Clara school. All guests are welcome — even if you have attended a previous meeting. Look us over several times . . . before you decide about joining our club!"

"All members are welcome also — attendance has declined. . . ."

"If Henry B. can lift a finger we may have paper cups so guests and members can drink the coffee. . . . If he lifts a second finger — maybe we could have movies!"

"WHAT'S FLYING? This is a new feature . . . designed to forever etch in the annuls of history those fleeting moments in each modeler's life — that can be described as, flying . . ."

"Most of the rest of us are patching — swearing, building — swearing . . . and saving our copper nickels for new goodies. Anyone who feels left out of the list may contact the editor — that's contact, not smash — and **your** plane will be added to the list . . ."

"Jim Tull says that he was unable to rouse up any cowboys — or cowgirls, for that matter — with land available for our use. He suggested we all take up indoor gliders. Jim (a radio announcer) said he could only ad lib — I think that's when your upper lip doesn't meet your lower lip — for a couple hours about R/C on the air. Many thanks, anyway, Jim — and keep up the good work on that ad lib stuff. You are always welcome at the field and meetings — lib, or no lib. . . ."

To this, we can only add an original thought created just for this occasion — it takes all kinds. . . .

TOP OUT'S
CONTEST CALENDAR

SEPT. 9-10 — Cleburne, Tex. (AAA) Cleburne Centennial Air Show for Class II-III, Pylon Racing (J)(SO). Site: Municipal Airport. C. Gragg CD, 1104 E. 6th St., Irving, Tex. 75060.

SEPT. 9-10—Hastings, Nebr. (AA), Hastings Skylarks R/C Meet for Class I, II, III, Scale (O)-P. Site: 6 miles north of Hastings. M. Shafer CD, RR #2, Hastings, Nebr. 68901. Sponsor: Hastings Skylarks R/C Club.

SEPT. 9-10 — Detroit, Mich. (AA) Greater Detroit Air Show Meet for Class III, Scale (O)-G. Site: 18 Mile & Mound. By Invitation Only. K. Taylor CD, 20222 Marx, Detroit, Mich. 48203. Sponsor: R/C Club of Detroit.

SEPT. 10 — Sharon, Pa. Skylarks R/C Invitational for Class I-III (O)-G. Spec. Events. Site: Club field, Weldon Rd. G. Ehnot CD, 365 N. Oakland Ave., Sharon, Pa. 16146. Sponsor: Skylarks MAC.

SEPT. 10 — Fiskdale, Mass. (AA) 2nd Annual New England Hydro R/C Championships for Class I-III, Scale (JSO). Site: Brimfield Dam. J. Ross CD, 19 Sterling Dr., Dover, Mass. 02030. Sponsor: New England R/C Modellers.

SEPT. 10 — Buffalo, N. Y. (AA) Bison R/C Races for Pylon, Pylon Racing (JSO)-P. Site: Amherst Air Park. H. deBolt CD, 3833 Harlem Rd., Buffalo, New York 14225.

SEPT. 16-17 — West Suffield, Conn. (AA) 3rd Annual NCRCC Contest for Class I-III, Scale, Pylon Racing Goodyear (O)-P. Site: NCRCC Field. B. Williams CD, 347 Southwick Rd., Westfield, Mass. 01085.

SEPT. 16-17 — Conklin, Mich. (AA) Grand Rapids Annual R/C Meet for Class III N/E (O)-G. Site: Den Hoff Farm. J. Wolflin CD, 807 Eleanor N.E., Grand Rapids, Mich. 49505. Sponsor: Grand Rapids R/C Club.

SEPT. 17 — Ft. Wayne, Ind. (AA) Ft. Wayne Flying Circuits Annual Contest for Class I, III (JSO) Pylon (Solo) Open (JS) (O). R. Steele CD, 2136 Gillmore Dr., Ft. Wayne, Ind. 46808.

SEPT. 17 — Frederick, Md. (AAA) 1967 Maryland Model Airplane Meet for Class I (J) (SO) Class II, III N/E (JSO)-P. Site: Municipal Airport. J. Patton CD, Route 5, Frederick, Md. 21701. Sponsor: Frederick MAC.

SEPT. 17 — Lakehurst, N. J. (AA) North Jersey R/C Contest for Class I-II, III N/E, Scale-P. Site: Naval Air Station. T. Bonetti CD, 200 Park Ave., Emerson, N. J. 07630. Sponsor: North Jersey R/C Club.

SEPT. 17 — Falconer, N. Y. (AA) Flying Aces Annual Contest for Pylon (Solo) Open & Goodyear, Scale (O)-G. Spec. Events. Site: Model Airport. W. Johnson CD, 62 Widrig Ave., Jamestown, N. Y. 14701.

SEPT. 17 — New Castle, Pa. PORKS 8th Annual Invitational Meet for Class I, II, III, Pylon (Solo). Z. Allerton CD, 124 Richelieu Ave., New Castle, Pa. 16101. Sponsor: P.O.R.K.S.

SEPT. 23 — Rhinebeck, N. Y. (A) World War I R/C Aircraft Jamboree. Site: Old Rhinebeck Aerodrome. R. Allen CD, Birch Hill Dr. #3, Poughkeepsie, N. Y. 12603. Sponsor: IBM R/C Model Club of Poughkeepsie.

SEPT. 23-24 — Wyandotte, Mich. (AA) 14th Annual Indian City Meet for Scale (JSO)-D&G. Site: Penns. & Allen Rds. E. Lynn CD, 3167 22nd, Wyandotte, Mich. 48192.

SEPT. 23-24 — Houston, Tex. (AA) Houston R/C 1st Annual Fall Contest for Class I (JS) (O) Class II, III N/E, Scale-Pylon Racing (JSO)-D. Site: Houston R/C Field. C. Hirsch CD, 412 W. 30th, Houston Tex. 77018. Sponsor: Houston R/C Club.

SEPT. 24 — Rock, N. Y. (AA) Penn. Ave. R/C Society Annual Meet for Class II, III N/E (O)-P. Site: Riis Park. J. D'Amico CD, 9224 Rost Pl., Brooklyn, N. Y. 11236. Sponsor: Penn. Ave. R/C Soc.

SEPT. 24 — Cleveland, Ohio (AA) 1st Annual Northern Ohio Pylon Day for Pylon (Solo) Open, AMA & Goodyear (JSO)-GX. Site: City Rec. Field. J. Grega CD, 355 Grand Blvd., Bedford, Ohio 44014.

SEPT. 30-OCT. 1 — New Orleans, La. (AA) 6th Annual Crescent City R/C Contest for Class I-II, III N/E, Pylon Racing (JSO)-G. Spec. Event. Site: Club Flying Field. A Wiltz CD, 3231 47th St., Metairie, La. 70001. Sponsor: Crescent City R/C Club.

SEPT. 30-OCT. 1 — Norfolk, Va. (AA) Annual R/C Contest for Class I, II-III N/E, Pylon Racing Open & Goodyear (JSO)-P. Site: Navy Field, Fentress. A. Andersen CD, 107 Delaware Ave., Norfolk, Va. 23504. Sponsor: Tidewater R/C Club.

OCT. 1 — Pittstown, N. J. (AA) Central Jersey Eastern States R/C Meet for Class I-III, Scale-Pylon Racing (JSO)-G. Site: Sky-Manor Airport. L. Shulman CD, 42 Blake Ave., Cranford, N. J. 07016. Sponsor: Central Jersey R/C Club.

OCT. 7-8 — Las Vegas, Nev. (AA) LVRC Annual Meet for Class I-II, III N/E, Pylon (Solo)-Scale-Pylon Racing (JS) (O)-D. Site: Henderson Dry Lake. D. Kinard CD, 5300 W. Doe Ave., Las Vegas, Nev. 89102. Sponsor: Las Vegas Radio Controllers.

OCT. 8 — Watermill, L. I., N. Y. (AA) Suffolk Falcons Seaplane R/C Meet for Class II-III, Scale. Site: Watermill Pond. D. McGovern CD, Drawer E, 140 Wagon Lane West, Centereach, L. I., N. Y. 11720. Sponsor: Suffolk Falcons.

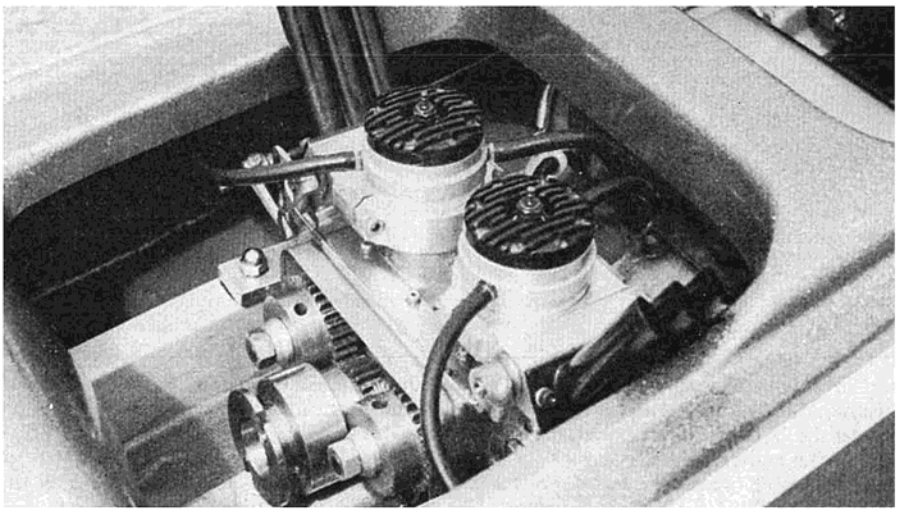
OCT. 14-15 — San Antonio, Texas. (AA) ARCS Fall R/C Contest for Class I-II-III-Pylon (Solo) (JSO)-G&P. Site: Culebra & Calahan Rd. G. Aldrich CD, 3219 Shady Springs, San Antonio, Tex. 78230. Sponsor: Alamo R/C Society.

OCT. 21-22 — Mobile, Ala. (AA) Gulf Coast R/C Club 4th Annual Meet for Class I-II, III N/E, Scale-Pylon Racing (JSO)-P. Site: Plum Forty. J. Sabine CD, 10 Maury Dr., Mobile, Ala. 36606. Sponsor: Gulf Coast R/C Club.

NOV. 4-5 — Tucson, Ariz. (AA) 3rd Annual Cactus Festival for Class III N/E. Pylon Racing Goodyear (O)-P. Site: Marana Air Park. E. Metzer CD, 7043 E. Malvern, Tucson, Ariz. 85710.

NOV. 11-12 — Sunnyvale, Calif. (AA) Pioneer R/C Stunt Meet for Class I-III (O)-P. Site: Pioneer Field. J. Sunday CD, 363 El Camino Real, Mt. View, Calif. 94040. Sponsor: Pioneer R/C Club.

DEC. 29-31—Sebring, Fla. (AAA) 14th King Orange Internationals for Class I-III, Pylon, Scale (J) (S) (O)-G&P. Spec. Events. Site: Air Terminal. T. Sutor CD, Rt. #2, Box 470, Sebring, Fla. 33870.



The Ultimate Twin in Mako fiberglass ski boat. IMPBA record holder. Note stainless steel safety shield over gears, exhaust stacks painted with hi-temp black enamel, and coupled exhaust baffle throttles.

ULTIMATE TWIN!

BY JIM WHITLATCH

The Rossi Twin .60, or "How Uncle Jim created a monster!"

I SAID last month in the Bara Boat article that I'd follow up with some pictures and comments on the Rossi Twin. This project is the culmination of a twenty year desire to make a "geared-together" twin. I originally drew up the spec's for a pair of Hornet 60's way back in 1947! With two racing Rossi's you just gotta' hear it and see it to believe it! First let me give credit where credit is due—first to Lewis A. Stevens (world R/C boat speed record holder and master machinist) for doing the beautiful work on the twin; second to Bill McGraw owner of Bill's Miniature Engines, 1325 Carol Drive, Memphis, Tennessee, (chief importer of Rossi's who supplied 'em); third to Dick McCoy of McCoy racing (and other) engine fame who was technical advisor on the proper gears, pitch and hardness; to Tom Perzentka of Octura Models who supplied the Rossi flywheel tapered collets for gear mounting, etc., and finally to my innumerable "friends" who said **it wouldn't work** and thereby provided motivation for finishing the Ultimate Twin.

If you aren't a machinist or don't have a close friend who is — just **read** this article — don't plan on duplicating this thing with a file and hand drill! In other words this is a "pros" project. However, here's some tips for you brave, foolish, rich and "able - to - conceal - from - your - wives - how - much - R/C - model - boating - really-costs," modelers, on how **we** did it.

First you have to realize that one Rossi sits backwards — the exhaust port is out the wrong side. Ever try turning a Rossi around by just unbolting the front and rear ends and reassembling? If you have, you'll soon discover that the inside I.D. is not the same on both ends. Therefore you have to machine out to a larger diameter the crankshaft end so that the rotor valve assembly will fit into it, then sleeve the crankshaft end cap to fit into the larger diameter rotor end. Confusin' ain't it?

Now you've got the left engine with the exhaust pointing to the outside. Helps keep the other engine cool.

Next, what gears to use? I went to the Boston Gear Co. small gear and bearing catalog for help, and with advice from Dick McCoy's 25 years of race car experience, selected steel 20 pitch, 20° pressure angle gears. Part No. YA 30 on the engines turning YA 25 on the jack shaft gave me a 20% overdrive. These gears have ½" faces, a projecting hub of 7/16" and a hole of ½". Chuck up the hub, dial indicate 'till true, then cut the teeth working face down to ¼" and taper bore to fit Octura's Rossi Flywheel "four way split" tapered collets. Now you're well on your way. By using a ⅜" jack shaft the Rossi collet works for the center gear, too. We used Fafnir ball bearings for the jack shaft. They're special, too, having a relatively small outside diameter so the engines can sit so close together, (3/16").

Of course, the **real** complicated part of this mill is laying out and machinging the connecting face plate and bearing housing block. Use the pitch diameters of the gears, figure how far the engines can be apart, how far below crankshaft center line the jack shaft has to be so the ball bearings O.D. have clearance, and it's simple! Like a Japanese wooden puzzle. Oh yeah — I forgot to mention, when you're machining the Rossi blocks don't forget to water jacket 'em, and while you're at it, re-drill and tap all those Italian size front and rear case holes out to 8-32 allen head cap screw size.

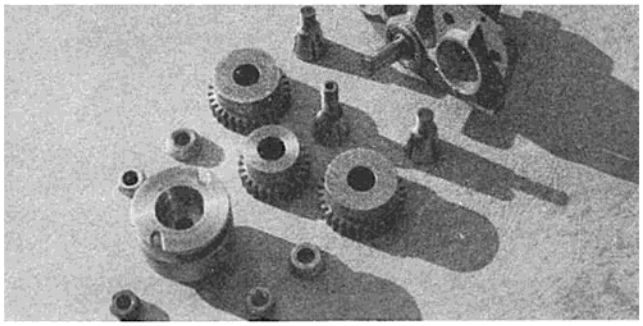
From here on just look at the pictures and capitions and quit drooling all over — that's how "Steve" Stevens machines things!

Some running tips: I didn't want to run "pressure" so I inserted ½" O.D. thin wall brass tubes into the stock Rossi racing carbs, flared the ends, left them approx. 2⅜" long from flared end to **face** of rotor valve, and then to get even more suction, used Super Tiger 51 R/C "spray bar" type needle valves. By exhaust baffles only I obtained a very good idle. With this type setup, when your baffle closes, it slows down the engine — slower engine r.p.m. means less suction — less suction less fuel — doesn't "go rich" so bad. You **can't** throttle a "pressure" system with exhaust baffle only — the engine goes rich so fast it'll stop in a second or two. I'll be showing pictures of our "coupled" exhaust baffle secondary low speed needle valve system next month for pressure Rossi's and Super Tigers. When setting up the engines I set the gears to give alternate firing for smoothness and better idle, but honestly — mostly for that "oh so beautiful sound!" You might think two needle valves are foolish, and that I should have piped 'em together and only had one. **Not so!** No two engines (two cycle anyway) "needle in" exactly the same. One will be richer or leaner than the other at the same setting. By putting on a smaller prop, (an X-45), removing one glo plug, and firing up on one cylinder I needled in to a good lean two cycle on first one "lung." Then by removing the plug and inserting in the other cylinder and repeating the same "needling in" process, I got both engines set fairly close to the same r.p.m. Then I put on an X-50 Octura, put in both plugs and let 'er go! Actually the twin ran so much faster I had to turn in the needles about ½" turn each to get it to clean out. You've no doubt noticed the engines sit facing forward so that the gearing turns the rotation around — back to normal counter-clock-wise at the prop.

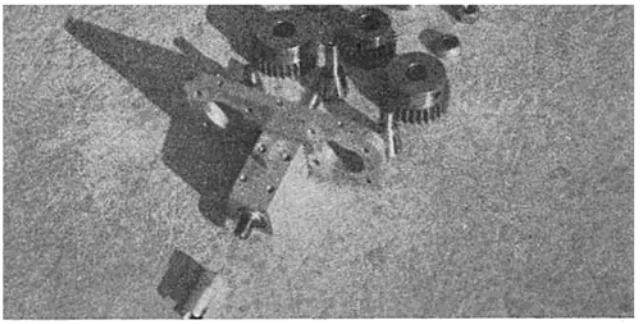
Frankly, the only problem I've had with the twin is not having a big enough hull to absorb so much power. I've flipped the big Mako several times and my luck is such that on three occasions I had to put in new connecting rods. They sorta' looked like a letter "s" after hydraulicing.

Really, shouldn't complain though, on its first official timing at Delano, California IMPBA (& Western Assoc. Modelers) Record Trials it set a new 1/16 mile record.

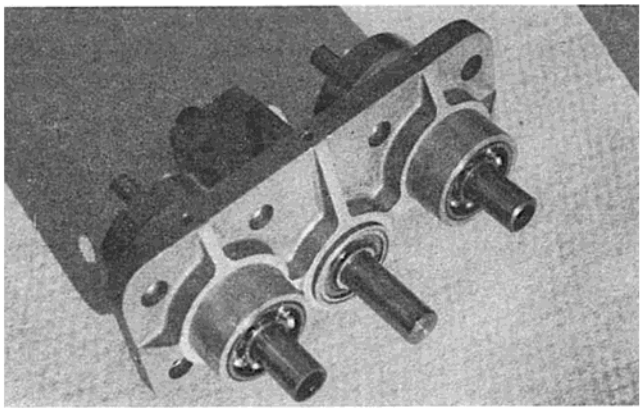
Good luck if you make one of these monsters.



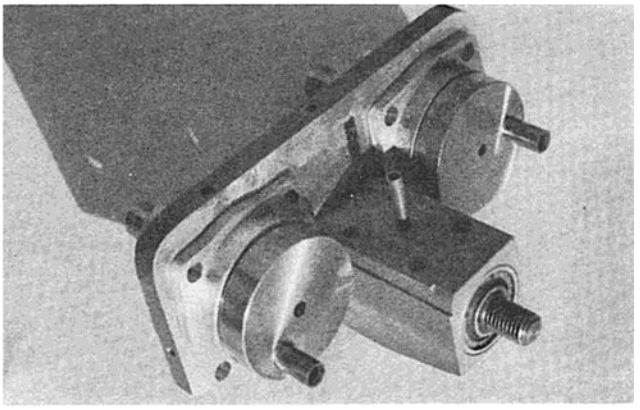
Parts layout ready for step one asembly. Jack shaft ball bearing housing block pressed into connecting face plate. Note fancy mill work on face plate by Steve Stevens.



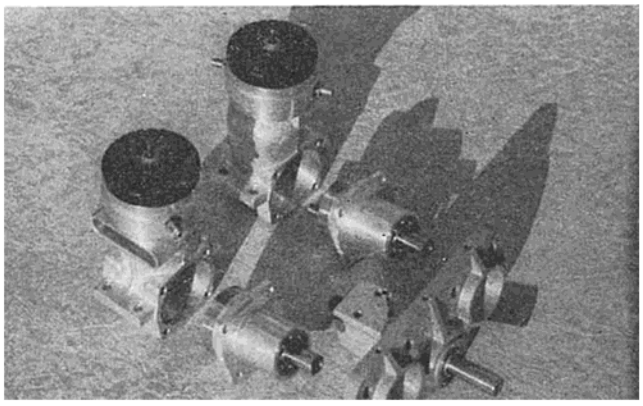
Octura Rossi flywheel tapered collects for mounting gears to engines and jackshaft. Stainless steel flywheel on center gear only has starting cord groove and notches.



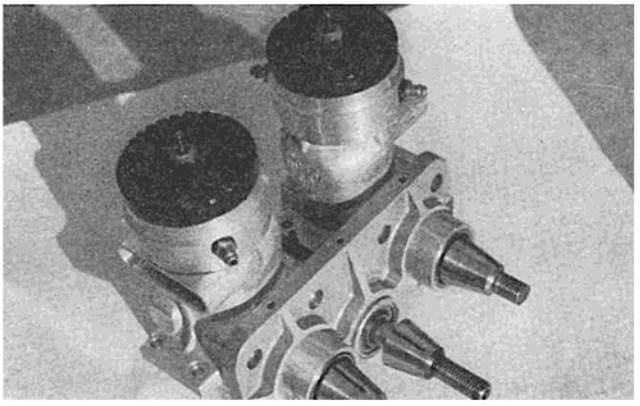
Rossi front crankshaft bearing caps machined and "palm" pressed through front connecting face plate. Note sealed ball bearing jack shaft mounting.



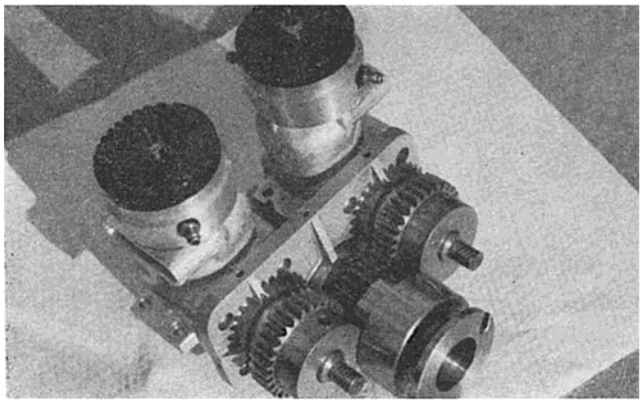
Tapped holes in jackshaft housing block are for center (inside) lugs of Rossi's to bolt down to. Threaded universal joint output end of jackshaft.



Ready to slide together. Countersunk allen-head cap screw holes in face plate don't go all the way through. Face plate is held to front caps and thus to crankcases.



All one big chunk! Everything bolts to something so that outside lugs only can be used for mounting to ¼" aluminum mounting strips.



Gears and flywheel mounted on tapered collects, flywheel presses on the projecting hub of the center gear. Rossi's **do** turn the same direction as each other.

Author-owner Jim Whitlatch gets bruised shin bones while scared helper "steadies" with one hand; look at that water the twin pushes back!

POWER & SAIL TESTS THE

AQUATRONICS DIGITAL SYSTEM

BY STEVE MUCK

The Aquatronics Proportional Control System, manufactured by the J. T. Goode Company, 894 West 18th Street, Costa Mesa, California, is available in both power and sail digital systems. The former includes servo control for motor and rudder, while the latter includes sail winch and rudder servos. The system is a full two channel digital, simultaneous, fully proportional, which gives the boating fraternity all the control needed at a low price. This radio system brings a first to the United States with the on-the-spot crystal change. Now you can enter multiple power or sailboat races and be assured of a chance to race; with Aquatronics you won't have to worry about someone else being on your Frequency. All five 27MC Frequencies are available from the manufacturer including a storage panel to keep track of them.

The Aquatronics as received by the Author consisted of a fully tuned and factory tested transmitted (2 channels), receiver and antenna loading coil, two servos, switch harness with charging jack and charging harness for transmitter and receiver power packs. Total weight of unit in boat was **30** ounces, including power pack and water tight box in which radio was mounted. This is a digital type system utilizing solid state circuitry throughout. A separate charger must be used in connection with the charging panel to charge the 12 volt transmitter battery and 9.0 volt receiver battery simultaneously. The type of charger that can be used is any 12 volt 1 amp car battery charger. (About $5.00).

The receiver battery pack used in the test radio was a seven cell 1.25 volt 600 MAH Gould Ni-Cad® rechargeable batteries. This system will also operate on six size "D" large flashlight cells. This could be rather heavy for power boats, but wouldn't bother the sailboater. The transmitter also has two battery pack options; the first being as in the test radio 8 size "C" Medium flashlight cells or 10 nickel cadmium cells of 225 MAH capacity. Another option could be 500 MAH cells. This is up to the boater and his amount of operating time. Batteries listed above will give 4 to 8 hours operation with these battery complements.

Aquatronics Transmitter

The Aquatronics transmitter is an all-transistorized unit delivering .6 watt power output, which is more than adequate.

The transmitter case is cad-iridite Steel, primed with Zinc Chromate and sprayed light blue enamel with white over printing. The sailboat version uses a knob with 270° of rudder steering, while the power boat version uses a stick with 90° of movement and self-centering. The power boat version also uses an electronic trim control knob located on the top face of the transmitter panel. The lever motor control is located on the upper left-hand face of the transmitter. The sail boat model uses push buttons for in and out sheet. The switch and charging jacks are located on the front face panel within easy reach.

The operating voltage of the Aquatronics transmitter is 12 volts DC with the power amplifier input (current) being 70 MA. The modulation time is 2 milliseconds nominal channel width at 100% modulation percentage. The overall tuning range is 26.995 to 27.255. Operating temperature range is 0-150 degrees Fah. Size of the transmitter is 2" deep by 5" wide by 7" high. Antenna is 44" collapsible base loaded whip.

Aquatronics Receiver

The Aquatronics receiver is prewired and employs color coded connectors for easy identification of each servo function. The receiver is a superheterodyne design with plug in crystal and no tuning required for frequency change. It has single deck construction. In the case of using it with a power boat, the antenna loading coil is used.

The measured sensitivity was 3 microvolts, with full range automatic gain control. Intermediate frequency is 455 KCS. Operating voltage is 9.0 volts with 40 MA current drain at Idle and 200 MA on command. Optional power can be 6 — 1½ volt dry or Alkaline cells, or as the test radio 7 — 225 or 500 MA nickel cadmium cells. Operating temperature range is from 0 degrees F to +150 degrees F. All R/C frequencies are available from stock. Overall receiver dimensions: 1" high x 2" wide x 4¼" long. The receiver weight including plugs and wires is 5 ounces.

Aquatronics Servos

The Aquatronics system utilizes the disc type output. Two types of servos are available. The test radio servos were disc type while the sailboat sheet servo has a winch drum.

Servo components and circuitry are housed in a Cadiridite Steel case same as receiver for maximum water protection.

The servo output arm is a disc type output for rudder and motor control, with ½" throw at 8 lbs. thrust or ⅝" throw at 6 lbs. thrust. Duo-Bio V-link connectors are used. The sheet servo is a winch type and rotates either direction on command. The response time for rudder and motor servo is less than ½ second from neutral to full. The winch servo response is 3 inches per second. The servos may be mounted horizontally or vertically as well as the case being rotated 180° for side mounting, and in addition the winch servo can be mounted through the deck.

Servo dimensions: 1" wide x 1⅞" high x 3 11/16" long. Weight: 5½ ounces.

Accessories

A control panel for the receiver is furnished which is wired and contains an On-Off switch with charging jack. A prewired harness is also supplied, which connects the transmitter charging jack and receiver jack to a panel containing the proper resistors for proper charging of each power pack.

Price and Availability

The Aquatronics is available from dealers or direct for $195 less battery packs and charger. Also available are crystal sets for $10.00 each.

Findings

Bench checking the removable crystals was very enlightening. By taking off the back plate of transmitter, the crystal is easily accessible for quick removal. Making sure the color coded by frequency crystals are installed with the transmitter receiving the crystal with one dot and the receiver with two dots. The next step was to center the servos. There are two centering pot controls on the printed circuit board that are screw driver adjustments. One is labeled "R" for rudder and the other "T" for throttle. The servos were centered per instructions so that the wheel holes were at right angles to the servo and stick response was equal in both directions. A note of caution — Do not use centering pots to compensate for improper linkage neutral adjustments. During installation, it is required that you hook up your own battery pack. Although the receiver control panel is prewired leaving a red and black wire to go to the 9 volt receiver pack, care must be taken that the red wire is connected to +9 volts and black to —9 volts. During checkout on the bench, the power pack was accidently plugged in in reverse; this due to a non-polarized plug installed by the author, not the factory. When the transmitter was turned on, nothing happened, so a quick check revealed the goof and the power pack quickly unplugged. The receiver and power pack were not damaged, but the servo plugged in at the time was warm and obviously damaged. The servo, after cooling, was again plugged in and found to work, but not as efficiently as before. The servo was sent to the factory and found that two transistors had been damaged. Within three days, the servo was back and operating. After installing the radio in a water tight box, it was next decided to install the radio first in a Norco Avalon which had been run for some time, which allowed us to know what we should expect of the new radio.

Running Evaluation

The first outing to the pond was not as planned! A short range check of 50 feet was made and everything checked out okay. After releasing the boat, things were well in hand until about 80 to 100 feet, when we lost it. The servos rotated to right rudder and slow engine and the boat ran until out of fuel. The receiver was sent back to the factory on Monday along with the transmitter and a diode was found at fault in the receiver (due to my connecting the batteries backward). By the following Thursday (which proved the company has good service turnaround), the radio was back and a further range check showed all problems solved with all kinds of range available.

The boat and radio were then run at a speed trial a few weeks later, and the boat now holds a WAM West Coast ¼ oval record using an ST 19 engine, Norco Avalon hull, and Aquatronics radio. Metal to metal clevis and arms which have caused some digital systems to run wild, especially

in boats, did not bother this system at all because I used metal clevis throughout. In future months, I will be installing this radio in an Octura White Heat 30 for more testing.

Here are some Recommendations

A periodic check of the receiver crystal should be made to insure it has not loosened in its socket due to rough handling. The receiver should be encased in foam for shock mounting purposes which should lessen the chances for it becoming loose. A check of our crystal after many weeks of running showed it still mounted in place with no signs of moving.

Make sure all battery packs are charged fully for two days after each weekend of running for the charging harness allows only a 20 MA rate when connected to a 12 Volt 1 Amp charger. A faster rate can be accomplished by changing the resistor on the harness and charging at a higher MA rate, say 40 to 60.

Tested, Approved, and Recommended by RCM.

AT RANDOM . . .

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Gary Preusse of G.E.M. Models in the Chicago area sent Jim Whitlatch one of his Super Challengers equipped with a 2½ horsepower Tas engine. Jim's been "showing off" to the Southern Californians! The straightaway speeds are between 35 and 40 MPH and the sharp turns don't seem to slow it down at all. The Tas engine is very impressive, starts easily, is very reliable, and on a combination of 50% glo fuel and 50% plain gasoline, it goes like a bomb and runs forever on a 10 oz. clunk tank. RCM can highly recommend this combination.

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The Blue Dolphins of Bakersfield, Calif., are holding an all day Multi Boat race on Sunday, October 1, 1967, with several classes of engine size; .00 to .20, .21 to .40 and .41 and over. Hydros will be a separate class. And they've promised some new and more challenging courses to run, etc. See you at Lake Woollomes in Delano the first of October.

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White Heats invade West Coast! Don Tucker and Roger Stump of San Fernando Valley showed the Southern California boys the way around at the Modeleers' recent meet in Los Angeles. Don took first place in both the Lap Speed event and the Multi Boat Race with Roger taking second place in both events. The race was stacked in favor of the White Heats since they were run clockwise (right hand turns) as in the East and Mid-West. At least this was the excuse given by the supposedly hot West Coast boaters that couldn't keep up! Both boats are Tom Perzentka's (Octura Models) 4-60 types. And both were using Super Tiger 60 R/C model engines. Jim Whitlatch just couldn't resist reporting that in the lap speed event his record holding Ski boat with a new K&B rear rotor 40 turned the course in 32 seconds while Tucker's fastest time with his 60 powered White Heat was 35 seconds. Of course hardly anybody can turn lap times like Jim's little Ski boat. He just set a new all time official IMPBA and WAM ¼ mile oval record of 39 seconds. This is the first time that a monoplane has ever turned the ¼ mile in under 40 seconds in **any** class!

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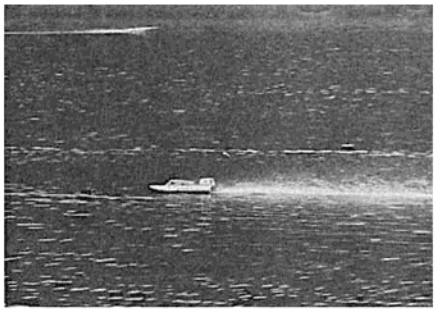
The DeVry Dolphins held their invitational R/C model multi-boat race on June 12th at Wheeling, Illinois. Combined

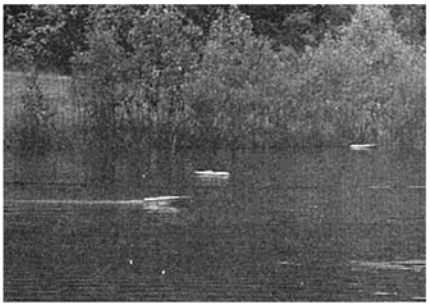


classes "A"-"B", "C"-"D" and "E"-"F" were run two heats in each with a maximum of four boats in each heat.

Bob Voelker of the Minute Breakers R/C Model Boat Club took 1st in the combined "C"-"D" class with his White Heat 30 powered with a K&B 40 rear rotary. Bob used a home built Digitrio for control. Picture #1 shows Bob's hydro tearing down the front stretch while trailing in the back stretch is a ski boat in futile pursuit.

Picture #2 is Merle Kobernick of the Tri-City Radio Controllers with his hydro plane.

Picture #3 shows Mike Meelbush of the DeVry Dolphins bringing Gary Preusse's "F" class ski boat up after it sank while being towed off the course. George Dean also of the DeVry Dolphins maneuvers the retriever boat into position.

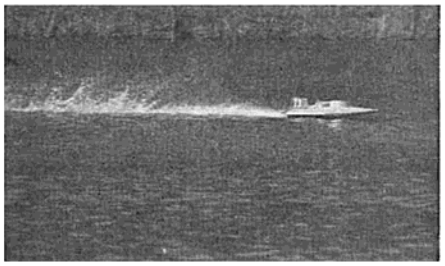


Picture #4 — Carver Penwell of the Minute Breakers, ski boat "Hot Canary" streaks past his dormant competition in the Sportsman class race for ski boats. The winner of any race is the one that gets across the finish line first.

Picture #5 — winner of the combined Class "E" and "R" was Dick Schnell of Morton Grove, Illinois. Dick was running his "Mach Schnell," a White Heat 4-60 powered with a Rossi 60 in competition for the first time. A Citizenship proportional was used for control. Missile mist fuel and an Octura #5 prop.

Picture #6 is of Dick receiving his trophy from George Dean of the DeVry Dolphins.

Picture #7 is of Dick Schnell's hull under way down the back stretch.

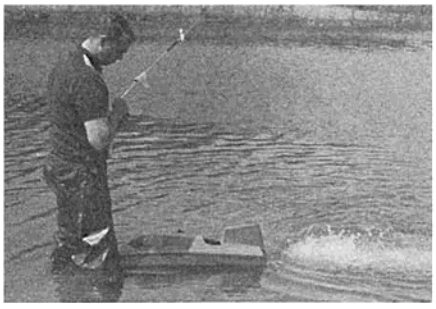


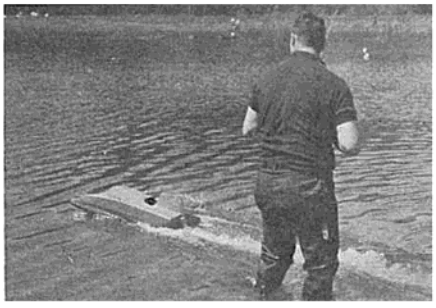
Picture #8 is of, left to right, Mike Meelbush of the DeVry Dolphins, Dick Schnell of Morton Grove, Illinois, Ron Buck of the Minute Breakers R/C Club. All three hulls are White Heat 4-60's, plywood construction, fiberglass cowls, front

and rear. All used Rossi 60 engines, Octura fittings — Mike and Ron used Octura X55 props and Dick used an Octura #5 prop which he finished himself.

Mike used an Orbit 3+1, Ron Buck a Logictrol. Ron took a 2nd and Mike — his boat ran out of fuel about 10 feet before the finish line. Tough luck.

Picture #9 — Mike Meelbush releases his O&R C-III powered "Hydro-phobia," a White Heat XV design. Hull is all plywood, natural mahogany finish with fiberglass cowlings finished in International Orange.





Picture #10 — Bob Weirick of the Tri-City Radio Controllers, Beloit, Wisconsin, with his White Heat XIV hydro powered with an O&R C-III engine.

Also competing for the first time was Ed Kalfus of Poughkeepsie, New York. Ed, top man in tether boat racing, has switched to R/C boating. Using his record breaking 15cc tether engine (104 m.p.h.) detuned and equipped with exhaust restrictors he has installed it in a White Heat 4-60 hull, for this year's running. Last year he had it mounted in a White Heat 60 hull but found the combination not suitable for oval racing. However, this year it's a different story. This was Ed's first time on a measured course with three buoy turns, and his first time in multi boat racing. While Ed didn't place this race, he picked up some valuable experience. His competitors were Ron Buck, Mike Meelbush and Gene Milasius. Any of these fellows will tell you Ed did not sneak up on them unheard, they heard him coming. Ask Jim Whitlatch about the sound of Ed's engine when he opens the throttle.

After checking all the photos taken it was discovered no pictures of Ed's boat had been taken, either underway or on the stand. Some oversight! But you'll probably be seeing and hearing more about this boat, named "Oops" as the season progresses.

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The Hawaiian Model Boat Association, known as the Aloha Model Power Boat Association is only a little over three months old. Most of the model boat activity centers around the lagoon at the Diamond Head end of Ala Moana Park on Sunday afternoons. The photo shows two Dumas 18" Ace Racing Sloops with Waikiki in the background.

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